Partners In Flight
Draft Bird Conservation Plan
Montana

VERSION 1.0

Montana Partners In Flight
Draft: January 2000

Address comments to:
Daniel Casey
American Bird Conservancy
c/o Montana Fish, Wildlife and Parks
490 N. Meridian
Kalispell, MT 59901

(406)756-2681

dancasey@digisys.net

EXECUTIVE SUMMARY:

JUSTIFICATION

Continental and local declines in numerous bird populations have lead to concern for the future of migratory and resident bird species. The reasons for these declines are complex. Habitat loss, modification, and fragmentation, loss of wintering and migration habitat, and brood parasitism have all been implicated. Scientists and the concerned public agreed that a coordinated, cooperative conservation effort focusing on birds was needed. Partners in Flight was conceived as a voluntary, international coalition of government agencies, academic institutions, private businesses and citizens dedicated to the concept of "keeping common birds common".

PURPOSE AND SCOPE

Montana Partners in Flight has prepared this plan to focus on restoring healthy ecosystems that will sustain productive and complete bird communities. By identifying priority species and habitats, and providing a number of conservation objectives and strategies for each, we hope to empower agencies, landowners, conservation groups and local decision makers to take the steps necessary to ensure a sound future for Montana's avifauna.

Priority habitats were identified from the combined needs of priority species, as well as conservation concerns specific to the habitats themselves. This is, therefore, very much a habitat-based plan.

This version (1.0) of the Montana Bird Conservation Plan covers 5 major habitat groups (Grassland, Shrubland, Forest, Riparian and Wetland), and from 2-9 prioritized subtypes in each. We describe the distribution, importance, vegetative and structural characteristics, historical and current trends, and species associations characteristic to each priority habitat. Management issues, recommendations and objectives are given for each. These are tied to the needs of priority bird species, with assumptions, research and monitoring needs identified in each case. This is the first version of this plan to see wide circulation, and it is meant to serve as a significant starting point toward all-bird conservation in Montana. Future versions will address habitats in more detail, and will incorporate changes designed to increase the utility of the plan.

Montana Partners in Flight considered 141 species for priority status. We identified 14 high priority species in need of immediate conservation action, 43 moderate priority species with lesser threats but in need of better monitoring and conservation consideration, and 51 species of "local interest" whose habitat needs may play a role in the design and selection of conservation strategies.

OBJECTIVES AND STRATEGIES

The highest priority habitats in Montana are Mixed Grassland, Sagebrush Steppe, Dry (Ponderosa pine/Douglas-fir) Forest, Riparian Deciduous Forest, and Prairie Pothole wetlands. Our primary objectives in each priority habitat are to restore ecological processes necessary to provide suitable habitat for priority species, identify and protect those remaining blocks of habitats that have undergone drastic declines, and develop management prescriptions which can be applied at all geographic scales. Specific population objectives were developed where possible for priority species. The highest priority species are the Common Loon, Trumpeter Swan, Harlequin Duck, Sage Grouse, Piping and Mountain Plovers, Interior Least Tern, Flammulated and Burrowing Owls, Black-backed Woodpecker, Olive-sided Flycatcher, Brown Creeper, Sprague's Pipit and Baird's Sparrow.

COORDINATION

Many partners were involved in writing this plan. But without a Coordinator position this plan could not have been completed. Implementation of this Montana Bird Conservation Plan will require continued coordination between partners in the state, and with neighboring states and provinces. Development of specific implementation strategies will flow from the review and use of this plan, and will involve interaction with the Western Working Group of PIF, as well as with the Intermountain and Prairie Potholes Joint Ventures.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES (cont.)

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

Partners In Flight

Continental and local declines in numerous bird populations have led to concern for the future of migratory and resident bird species. The reasons for declines are complex. Habitat loss, modification and fragmentation, loss of wintering and migratory habitat and brood parasitism have been implicated. In the case of many other landbirds, we do not have adequate monitoring data to determine whether or not populations are stable. Scientists and the concerned public agreed that a coordinated, cooperative conservation initiative focusing on nongame landbirds was needed. In late 1990, the National Fish and Wildlife Foundation brought together federal, state, and local government agencies, foundations, conservation groups, industry and the academic community to form a program to address the problem. Thus, Partners in Flight was conceived as a voluntary, international coalition of government agencies, conservation groups, academic institutions, private businesses, and citizens dedicated to "keeping common birds common" and reversing the downward trends of declining species. The Montana Partners in Flight first met during fall 1990.

Partners in Flight's primary goal is to direct resources to the conservation of all birds and their habitats through cooperative efforts in the areas of monitoring, research, management, education, and international cooperation.

Montana PIF Mission Statement:

Montana Partners In Flight (Montana PIF) is a partnership of government and nongovernment agencies, organizations and individuals committed to the conservation of long- and short-distance migrant and resident landbirds and their habitats through inventory and monitoring, research, management and education efforts across the state of Montana.

The Flight Plan: Bird Conservation Planning

Geographically based conservation plans were identified as necessary for nongame landbirds, much as the North American Waterfowl Management Plan directs efforts and prioritizes funding for waterfowl. "The Flight Plan" forms the strategy for coordinating, developing and writing Bird Conservation Plans at the national, regional, and state level.

Effective and efficient ecological management involves determining which species and habitats are most in need of conservation. This plan identifies priority species and habitats, and establishes objectives for bird populations and habitats in Montana. The plan not only focuses on microhabitat requirements of priority species, but also identifies landscape scale requirements. Conservation actions are recommended and partnerships are identified to accomplish the objectives.

The PIF bird conservations plans are intended to complement the successful North American Waterfowl Management Plan and the recently initiated National Shorebird Conservation Plan and North American Colonial Waterbird Conservation Plan. This Montana plan is intended to complement and incorporate elements of plans prepared for the two physiographic areas which overlap Montana (see Overview). Resident game birds are generally not covered by this plan because their needs are being met by state agencies and conservation groups. However, it is ecologically and economically sensible to coordinate with representatives of other bird groups' when implementing actions. Discussions of waterfowl species, shorebirds, colonial water birds and/or resident game birds are included in this plan where they contribute to the ecological picture of the landbird species or habitat being addressed.

This BCP was developed by many people offering input in planning meetings and as reviewers. Planning meetings were held by state working groups and habitat working groups functioning under the umbrella of the Montana Partners in Flight. Planning meetings were open to anyone who had an interest in bird conservation and were designed to solicit information from participants that would form the core of the plan. An important result of planning meetings was to capture scientific data and personal observations that were not available in the scientific literature. This information is especially important because local variations can dictate different needs and approaches.

The Montana Partners in Flight recognize that there are gaps in our knowledge of this state's birds. However, our intention is to assemble the best and most current scientific information into a format that land managers and landowners can use to put ideas into action. When new information becomes available either through monitoring recommended in this plan or from information overlooked, it will be incorporated into our recommendations and reprinted as a new version. Thus, we consider this (Version 1.0) a dynamic document in which adaptive management will play a large role.

Acknowledgments:

This Bird Conservation Plan was prepared in part under a grant from the National Fish and Wildlife Foundation (#99-042) , using matching funds supplied from the American Bird Conservancy and the LaSalle Adams Foundation.

We would like to extend appreciation and thanks to all of the partners who contributed their time and expertise to write this plan. Their hard work and dedication has made this very important endeavor possible. We thank all cooperating government agencies and organizations of Montana PIF, including:

Benton Lake National Wildlife Refuge
Bitterroot Audubon
Bitterroot National Forest
Bowdoin National Wildlife Refuge
Bureau of Land Management
Confederated Salish and Kootenai Tribes (CSKT)
Flathead Audubon
Flathead National Forest
Gallatin National Forest
Glacier National Park
Lee Metcalf National Wildlife Refuge
Lolo National Forest
Montana Audubon Council
Montana Cooperative Wildlife Research Unit
Montana Department of State Lands
Montana Fish, Wildlife and Parks (MFWP)
Montana Natural Heritage Program (MNHP)
Montana State University
National Bison Range
National Wildlife Federation
Plum Creek Timber Company
The Nature Conservancy (TNC)
University of Montana (UM)
USDA Forest Service, Northern Region
USFS Intermountain Research Station
U.S. Fish and Wildlife Service (USFWS)
Western Energy Company
Westmoreland Resources, Inc.
Yellowstone Audubon
Yellowstone National Park

The following individuals contributed significantly to the development, writing and editing of this plan. We would like to especially thank: Lisa Bate (U. Idaho, UM), Dwight Bergeron (MFWP), Kristi DuBois (MFWP), Dennis Flath (MFWP), Brian Gilbert (Plum Creek Timber), John Gobeille (CSKT), Sallie Hejl (USFS Intermountain Res. Sta.), John Hoffland (USFS Region 1), Skip Kowalski (USFS Region 1), Susan Lenard (Montana Audubon), Steve Martin (USFWS, Benton Lake NWR), Sherry Ritter (Idaho PIF), Jim

Roscoe (BLM), Sally Sovey (BLM), Josh Tewskbury (UM), Davic Waller (BLM), and Jock Young (UM).

We would also like to thank the following individuals for their participation in conservation planning meetings, information assembly and/or manuscript review: Eric Atkinson, Steve Gniadek (Glacier NP), Paul Hendricks (MNHP), Stephanie Jones (USFWS, Denver), Robert Lubbers (Yellowstone Audubon), Brian Martin (TNC), Terry McEneaney (Yellowstone NP), Mary McFadzen (USFS), Chris Paige (Ravenworks Ecology), David Pashley (American Bird Conservancy), Jim Phelps (Yellowstone Audubon), Jim Reichel (MNHP), Mike Roedel (MNHP), Bill Roney (Yellowstone Audubon), Mike Roy (National Wildlife Federation), Chris Yde (Montana DEQ). We apologize to any other participants we have unintentionally omitted.

OVERVIEW OF MONTANA

GEOGRAPHY

This plan covers the state of Montana. Some aspects of the nomenclature selected for habitats, priority-setting processes and coordination of conservation strategies were and will be broader in nature, as we look to efficiently interact with adjacent states and provinces.

Physiographic Areas. Three of the physiographic areas used for Partners in Flight Planning overlap, the state of Montana. These are the Northern Shortgrass (39), Central Rockies (64), and Wyoming Basin (86), although the latter is a minor component of the state (Figure 1). We cite priority scores from physiographic areas 39 and 64 frequently in this draft, and refer to them as the northern Great Plains and Northern Rockies, respectively. Conceptual conservation plans are available at the PIF website for each of these physiographic areas.

Implementation of conservation efforts will require direct coordination with adjoining states and provinces, and with other bird conservation initiatives. The passage of the North American Bird Conservation Initiative (NABCI) and the subsequent designation of Bird Conservation Regions (BCR's) will facilitate this process. Montana is incorporated into three BCR's (Figure 2), the Northern Rockies, Prairie Potholes, and Badlands and Prairies. As of this writing, the primary author of the Montana Bird Conservation Plan was newly appointed as the coordinator for the Northern Rockies BCR.

Primary Physical Features

Montana is a land of contrasts, with an elevational range of almost 11,000 feet, from 1820 ft along the Kootenai River where it leaves the state, to Granite Peak in the Absaroka Range of southcentral Montana, the state's highest point at 12,799 ft. At 148,000 mi^2, we are the fourth largest state in the U.S., yet less than 1 million people call Montana home. The high plains of eastern Montana have a continental climate, with mild summers and sometimes brutal winters. Western Montana has more of a maritime influence, with more moderate temperatures and more precipitation year-round.

The eastern two-thirds of Montana are high plains, the western third mountains and valleys. But unlike other Rocky Mountain states, Montana also has disjunct, "island" mountain ranges east into plains, including the Little Rockies and Sweetgrass Hills in the north, the Highwoods, Bearspaw, Snowies, Judith and Little Belts in the middle, and the Crazies and Pryors in the south.

Not available in electronic format for this plan.

Figure 1. Map of the physiographic areas that overlay Montana.

Not yet available in electronic format for this plan.

Figure 2. Bird Conservation Region Map of North America (see www.rfi.on.ca/cec/)

Four major rivers leave the state. Two, the Clark Fork and Kootenai, are headwaters of the Columbia River and drain the western mountains. Their tributaries, including the Blackfoot, Bitterroot, and various forks of the Flathead flow from watersheds which include the Bob Marshall, Scapegoat, Great Bear, and Selway-Bitterroot wilderness areas. The Missouri and Yellowstone Rivers flow through eastern Montana, the latter being the longest undammed river in the country. Their headwater tributaries include legendary trout streams: the Bighorn, Bighole, Jefferson, Madison, Gallatin, and Smith. They originate in the Greater Yellowstone Ecosytem and along the Rocky Mountain Front, perhaps Montana's signature landscape of grassland meeting mountains.

Habitat

Eastern Montana was and is still dominated by grassland and shrub steppe habitats, with lush riparian habitats along the major drainages. Broken badlands dominate the Missouri River drainage and other upland areas, and are interspersed with hardwood draws in the easternmost portions of the state. Most of the island mountain ranges are dominated by the same coniferous forest types found in the western ranges, with ponderosa pine and Douglas-fir being the dominant trees. The formerly glaciated portion of the state north of Missouri River is rich with pothole wetlands.

Western Montana's mountains support a wide variety of coniferous forest habitats. Drier types throughout the central and southern mountains are dominated by ponderosa pine, Douglas-fir and lodgepole pine at lower elevations, Engelman spruce and subalpine fir at higher elevations. As one proceeds further north and west, mixed mesic forests with western larch and grand fir are more prevalent, and in the northwestern corner western red cedar and western hemlock are found in the moister sites. Montana's intermountain valleys are dominated by grassland and sagebrush steppe habitats with various riparian types along the rivers. Significant wetlands occur in some of the valleys.

Detailed descriptions of Montana's habitats are provided by the Montana Gap project (Redmond et al. 1998). The nomenclature we used to lump habitats for consideration in this plan was developed through cooperation and consultation with all Montana PIF participants to be consistent with adjoining states, physiographic area plans and the planning efforts of the Western Working Group of PIF. The types we considered for planning purposes are summarized in Table 1, with cross-references to the Montana Gap habitat types. The scientific names of all plants mentioned in the text are summarized in Appendix A.

Land Use

Eastern Montana is primarily dominated by agricultural uses (Figure 3). Much of the historical grassland has been tilled and converted into cropland, with wheat being the primary crop. Most of the unbroken grassland and shrub steppe habitat is used as pasture, with cattle being the primary livestock. The highest percentage of public lands in eastern Montana are administered by the Bureau of Land Management (Figure 4).

Throughout the forested landscape of central and western Montana, the primary land use is timber production on private lands and timber production combined with outdoor recreation and other public uses on public lands. Grazing is also a primary use on much of the forested landscape, particularly in the south and central portions of the state. Western valleys are also important for livestock and crop production. A higher percentage of the land base in western Montana is public land (Figure 4), with the U.S. Forest Service being the majority land management agency.

Table 1. Montana PIF habitat types, cross-referenced with Gap habitat types (Redmond et al. 1998.)

Montana PIF Habitat Types:	Montana Gap Model Habitat Types:	
Grassland:	**Code:**	**Type:**
Mixed Prairie		
Shortgrass	3130	Very Low Cover Grasslands
Mixed (mid) Grass	3150	Low/Moderate Cover Grasslands
	3170	Moderate/High Cover Grasslands
Intermountain Grassland	3180	Montane Parklands & Subalpine Meadows
(Parkland, Palouse Prairie, Western Valley Grassland)		
Shrubland:		
Sagebrush Shrubsteppe	3350	Sagebrush
	3520	Xeric Shrub - Grassland Associations
Montane Shrubland	3200	Mixed Mesic Shrubs
	3300	Mixed Xeric Shrubs
	3510	Mesic Shrub - Grassland Associations
Forest:		
Dry Forest	4000	Low Density Xeric Forest
	4206	Ponderosa Pine
	4290	Mixed Xeric Forest
Cedar/Hemlock Forest	4210	Western Red Cedar
	4211	Western Hemlock
Burned Forest	4400	Standing Burned Forest
Moist Douglas-Fir Forest	4207	Grand Fir
	4212	Douglas-fir
	4215	Western Larch
	4280	Mixed Mesic Forest
Whitebark Pine	4260	Mixed Whitebark Pine Forest
Aspen	4140	Mixed Broadleaf Forest
	4300	Mixed Broadleaf and Conifer Forest
Wet Subalpine Fir	4270	Mixed Subalpine Forest
Juniper/Limber Pine	4205	Limber Pine
	4214	Rocky Mountain Juniper
	4216	Utah Juniper
Dry Subalpine-fir/Lodgepole Pine	4203	Lodgepole Pine
	4223	Douglas-fir / Lodgepole Pine
Riparian:		
Riparian Deciduous Forest	6120	Broadleaf Riparian
	6130	Mixed Broadleaf and Conifer Riparian
Riparian Shrubland	6300	Shrub Riparian
	6400	Mixed Riparian
Hardwood Draws	4140	Mixed Broadleaf Forest
	6120	Broadleaf Riparian
Riparian Coniferous Forest	6110	Conifer Riparian
Wetland:	5000	Water
Prairie Potholes		6200 Graminoid and Forb Riparian
Intermountain Valley Wetlands		
Irrigation Reservoirs >640 ac		
Irrigation Reservoirs <640 ac		
High Elevation Wetlands		
Unique Habitats:	7300	Rock
	8100	Alpine Meadows
	9100	Snowfields or Ice

Not available in electronic format for this plan.

Figure 3. Land use map, Montana.

Not available in electronic format for this plan.

Figure 4. Land ownership map, Montana.

Urban areas are generally confined to the river corridors and mountain valleys (Figure 3), and these continue to be the areas where human population growth is a primary land use concern. Specific land use patterns and trends are included in each of the habitat sections of this plan.

AVIFAUNA

More than 400 species have been recorded in the state of Montana (Montana Bird Distribution Committee 1996), including 254 species which are known to breed. The common and scientific names, and priority scores of all Montana breeding birds are included in Appendix B. Many species reach their western (e.g. Chestnut-collared Longspur, Baird's Sparrow), eastern (Varied Thrush, Townsend's Warbler), or southern (Common Loon, Boreal Chickadee) U.S. limits in Montana.

Unlike many states, Montana has no breeding bird atlas to clearly delineate the breeding status and distribution of bird species. Montana Bird Distribution is the standard reference for the distribution of the state's birds. It displays the known status of each species by 1-degree blocks of latitude and longitude, and in recent editions in each 1/4 latilong block (Bergeron et al. 1992, Montana Bird Distribution Committee 1996). In combination with P.L. Wright's summary of the rare birds Montana (Wright 1996), this is the single desk reference for the avifauna of Montana. Current plans are to work on an updated version in 2001, and at 5-yr intervals thereafter. These should serve an incentive for coordinated monitoring efforts.

CONSERVATION ISSUES / OPPORTUNITIES IN MONTANA

Montanans commonly refer to our state as "The Last Best Place", and in many ways this is true. We are still primarily a rural state, with large intact blocks of habitat in private and public ownership. We have more intact grassland than any other state except Texas, and large forested wilderness areas, and are a center of abundance for many species which are experiencing range wide declines. We still have opportunities to restore ecological processes at a landscape scale.

There are a number of broad-scale issues that are driving habitat change and agency response to change, and many of these have presented unique opportunities for bird conservation in the state. The pressures of residential development, particularly in western and southcentral Montana, have caused dramatic losses of grassland, shrubsteppe and riparian habitat, but have also spawned local efforts at master plans, citizens groups, and conservation coalitions designed to protect habitat and guide development pressure away from critical habitats. Numerous land trusts have been formed to preserve traditional land use and wildlife habitat. In the face of changes in the forest products industry, collaborative processes have been established to design sustainable and wildlife-compatible approaches to timber sales, and forest stewardship programs have been initiated. Ecosystem restoration at a landscape level has become a U.S. Forest Service planning emphasis. A changing agricultural economy has forced farmers and ranchers to look for alternative crops, more sustainable harvest methods and soil protection tools. Farm Bill programs administered through the NRCS and developed in response to these needs provide other excellent opportunities to provide, maintain and enhance wildlife habitats.

We have tried to capture these unique trends and opportunities in each habitat section of this plan, and will expand upon them in our implementation framework, which will be prepared in 2000. One primary goal of this plan is to strengthen those conservation programs of partners through a clarification of landbird priorities. Two examples follow:

Northern Great Plains Initiative. The Nature Conservancy has compiled, through a series of experts workshops, ecologically sensitive area of remnant grassland and shrubsteppe in the northern Great Plains (The Nature Conservancy 1999). We will build upon this effort to implement conservation measures in these polygons.

Land Trusts. Land trusts are non-profit organizations that help landowners find ways to protect their land in the face of ever-growing development pressure. They work with landowners to write conservation easements (permanent deed restrictions that prevent harmful land uses), acquire land through donation and purchase, or devise other plans to maintain all kinds of open space--wetlands, wildlife habitat, ranches, shorelines, forests, scenic views, farms, watersheds, historic estates, and recreational areas. There are at least 10 land trusts operating on a statewide, regional or local level in Montana (Appendix C), including the Montana Land Reliance, Trust for Public Lands, Five Valleys Land Trust, the Nature Conservancy, and the Rocky Mountain Elk Foundation. Well over 600,000 acres have been protected through conservation easements in Montana, the highest state total in the United States (Montana Fish, Wildlife and Parks 1999).

THE PRIORITIZATION PROCESS

Species Prioritization

Partners in Flight uses a system that identifies species of conservation priority in each of its planning units, rather than writing planning information about all species. It is assumed that if conservation measures are focused on these species and their habitats, the other species in the area will benefit as well.

We identified a pool of species from among the breeding avifauna, which represents priorities for conservation action within Montana (Table 2). Note that a species may be considered a priority for several different reasons, including global threats to the species, high concern for regional or local populations, or high state responsibility for conserving large or important populations of the species. The different potential reasons for priority status are represented by shaded cells in Table 2. Our primary means of prioritizing species was through the PIF prioritization scores generated by the Colorado Bird Observatory (Hunter et al. 1993, Carter et al. 1998). This system ranks species according to seven measures of conservation vulnerability. These include four global measures (i.e., they do not change from area to area), as well as measures which are specific to each physiographic area or state. A total rank score is then derived, which is a measure of overall conservation priority; scores for all breeding species in Montana are found in Appendix B.

The Partners in Flight Species Prioritization scheme was first developed in 1991, and has been continually reviewed and refined in the years following inception (Carter et al. 1998). The system ranks each species of North American breeding bird based upon seven measures of conservation "vulnerability". These factors include relative abundance (interspecific; RA), size of breeding (BD) and non-breeding (ND) ranges, threats to the species in breeding (TB) and non-breeding (TN) areas, population trend (PT), and relative density (intraspecific; AI) in a given planning unit compared to the maximum reached within its range. Each species is given a score of 1-5 in each category, with 1 indicating the least amount of vulnerability with regard to that parameter and 5 the most. Scores in each category are then summed to produce a composite score potentially ranging from 7-35. Species with relatively high overall scores (e.g. >22) are considered most vulnerable to extinction (although they often are not endangered at present) and usually need conservation measures or at least need to be carefully monitored through their ranges.

We used the following criteria to help us select priority bird species in Montana:

Species of importance in Montana. (PA 64, 39) Species scoring $\geq$22 in the PIF system, for Montana or either physiographic area overlapping the state. Indicates a species of moderate or high global vulnerability, and with relatively high abundance as well as declining or uncertain population trend in the physiographic area or in Montana.

Species showing significant declines. Species for which BBS data sample sizes are adequate to indicate significant declines over the period 1966-1996 (CBO scores of 5/1 or 5/2 for population trend (PT) and population trend uncertainty (PTU) in PA 39, PA 64 or MT). Species whose populations are declining range wide may or may not be declining in a given planning unit. It is important to focus active management in those areas where declines should be stabilized or reversed and to identify the factors responsible for stable or increasing trends in other areas so that similar conditions can be achieved where needed.

High responsibility species. (by Physiographic Area) Species with relatively high proportion (>20%) of their global population for either of the physiographic areas overlapping Montana. Percent of population calculated from percent of range area, weighted by BBS relative abundance (see Rosenberg and Wells, in press). Percent of geographic range used for species with inadequate relative abundance data. Signifies high responsibility for long-term conservation of species, even if not currently threatened. Physiographic areas with large percentages are able to take greater conservation responsibility for that species because affecting an increase or decrease in a population trend has greater potential impacts in areas where numbers of individuals are greater.

Special status. (FWP, NHP, BLM, USFS, Watch List) We included for consideration any bird species listed by one of the following entities as being of management concern. Typically, a species was not considered high priority if it appeared on only one of the following lists; those appearing on 3 or more were considered a priority even if other criteria were not met:

- S Montana Fish, Wildlife and Parks Species of Special Concern
- N Montana Natural Heritage Program Sensitive Species
- B Bureau of Land Management Special Status Species
- F U.S. Forest Service (Region 1) Sensitive Species
- W National Audubon's National Watch List

Special Consideration. (Local Concern) Species of justifiable local concern or interest. These were generally habitat obligates or species of immediate concern, as identified by Montana PIF (P). May represent geographically variable population or be representative of specific habitat of conservation concern. These were generally selected based on the specific expertise of planning participants.

Additional listed species. Species on federal endangered or threatened list not meeting any of the above criteria.

Montana Priority Levels

We assigned each of the 141 species in Table 2 to one of the following four priority levels. All species designated as levels I-III are treated in this plan. Generally, level I species are the highest priority and are the focus of proposed conservation actions. Most biological objectives are integrated, however, and addresses multiple species needs. The names of these levels (e.g. "Conservation Action") should not therefore be considered mutually exclusive.

I. **Conservation Action.** Generally high overall scores (>22), declining population trends (PT/PTU of 5/1 or 5/2), and/or high area importance (PA % Pop.>20). These are the species for which Montana has a clear obligation to implement conservation

II. **Monitoring Species.** Species in need for which we have responsibility, but with lesser threat or stable/increasing populations in the state. As compared to level I, these species have generally lower overall scores, in many cases because they are poorly sampled by the BBS. Montana has a high responsibility to monitor the status of these species, and/or to design conservation actions.

III. **Local Concern.** Species of concern (often designated as such by participating agencies) which rank lower, are not in imminent risk, or which are near-obligates for high priority habitat. Presence of these species may serve as added criteria in the design and selection of conservation or monitoring strategies.

IV. **Non-Priority.** Formerly suggested for inclusion in the planning effort, but recommended for deletion because of occurrence as rare migrants only, extremely peripheral occurrence, or lack of imminent risk (widespread, generalist, increasing).

Table 2. Bird species considered for priority status by Montana PIF, with assigned priority levels, CBO priority scores, population trend, percent population within physiographic areas, and special status.

Species	Priority	CBO Score		BBS Population Trend (PT/PTU)		Percent Population		Special Status	Comments
		PA 64	PA39	PA 64	PA39	PA 64	PA39		
Common Loon	I	16	-	2/4				SNBF	MT Score = 19
Clark's Grebe	III	19	20	3/8	3/8			N	Colonial
Horned Grebe	II		20	3/7	5/2		37.3		
American White Pelican	III	22	21	3/6	3/6	16.3		N	Colonial
American Bittern	III	17	18	3/6	4/3				
Black-crowned Night-heron	III	13	14	3/8	3/6			N	Colonial
White-faced Ibis	II	15	16	3/8	3/8			SNB	Colonial
Trumpeter Swan	I	26	26	3/7	3/8	10		SNBF W	T&E
Canvasback	IV			3/7	3/5			B	
Harlequin Duck	I	-	-	3/8				SNBF	MT Score=21
Barrow's Goldeneye	II	24		3/5		35.5			
Hooded Merganser	II	22		3/7	3/8	24.1			
Osprey	IV	16		2/4	3/8	24.9			
Bald Eagle	II	16	19	2/4	3/8			SNF	T&E
Northern Harrier	III		17	2/1	2/1		25.6		
Sharp-shinned Hawk	III	18		3/6	3/8	32.4			
Northern Goshawk	II	21	19	4/3	3/8			SNB	Management concern
Swainson's Hawk	III		20	2/2	2/4		20.9	B	
Ferruginous Hawk	II	22	20	3/6	1/1	10.5	26.7	SNBF	Special concern
Peregrine Falcon	II	18	19	3/7	3/8			SNF	T&E
Blue Grouse	III	24		5/2	3/8	14.2			
White-tailed Ptarmigan	III	22		3/8					
Ruffed Grouse	II	21		5/1	3/7	10.0			
Sage Grouse	I	23	25	3/8	3/5	25.0	33.0		
Sharp-tailed Grouse	IV		21	3/7	4/4		32.8		
(Columb.) Sharp-tailed Grouse	II	-	-	3/7				SNBF	Special concern
Yellow Rail	III	-	24		3/8			NW	Peripheral sp.?
Whooping Crane	IV	-	-					SNF	T&E migrant
Piping Plover	I	-	26		3/8			SN	T&E
Killdeer	III	18	18	5/1	5/1				
Mountain Plover	I	25	27	3/8	3/8			SNBF W	Special concern
Black-necked Stilt	III	-	15		3/8			N	Colonial
Willet	III		18	3/6	2/1		22.6	W	
Spotted Sandpiper	IV	15		2/1	2/4				
Upland Sandpiper	IV	19	20	3/7	3/5				
Long-billed Curlew	II	20	23	½	4/4	10.5	18.9	SBW	
Marbled Godwit	II		23	3/8	2/1		49.1		
Wilson's Phalarope	III	19	19	2/2	2/1	5.4	28.5		MT Score=21
Transient Shorebirds	II	-	-						*multiple species*
Franklin's Gull	II	22	24	3/7	5/2	8.2	8.0	SNW	Colonial
Caspian Tern	II	15	14	3/8	3/8			SN	Colonial
Common Tern	II	14	14	3/8	3/6			SN	Colonial
Forster's Tern	II	20	19	3/7	3/8			N	Colonial
(Interior) Least Tern	I	-	17		3/8			SN	T&E
Black Tern	II	17	19	2/3	4/4			SNB	Colonial
Mourning Dove	IV	12		5/1	2/1				
Black-billed Cuckoo	II	17	19	3/7	3/6				
Yellow-billed Cuckoo	II	18	19	3/8	3/7			SN	
Flammulated Owl	I	22	-	3/8				SNBF	MT Score=24

Table 2. Bird species considered for priority status by Montana PIF, with assigned priority levels, CBO priority scores, population trend, percent population within physiographic areas, and special status(cont.)

Species	Priority	CBO Score		BBS Population Trend (PT/PTU)		Percent Population		Special Status	Comments
		PA 64	PA39	PA 64	PA39	PA 64	PA39		
Eastern Screech-owl	III	17	17	3/8	3/8			P	
Western Screech-owl	III	19	-	3/8				P	
Northern Hawk-owl	IV	17	-	3/8					Peripheral species
Burrowing Owl	I	17	21	3/8	5/2			SNB	Special concern
Great Gray Owl	III	18	17	3/8	3/8			SNB	Management concern
Boreal Owl	III			3/8				SNBF	
Short-eared Owl	III	19	20	2/3	3/5		24.4	W	
Common Poorwill	III	19	19	3/8	3/7				
Black Swift	II	23	-	3/6		12.1		SNW	
Chimney Swift	III	-	16		3/8			W	
Vaux's Swift	II	22	-	3/5		41.3			
Calliope Hummingbird	II	22	20	2/1	3/8	76.0			
Rufous Hummingbird	III	19	20	1/1	3/8	18.4		W	MT Score=21
Lewis's Woodpecker	II	22	22	3/5	3/8	23.8		W	
Red-headed Woodpecker	II	18	19	3/8	3/6			W	
Red-naped Sapsucker	II	21	21	1/1	3/6	59.3	4.9		
Williamson's Sapsucker	II	22	-	3/5		47.6			
Downy Woodpecker	III		16	3/5	5/2				
Hairy Woodpecker	IV			1/1	2/2			B	
Three-toed Woodpecker	II	19	18	3/6	3/8			B	
Black-backed Woodpecker	I	22	20	4/3	3/8	6.4		SNBF	Management concern
Pileated Woodpecker	II	14	-	2/4				B	
Olive-sided Flycatcher	I	20	17	5/1	3/7	7.0			
Western Wood-Pewee	IV	16	15	2/1	2/1	16.0			
Alder Flycatcher	IV	16	-	2/4				N	Peripheral species
Willow Flycatcher	II	21	19	2/1	3/6	29.8			
Least Flycatcher	III	17	15	3/5	1/1				
Hammond's Flycatcher	II	22	20	2/1	3/8	29.4			MT Score=23
Dusky Flycatcher	IV	22		2/1	3/6	32.2			MT Score=19
Cordilleran Flycatcher	II	20	21	3/5	3/6	29.1	10.5		
Say's Phoebe	IV	14	16	½	2/4				
Cassin's Kingbird	IV	-	22		3/8			N	Peripheral species
Horned Lark	IV	12		5/1	2/1				
Clark's Nutcracker	III	16	16	1/1	3/7	39.3		P	
Black-billed Magpie	IV	19	18	5/1	5/1	12.0			
Mountain Chickadee	IV	16		2/1	3/8	29.9			
Chestnut-backed Chickadee	III	18	-	½				P	MT Score=21
Red-breasted Nuthatch	IV	14		1/1	½	32.7			
Brown Creeper	I	18	-	5/1	3/8	11.7		P	Management concern
Rock Wren	IV		18	2/1	5/2				
Winter Wren	II	14	-	2/4				P	
Canyon Wren	IV	17	16	3/7	3/7			P	
Sedge Wren	III	-	21		3/8				Peripheral species
American Dipper	III	21		2/2	3/8	55.4			
Golden-crowned Kinglet	III	17		2/1	3/7	22.8			
Townsend's Solitaire	III	19	18	2/1	2/4	26.5	10.9		
Varied Thrush	III	18	-	2/1				P	MT Score=20
Veery	II	17	17	2/1	3/6	8.3		W	
Gray Catbird	III	15	16	3/5	2/2			W	

Table 2. Bird species considered for priority status by Montana PIF, with assigned priority levels, CBO priority scores, population trend, percent population within physiographic areas, and special status(cont.)

Species	Priority	CBO Score		BBS Population Trend (PT/PTU)		Percent Population		Special Status	Comments
		PA 64	PA39	PA 64	PA39	PA 64	PA39		
Sage Thrasher	III	16	17	2/4	3/5				MT Score=19
Sprague's Pipit	I	22	24	3/7	2/1	11.6	48.1	SW	
Loggerhead Shrike	II	18	17	3/8	2/1			SBFW	Special concern
Cassin's Vireo	III	20	-	1/1					
Plumbeous Vireo	III	22	20	3/8	3/8	41.5			
Warbling Vireo	III	17	17	1/1	3/5	24.1		P	
Red-eyed Vireo	II	16	16	5/1	5/2			P	Riparian indicator
Tennessee Warbler	IV	18	-	3/5					
Nashville Warbler	III	16	-	1/1		31.8			MT Score=18
Yellow-rumped (Aud.) Warbler	IV	16		5/1	4/4				MT PT/PTU= 2/2
Townsend's Warbler	III	19	-	1/1		44.3			MT Score=20
Ovenbird	III	19	18	3/8	2/2				
American Redstart	III	16	16	4/4				P	
MacGillivray's Warbler	III	20	19	2/4	3/6	36.0			
Western Tanager	IV	19		2/1	4/4	38.1			
Lazuli Bunting	II	19	19	1/1	3/5	38.5			
Dickcissel	IV				3/8			SNBW	Peripheral
Green-tailed Towhee	III	18	19	2/2	3/6	13.8		P	
Chipping Sparrow	III		16	2/1	5/1				
Clay-colored Sparrow	III	18	18	½	2/1	1.3	10.5	W	
Brewer's Sparrow	II	21	21	5/1	5/1	7.2	6.2	W	
Field Sparrow	IV	-	19		3/6				
Lark Sparrow	III	15	16	2/2	2/1				
Sage Sparrow	IV	22	21	3/8	3/7			BW	Peripheral species
Lark Bunting	II	20	18	3/6	1/1	1.0	36.7	W	
Baird's Sparrow	I	25	26	3/8	3/5	1.0	39.7	SNBF W	MT Score=27
Grasshopper Sparrow	II	20	16	5/2	1/1	1.0			
Le Conte's Sparrow	III	23	23	3/8	3/6		14.7	NBS	Special concern
Nelson's Sharp-tailed Sparrow	III	-	26		3/8			SNW	Peripheral species
Song Sparrow	III	14		5/1	4/4				
McCown's Longspur	II	27	27	3/6	3/5	13.1	65.7	W	MT Score=28
Chestnut-collared Longspur	II	22	21	3/7	2/4		46.6		
Bobolink	III	19	19	3/5	2.2		1.1	W	
Red-winged Blackbird	III		14	2/1	5/1				MT PT/PTU = 5/1
Western Meadowlark	IV	17		5/1	2/1				MT PT/PTU = 2/1
Yellow-headed Blackbird	III	16	18	2/1	3/5				
Brewer's Blackbird	III	15		5/1	2/1	12.1			MT PT/PTU = 5/1
Orchard Oriole	III	-	17		3/7				
Black Rosy-Finch	II	22		3/8		100.0			
Cassin's Finch	III	19		2/4	3/7	59.8			
Red Crossbill	III	16		1/1	3/5	40.5			
Pine Siskin	IV	13		2/1	4/4	26.8			
House Sparrow	IV	12		5/1	2/1				

Habitat Prioritization

We initiated a process for prioritizing habitats during a Montana PIF meeting in March 1997. Our philosophy was that conservation priority should be placed on those habitats that: 1) support high numbers of priority bird species; 2) are significantly threatened; 3) have shown significant historic losses; 3) support unique or particularly diverse avifauna; 4) have detailed data available; and/or 5) have good potential for implementation of conservation action.

After building species/habitat matrices (which appear in revised form in this plan at the head of each habitat section), we used a "Delphi" process to identify the highest priority subtypes in each habitat category. We used the following criteria for this effort, with average scores used as preliminary prioritization scheme: a rank of **1** was used for the habitat which most meets the intent of the criteria (e.g. has the most priority species, greatest threat, is most unique); **2** is the next highest priority, etc., with the maximum value assigned to the habitat which **least** meets the criteria (e.g. it comes in 5th).

> **Priority Species:** Ranked the habitats based on the number of priority species (especially category I and II) they support.
>
> **Threat:** Ranked the habitats based on threats to their quality or quantity, with a rank of 1 for the most threatened habitat.
>
> **Historic Loss:** Ranked the habitats based on historic losses of acreage within the state: the habitat with the least extant habitat relative to historic levels gets a rank of 1.
>
> **Unique:** Ranked the habitats based on their unique features, unique species or communities they support, relative to each.
>
> **Data Availability:** Those habitats where we have the most data will likely be the ones in which we can most effectively implement conservation activities. More data = rank 1.
>
> **Conservation Potential:** Ranked the habitats on the likelihood of achieving effective conservation: habitats primarily on public lands, with easily identified management issues and existing conservation impetus, would rank higher (1) than those with more nebulous potential for success.

This process led us to an additional list of high priority habitats, which was further refined as the planning process proceeded to the list of habitats treated in this plan. Within each of the five habitat categories (Grassland, Shrubland, Forest, Riparian, Wetlands) individual habitats are treated in priority order.

Development of Biological Objectives

The primary principles guiding the development of biological (species and habitat) objectives were to:

- **Reverse downward trends;**
- **Restore natural processes;**
- **Maintain viable populations (do we know what these are?);**
- **Address a broad complement of habitats; and to**
- **Adequately monitor (all) priority species.**

BIRD CONSERVATION PRIORITIES IN MONTANA

Priority Bird Species List

Our prioritization process led to the selection of the following 107 species (one group) that merited priority status in the state. These included 14 species at priority level I, 43 at level II, and 51 level III, or "local concern" species:

Level I (n=14)

Common Loon
Trumpeter Swan
Harlequin Duck
Sage Grouse
Piping Plover
Mountain Plover
Interior Least Tern
Flammulated Owl
Burrowing Owl
Black-backed Woodpecker
Olive-sided Flycatcher
Brown Creeper
Sprague's Pipit
Baird's Sparrow

Level II (n=43)

Horned Grebe
White-faced Ibis
Barrow's Goldeneye
Hooded Merganser
Bald Eagle
Northern Goshawk
Ferruginous Hawk
Peregrine Falcon
Ruffed Grouse
Columbian Sharp-tailed Grouse
Long-billed Curlew
Marbled Godwit
transient shorebirds
Franklin's Gull
Caspian Tern
Common Tern
Forster's Tern
Black Tern
Black-billed Cuckoo
Yellow-billed Cuckoo
Black Swift
Vaux's Swift
Calliope Hummingbird
Lewis's Woodpecker
Red-headed Woodpecker
Red-naped Sapsucker
Williamson's Sapsucker
Three-toed Woodpecker
Pileated Woodpecker
Willow Flycatcher
Hammond's Flycatcher
Cordilleran Flycatcher
Winter Wren
Veery
Loggerhead Shrike
Red-eyed Vireo
Lazuli Bunting
Brewer's Sparrow
Lark Bunting
Grasshopper Sparrow
McCown's Longspur
Chestnut-collared Longspur
Black Rosy-finch

Level III (n=51)

Clark's Grebe
American White Pelican
American Bittern
Black-crowned Night-heron
Northern Harrier
Sharp-shinned Hawk
Swainson's Hawk
Blue Grouse
White-tailed Ptarmigan
Yellow Rail
Killdeer
Black-necked Stilt
Willet
Wilson's Phalarope
Eastern Screech-owl
Western Screech-owl
Great Gray Owl
Boreal Owl
Short-eared Owl
Common Poorwill
Chimney Swift
Rufous Hummingbird
Downy Woodpecker
Least Flycatcher
Clark's Nutcracker
Chestnut-backed Chickadee
Sedge Wren
American Dipper
Golden-crowned Kinglet
Townsend's Solitaire
Varied Thrush
Gray Catbird
Sage Thrasher
Cassin's Vireo
Plumbeous Vireo
Warbling Vireo
Nashville Warbler
Townsend's Warbler
Ovenbird
American Redstart
MacGillivray's Warbler
Green-tailed Towhee
Chipping Sparrow
Clay-colored Sparrow
Lark Sparrow
LeConte's Sparrow
Nelson's Sharp-tailed Sparrow
Song Sparrow
Bobolink
Red-winged Blackbird
Yellow-headed Blackbird
Brewer's Blackbird
Orchard Oriole
Cassin's Finch
Red Crossbill

Overview

The bulk of this plan is divided into 5 broad habitat sections: 1) Grassland ; 2) Shrubland; 3) Forest; 4) Riparian; and 5) Wetlands. The distribution of these 5 major habitat groupings in the state is shown in Figure 5. Each section includes habitat subtypes, and the priority species associated with each.

How to Use This Plan

This plan is organized by habitat, subtypes within each habitat, and priority species within each subtype. Readers will generally go to a habitat of interest first, but can use the table of contents to find priority birds within the habitat they appear.

Each habitat section is broken down into the subtypes considered for conservation action, in **priority order**. The distribution, characteristics, importance and management issues in each are discussed. There is a **matrix** at the beginning of each showing the occurrence of priority bird species (in taxonomic order) within the subtypes. **Species accounts** (in taxonomic order within priority levels) follow for each priority species; these generally appear in the primary habitat for that species, although many species occur in more than one habitat. In such cases, these species are usually cross-referenced in the biological objectives. Species accounts include the **reason for concern**, distribution, habitat requirements, ecology (feeding/breeding), associated species, and **management issues/recommendations**. When priority birds are included in the lists of associated species in a species account, they are listed in **boldface**. At the end of each habitat subtype, we present integrated biological objectives for the type.

Habitat and population objectives are found at the end of each habitat section, following the species accounts. They are generally a compilation of individual species recommendations, include **monitoring objectives**, assumptions, and research needs.

Not yet available in electronic format for this report.

Figure 5. Distribution of the 5 major habitat types considered by Montana PIF for bird conservation.

GRASSLAND

Reason for Concern: The largest number of North American grassland species are found in the northern Great Plains, especially in the Dakotas, Montana, and adjacent Canadian provinces. Grassland birds show the most consistent declines of any group of birds monitored by the BBS; fewer than 30 % of the species show increasing populations. Declines prevail throughout North America. Areas with increasing trends are generally small and localized (Sauer et al. 1995). A number of our Priority I species are found in grassland (Table 3).

Table 3. Grassland habitat associations, Montana PIF priority bird species.

PRIORITY SPECIES	Priority	Occurrence by Habitat Type and Subtype				
		Mixed Prairie		Intermountain Grassland		
		Shortgrass	Mixed (mid)	Parkland	Palouse	W. Valley
Northern Harrier	III	x	x	x	x	x
Ferruginous Hawk	II	x	x	x		
(Columbian) Sharp-tailed Grouse	II				x	
Mountain Plover	I	x				
Long-billed Curlew	II	x	x		x	
Burrowing Owl	I	x	x	x		
Short-eared Owl	III	x	x	x	x	x
Sprague's Pipit	I		x			
Lark Bunting	II	x	x			
Baird's Sparrow	I		x			
Grasshopper Sparrow	II	x	x		x	
McCown's Longspur	II	x		x		
Chestnut-collared Longspur	II	x	x	x		
Bobolink	III		x			x

Many grassland birds have been consistently declining since at least 1966, when the BBS data was first collected. Factors responsible for this decline include the destruction of suitable habitats as well as increased mowing of remaining grasslands for hay production. Since the mid- 1980s, the Conservation Reserve Program (CRP) has been responsible for the creation of millions of acres of (primary non-native) grasslands across the United States. Some grassland birds have benefitted from the habitats created by the CRP (Johnson and Schwartz 1993, Reynolds et al. 1994), reducing the rates of decline or even reversing the declining trends for some species. Despite these short-term benefits from the CRP, the long-term prospects for most grassland birds remain bleak (Sauer et al. 1995). Yet Montana has more remaining grassland than any western state.

Mixed-grass Prairie

Distribution. Mixed-grass prairie was historically found throughout Montana east of the continental divide. Since settlement and the advent of modern agricultural methods the amount of grassland has declined substantially. Losses have been most significant from the northeast corner west across the northern tier of counties to the foothills north and west of Great Falls. Within the northeast corner of the state, approximately 60 percent of the grassland has been converted to croplands (B. Martin, Pers. comm.). Most remaining large blocks of grassland are found in an area extending from the central to east-central regions of the state and trending to the southeast. The Nature Conservancy (TAC) has identified and mapped existing blocks of grassland (Figure 6). Montana Gap models define eastern Montana grasslands by cover class (Very Low, Low/Moderate, Moderate/High), covering a combined 12.8 million ha, or approximately 44% of the state (Edmond et al. 1998).

Type Description. Mixed-grass prairie is defined here as incorporating both prairie grassland habitat with mid-sized grasses (mixed-grass prairie), and short-grass prairie with very open structure and low stature grasses (Figure 7). The two types are discussed below.
Typical mixed-grass prairie is comprised of denser and relatively taller grass species than short-grass prairie. Species composition is dominated by western and blue bunch wheatgrass with other species including needle-and-thread, June grass, Kentucky blue grass, and blue gamma present. Specialized microsites contain prairie centrad and little bluestem. Horizontal structure varies but in general is closed and dense compared to short-grass areas. Litter density also varies but is considerable more than that found in short-grass prairie. Litter may be very dense particularly in swales and along drainages. All of the 1.2 million ha of Moderate/High Cover Grasslands, and most of the 10.4 million ha of Low/Moderate Cover Grasslands identified by Edmond et al. (1998) fall in our Mixed-grass prairie type.

Short-grass prairie was also defined by structure. True short-grass prairie, which is dominated by buffalo grass, is uncommon in Montana. This type is characterized like true short-grass prairie with little vertical structure, and large interstices between grasses. Both vertical and horizontal structure is very open. This type occurs because of soil type, land use patterns (grazing), and plant communities dominated by short stature plants such as blue gamma. Other grasses include fescues and June grass; needle-and-thread and western wheatgrass are present to a lesser extent. Cobble is often present adding to the phase's open nature. This type is often found on harsher soil type areas and frequently in consistently overgrazed pastures, and corresponds with the 1.1 million ha of Very Low Cover Grasslands, and a portion of the 10.4 million ha of Low/Moderate Cover Grasslands identified by the Gap model (Edmond et al. 1998).

Historical Distribution. Montana prairies consisted of a complex matrix of these grassland types. The combination of grazing by buffalo (*Bison bison*), the presence of prairie dogs (*Cynomys spp*.), and frequent large scale fires historically resulted in a dynamic mosaic of short-grass and mixed-grass habitats. While distribution of the two types has always changed over time, these activities resulted in a diverse landscape with both types available within relatively short distance. The resultant landscape probably supported a wider range of species than current conditions allow.

Not yet available in electronic format for this report.

Figure 6. Remaining intact blocks of contiguous grassland, Montana (The Nature Conservancy 1999)

Not yet available in electronic format for this report.

Figure 7. Distribution of Mixed Grass and Shortgrass habitat types, Montana (after Edmond, et al. 1998).

Avifauna. The priority species in Mixed-grass Prairie have varied needs, from low-structured short-grass to high structured mixed grasses, as well as varied tolerance for shrub cover density and non-native grasses and forbs (Table 4).

Table 4. Relationships of Montana PIF priority species to vegetative features, Grassland habitat types.

Species	Structure			Area Dep.	Shrub Cover	Use of Non-native	Litter	Prairie Dog Assoc.
	Low	Med.	High					
Ferruginous Hawk	x	x	x	x	NA	yes	NA	x
Northern Harrier		x	x	x	NA	yes	med-high	
Mountain Plover	x			x	0%	no	bare	x
Long-billed Curlew	x	x			0%	yes	low	
Burrowing Owl	x			x	0%	low	bare	x
Short-eared Owl		x	x	x		yes	med-high	
Sprague's Pipit		x		x	<15%	low	low	
Lark Bunting	x	x	x		<60%	no	med.	
Baird's Sparrow		x		x	<25%	low	6-11cm	
Grasshopper Sparrow		x	x		<35%	yes	med.	
McCown's Longspur	x				<10%	no	bare/low	x
Chestnut-collared Longspur	x				<25%	low	low	
Bobolink			x		<10%	yes	med	
(Columbian) Sharp-tailed Grouse (Intermountain Grassland)		x	x	x	yes	no	high	

Management Issues. The most immediate threat to grasslands comes from the conversion of existing native grassland to cropland. The Conservation Reserve Program (CRP) program has the potential to slow the rate of conversion but only if participating individuals retain existing grasslands intact instead of plowing them to compensate for lost cropland. In addition the CRP program can function in re-establishing native grassland depending upon the seed mix. However, exotic grasses such as crested wheatgrass and smooth brome may poise an additional threat to native species and habitats. The effectiveness of CRP will be further limited by the timing and extent of emergency mowing.

Other potential problems within grasslands include:

- grazing regimes
- introduction of noxious weeds
- replacement of fire regime
- oil/gas and mineral development
- fragmentation of existing grassland
- increased cowbird predation
- urbanization
- shrub and tree encroachment.

Mountain Plover

Priority Level: I   MT Score: 27   AI: 3

Reason for Concern. Mountain Plovers are entirely dependent on shortgrass prairie for breeding, and have experienced habitat loss and population declines throughout their range. They have been proposed for listing under the Endangered Species Act.

Distribution. Mountain Plovers breed from southeastern Alberta and southwestern Saskatchewan through central Montana, south to southcentral Wyoming, eastcentral Colorado and northeastern New Mexico. Mountain Plovers are also found in small areas of northern Texas and western Kansas. Within Montana, Mountain Plovers are found east of the divide within short-grass prairie areas (Figure 8). There are an estimated 876,000 ha of suitable habitat in the state (Edmond et al. 1998). The majority of sightings occur in north-central Montana (south Phillips county).

Habitat Requirements. Mountain Plovers prefer large, level grassland with short sparse vegetation and considerable amounts of bare ground. Within Montana, Plovers are closely associated with blue grama grass and black-tailed prairie dog (*Cynomys ludovicianus*) towns. Mountain Plovers were seldom seen outside of prairie dog towns (Knowles et al., 1982). Prairie dog towns that are moderately to heavily grazed on a four year rest rotation grazing system provide an adequate mix of short vegetation and bare ground required by Plovers. Knopf (1996b) estimated bare ground near nest sites at 32 percent. In Alberta bare ground at unburned sites was 15 to 25 percent (Wershler and Wallis, 1987). Recently burned areas may also provide adequate habitat until dense vegetation has been reestablished. Wershler and Wallis (1987) found that bare ground on burned nest sites ranged between 45 and 50 percent.

The minimum area needed to raise broods was reported as 28 ha with males defending territories averaging 16 ha (Graul 1973, Knopf and Rupert 1996). Prairie Dog town size was important. Mountain Plovers were found on towns ranging from 6 to 50 ha (Knowles et. 1982, Olson 1984, Olson-Edge and Edge 1987). Dog towns less than 10 ha were considered marginal (Knowles et al. 1982, Olson 1984). Towns appear to provide greater food resources. Broods often use overlapping areas.

Ecology. Mountain Plovers arrive on the southern breeding grounds beginning in April and depart in August. Egg-laying begins in late April and usually clutches consist of three eggs. Nests occasionally have up to four eggs. Incubation by males begins once the clutch is complete and hatching is usually synchronous. Nests are often placed near cow pies, rocks, or clumps of vegetation. Litter cover near nests was greater than the surrounding habitat. Females may attempt to re-nest if failure occurs prior to June (Knopf 1966a). Multiple nesting with the male and female both incubating clutches has been reported (Graul 1973, Knopf 1996b). Chicks fledge in 33 to 34 days.

Associated Species. Burrowing Owl, **McCown's Longspur**, black-tailed prairie dog.

Not yet available in electronic format for this report.

Figure 8. Map of Mountain Plover distribution in Montana.

Management Issues and Conservation Recommendations:

- Historical breeding locations should be maintained because of breeding site fidelity.
- Breeding sites should be protected from disturbance during the breeding period.
- Prairie dog towns should be maintained. Sheep and cattle grazing in these areas should be encouraged as long as it doesn't prove excessive.
- Shooting and/or poisoning prairie dogs should be strictly controlled, and curtailed or eliminated at those sites inhabited by plovers.
- Existing native grassland should be protected from conversion to cropland.
- Adequate blocks of habitat should be maintained across the species range.
- Maintain a fire regime similar to historic occurrences. Burns should be conducted in late summer or early fall to promote vegetation that is associated with Mountain Plover habitat.
- Grazing regimes within mixed and short-grass prairies can be used to maintain habitats for Mountain Plovers.
- CRP land should be seeded/reseeded with native species of grasses. The use of exotic grasses should be discouraged.
- Shrub and noxious weed encroachment should be controlled at known and potential breeding sites.

Population objectives. The current population (estimated at 1400, Knowles, pers. comm.) must be maintained and increased. The current target population should be set at 2800 pairs or higher, dependent on changes in information concerning the species. Habitat blocks should be maintained in the vicinity of current and historic breeding sites.

Burrowing Owl

Priority Level: I MT Score: 21 AI: 4

Reason for Concern. Burrowing Owl populations have declined significantly in the northern Great Plains (p.a. 64). Their declines can be attributed primarily to declines in the number and extent of prairie dog colonies.

Distribution. Western Burrowing Owls breed from southern Alberta south to southern California, and east to eastern North Dakota, westcentral Kansas, and Texas. Populations in the northern part of this range are migratory. Suitable habitat in Montana is limited primarily to the eastern two-thirds of the state; given the current reduced status of prairie dogs, the estimate of >60% of the state being suitable habitat for this species (Edmond et al. 1998) is overly optimistic. Two authors have gathered recent information on Burrowing Owls in Montana. Restani (pers. comm 1999) documented 190 nesting pairs while surveying 22 percent of known black-tailed prairie dog town acreas in Montana. Atkinson (pers. comm. 1999) working with a number of biologist through out the state found that approximately 40 percent of the towns surveyed were occupied with Burrowing Owls.

Habitat Requirements. Burrowing Owls prefer open areas such as deserts, grasslands, and shrubsteppe that are characterized by sparse vegetation and bare ground. Moderately or heavily grazed pasture can be used (Bent 1961; Stewart 1975; MacCracken et al. 1985a; Haug and Oliphant 1987; Stockrahm 1995). Burrowing Owls breed primarily in native prairie, tame pasture and occasionally in urban settings. Although Burrowing Owls occasionally nest in cropland (Grant 1965, Butts 1973, Schmutz and Moody 1989), most of these nests probably fail when the land is cultivated.

Western Burrowing Owls are not known to excavate their own burrows. Burrowing mammals, particularly black-tailed prairie dogs and Richardson's ground squirrels (*Spermophilus richardsoni*) provide nest sites. Availability of burrows may be limiting particularly in areas lacking colonial burrowing rodents (Desmond and Savidge 1996). Burrowing Owls may also use badger (*Taxidea taxus*)excavations as nest sites (Scott 1940, Butts 1973, Stewart 1975). Most Burrowing Owls in southcentral Saskatchewan nested in abandoned American badger excavations (Wedgwood 1976). Burrowing Owls occasionally nest in the burrows of the white-tailed prairie dog (*C. leucurus*) but seem to prefer black-tailed prairie dog colonies because of the shorter vegetation. Nests are usually placed at the end of a 4-12 foot long burrow.

Burrowing Owls can use several non-nest or satellite burrows. Several authors feel that the use of satellite burrows reduces nest parasites (Grant 1965; Butts 1973; Konrad and Gilmer 1984; Haug 1985; Desmond 1991). Others have suggested that it is a predator avoidance strategy designed to protect broods (Desmond 1991, Toombs 1997). In Saskatchewan, an average of six burrows occurred within 30 m of the nest burrow (Haug 1985; Haug and Oliphant 1987, 1990). Plumpton and Lutz (1993) found that burrows used as nest sites in northcentral Colorado were closer to roads, farther from perches, and surrounded by more bare ground, and shorter grasses than non-nest burrows.

Burrowing Owls nesting on prairie dog colonies have been referred to as semi-colonial in that they will use nest burrows in clusters (Butts 1973; Desmond 1991). Clustered nest distributions may reduce depredation by allowing owls to alert one another to potential predators. In Nebraska, Burrowing Owls on large (> 35 ha) black-tailed prairie dog colonies nested in clusters with a mean nearest-neighbor distances of 125 meters while Owls in smaller (<35 ha) colonies nested with mean nearest-neighbor distances of 105 meters (Desmond 1991, Desmond et al. 1995, Desmond and Savidge 1996).

Burrowing Owls have been shown to prefer active prairie dog towns to inactive towns. Owls in larger well-populated prairie dog colonies are more likely to exhibit nest site fidelity, experience lower rates of nest depredation, and have higher nest success than owls in smaller colonies or in colonies with lower densities of prairie dogs (Butts 1973; Desmond and Savidge 1996; Toombs 1997).

Burrow fidelity has been reported in some areas (Schmutz et al. 1989, Feeney 1997). Many researchers have shown reuse of traditional nesting areas without using the same burrow. Both burrow fidelity and nest area re-use are enhanced if birds were reproductively successful during the previous year (Pezzolesi 1994, De Smet 1997, Feeney 1997, Plumpton and Lutz 1998). Elimination of prairie dogs from colonies results in the deterioration of burrows and vegetative succession. Black-tailed prairie dog colonies in Oklahoma became unsuitable for Burrowing Owls within 1-3 years of abandonment (Butts 1973). All nesting attempts in northcentral Colorado occurred in active black-tailed prairie dog colonies (Pezzolesi 1994). The density of Burrowing Owls in prairie dog colonies in northeastern Colorado was positively related to the percentage of active burrows (Hughes 1993). At least 50% of the burrows were active in 26 of 27 occupied colonies. For prairie dog colonies with over 90% active burrows, mean density of Burrowing Owls was 2.85 owls/ha, and for those with 70-80% active burrows, mean density was 0.57 owls/ha, suggesting that owls selected colonies with a high proportion of active burrows.

Burrowing Owls in northcentral Oregon appeared to require observation perches in habitats where the vegetation was greater than 5cm tall (Green and Anthony 1989). In Minnesota, territories always included observation perches such as fence posts, dirt mounds, boulders, or utility poles (Grant 1965).

Burrowing Owls prey on arthropods and small mammals, and are believed to be opportunistic feeders. In northcentral Colorado, Burrowing Owls selected for arthropods (Plumpton 1992, Plumpton and Lutz 1993) while in southeastern Alberta, voles (*Microtus spp.*) and mice (*Peromyscus spp.*) were the preferred prey (Schmutz et al. 1991).

Fledgling success in Burrowing Owls is related to adequate food supply. Successful reproduction during a single year in southeastern Saskatchewan was the result of an overabundance of voles during the breeding season (Clayton 1997, Wellicome 1997a, Todd 1998). In southeastern Idaho, starvation of fledgling owls appeared to be an important mortality factor (Gleason 1978).

Burrowing Owls forage in a variety of habitats, including cropland, pasture, prairie dog colonies, fallow fields, and sparsely vegetated areas. Habitats with tall (30-60 cm) vegetative cover (road rights-of-way, native grassland, and mature cropland) had more abundant prey than hayland, pasture, or fallow fields (Wellicome 1994, Wellicome and Haug 1995). However, tall dense vegetation may preclude Burrowing Owls from locating and/or catching prey (Haug and Oliphant 1987, 1990; Wellicome 1994). Owls in central Saskatchewan appeared to prefer grass/forb areas (e.g., road rights-of-way and uncultivated areas) over non-irrigated cropland or native pastures, possibly because grasshopper (Acrididae) abundances were high (Haug 1985, Haug and Oliphant 1990).

Area Requirements. Burrowing Owls generally stay close to the nest burrow during the daylight hours, and forage farther from the nest between dusk and dawn (Haug 1985, Haug and Oliphant 1990). Nesting-area requirements ranged from 4.9 to 6.5 ha in Minnesota: 4.1 to 7.3 ha in North Dakota (Grant 1965): 3.5 ha in Wyoming (Thompson 1984). Foraging-area requirements are considerably larger than nesting-area requirements; in southern Saskatchewan, male owls foraged within areas ranging from 14 to 481 ha (Haug 1985, Haug and Oliphant 1990): in southern Saskatchewan foraging areas averaged 35 ha (Sissons et al. 1998). In northeastern Colorado, prairie dog colonies used by Owls ranged in size from 1.9 to 167.6 ha (Hughes 1993.

Habitat fragmentation allows predators to find nests easily (James et al. 1997, Warnock and James 1997). In Saskatchewan, Owls in smaller habitat patches experienced higher levels of nest depredation, foraging interference, and aggression (Warnock and James 1997). Additionally, extirpation of Owls from habitat patches was less probable with increasing habitat continuity (Warnock 1996, 1997). Pastures occupied by Owls had a lower edge-to-area ratio than randomly chosen, unoccupied pastures (Wellicome and Haug 1995; Warnock 1996, 1997).

Breeding Season. Burrowing Owls occupy their breeding grounds within the Great Plains from about early April until September (Bent 1961, Grant 1965, Maher 1974, Wedgwood 1976, Gleason 1978, Haug 1985, Ratcliff 1986, Haug and Oliphant 1990). Renesting attempts following failed nests have been reported in western Oklahoma (Butts 1973), western Nebraska (Desmond 1991), and Saskatchewan (Wedgwood 1976, Haug 1985).

Species' Response to Management. Urban development (Zarn 1974, Konrad and Gilmer 1984, Barclay et al. 1998), conversion of pastures to cropland (Grant 1965, Konrad and Gilmer 1984, Ratcliff 1986), and cultivation of grasslands (Grant 1965, Faanes and Lingle 1995) limit Burrowing Owl populations through the destruction of nesting habitat.

Elimination of burrowing rodents through control programs has been identified as the primary factor in the recent decline of Burrowing Owl populations (Grant 1965; Butts 1973; Zarn 1974; Butts and Lewis 1982; Evans 1982; Ratcliff 1986; Pezzolesi 1994; Faanes and Lingle 1995; Desmond and Savidge 1996, 1998, in press, in prep.; Toombs 1997; Barclay et al. 1998; Murphy et al. in press). Preservation of black-tailed prairie dogs and Richardson's ground squirrels may be essential to the conservation of Burrowing Owls. Fragmentation and isolation of prairie dog towns may be potentially important factors in the decline of black-tailed prairie dog populations, but are largely unstudied. Declines of Burrowing Owl populations north and east of the Missouri River in North Dakota could be related to declines in Richardson's ground squirrel populations (Murphy et al. in press) while declines south and west of the Missouri River may be related to reductions in black-tailed prairie dogs. In western Nebraska, a 63% decline in Burrowing Owl numbers over a 7-yr period in 17 black-tailed prairie dog colonies was associated with declines in black-tailed prairie dog densities due to control activities (Desmond and Savidge 1998, in prep.). Burrowing Owl reproductive success was positively correlated density of active black-tailed prairie dog burrows.

Little information exists on the response of Burrowing Owls to burning. In Oregon, Burrowing Owls were observed nesting in badger excavations in previously unused areas. It was suggested that fire may create suitable habitat by reducing vegetation around potential nest sites (Green and Anthony 1989). Additionally, in North Dakota fire suppression may be responsible for the development of a taller, denser, and woodier plant community that excludes Burrowing Owls (Murphy 1993).

Burrowing Owls prefer grasslands grazed heavily by cattle or prairie dogs. Cessation of grazing negatively impacts Burrowing Owl populations. In southcentral Saskatchewan, heavily grazed, poor soils were used frequently by Burrowing Owls, and moderate to heavy grazing on good soils reduced lush vegetative growth and provided suitable habitat (Wedgwood 1976). Burrowing Owls in North Dakota nested in moderately or heavily grazed mixed-grass pastures, but not in hayed or lightly grazed mixed-grass (Kantrud 1981). Optimal breeding habitat in portions of Colorado, Montana, Nebraska, North Dakota, South Dakota, and Wyoming occurred in heavily grazed areas (Kantrud and Kologiski 1982).

The use of insecticides and rodenticides in Burrowing Owl habitat can be detrimental. Pesticides not only reduce food supply and burrowing mammals, but these chemicals also may be toxic to the owl. Owls have been observed ingesting poisoned rodents and insects in areas littered with poison grains (Butts 1973, James et al. 1990). A breeding population in the Oklahoma Panhandle declined by 71% one year after sodium fluoroacetate was applied to the prairie dog colony (Butts 1973). Owl nests can accidentally be fumigated and sealed in control programs.

Management Recommendations. Keys to Burrowing Owl management include providing areas of short, sparse vegetation and maintaining populations of prey species and burrowing mammals to ensure availability of burrows as nest sites. In particular, the conservation of black-tailed prairie dog and Richardson's ground squirrel colonies appears to be vital to the preservation of Burrowing Owls.

C Educate the public, especially private landowners, about the status of Burrowing Owls, the benefits of protecting habitat for the species and for burrowing mammals, and the negative effects of insecticides.

C Develop educational programs for schools and outdoor education.

C Enlist landowners' help in protecting burrows. Operation Burrowing Owl (a private stewardship program in Canada) and the Prairie Partners program of the Colorado Bird Observatory have been extremely successful at obtaining landowner cooperation.

C Work to improve the image of prairie dogs.

C Enlist municipal, state, or federal governments and conservation organizations in obtaining easements or purchasing land in prime owl habitat. Offer financial incentives to landowners who avoid agricultural activities that negatively affect the Burrowing Owl.

C Encourage municipal governments and agricultural representatives to reduce or restrict the use of pesticides, and to use pesticides of low toxicity to nontarget species.

C Government agencies should shift from subsidizing prairie dog reduction to leadership in finding workable alternatives that maintain viable prairie dog communities and ranching systems.

C Identify owl nesting sites on public lands so that they can be protected.

C Preserve traditional nesting sites.

C Maintain large, contiguous areas of native grassland.

C Allow moderate to intense grazing on good soils that otherwise would support tall vegetation.

C Do not spray pesticides within 400-600 m of owl nest burrows during the breeding season.

C Regulate poisoning and shooting of prairie dogs, particularly on public lands.

C If lethal control of burrowing mammals is necessary, restrict the timing of control activities to avoid the period when Burrowing Owls choose nest sites or are nesting.

C Consider relocating owls on an experimental basis before poisoning mammals. Do not use traps, poisoned meat, or poisoned grain for rodent control when Burrowing Owls are present.

C Increase the area of prairie dog colonies, possibly by reintroducing prairie dogs where they have been eliminated, or by releasing additional prairie dogs into active colonies to promote colony expansion.

C Protect colonies and increase populations of burrowing mammals.

- C Preservation of large tracts of remaining prairies is crucial to maintaining the prairie mammal community.

- C Preserve, restore, or enhance prey habitats such as road rights-of-way, hayland, and uncultivated areas of medium height vegetation within a 1-km radius of nesting areas.

- C Plant permanent vegetation strips in heavily cultivated regions to increase habitat for rodent prey.

- C Implement rotational grazing in heavily grazed areas to increase prey populations.

Population Objectives. Maintain or increase the number of Burrowing Owls in the state. Use the guidelines of 190 nesting pairs on 22 percent of dog town acreages (Restani, pers. comm., 1999) and approximately 40 percent occupancy in dog towns (Atkinson, pers. comm., 1999) as population objectives. These guidelines may be changed if new information indicates target numbers must be larger in order to sustain populations.

Sprague's Pipit

Priority Level: I MT Score: 24 AI: 5

Reason for Concern. Although their populations do not seem to be declining, Montana has a high responsibility for this species because a high percentage of its range falls within the state.

Distribution. Sprague's Pipits breed in an area from north central Alberta east to central Manitoba then south through Montana (except for extreme south east Montana) and into North central South Dakota. As much as 9 million ha may be suitable habitat for this species in the state (Edmond et al. 1998).

Habitat Requirements. Sprague's Pipits prefer grassland areas of moderate to intermediate vegetation density with moderate grass height and variation (Dale 1983, Madden 1996, Sutter 1996, Sutter and Brigham 1996). Although they will use introduced tame pasture land, they are significantly more abundant in, and prefer, native prairie (Dale 1992, Anstey et al. 1995, Madden 1996. In Saskatchewan Dale et al. (1997) found a higher production in idle grassland then that of native hayland or tame pasture. Other important vegetative and physical features include low visual obstruction, moderate litter cover, little or no woody vegetation. In Alberta native grassland, Sprague's Pipits preferred areas with moderate cover diversity, moderate grass height and height variation, and moderate to high grass:forb ratio (Prescott and Murphy 1996). Prescott and Wagner (1996) found that the number of Pipits increased with declining litter depth, decreasing number of plant contacts >10 cm, increasing percent grass and sedge cover, and increasing maximum vegetation height. They also found that Sprague's Pipits were negatively correlated with litter depth.

While Sprague's Pipits are most abundant in idle grasslands light to moderate grazing, prescribed burning, and mowing done the previous year can be important management tools in preventing litter buildup and encroachment from shrubs. Sprague's Pipit may not use these areas immediately after implementing the technique but will return after grassland structure has been adequately restored. Sprague's Pipits avoided idle areas with deep litter in North Dakota (Madden 1996). Grazed grasslands generally support fewer Sprague's Pipits than ungrazed grasslands. Heavy grazing is detrimental as it reduces vegetation height below those required by Sprague's Pipits (Maher 1973, Owens and Myres 1973, Dale 1984). However, lightly to moderately grazed grasslands are used throughout the breeding range (Owens and Myres 1973, Kantrud and Kologiski 1982, Bock et al. 1993, Anstey et al. 1995). Pylypec (1991) found that populations declined for two years following fall burns before recovering. While frequently hayed lands were avoided, Pipits did use hayland in Canada one year after moving (Owens and Myres 1973, Dale et al. 1997).

Area Requirements. Studies of Sprague's Pipits conducted in large blocks of grasslands, indicate that the species is most abundant in large grassland areas and may be area sensitive. In Saskatchewan, Sprague's Pipits had minimum area requirement of 190 ha (SWCC 1997).

Breeding Season. Sprague's Pipits arrive in April or early May and depart in September and October (Bent 1965, Stewart 1975). In North Dakota they have two periods of breeding activity-late April to early June, and again from mid-July to early September (Stewart 1975). Clutches were begun about 11 May through about 29 July in Maher's (1973) study in Saskatchewan. Another study found two breeding activity periods (21-31 May and 1-10 July) in 1994, but only a single peak (1-10 June) in 1995 (Sutter 1996). These studies indicate that females lay replacement clutches, and may be double brooded in some years (Maher 1973, Sutter 1996).

Management Recommendations. Keys to Sprague's Pipit management include providing suitable grassland habitat, especially native prairie, with intermediate vegetation height and low visual obstruction, and controlling succession.

C When implementing management, such as burning, grazing or haying avoid disturbing nesting habitat during the breeding season.

C Protect existing grassland habitat.

C Provide large bocks of grassland habitat to maintain area sensitive birds and decrease nest depredation and cowbird brood parasitism.

C Maintain grasslands free of woody vegetation.

C Burning grasslands can help maintain litter requirements. Populations can be expected to decline immediately after burning and vegetation must recover before Sprague's Pipit will recolonize areas.

C Mow hayland using a rotational schedule to provide optimal habitat. Divide large fields in half, with each half being mowed in alternate years, to ensure productivity of hay and of birds Complete idling of hayfields is detrimental for Sprague's Pipits in Saskatchewan.

C Delay mowing until after 15 July, which may allow >70% of nests to fledge (Berkey et al. 1993, Dale et al. 1997). In years with delayed nesting, mowing may have to be delayed until late July or August to protect nests and fledglings.

C Avoid heavy grazing; light to moderate grazing may be beneficial.

C Convert non-native uplands, including hayland and pasture, to native vegetation.

C Encourage the use of native mixtures in all CRP plantings.

Baird's Sparrow

Priority Level: I   MT Score: 27   AI: 5

Reason for Concern: There appears to be long term decline in the population. This decline is probably related to the conversion of native grassland to cropland. Montana supports a large percentage of the global population of this species.

Distribution. General distribution extends from southern Alberta, across Saskatchewan and the southwest corner of Manitoba, south through North Dakota and into South Dakota. Within Montana, the species is found from west of Great Falls eastwardly to North Dakota and south along that border. Most of the sightings occurred north of the Missouri River, in the glaciated portion of the mixed-grass prairie; the corresponding estimate of suitable habitat in the state predicted by Montana Gap models is 4.3 million ha (Edmond et al. 1998).

Habitat Requirements. Baird's Sparrow seem to prefer grasslands that are lightly grazed or not grazed. Vegetation heights at preferred sites tend to be between 20 cm and 100 cm with moderate to dense litter present. Shrub cover above 25 % can reduce habitat suitability (Sousa and McDonal, 1983). Native prairie appears to be preferred habitat although some work has indicated that structure is more important than species composition. There has been documented use of crested wheatgrass fields, while wide-leaf exotics such as smooth brome are avoided (Anstey et al., 1995; Mahon, 1995; Sutter, et al.,1995). Overly dense habitats also appear to be avoided. Baird's Sparrow appear to use drier areas during unusually wet years and wet areas during unusually dry years. Baird's Sparrow also appear to require patchy but higher than normal occurrence of forbs.

Ecology. Baird's Sparrows begin arriving on the breeding grounds from late April to early May. Nesting begins in late May and continues until August. The status of double nesting is unclear. Double broods have been noted, and Maher (1973) noted two peaks in clutch initiation dates suggesting double brooding. However, Lane (1968) suggested a low probability of second nests. Territorial area requirement estimates vary; Lane (1968) reported territories ranging from 0.4 to 0.8 ha while Winter (1994) reported territory sizes up to 1.2 ha. In Saskatchewan, minimum area requirements were estimated at 63 ha (Saskatchewan Wetland Conservation Corp, 1997).

Associated Species. Other bird species that require similar dense nesting habitat include the **Sprague's Pipit**, **Grasshopper Sparrow**, Vesper Sparrow, and Western Meadowlark.

Management Issues / Recommendations. Baird's Sparrows are irruptive, with populations shifting location to take advantage of habitat changes and local environmental conditions. The most immediate need is to protect large blocks of grassland with adequate cover to meet nesting requirements of Baird's Sparrows throughout the range of the species. Each area should be large enough to support numerous breeding territories. Because of the irruptive nature of the species, it is recommended that blocks be maintained on a regional basis to buffer the population from local adverse conditions.

C   Conversion of native grassland to cropland should be halted.

- Prescribed burning is recommended to prevent the encroachment of woody vegetation and to avoid conditions where litter and vegetation is too dense to support populations. However, since Baird's Sparrow populations may decline within these burned areas for up to a year or two, the number of habitat blocks required for management must be increased. Each management area should maintain an assortment of unburned, burned and post-burn areas. Burning should reflect historic fire regime.

- When possible mowing should be delayed until mid-July or August. Adverse spring weather conditions may push the mowing date further into late summer/fall.

- Only light grazing is recommended. A deferred rotational system that only gazes part of the range during the growing season appears to work best.

- Restored grassland and CRP lands should be reseeded with native grasses.

- Vegetative diversity should be maintained and enhanced. Scatted patches of forbs, varying grass heights, and a variety of litter densities should be provided.

Population Objectives. Document population changes by implementing habitat-based point count monitoring for grassland species, and supplement these with investigations of nest success. Nest success should be greater than 40% with 2.5 fledglings/pair at 6 to numerous sites for a minimum of five years. We must restore historical populations where possible.

Ferruginous Hawk

Priority Level: II MT Score: 21 AI: 4

Reason for Concern. Montana has a high responsibility for this species, which is a species of special concern to most partner agencies. Although populations are apparently increasing in the state, the Ferruginous Hawk is considered to be sensitive to habitat change and disturbance.

Distribution. Ferruginous Hawk occurs from northeast Washington across southern Alberta and southern Saskatchewan south to southern California; east through northern Arizona to northern Texas and as far east as eastern North Dakota. Two subpopulations were identified by Bechard and Schmutz (1995). The subpopulations are separated at the Rocky Mountains with one subpopulation east and the other west. The species occurs throughout eastern Montana, and in the sagebrush/grassland valleys of the southwest (e.g. Beaverhead NF).

Habitat Requirements. Ferruginous Hawks are usually associated with open grasslands or shrubsteppe habitats characterized by rolling to rugged terrain. They use various grasslands types, including native prairie, pasture, and haylands. Croplands have been used occasionally, although Konrad and Gilmer (1986) found cultivated fields were rarely used in North Dakota. Leary et al. (1998) indicated that agricultural fields became an important foraging area when prey densities dropped in adjacent habitats. Habitats that are avoided include parkland, forest interior, high elevation habitats and narrow canyon lands and cliff areas (Janes 1985, Palmer 1988, Black 1992, Restani 1991, and Schmutz 1991a). Ferruginous Hawks tend to be opportunistic nesters (Olendorff 1973, Woffinden 1975, Gilmer and Stewart 1983), nesting on or near the ground, in trees, shrubs (Restani 1991), artificial platforms and river cutbanks.

Nest placement is dependent on land use patterns, topography and available substrate. Ferruginous Hawks are sensitive to human disturbance and tend to avoid areas of activity. Ground nests are situated in open elevated grassland far from human activity. Alberta birds seldom nested within 0.5 km of farmyards (Schmutz 1984). Ferruginous Hawks in North Dakota tended to avoid nesting within 0.7 km of occupied buildings. Tree-nesters are less sensitive than ground nesters but still tend to avoid areas of human activity (Gilmer and Stewart 1983, Schmutz 1984, Bechard et al. 1990). Ground nesting birds in northern Montana tended to place nests in rolling grass dominated types and avoid cultivated fields and sagebrush types (Black 1992).

Area Requirements. Wakeley (1978) found that Idaho birds may require up to 21.7 km^2 for one hunting pair. Estimates of home range vary with birds from Colombia basin averaging from 3 to 8 km^2 and Washington birds ranging 90.3 km^2 (Janes 1985, Leary et al. 1998).

Ecology. While birds, herps and insects are frequently taken small mammals constitute the majority of prey items during the breeding season (Restani 1991). The primary prey includes ground squirrels, pocket gophers (*Geomys spp.),* and white-tailed jackrabbits (*Lepus townsendii).* White-tailed and black-tailed prairie dogs also are prey items. Habitat types characterized by dense vegetation are avoided by Ferruginous Hawks because of prey vulnerability (Howard and Wolfe 1976, Wakeley 1978 and Schmutz 1987).

Ferruginous Hawks usually arrive in Montana during April and May (Restani 1991). Pairs tend to return to previous years territory and to one of several nest sites within a territory. Schmutz (1991b) reported mate fidelity. Ground nests tend to be placed in grasslands on elevated landforms. Black (1992) working in northern Montana found that nests were placed on the top of small rises or on hillsides with slopes of from 10 to 50%. Atkinson (1992) found that nests in southwestern Montana were on the upper 1/3 of slopes that averaged 62.8%. Black (1992) found that the average height above the valley floor was 10.4 m. Tree nesting birds tended to use trees that were isolated or peripheral.

Management Issues. Ferruginous Hawks are particularly sensitive to disturbance during the breeding season (Olendorff 1973, Gilmer and Stewart 1983, Schmutz 1984, White and Thurow 1985, Bechard et al. 1990). High rates of abandonment occur in the early stages of nesting (Davy 1930, Weston 1968, Fitzner et al. 1977). Abandonment may increase in years of low prey numbers (White and Thurow 1985). Blair (1978) found greater nesting success in remote areas than in nests placed within 1.5 mi of occupied buildings.

Management Recommendations. Keys to management are to provide large blocks of suitable habitat, provide suitable nest sites, protect active nest areas from disturbance, and improve habitat for prey.

C Maintain existing large blocks of native grasslands.

C Protect known nest sites from disturbance, 15 March to 15 July.

C Encourage use of native seed mix in all CRP lands.

C Discourage the use of non-native exotic grasses near Ferruginous Hawk territories.

C Discourage shooting of prairie dog, ground squirrel and other prey species in Ferruginous Hawk territories.

C Avoid treatment activities (grazing/haying/burning) within a March to August time frame.

Long-billed Curlew

Priority Level: II MT Score: 23 AI: 4

Reason for Concern. North American population has declined in the past 25 years as suitable nesting habitat has been converted to other uses. The species was formerly listed as a category 2 candidate for federally threatened and endangered status. Breeding habitat within the state appears to be fragmented and unprotected (Edmond in Clark et al. 1989). Migration is directly southwest from the breeding grounds to the wintering grounds in southern California and Mexico (Paulson 1993, Edmond, et al.1998).

Distribution. The Long-Billed Curlew, North America's largest shorebird, is found throughout the northwestern states where sufficient native grasslands and shortgrass prairie remain for its nesting sites. It winters on the gulf coast, in southern California, and western Mexico. In Montana the species can be found breeding and migrating throughout the state, however they are more common east of the Rockies, particularly along the Rocky Mountain Front. There are a few records from the extreme western edge of the state. Overwintering does not occur in Montana. (Edmond, et al.1998; Montana Bird Distribution Committee 1996; Kaufman 1998); peak numbers during migration occur in August and September.

Habitat Requirements. Usually found in the prairies and grasslands of the northwestern interior of North America, their range does extend into southwestern Canada. Presence of short grasses such as native shortgrass prairie is a requirement. Apparently the structure of the grassland is much more important than species composition or aridity. Two authors (Bicak et al. 1982, Pampush and Anthony 1993) have found that in Idaho abundance is negatively correlated with vegetation height and percent vertical coverage. Vertical structure should be under 30 cm tall. While wet habitats are not necessary for nesting water does seem to be important; many nests have been located in arid habitats relatively close to a water source. Have adapted well to nesting in crop lands if the vegetation is of the correct height. Proximity to water influences nest success.

Ecology. Long-Billed Curlews nest in the high plains, preferring well-drained native grasslands, sagebrush, and agricultural land with a gently rolling topography. Eats mostly terrestrial insects, especially beetles and grasshoppers; may occasionally eat toads, spiders, berries, and the eggs and young of other birds. Also forages in mudflats, shorelines and wetlands, however these areas are more often foraged on the wintering grounds than on breeding grounds. (Edmond, et al.1998, Kaufman 1998). Long-billed Curlews seem to require large blocks of grasslands. Bicak et al. (1982) found that territories averaged 14 ha in size and were set in a buffer zone of from 300 to 500 m of grassland. Also, proximity to water has an influence on nest success; this may be to provide a diversity of foraging habitats (Edmond, et al.1998, Paulson 1993). Nest sites are usually on dry grassland in open grass, and often very close to some feature that breaks up the landscape such as a rock or cow dung. (Paulson 1993). Incubation is 27-30 days. Young feed themselves, though both parents attend the young. First flight is anywhere from 32-45 days (Ehrlich et al 1988).

Management Issues. Adaptable to agricultural lands but restricted to crops of suitable height and thickness. Burning and heavy grazing by livestock reduces vegetation coverage and density, improving habitat; however these practices at the wrong time or to a high degree can lead to heavy nest failure (Edmond, et al.1998).

Management Recommendations

- Provide large blocks of suitable habitat.

- Maintain vertical structure through appropriate management techniques such as light grazing, and occasional prescribed burning.

- Management activities, and grazing should be delayed until after the breeding season (approximately July 15).

- Prevent loss of rangelands through sodbusting

Lark Bunting

Priority Level: II MT Score: 20 AI: 4

Reason for Concern. Due to population declines, sizeable annual fluctuations in local abundances, loss of habitat, grasshopper control practices, and contraction of breeding range, the Lark Bunting merits consideration as a sensitive species (Finch 1992). The habitat provided in Montana is important in the conservation of Lark Bunting due to the large proportion of the existing population that breeds in the state.

Like many other grassland birds, habitat destruction has been responsible for declines in Lark Bunting populations since the nineteenth century (Andrews and Righter 1992). However, this species is fairly nomadic during the breeding season, and short-term movements can obscure or accentuate long-term trends. For example, Lark Buntings are normally scarce residents of eastern South Dakota, but large numbers appeared in that portion of the state during 1964. They remained numerous through 1970, but then returned to their previous abundance (SDOU 1978). Similar fluctuations have been reported elsewhere, but are normally of shorter duration. Annual fluctuations in precipitation levels and habitat conditions are believed to be primarily responsible for these nomadic movements.

Along BBS routes, Lark Buntings are normally most numerous on the central and western Great Plains from eastern Colorado and western Kansas north to Montana and North Dakota. Their numbers rapidly diminish towards the peripheries of their range. Despite their nomadic movements, population declines predominate throughout most of their range. Increasing populations tend to be small and localized, except for portions of Montana and Alberta. Regional trends are generally non-significant declines during 1966-1994; there are no significant increases, and declines are evident in 3 states/provinces and 2 physiographic strata (Sauer et al. 1995).

Distribution. Lark Buntings breed from southern Alberta to southern Manitoba, south to northeastern New Mexico and northwestern Texas, and east to Nebraska (Sauer et al. 1995, Finch et al. 1987). During the winter months, Lark Buntings are most prevalent in the southwestern deserts from south Texas to southern Arizona and south into Mexico. They occupy weedy, barren habitats within these desert communities (Phillips et al. 1964, Sauer et al. 1995). In Montana, Lark Buntings are distributed east of the continental divide (Mont. Bird Distr. Com. 1996). High populations of Lark Buntings occur in a zone roughly extending from southeastern South Dakota to central Montana, then southerly through the shrubsteppe area of Montana and Wyoming into the shortgrass area of northeastern Colorado and the southwestern portion of the Nebraska panhandle (Kantrud 1982). The Montana Gap model predicts >20 million ha of suitable habitat in the state (Edmond et al. 1998).

Habitat Requirements. Lark Bunting is a conspicuous occupant of short-grass and mixed-grass communities of the Great Plains. In North Dakota, their optimum habitats are sage prairies, although they are found in other mixed-grass communities as well as fallow fields, weedy roadsides, and hayfields (Stewart 1975). In Colorado, they are most numerous in short-grass prairies but also occupy sagebrush habitats in mountain parks (Andrews and Righter 1992). Lark Buntings also breed in rabbitbrush, alfalfa, greasewood and saltbush habitats (Finch et al. 1987). In Colorado, Lark Buntings preferred taller and denser vegetation than Horned Larks or Chestnut-collared Longspurs (Creighton 1974).

Grass height and cover, and percentage of bare ground are important habitat variables affecting Lark Bunting populations. Overall vegetative cover varied from 70 to 90%, while bare ground was 10 to 16%. Shrubs or tall, weedy annual plants are an important component of nesting habitat. Optimal percent canopy cover of vegetation taller than the dominant grass stratum is considered to be 10 to 30%. Protective cover from solar radiation at the nest is a crucial factor for breeding Lark Buntings (Finch et al. 1987).

Lark Buntings are gregarious, with male flocks observed during the summer months (Finch 1992). Breeding densities of Lark Buntings fluctuate greatly from year to year (Wiens and Dyer 1975). Territory sizes for male Lark Buntings range from approximately 0.2 ha to 0.75 ha (Finch et al. 1987).

Ecology. Foraging is primarily on the ground, but this species will hawk from the air. The adult diet is grasshoppers, grass, and forb seeds; the young essentially eat insects only (Ehrlich et al. 1988, Finch et al. 1987). Lark Bunting nests are placed on the ground in shallow depressions, often sheltered by overhead vegetation. The nest is woven of grass, forbs, fine roots, lined with finer grass, stems, hair, or plant down. The incubation period is 11-12 days. The clutch size is 4-5. Young are able to fly after 8-9 days (Ehrlich et al. 1988).

In Colorado, Lark Bunting nesting peaked from late May through mid-June and ended by mid-July (Creighton 1974). The breeding season in Montana would be shorter then those dates and the breeding season is estimated to start in mid-May and migration to occur in late August.

During the winter months, Lark Buntings are most prevalent in the southwestern deserts from south Texas to southern Arizona and south into Mexico. They are also quite nomadic during these months, apparently in response to food availability. Throughout their winter range, Lark Buntings can be locally numerous one year and nearly absent the next. These fluctuations in abundance are responsible for very imprecise trend estimates based on data from CBCs, although these data suggest that their populations are also declining (Sauer et al. 1995).

Associated Species. Other bird species that may respond similarly to habitat components used by Lark Buntings include Horned Lark, **Chestnut-collared Longspur**, Western Meadowlark, Vesper Sparrow, **Brewer's Sparrow**, and **Northern Harrier**. Five of these species (Lark Buntings, Horned Larks, **Chestnut-collared Longspurs**, Western Meadowlarks, and **Brewer's Sparrows**) have a center of abundance in east-central Montana (Kantrud 1982). In Colorado, Lark Buntings preferred taller and denser vegetation than Horned Larks or Chestnut-collared Longspurs (Creighton 1974).

Management Issues/Recommendations. Lark Buntings using grasslands of the North American Great Plains and Southwest for breeding and/or wintering, usually respond positively, at least to moderate grazing in taller grasslands, but respond negatively, at least to heavier grazing in shorter grasslands (Bock et al., 1993). When vegetation height is taller than buntings prefer (e.g., >30 cm), heavy grazing can improve habitat quality by decreasing canopy height. In shortgrass types, heavy grazing is detrimental because percent of bare ground is drastically increased and food, shade, and nest site availability are reduced (Finch et al. 1987). Local population levels vary greatly from year to year, possibly in response to fluctuations in abundance of grasshoppers, a preferred prey item.

C Provide and maintain shrub prairie, native grasslands, or disturbance habitats such as retired cropland, weedy stubble fields, and alfalfa and sweet clover of adequate size.

C Provide well-distributed patches of suitable habitat throughout the range of the species in the state.

C Tailor grazing intensity to local conditions: tall-grass areas can be made suitable for breeding Lark Buntings by implementing moderate to heavy, or season-long grazing.

C Reduce or eliminate heavy summer grazing where Lark Buntings occupy arid, short grass areas.

Grasshopper Sparrow

Priority Level: II MT Score: 16 AI: 3

Reason for Concern. The Grasshopper Sparrow has experienced rangewide population declines, including physiographic area 64 (PT/PTU = 5/2), but has done well in the norther n Great Plains (1/1), and in Montana (2/2). It does well in many CRP plantings, but is sensitive to grazing.

Distribution. Grasshopper Sparrows breed from southern British Columbia to southern Maine, south to southern California central Texas and central Georgia. The Great Plains from North Dakota to Texas and east to Illinois contain the majority of the Grasshopper Sparrows. The Montana Gap model predicts >15 million ha of potential habitat in the state (Edmond et al. 1998).

Habitat Requirements. The preferred habitat of the Grasshopper Sparrow appears to be grasslands of intermediate height (Bent 1968, Blankespoor 1980, Vickery 1996). The birds are often associated with clumped vegetation interspersed with patches of bare ground, moderately deep litter and sparse woody vegetation (Smith 1963, Wiens 1970, Kahl et al. 1985, Arnold and Higgins 1986). Grasshopper Sparrows have been found in both native and tame pastures (Kendeigh 1941, Whitmore 1979, Wilson and Belcher 1989, Madden 1996). Grasshopper Sparrows have occasionally been found using cropland, but at much lower densities than within grasslands (Smith 1963, Smith 1968, Ducey and Miller 1980, Basore et al. 1986, Best et al. 1997).

Area Requirements. Territory size for Grasshopper Sparrows appears to be relatively small. Several authors (Wiens 1970, Ducey and Miller 1980, Laubach 1984) found territories less than 2 hectares. While territories may be relatively small, Grasshopper Sparrows appear to be area dependant. Large blocks of grasslands are much preferred than small areas (Herkert 1994a and b, Vickery et al. 1994, Helzer 1996). The minimum area that supported populations ranged from 8 to 30 ha (Herkert 1991, Helzer 1996) with 30 ha required to sustain breeding populations (Herkert 1994b). Johnson and Temple (1986) found that you are more likely to find Sparrows on large fragments far from a forest edge and four years post-burn. In a 1990 paper, they found lower nest parasitism rates on larger areas (130-486 ha) than on small areas (16-32 ha).

Ecology. Grasshopper Sparrows generally arrive on breeding grounds from early to mid-May with the fall migration beginning in August (Knapton 1979). Grasshopper Sparrows can produce two broods (George 1952, Smith 1968, Vickery 1996) but one brood is most likely in the northern portions of its range. Grasshopper Sparrows will renest after nest failure. Vickery (1996) found three to four renest attempts when previous attempts were unsuccessful.

Management Issues/Recommendations. Grasshopper Sparrow numbers can be altered by management actions. Prescribed burning and heavy grazing will eliminate Sparrows because of the immediate loss in vegetative nesting cover. Madden (1996), Johnson (1997), Forde et al. (1984) and Volkert (1992) all found that Grasshopper Sparrow numbers increased 2-3 years post-fire, once vegetative cover was re-established. Bock and Bock (1987) reported depressed numbers in Montana more than three years post fire. Light to moderate grazing was considered an appropriate management practice where dense litter buildup had eliminated Grasshopper Sparrows (Kantrud 1981, Whitmore 1981 and Kantrud and Kologiski 1982). Early spring mowing (prior to arrival) can be used to reduce litter density and improve the site for Sparrows (Swengel 1996).

- Provide and maintain large areas of grasslands characterized by intermediate grass height, moderate litter depth and low shrub density.
- Provide a mosaic of successional stages on a rotational schedule.
- Plant native bunch grasses on disturbed sites and CRP lands allowing openings in vegetation for foraging Sparrows.
- Discourage woody vegetation through prescribed techniques for mowing, burning and grazing.
- Management techniques should occur prior to or following the breeding season.
- Graze (early season or after July 15) areas of tall, dense vegetation (both native and tame pastures) to provide variable grass heights and litter densities.
- Provide suitable habitat blocks relatively close together and regionally.

McCown's Longspur

Priority Level: II MT Score: 28 AI: 4

Reason for Concern. McCown's Longspur populations have undergone noticeable declines during historic times. Their population declines were most apparent during the first decades of the twentieth century, especially 1905-1930 in North Dakota when these longspurs disappeared from most of their range in the state (Stewart 1975). Similar declines were apparent in the winter range during this period, especially in portions of Arizona and Texas (Phillips et al. 1964, Oberholser 1974). Another sharp decline was apparent in the Texas panhandle after 1940. The most significant population declines occurred prior to the initiation of the BBS. Since 1966, BBS data suggest McCown's Longspur population trends are generally mixed non-significant increases and declines (Sauer et al. 1995). Data from Canadian routes show a long term decline (Canadian Bird Trends Database 1996).

Habitat loss was believed to be primarily responsible for the historic declines in McCown's Longspur populations, especially the conversion of short-grass prairies to cultivated fields (Stewart 1975). Some populations are still affected by this habitat loss. However, factors on the wintering grounds undoubtedly contributed to these declines, as breeding pairs have even disappeared from suitable native short-grass prairies (Stewart 1975). Their winter ecology is poorly understood, as are the historic factors affecting these longspurs on their winter range (Sauer et al. 1995).

Distribution: The McCown's Longspur breeds from southern Alberta and southern Saskatchewan, south through Montana, eastern and central Wyoming, and northcentral Colorado, and east to western Nebraska, northcentral South Dakota and southwestern North Dakota (Dechant et al. 1999). Its winter range is primarily in the remaining grasslands of the southwestern U.S. from west Texas into Arizona (Sauer et al. 1995). This species is most numerous along BBS routes in southwestern Saskatchewan and locally in Montana and Wyoming (Sauer et al. 1995). Montana provides a large proportion of the existing breeding habitat for the species. In Montana McCown's Longspurs are distributed east of the continental divide, with the main concentration within an area bounded by Great Falls, Billings, Malta, and Havre (Mont. Bird Distr. Comm. 1996); the Montana Gap model predicts >15 million ha of potential habitat in the state (Edmond et al. 1998).

Habitat Requirements: The McCown's Longspur is a characteristic summer resident of short-grass prairie communities on the western Great Plains of North America. (Sauer et al. 1995). McCown's Longspurs use grasslands with little litter (Felske 1971) and low vegetation cover (DuBois 1935, Creighton 1974), such as that provided by true native shortgrass prairie or heavily grazed mixed-grass prairie. Cultivated lands also may be utilized, including small-grain stubble fields, minimum- and conventional-tilled land, and summer fallow fields (Felske 1971, Stewart 1975,). Blue grama and buffalo grass are dominant plants in shortgrass nesting areas.

Ecology: Foraging height is from the ground and a few inches above the ground. The diet is grass and forb seeds for adults and the young are fed all or mostly on insects (Ehrlich et al. 1988).

The breeding season extends approximately from mid-March to August rangewide. The breeding season in Montana would be shorter then those dates and is estimated from May through August. Second broods were reported in northcentral Colorado and in Montana (DuBois 1935, Strong 1971). McCown's Longspurs nest in shallow natural or scraped depressions located on the ground. The nest is occasionally in the open, and about one-third to one-half of nests are placed near clumps of grass, shrubs, plains prickly pear, or cow pies (DuBois 1935, Mickey 1943, With 1994b). The nest is made from coarse grass, lichen, and occasionally shredded bark. It is lined with fine grass or sometimes feathers. The incubation period is 12 days. The clutch size is 3-4. Young are able to fly after 10-12 days (Ehrlich et al. 1988).

Territorial area requirements of McCown's Longspurs vary by region. Occupied territories also had fewer cow pies, less lichen, and lower forb coverage than unoccupied areas (Dechant et al. 1999). Reported territory sizes were 0.6 ha (1.5 acres) in southeastern Wyoming (Greer and Anderson 1989), 0.5-1.0 ha (1.2-2.5 acres) in Saskatchewan (Felske 1971), and 1-1.5 ha (2.5-3.7 acres) in central Colorado (Wiens 1970, 1971; With 1994a). The territory size in good habitat is 13-15 pairs per 100 acres on the Pawnee National Grasslands (Giezentanner 1970a). Pairs often nest near each other (Mickey 1943, Felske 1971).

Associated Species: Other bird species that may respond similarly to habitat components used by McCown's Longspurs include **Mountain Plover**, Horned Lark, **Chestnut-collared Longspur**, **Lark Bunting**, and **Sprague's Pipit**. McCown's Longspurs prefer more xeric habitats with shorter vegetation than Chestnut-collared Longspurs (Sauer et al. 1995).

Management Issues. McCown's Longspurs usually respond positively to grazing in both breeding and wintering areas(Bock et al. 1993). Use of cultivated lands has included small-grain stubble fields, minimum- and conventional-tilled land, and summer fallow fields (Felske 1971, Stewart 1975).

Little is known about the short- or long-term effects of burning on McCown's Longspur populations. Some authors have suggested that prairie fire suppression has contributed to the population decline of the species (Krause 1968, Oberholser 1974, With 1994a).

In areas where grass is too tall or thick for McCown's Longspurs, grazing can improve habitat by providing shorter, sparser vegetation (Giezentanner 1970a, Stewart 1975, Kantrud and Kologiski 1982, Bock et al. 1993). Heavily grazed areas with aridic boroll soils and moderately grazed areas with aridic ustoll soils appeared to be ideal nesting habitat in portions of North Dakota, Montana, Wyoming, Colorado, and Nebraska (Kantrud and Kologiski 1982). In Alberta, McCown's Longspurs preferred continuously grazed (season-long) native pastures, and were fairly common in native pastures grazed in early summer (Prescott et al. 1993, Prescott and Wagner 1996). They infrequently occupied spring-grazed (late April to mid-June) pastures of crested wheatgrass, and they avoided deferred-grazed (grazed after 15 July) native pastures. In northcentral Alberta, McCown's Longspur used moderately to heavily grazed grasslands on drier, sandier sites than those used by Chestnut-collared Longspurs (Wershler et al. 1991). McCown's Longspurs nesting in Alberta and Saskatchewan were found to favor season-long grazed native pasture over areas managed with complementary grazing (early-season grazing on crested wheatgrass with cattle rotated through several native-grassland paddocks for the remainder of the summer) (Dale and McKeating 1996). McCown's Longspurs did not breed on idle mixed-grass in Saskatchewan, and preferred heavily grazed pastures over lightly or moderately grazed pastures (Felske 1971). Summer-grazed areas were preferred over winter-grazed areas in Colorado shortgrass prairie (Giezentanner and Ryder 1969; Giezentanner 1970a,b; Wiens 1970). However, overgrazing may be detrimental (Oberholser 1974), particularly in arid, sparse shortgrass (Ryder 1980).

Biological Objective: Keys to management include providing short, sparsely vegetated native grassland blocks of adequate size. Mixed-grass areas can be made suitable for breeding McCown's Longspurs by implementing moderate to heavy, or season-long grazing (Dechant et al. 1999).

Management Recommendations:

C Provide areas of adequate size to support multiple McCown's Longspur territories (0.5-1.5 ha per territory, depending on geographic location), as pairs often nest near each other.

C Protect McCown's Longspur habitat from agricultural and urban development.

C Provide areas with little litter and short, sparse vegetation with low forb cover.

C Prescribed prairie burns have been suggested for historically burned areas where fire has been suppressed.

- Protect vegetation that is already sparse and short from overgrazing, especially in areas of low precipitation.

- Graze areas where grass is too tall or thick for breeding McCown's Longspurs.

Chestnut-collared Longspur

Priority Level: II   MT Score: 22   AI: 4

Reason for Concern. Physiographic area 39 supports nearly 50% of this species' population. It is one of a suite of species reliant on native prairie for which Montana has a high responsibility. This species was formerly abundant in the native mixed-grass prairies, but its numbers have greatly declined since the nineteenth century as these habitats were converted to cultivated fields (Stewart 1975). Overgrazing is also detrimental to these longspurs, and contributed to these historic declines. Reduced wintering numbers have also been apparent in portions of Texas (Oberholser 1974).

Since its preferred habitats continue to be lost to agriculture, the recent declines shown by the BBS are not unexpected. The 1966-1994 trends are generally non-significant; the only significant trend is a decline in South Dakota. The 1966-1979 trends are generally in a positive direction, including significant increases in the Glaciated Missouri Plateau stratum, Western BBS Region, and Canada. In contrast the 1980-1994 trends are generally in a negative direction, with significant declines in South Dakota and the Great Plains Roughlands stratum. The trend map is a mosaic of increases and declines, perhaps with a predominance of declines. The survey-wide indices are variable, but with an increasing tendency through the late 1970s followed by a decline through the late 1980s. Whether or not the increasing tendency indicated during the 1970s was real or an artifact of the coverage of particular BBS routes during those years is unknown (Sauer et al. 1995). In Montana the species has shown a positive population trend.

Distribution. Chestnut-collared Longspurs breed from southern Alberta to southern Manitoba, south to westcentral Colorado, and east through North Dakota and South Dakota to western Minnesota (Dechant et al. 1999). Its winter range is primarily grasslands from the Texas panhandle west to southeastern Arizona (Sauer et al. 1995). Along BBS routes, the peak abundance of Chestnut-collared Longspurs is attained from southern Alberta and Saskatchewan into Montana and the Dakotas. Because of small sample sizes and incomplete coverage of BBS routes within portions of this range, the BBS trend estimates for this species should be viewed with caution.

In Montana Chestnut-collared Longspurs are distributed east of the continental divide, with an even concentration on the plains in the northern 2/3 of eastern Montana (Sauer et al. 1995, Montana Bird Distribution Committee 1996). Over 15 million ha of potential habitat may exist in the state (Edmond et al. 1998).

Habitat Requirements. The Chestnut-collared Longspur is a characteristic breeding species of native mixed-grass prairies across the northern Great Plains. Along the western margin of its range, it is also found in tall short-grass habitats (Andrews and Righter 1992, Stewart 1975). It prefers taller and more mesic habitats than the McCown's Longspur (Sauer et al. 1995). Chestnut-collared Longspurs use level to rolling mixed-grass and shortgrass uplands, and, in drier habitats, moist lowlands. They prefer open prairie and avoid excessively shrubby areas (Arnold and Higgins 1986). However, scattered shrubs and other low elevated perches such as Canada thistle often are used for singing. Grasslands with dense litter accumulations are avoided (Renken 1983, Berkey et al. 1993, Anstey et al. 1995). In Alberta croplands, litter depth was positively correlated with number of productive territories and total productivity.

In order of preference, Chestnut-collared Longspurs use native pastures, followed by other grazed grasslands and hayland. Preferred vegetation height is <20-30 cm (Fairfield 1968). Although usually avoided, cultivated fields, fallow fields, stubble, and dense, idle areas may support a small number of Chestnut-collared Longspurs if vegetation is of suitable height and density (Fairfield 1968, Owens and Myres 1973, Anstey et al. 1995). In Nebraska, breeding occurred more frequently on idle shortgrass and mowed mixed-grass prairie than in low meadow zones or pasture (Johnsgard 1980). In North Dakota, Chestnut-collared Longspur densities were higher in cropland than in the tall, dense vegetation provided by idle Conservation Reserve Program fields (Johnson and Igl 1995).

Within drier shortgrass habitats, Chestnut-collared Longspurs prefer wetter, taller, and more densely vegetated areas than McCown's Longspur and Horned Lark. Low, moist areas and wet-meadow zones around wetlands provide suitable habitat in these areas (DuBois 1937,Giezentanner 1970, Stewart 1975). In moister, more thickly vegetated mixed-grass habitat, Chestnut-collared Longspurs avoid tall, dense vegetation, preferring sparser upland grasslands with more bare ground.

Little information is available regarding the area requirements of Chestnut-collared Longspurs. In Saskatchewan, their minimum area requirements were about 58 ha (SWCC 1997). Territory sizes for two males in Manitoba were about 0.2 ha and 0.4 ha (Harris 1944). In Saskatchewan, territories were about 0.4-0.8 ha, increasing to almost 4 ha in marginal habitat (Fairfield 1968). In southeastern Alberta, territories were about 1 ha (Hill and Gould 1997).

Ecology. Foraging height is from the ground and a few inches above the ground. The diet is spiders, grass, forb, and sedge seeds for adults and the young are fed all on insects (Ehrlich et al. 1988). Chestnut-collared Longspurs nest in shallow depressions located on the ground. The nest is usually well concealed under a clump of grass. The nest is made from dried grass and lined with fine grass, feathers, hair, and rootlets. The incubation period is 10-13 days. Young are able to fly after 9-14 days (Ehrlich et al. 1988).

Chestnut-collared Longspurs arrive on the breeding grounds in late March and early April, with males preceding females by 1-2 weeks. First clutches are initiated in early to mid-May, and second or replacement clutches may be initiated through late July (DuBois 1935, Fairfield 1968, Maher 1973). Chestnut-collared Longspurs produced two broods per season in Colorado (Strong 1971), and initiation dates of confirmed second clutches in Alberta ranged from early June to mid-July (Hill and Gould 1997). Third broods occur occasionally (Harris 1944, Hill and Gould 1997). Flocking occurs as nesting ends in mid-August, and flocks forage in ditches, dry sloughs, and rough ground outside of the breeding areas (Harris 1944). Fall migration occurs in September and October (Fairfield 1968, Maher 1973, Johnsgard 1980). The breeding season in Montana would be shorter then those dates and the breeding season is estimated to start in late April and migration to occur in early September.

Associated Species. Other bird species that may respond similarly to habitat components used by Chestnut-collared Longspurs include Horned Lark, **McCown's Longspur**, **Lark Bunting**, **Sprague's Pipit**, and **Baird's Sparrow**. Within drier shortgrass habitats, Chestnut-collared Longspurs prefer relatively wetter, taller, and more densely vegetated areas than McCown's Longspur and Horned Lark.

Management Issues. In Saskatchewan, abundance of Chestnut-collared Longspurs declined during the first season after burning, but during the second year postburn abundance increased to a level similar to that on grazed pastures (Maher 1973). In South Dakota, spring burning of mixed-grass habitat provided open areas of short vegetation that was used by Chestnut-collared Longspurs during the first few months postburn, after which use declined (Huber and Steuter 1984).

Mowing can improve habitat in mixed-grass areas by decreasing vegetation height and density (Owens and Myres 1973, Stewart 1975). However, grazed areas usually are preferred to mowed areas (Owens and Myres 1973, Kantrud 1981). Periodically hayed fields (every 3 yr) were avoided by Chestnut-collared Longspurs in southcentral Saskatchewan (Dale et al. 1997).

Throughout their range, Chestnut-collared Longspurs prefer grazed areas to ungrazed areas, and native pastures to other types of pasture (Owens and Myres 1973, Anstey et al. 1995). In Saskatchewan, Chestnut-collared Longspurs occurred most often in native mixed-grass pasture than in tame pastures of crested wheatgrass. In another Saskatchewan study, no significant difference in abundance was found between lightly grazed mixed-grass prairie and lightly grazed stands of crested wheatgrass (Sutter and Brigham 1998). In Alberta, Chestnut-collared Longspur frequency of occurrence did not differ significantly between four grazing treatments: early season tame (grazed from late April to mid-June), early season native (grazed in early summer), deferred grazed native (grazed after 15 July), and continuously grazed native (Prescott and Wagner 1996).

Chestnut-collared Longspurs in native pastures may tolerate a wider range of grazing intensities than those in tame pastures (Anstey et al. 1995). Optimal grazing intensity varies according to prairie type. In mixed-grass or wetter prairie areas where grass is too tall or thick for Chestnut-collared Longspurs, moderate to heavy grazing can effectively improve habitat by providing shorter, sparser vegetation (Ryder 1980, Kantrud and Kologiski 1982, Messmer 1990). In dry, sparse shortgrass prairie, light to moderate grazing is more appropriate, and heavy grazing or overgrazing may be detrimental.

Management Recommendations. Keys to management include providing and maintaining native pastures with fairly short vegetation and sparse litter accumulation, and tailoring grazing intensity to local conditions (Dechant et al. 1999).

C Protect prairie areas from plowing and cultivation.

C Provide large blocks of open, grazed native prairie.

C Avoid managing for dense vegetation, as Chestnut-collared Longspur densities decrease with increased mean vertical density, diversity, and litter depth.

C Burning may benefit Chestnut-collared Longspurs, provided that vegetative regrowth is not too tall or dense.

C In mixed-grass areas, mow to improve habitat by decreasing vegetation height and density. Annual mowing was more beneficial than periodic mowing (once every 3 yr) in northern mixed-grass prairie

- C In mixed-grass prairie, graze at moderate to heavy intensity. Graze moister areas to increase diversity and patchiness and reduce tall, thick vegetation.

- C In shortgrass prairie, graze at light to moderate intensity; avoid overgrazing.

Northern Harrier

Priority Level: III MT Score: 16 AI: 3

Reason for Concern. Eastern Montana supports some of the highest densities of this species in the nation. Populations are increasing currently, but we have a responsibility to monitor and maintain the popualtion over time.

Distribution. Northern Harriers breed from Alaska to Nova Scotia, south to southern California and Texas; east to New Jersey and Maine. They are found throughout the state of Montana; Redmond et al. (1998) estimated that as much as 70% of the state is suitable habitat for the species.

Habitat Requirements. Northern Harriers prefer open habitats typified by tall, dense vegetation with dense litter (Duebbert and Lokemoen 1977, Hamerstrom and Kopeny 1981, Apfelbaum and Seelbach 1983, Kantrud and Higgins 1992). Northern Harriers are ground nesters or over water on platforms of emergent vegetation (Stewart 1975, MacWhirter and Bildstein 1996). They will use native or tame vegetation in marshy grasslands. Dry upland grasslands will be used if adequate grass cover is present. Lightly grazed pastures, old fields, and brushy areas are also used for nesting cover (Stewart 1975, Linner 1980, Evans 1982, Faanes 1983). The majority of nests are located in undisturbed wetlands or grasslands characterized by thick vegetation.

Within the northern Great Plains, few nests were found in croplands or areas where litter cover was <12% of total cover (Kantrud and Higgins 1992). Nest success may be lower in cropland than in undisturbed areas (Kibbe 1975). In planted grass/legume fields in the Dakotas nests were in cover >60 cm tall. These nests were in grasslands dominated by smooth brome, intermediate wheatgrass, and forbs (Duebbert and Lokemoen 1977). Northern Great Plains Harrier nests are often associated with western snowberry (Messmer 1990, Murphy 1993, Sedivec 1994). Nests located in western North Dakota were in 0.05-0.5 ha clumps of western snowberry or snowberry/other shrub (Murphy 1993). Saskatchewan shrub nest success was highly variable with fledgling success from 0 to 100% (Sealy 1967). Sutherland (1987) found Harriers nesting in tame grass/legume and western snowberry areas more commonly than predicted by habitat availability (Sutherland 1987).

Nest placement in wet versus dry sites may be a response to vole (Microtus) populations. A compromise may have been made between nesting in secure low predation wet areas and nesting closer to upland areas where vole populations were higher (Simmons and Smith 1985).

Ecology. The primary prey of Northern Harriers is voles and other small rodents. Other mammals, birds, and reptiles and frogs are also taken occasionally (Sutherland 1987, MacWhirter and Bildstein 1996). Insects comprise a small part of the diet, and are most frequently used by young of the year (MacWhirter and Bildstein 1996). In Wisconsin, Hamerstrom (1978) and Hamerstrom et al. (1985) found that changes in vole abundance were closely associated with a corresponding change in productivity of nesting harriers.

Northern Harriers forage over open habitats of moderate to heavy cover, such as ungrazed prairies and wetland. In shrubsteppe habitat in Idaho, Northern Harriers foraged over alfalfa fields until the crop reached 46 cm, then shifted to foraging in open shrub-steppe (Martin 1987).

In CRP, Northern Harriers were uncommon in blocks of contiguous grassland smaller than 100 ha. In Illinois, Harriers used small (>7 ha) habitat blocks set within a more extensive complex of habitat, although 89% of 37 nests were in tracts >40 ha (Herkert et al. 1996). One nest per 11-54 ha was typical in the southern extent of the Missouri Coteau in North Dakota (Duebbert and Lokemoen 1977). Home ranges varied from 259 ha in Minnesota (Breckenridge 1935) to 1,570 ha for males and 113 ha for females in Idaho (Martin 1987).

Spring arrival dates extend from late March though April with nest initiation beginning in April and extending through July (Hammond and Henry 1949, Stewart 1975, Duebbert and Lokemoen 1977. Harriers produce only one brood per breeding season. But will re-nest if the nest is deserted or destroyed during egg laying (Bildstein and Gollop 1988, MacWhirter and Bildstein 1996). Of nine failed nests 44% of pairs re-nested elsewhere in their territory (MacWhirter and Bildstein 1996). In Michigan, one pair out of eight re-nested after nest destruction (Bildstein and Gollop 1988). Northern Harriers may return to the same general area for the next breeding cycle. Fall migration extends from August to November.

Management Issues/Recommendations. In Manitoba, no nests were found in burned or mowed areas (Hecht 1951). Berkey et al. (1993) suggested that dense nesting cover in uplands can be hayed periodically to stimulate plant growth. Burning or mowing every 3-5 years is recommended to maintain habitat for Harriers and their prey (Lemen and Clausen 1984, Kaufman et al. 1990).

C Burning, haying, and mowing should be avoided during the nesting period. These management activities can result in the direct loss of nests and nestlings.

C Delay haying until after 15 July.

C Only light grazing that maintains the vegetative structure is recommended.

C Preserve native grassland. Collaborate with ranching and farming interests to maintain native rangeland and pasture land.

C Protect grasslands through conservation easements, land purchases, and development of farm programs that hold conservation of wildlife habitat in high priority. Continue the Conservation Reserve Program to provide nesting and foraging habitat.

C Discourage farmers from tilling wetlands. Protect wetlands from drainage through conservation easements, land purchases, tax incentives, management agreements, restoration, continuation of Wetland Reserve Program, and enforcement of wetland-protection regulations.

C Maintain a mosaic of grasslands and wetlands so that while some units are being treated to halt succession, other units are available.

C Treated units should be small (100-200 ha) to minimize the number of displaced nesting harriers.

Nearby untreated units should be large enough to meet the requirements of multiple female Harriers during the nesting season.

C Periodically mow, burn, or graze to maintain the 2-5 yr old accumulations of residual vegetation. Mowing, burning, or grazing is recommended every 3-5 yr to maintain habitat for small mammal prey.

C Provide large areas (> 100 ha) of idle prairie with patches of woody plants, such as western snowberry.

C Increase the amount of public rangeland from which livestock are excluded.

C Where water levels are artificially maintained, do not allow water levels to rise more than 15 cm from April to August.

C On large islands, maintain tame grass/legume and brush cover and reduce mammalian predators.

C Minimize human disturbance near nests.

C Do not use chemical pesticides in habitats used by harriers.

Short-eared Owl

Priority Level: III	MT Score: 20	AI: 4

Reason for Concern. Nearly one-fourth of the continental population of Short-eared Owls is found in p.a. 39. Monitoring data for Montana are inconclusive, but this ground-nesting owl merits consideration in management decisions regarding grassland/wetland complexes in the state.

Distribution. Short-eared Owls have a wide distribution stretching from Alaska through Canada to the southern Baffin Islands south to a line from central California and east through eastern Oklahoma and up to Ohio, Pennsylvania and Maryland.

Habitat Requirements. Short-eared Owls prefer large, open stands of grassland and wetlands. A variety of types are used including native prairie, hayland, retired cropland, stubble fields, shrubsteppe and wet meadow zones of wetlands (Townsend 1961, Clark 1975, Stewart 1975, Duebbert and Lokemoen 1977, Rotenberry and Wiens 1978, Harris 1980, Murphy 1991, Holt and Leasure 1993 and Johnson and Schwartz 1993). Nests are constructed on the ground (Stewart 1975, Holt and Leasure 1993). Dry uplands are preferred nesting habitat but wetter lowlands and wetlands have been used (Clark 1975, Linner 1980, Holt and Leasure 1993). Duebbert and Lokemoen (1977) found Short-Eared Owls nesting in 2 to 8 yr old vegetation with 30 to 60 cm standing litter. Nest sites in northwest North Dakota were mostly in snowberry with a variety of herbaceous vegetation (Murphy 1993).

Area Requirement. Short-eared Owls are usually associated with large open grassland expanses (Holt and Leasure 1993, Byre 1997). In Manitoba, five territories averaged 73.9 ha with a single individual ranging up to 121.4 ha (Clark 1975).

Ecology. Short-eared Owls will consume a variety of small mammals and birds however their primary prey is small rodents, particularly voles (Holt and Leasure 1993). Local Short-eared Owl populations and reproduction fluctuate considerably based on the vole prey base (Holt and Leasure 1993). Clark (1975) found that breeding territory size decreased with increasing vole densities.

Short-eared Owls may begin arriving in March and leave in the fall from September to November. Holt and Leasure (1993) found that where breeding range and winter range overlap nesting may begin in late March. Hatching dates in North Dakota ranged from early May to late July with a mean hatch date in mid-June (Murphy and Ensign 1996). Renesting after loss of the first nest has been documented (Holt and Leasure 1993, Townsend 1961).

Management Recommendations. The most important aspect of managing for Short-eared Owls is to provide and manage large blocks of grassland and wetlands for nesting and foraging areas.

- Create, protect and manage large blocks of grassland and wetlands throughout the state (nomadic species may be present in one area and absent in another).
- Manage blocks to maintain dense nesting cover and adequate prey habitat - this may include grazing systems, burning at appropriate intervals, or mowing at appropriate intervals and seasons of the year.
- Rotate management activities on blocks so that suitable habitat is always available within the area or region.
- Encourage the use of native seed mixtures in CRP lands, in blocks >100ha in size.
- Discourage mowing CRP prior to completion of the breeding season.
- Discourage sodbusting.

Bobolink

Priority Level: III MT Score: 21 AI: 3

Reason for Concern. This national Watch List species has shown significant population increases in Montana (PT/PTU = 5/1). It is one of the few grassland species we considered for priority status that relies on dense tall grassland for nesting. We should take advantage of CRP and other programs which will allow for continued population stability or increases in the state.

Distribution. Bobolink breed in Canada from southeastern B.C. across to Nova Scotia. The distribution extends south through southeastern Oregon, eastward through the middle of Illinois and Ohio to the east coast and north to Nova Scotia. Within the West, distribution is discontinuous and spotty with large areas lacking birds.

Habitat Requirements. Bobolink prefer areas of dense, relatively tall grasslands with intermediate amounts of litter. Bobolinks are found in native grasslands as well as non-native tame pastures, haylands wet meadows and old fields that are characterized by relatively dense tall grass. Usually there is little to no woody vegetation (Sample 1989, Bollinger and Gavin 1992). Bollinger (1988 and 1995) found Bobolinks preferred areas with high grass to forb ratios. In the same study Bobolinks appeared to avoid habitats with high legume to grass ratios although a forb component to the habitat was important for nesting cover. Schneider (1998) found that Bobolink abundance was negatively associated with communities that were dominated solely by native species. Schneider (1998) found the strongest predictors of Bobolink presence were decreasing bare ground, increasing litter and increasing density. Madden (1996) working in North Dakota mixed grass prairies found that strongest predictors were increasing forb and grass cover, decreasing shrub cover and decreasing frequency of native grasses. Patterson and Best (1996) working in Illinois CRP lands found abundance positively correlated to increasing grass canopy cover and litter depth, and negatively correlated with increasing forb cover and patchiness.

Area Requirements. Herkert et al. (1993) found that Bobolinks were area sensitive and preferred large grasslands to small areas. Helzer (1996) found a minimum patch size requirement in Nebraska wet meadow habitat of greater than 40 ha. Average territory size in Wisconsin ranged from 0.45 to 0.69 ha in mixed hayland and included both foraging and nesting areas (Martin 1967).

Ecology. Bobolink begin appearing in Montana during late May and early June. The peak breeding season is probably from early June to mid-July. Bobolinks tend to produce single broods (Johnsgard 1979) but double brooding has been observed (Martin 1971 and Gavin 1984). Females will renest if the first nest is destroyed. Bobolink demonstrate high site-fidelity (Martin 1971, Bollinger 1988, and George 1952).

Management Issues/Recommendations. The primary steps in conservation is to provide large blocks of suitable habitat including mixed native/tame grasslands with tall structure, large amounts of litter and closed horizontal structure. CRP lands offer potential for this species.

- Create large blocks of appropriate habitat with adequate vertical and horizontal structure including litter.
- Use appropriate management techniques to maintain habitats (burning, mowing, and light grazing).
- Manage habitats on a rotational basis so that adequate habitat blocks are available within each area.
- Provide variety of successional stages.
- Minimize woody edges and invasion by woody species.
- Prevent mowing CRP or management activities until 15 July to allow fledging of 70 % of nestlings.

Habitat and Population Objectives: Mixed -Grass Prairie

Short Grass Objectives-Suite A Mountain Plover, Burrowing Owl, McCowns Longspur: birds that utilize short grass habitat.

I. Provide large blocks of short grass types in a diverse mosaic of habitats across the state.

A. Protect existing blocks and historic breeding sites from cultivation
   1. Identify existing blocks of habitat
   2. Identify historic breeding sites
   3. Use conservation easements, purchases and leases to protect individual sites
   4. Select and publicize grassland-based Important Bird Areas (IBA's) to increase public awareness and grassroots support for conservation.

B. Restore highly erodible lands to grassland habitats
   1. Use CRP with native seed mixes to restore grasslands on privately held lands
   2. Use conservation easements, purchase and leases to management grasslands

C. Manage grasslands to maintain required cover conditions for shortgrass areas
   1. Apply techniques on a rotational basis to large blocks- ensure that adequate habitat is available at all times within all regions
   2. Implement techniques to maintain vegetative structural characteristics
      a. use an appropriate (moderate to heavy) grazing regime
         1. use sheep and cattle grazing to reduce structure of the habitat
      b. re-establish the historic fire regime
         1. use fire to duplicate vegetative structure preferred by plovers
         2. ensure that appropriate habitat is available adjacent to burn areas
         3. more frequent burns may be necessary to maintain this type
      c. mowing annually outside of the breeding season may be appropriate

D. Prairie dog management/conservation is appropriate for many species in this suite.
   1. identify existing prairie dog towns
   2. implement the existing Prairie Dog Management Plan
   3. maintain or increase the number of prairie dog colonies
   4. transplant/re-introduce prairie dogs into formerly occupied areas
   5. control hunting, poisoning and elimination of prairie dogs
   6. educate the public concerning the ecological value of prairie dogs
   7. investigate control of prairie dog diseases
   8. implement management methods outside of the breeding season

E. Control noxious weeds.

II. Ensure pesticide use is appropriate and non detrimental to bird populations.

III. Inventory for priority (and associated) species occurrence and distribution.

A. Count-based monitoring
   1. Establish and annually survey at least 30, 15-pt transects, randomly distributed.
   2. Survey known colony locations/prairie dog towns annually.

B. Demographic monitoring
   1. Implement constant-effort mist-netting and nest-searching at representative (random) sites.
   2. Conduct brood surveys for visible species such as Burrowing Owl and Moutain Plover.

Mixed Grassland Objectives- suite B Bairds' Sparrow, Sprague's Pipit, other species that require dense vegetative cover.

I. Provide large blocks of grasslands in a diverse mosaic of habitats across the state.

A. Protect existing blocks from loss to cultivated areas
1. Identify existing blocks of habitat.
2. Use techniques including conservation easements, purchase, and lease
3. Select and publicize grassland-based Important Bird Areas (IBA's) to increase public awareness and grassroots support for conservation.

B. Restore highly erodible lands to grassland habitats
1. Use CRP with native seed mixes to restore grasslands on privately held lands
2. Implement conservation easements, etc.

C. Manage grasslands to maintain required cover conditions- dense cover for this type
1. Rotate management techniques so that suitable blocks are available in all areas
2. Implement techniques to maintain characteristics for vegetative structure
a. use a light grazing system-rest rotation or deferred rotation
b. limit grazing on public lands in some areas
c. restore the historic fire regime (for areas of overly dense vegetation)
1. implement before or after breeding season
2. use a regional rotation sequence to ensure habitat is present
3. use infrequently (five year basis) to allow re-establishment and occupation by birds.
d. Implement mowing
1. occasional mowing may be used to reduce amounts of litter
2. mowing should be restricted to after breeding period (July 15)
3. Prevent encroachment of noxious weeds and woody habitats

D. Provide a variety or mosaic of habitats.
1. provide edge or interspersion of other habitats within large blocks targetted for conservation.
1. include shrub, deciduous and coniferous trees types

II. Minimize human disturbance near known nesting areas.

III. Limit the use of pesticides in known nesting areas.

IV. Inventory for priority (and associated) species occurrence and distribution.

A. Count-based monitoring
1. Establish and annually survey at least 30, 15-pt transects, randomly distributed.
2. Survey known colony locations/prairie dog towns annually.
B. Demographic monitoring
1. Implement constant-effort mist-netting and nest-searching at representative (random) sites.

Intermountain Grasslands

Distribution. The Intermountain grassland category is a combination of several different types. These types occupy the western one-third of the state stretching eastward down the Rocky Mountain Front and into the isolated mountain ranges of central Montana. The mountain ranges are generally oriented north/south and alternate with wide valleys. Valley floors occur from approximately 3,000 feet in the north-west to about 5,500 feet in the south-west. Intermountain Grasslands usually occur on valley floors, foothills toeslopes and south aspects within the region. Distribution is a result of topographic characteristics, soils, precipitation and temperature regime. Forests invade when water becomes more availabe.

Type Description. Intermountain grasslands reflect the varied environmental conditions found in the region. Areas east of the divide (including isolated mountain ranges) demonstrate more continental conditions. The climate tends to be dryer with temperatures warmer in summer and colder during winter months. These areas are characterized by five main types (after Mueggler and Stewart 1980) of dryer grassland:

1. Needle and thread/blue gramma grass
2. Bluebunch wheatgrass/blue gramma grass
3. Bluebunch wheatgrass/western wheatgrass
4. Idaho fescue/western wheatgrass
5. Rough fescue/Idaho fescue

In southwest Montana the most commonly encountered type is Idaho fescue/bluebunch wheatgrass. West of the divide and particularly in northwest Montana, you can encounter rough fescue/Idaho fescue and rough fescue/bluebunch wheatgrass types.

Several wetter types in western Montana are limited elevationally: for example the Idaho fescue/threadleaf sedge type is found above 7,800 feet while the Idaho fescue/hairgrass type (subalpine meadows) is occurs between 8,000 and 10,000 feet. Another type (hairgrass/sedge) is found between 6,000 and 9,000 feet and is the wettest grassland type found in western Montana.

Management Issues. As with mixed grass types the most immediate threat comes from conversion of existing native grasslands to other types. In western Montana conversion primarily occurs in three ways- urban sprawl, establishing tame pastures, and conversion to cropland. Another major concern is the introduction and spread of noxious weeds particularly knapweed. Other management issues include: 1) grazing regimes; 2) replacement of fire sequence; 3) fragmentation of existing grasslands; and 4)shrub and tree encroachment.

Columbian Sharp-tailed Grouse

Priority Level: II	MT Score: NA	AI: NA

Reason for Concern. The subspecies Columbian Sharp-tailed Grouse has undergone a significant rangewide decline; they currently occupy less than 10% of their former range (Ulliman et al. 1998). The conversion of native grassland and shrub/grass communities to agriculture and other unsuitable land uses has been primarily responsible for the reduction in Columbian Sharp-tailed Grouse populations (Ulliman et al. 1998). Much of the remaining historical habitat that has not been converted to other uses has been degraded by fire (too much in some areas, not enough in other areas), invasion of non-native annual vegetation, and excessive grazing by livestock (Ulliman et al. 1998). Habitat alteration in the Eureka area has resulted from subdivision activities and associated development. Sharp-tailed Grouse require thousands of hectares (acres) to support a self-sustaining population; large blocks of agriculture are not conducive to sharp-tail occupancy (Ulliman et al. 1998). Neither of the two remnant populations of this subspecies in Montana currently has enough contiguous habitat to support viable populations over the long term.

Distribution. Historically, the Columbian subspecies of the Sharp-tailed Grouse ranged in suitable habitats from British Columbia south through eastern Oregon and Washington, Idaho, western Montana, Wyoming, and Colorado, and northern Utah, Nevada, and California (Fig. 1 in Ulliman et al. 1998). Many remaining populations are small and widely separated from other populations. Idaho has the best remaining populations, with 75% of the remaining birds; the subspecies has been extirpated from Oregon, California, and Nevada and they are nearly gone in Montana (Ulliman et al. 1998). In Montana, there are just two known remnant populations, in the Tobacco Valley near Eureka, and in the Blackfoot Valley near Helmville. The Eureka population has been augmented by two transplants (Tim Thier, Pers. Comm.). Sharp-tailed Grouse obtained from a Canadian population were released near the established lek in 1996 (29 birds) and again in 1997 (49 birds). Seven males were observed on the lek during the spring of 1999 (Tim Thier, pers. comm.).

Habitat Requirements. Columbian Sharp-tailed Grouse are associated with prairie grasslands and sagebrush-grasslands. In Idaho, Saab and Marks (1992) found sharp-tails selected big sage habitat types during summer. They use areas dominated by perennial bunchgrasses like bluebunch wheatgrass or Idaho fescue (that have a high percentage of leaves to stem) and the shrub layer, if present, is dominated by big sagebrush and/or antelope bitterbrush (Ulliman et al. 1998). They use grasslands with only small amounts of shrubs to sagebrush/grass areas with shrub cover up to 40%. The common denominator appears to be the amount of cover provided by the vegetation, whether it is herbaceous, shrubs, or a combination. Brood sites are similar to nest sites, but they are usually close to broad-leaved brush patches or shrubby riparian zones. They will also nest and raise broods in cultivated fields (e.g., irrigated pasture, alfalfa hay, grain stubble, dryland seedings; Ulliman et al. 1998). Sharp-tailed Grouse need habitat with moderate vegetative cover, high plant diversity, and high structural diversity. They are predominately associated with flat to rolling terrain during the breeding season. A self-sustaining population of Sharp-tailed Grouse needs thousands of hectares (acres).

Tall, broad-leaved mountain shrub and riparian cover types are critical components of winter habitat for Sharp-tailed Grouse (Saab and Marks 1992). They often move to higher elevations to get into moister sites that support greater amounts of these types of shrubs (Ulliman et al. 1998). However, in mild winters, they often stay in the open grasslands and shrubland communities that they used for nesting and brood-rearing. Suitable winter sites need to be no more than 6.4 km (4 mi) from leks to be useful to sharp-tails (Ulliman et al. 1998).

Ecology. Sharp-tailed Grouse feed on leaves, buds, flowers, seeds, and fruit. The young in their first two to three weeks mostly eat insects. In the winter, they eat the buds of broad-leaved trees and shrubs. In Idaho, the fruits of hawthorn and snowberry are favored as are the buds of chokecherry and serviceberry (Ulliman et al. 1998). Alfalfa, wheat, and barley fields can provide important food resources, but they must be located near permanent cover that provides nesting, brood-rearing, and winter habitat (Ulliman et al. 1998). They form mixed-sex winter flocks of 10-35 birds, occasionally up to 100.

Males display on leks, usually in open areas such as a small knoll, bench, or ridge top. Their mating displays, or dancing, occur from March through June, peaking in April. Leks contain as few as two males to as many as 30 or more, but average about 12 males (Ulliman et al. 1998). The females come to the lek to mate, then return to the surrounding grassland or shrubland to nest. Most nest and brood locations are within 2 km (1.2 mi) of the lek where the hen was bred (Ulliman et al. 1998). Sharp-tailed Grouse nest on the ground in a shallow depression lined with grass, leaves, and other vegetative materials. They nest in sites with an overhead canopy of vegetation, provided either by grasses or shrubs.

Associated Species. Palouse grasssland also supports populations of **Long-billed Curlew**, Vesper Sparrow, **Grasshopper Sparrow**, and Western Meadowlarks, and comprises habitat for a number of rare plants.

Management Recommendations:

C Increase abundance and distribution of Columbian Sharp-tailed Grouse.

C Protect known active dancing grounds and the surrounding habitats within 2 km. Search for new leks in areas with appropriate physiographic and vegetative characteristics.

C Protect, maintain and enhance winter, brooding and nesting habitats near known populations.

C Solicit cooperation and communication between land managers and landowners in managing Columbian Sharp-tailed Grouse habitat. Use conservation easements where applicable to protect and enhance year round habitats currently occupied by Columbian Sharp-tailed Grouse.

C Monitor existing populations to determine if management actions are adequate.

C Develop a reintroduction plan. Identify potential reintroduction sites with adequate and sustainable habitats for all seasonal use requirements (such as the National Bison Range).

C Investigate and if feasible re-establish leks on historic sites or establish new leks.

C Provide information and assistance in developing appropriate grazing regimes in areas of known Columbian Sharp-tailed Grouse populations.

C Avoid pesticide use whenever possible on Columbian Sharp-tailed Grouse habitats.

Habitat and Population Objectives: Intermountain Grassland

C Maintain existing tracts of palouse prairie.
C Use conservation easements where appropriate to protect existing palouse prairie from subdivision and conversion to cropland.

C Develop an enhancement plan for publicly held tracts of palouse prairie.

- Prevent the introduction and spread of noxious weeds on existing tracts of palouse prairie.

- Prevent invasion of woody plants especially coniferous trees. Reestablish fire regime.

- Maintain the appropriate species composition, vertical and horizontal structure on existing tracts by developing appropriate grazing strategies.

- Develop and maintain large tracts of palouse prairie

SHRUBLAND

We identified two primary shrubland habitat types for consideration: Sagebrush Shrubsteppe, and Montane Shrublands. A number of high priority species use sagebrush almost exclusively, including the Sage Grouse and Brewer's Sparrow (Table 5), so it was considered the higher priority shrubland habitat.

Table 5. Shrubland habitat associations, Montana PIF priority bird species.

PRIORITY SPECIES	Priority	Species Occurrence by Type and Condition						
		Sagebrush	Area Dependent	Shrub Density Low	Shrub Density High	Patchiness Low	Patchiness High	Montane Shrub
Ferruginous Hawk	II	x	x	x			x	
Sage Grouse	I	x	x	x	x		x	
Common Poorwill	III							x
Calliope Hummingbird	II				x			x
Sage Thrasher	III	x		x	x		x	
Loggerhead Shrike	II	x		x			x	
Nashville Warbler	III							x
MacGillivray's Warbler	III				x			x
Lazuli Bunting	II							x
Green-tailed Towhee	III	x		x	x	x		x
Clay-colored Sparrow	III						x	x
Brewer's Sparrow	II	x	x		x	x		x
Lark Sparrow	III	x	x	x		x		x

Sagebrush Shrubsteppe

Description, Status and Importance

Sagebrush Shrubsteppe is meant here to include both relatively pure sagebrush shrubland (20-80% sagebrush cover) and true shrubsteppe, where there is a pronounced interspersion of grasses (5-20% shrub cover). The predominant sage species throughout sagebrush habitats in the state is basin big sage, although Wyoming big sage, mountain big sage, and black sage, or rubber rabbitbrush can be co-dominant. Most sagebrush shrubland in the state occurs in the southwest corner, particularly from Dillon south to the Idaho border, and along the entire southern border of the state. This type also occurs in the drier mountain valleys in all but the northwestern fourth of the state, and as a scattered component of sagebrush steppe and grassland matrices throughout east-central Montana. Redmond, et al. (1998) estimated that there are over 2 million ha of sagebrush shrubland, and over 500,00 ha of xeric shrub-grassland associations (shrubsteppe). Associated grasses typically include bluebunch wheatgrass, blue gramma, bluestem, needle-and-thread, and western wheatgrass (Redmond et al. 1998).

Sagebrush has always been a common habitat in drier, lower elevation valleys in the west, where their distribution and patchiness was a result of natural moisture and fire regimes (Paige and Ritter 1999). Large-scale changes in land use, including the introduction of grazing, conversion to agriculture, and use of fire, chemical and mechanical means to remove sagebrush cover, have severely altered the distribution and condition of Montana's sagebrush shrublands. Invasion of weeds and losses to development have had further impacts on sagebrush habitat. Combinations of these factors, notably heavy grazing, removal of native grasses, and planting/invasion of non-native vegetation have this habitat in ways which have affected its suitability for nesting birds, many of which are sagebrush obligates (Paige and Ritter 1999).

Sage Grouse

Priority Level: I MT Score: 25 AI: 4

Reason for Concern. Existing monitoring data, declining harvests, and continuing fragmentation/conversion of sagebrush habitat indicate that Sage Grouse populations are quite low and still declining in some areas. The Sage Grouse is classified as a game bird in Montana which has focused some additional population concerns that are lacking for other avian species. Concern over the range-wide health of breeding populations is driving current discussions about listing Sage Grouse under the Endangered Species Act. Procrastination in addressing habitat and species needs may ultimately reduce flexibility to manage Sage Grouse and will impose stringent limitations on conflicting land uses if the species becomes listed.

Habitat Requirements. The Sage Grouse is an obligate species dependent on shrubsteppe habitat dominated by big sagebrush. Sagebrush provides crucial forage and cover during all seasons and life stages of the Sage Grouse. Breeding (lek) and nesting sites are totally dependent on the presence of sagebrush of the proper canopy, height and density. Sagebrush canopy and plant heights are lowest on brood-rearing habitats where the interspersion with wet meadows and riparian areas is important. It appears that the highest quality summer habitats provide a mix of sagebrush species with an abundant forb composition. Hens and young may move considerable distances to take advantage of suitable brood rearing habitat.

Sagebrush is the dominant plant on most Sage Grouse ranges. Mountain big sagebrush, Wyoming big sagebrush, and Basin big sagebrush are the preferred subspecies throughout the range, although palatability and availability varies with individual site conditions. Black sage, low sage, and three-tip sage are also used where available, but due to plant size and/or nutritional value may not provide all the habitat needs afforded by big sagebrush. Herbaceous components are generally highest and most diverse on quality summer habitats, but again are site dependent.

Sagebrush canopy and density varies on seasonal Sage Grouse habitats. Leks are generally located on open ground within or adjacent to sagebrush stands, or on topographic features such as ridge tops, where sagebrush canopies are sparse. Average sagebrush canopy in these areas is usually 15-25%. Nesting success is strongly tied to habitats providing a sagebrush canopy of 15-25% with moderate amounts of herbaceous understory. Brood rearing habitat usually has lower sagebrush canopy (1-25%) made up of slightly shorter sagebrush plants (6-8") with a lush herbaceous component, often associated with wet meadows and riparian habitats.

Breeding and winter habitats are generally found on flatter, southern aspects. The interspersion of sagebrush stands with various structures habitat types, particularly meadows and riparian areas, increases habitat suitability.

Ecology. Sage Grouse require large expanses of sagebrush habitat throughout the year. Individual sagebrush stands need to be fairly homogenous in canopy and structure, particularly during certain seasons. Nesting generally occurs within one to two miles of the lek but dispersal to more remote habitat has been documented. Sage Grouse nests are generally placed under sagebrush plants that are 20-25" tall located within a few miles of the lek. Brood-rearing generally occurs in more open, shorter sagebrush stands, while daytime loafing areas for breeding males require the tallest, densest canopies available within close proximity of leks. Winter diets are almost exclusively comprised of sagebrush leaves, and survival is dependent on the availability of plants above snow. Drainages in low rolling foothills often provide crucial foraging areas and thermal cover, particularly in areas of heavy snowfall. Summer habitats are less restrictive provided that precipitation is adequate to provide abundant, succulent herbaceous forage for brood rearing. Sage Grouse movements between seasonal habitat emphasize the need for connectivity between sagebrush habitats in such areas.

Management Issues. Since populations of Sage Grouse utilizing higher elevation habitats often migrate considerable distances between summer and winter ranges, corridors of suitable habitat must be available to accommodate movements. Vegetation manipulation such as sagebrush burning or spraying, and agricultural conversion to croplands has seriously fragmented suitable habitat for Sage Grouse, and disrupted migration patterns. However in certain situations, conversion of native sagebrush ranges to irrigated cropland has provided alternate habitat suitable for summer use.

Management Recommendations. Develop a comprehensive conservation strategy that will focus on habitat and population needs across all ownerships in Sage Grouse habitat. Population and habitat objectives should be implemented immediately.

Loggerhead Shrike

Priority Level: II MT Score: 17 AI: 3

Reason for Concern. This species has shown declines throughout much of its range, although populations in Montana appear to be stable (PT/PTU = 2/2). Because of their predatory nature and use of open habitats, they are highly susceptible to pesticides on both their breeding and wintering areas. Continent-wide declines have been attributed to both the use of pesticides and breeding habitat losses (Yosef 1996). The relative reproductive success of shrikes nesting in grassland and agricultural habitats (e.g. windrows), and of those nesting in sagebrush habitats (notably in south west Montana) is unknown.

Distribution. Loggerhead Shrikes breed throughout the southern United States, from Florida to California, and north throughout the great plains into the southern prairie provinces of Canada (Price et al. 1995). It is a confirmed breeder in drier, open habitats throughout much of Montana east of the continental divide (Montana Bird Distribution Committee 1996). Redmond et al. (1998) predicted there are over 10 million ha of potential habitat for this species in the state.

Habitat Requirements. Loggerhead Shrikes nest in a wide variety of open habitats, as long as woody nesting strata (often thorny shrubs) are available. These may include grassland prairie with scattered trees, riparian areas or woody draws, cultivated lands with shelterbelts, or even badlands with few shrubs, in addition to the sagebrush shrubland and shrubsteppe habitats considered here. Research in Idaho has shown shrikes to have equivalent nesting success in sagebrush, bitterbrush, or greasewood, although 65% of the nests were in big sagebrush (Woods 1993, Woods and Cade 1996). Nests are usually located well within the structure of shrubs 1-2m tall, but almost always within 1m of the ground (mean 79 cm, Woods and Cade 1996). Various studies in Alberta (Prescott and Collister 1993, Telfer 1993) have shown local populations of this species to be reliant on shortgrass, mid-grass, or tall grass, so clearly there is a great deal of variation in preferred habitat, and indeed grass height may not play a role nest selection.

Ecology. The Loggerhead Shrike is a predatory bird which relies primarily on grasshoppers and beetles during the nesting season, but also takes a wide variety of mammal, bird and reptile prey (Yosef 1996). They prefer to hunt in areas with sparse vegetation, from an exposed perch, and often utilize roadside wires. Larger prey is often secured on thorns, broken branches or barbed wire to facilitate feeding.

Management Recommendations. The habitat needs of Loggerhead Shrikes can likely be met by providing for a suitable distribution of large sagebrush plants (1-2m tall), interspersed with open habitats for feeding, and by controlling the application of pesticides in known nesting areas. Additional data should be collected to delineate the distribution of the species in the state, particularly in shrubsteppe and grassland habitats, and to determine relative nesting success in the various habitats used by the species.

Brewer's Sparrow

Priority Level: II MT Score: 20 AI: 3

Reason for Concern. The nominate form of this species is a sagebrush obligate which has shown significant population declines throughout much of its range, including the two physiographic areas which overlap Montana. Very little is known about the distribution and habitat needs of the "Timberline" form of this species in the state.

Distribution. There are scattered breeding records throughout the State with only three latilongs not represented with evidence of breeding (Montana Bird Distribution Committee, 1996). Most suitable habitats are concentrated in the southern half of the State with few sightings in the northwest and north of the Missouri River. Gap (Redmond et al. 1998) modeling predicted four million ha of suitable habitat (or 11% of the state) for the species within Montana. The "Timberline" (Brewer's) Sparrow is a subspecies that is found breeding in high elevation shrubfields and krumholz. Within Montana, they have been located on the east side of the divide in Glacier National Park.

Habitat Requirements. Brewer's Sparrow is a species characteristically found within sagebrush habitat (Rising, 1996), and indeed is considered by most to be a sagebrush obligate (but see Timberline Sparrow). Both Johnsgard (1979) and Saab and Rich (1997) felt that Brewer's Sparrow is closely associated with shortgrass prairie with scattered to abundant amounts of sagebrush or other shrub-steppe vegetation. Others have shown a negative correlation with grass cover, with the species preferring dense sagebrush stands (Rotenberry and Wiens 1980). Best (1970) found Brewer's Sparrow utilizing sagebrush as important nesting cover; Bock and Bock (1987) found they preferred unburned to burned sagebrush. One Idaho study indicated that large patch size and robust shrub cover both increase the likelihood of use by this species (Knick and Rotenberry 1995). It is often the most common breeding bird where it occurs.

Ecology. This species feeds on insects found in the foliage of sagebrush and on the ground, and on the seeds of grasses and forbs. It nests in large, living sagebrush, rarely using shrubs <50 cm tall (Peterson and Best 1985). The nests are near the ground, and are usually placed in the finest branches of new growth near the tips of the branches (Rich 1980), so shrubs in good vigor are important to nesting. They show strong site fidelity, returning from year to year to nest in the same area (Wiens and Rotenberry 1985).

Management Issues. The species is vulnerable to parasitism by Brown-headed Cowbirds, especially where the sagebrush landscape has been broken up by agriculture and pastures. Reductions in sagebrush cover and vigor from control actions such as burning or herbicides will reduce or eliminate habitat suitability for the species. The long-term viability of the species in Montana will depend on the maintenance of large stands of sagebrush in robust condition throughout the species' range in the state. Wide distribution of suitable habitat is essential, due to their tendency toward site fidelity.

Management Recommendations. Implementing recommendations for SageGrouse should encompass all the needs of Brewer's Sparrows.

Sage Thrasher

Priority Level: II   MT Score: 19   AI: 3

Reason for Concern. This species is a sagebrush obligate. Although population trends of Sage Thrashers are currently stable, the conversion and fragmentation of big sagebrush habitat continues. Continued loss of habitat will likely result in declining populations.

Distribution. Sage Thrashers winter from southern California, Arizona, and New Mexico to central Mexico (Bent 1948). They breed throughout parts of southcentral and eastern Montana (Bergeron et al. 1992).

Habitat Requirements. Sage Thrashers are sagebrush obligates, occupying shrub-steppe communities dominated by big sagebrush. In microhabitat studies, the size and spatial distribution of sagebrush appear to be the most important variables in nest-site selection. Nests are most often placed in tall, large sagebrush plants that may provide support and concealment for the thrasher's conspicuous nests. They also tend to nest in areas where there are dense clumps of large sagebrush shrubs (Petersen and Best 1991). The presence of thrashers is positively correlated with sagebrush and shrub cover, shrub patch size, bare ground, and negatively correlated with spiny hopsage, budsage, grasses, and exotic plant species (Wiens and Rotenberry 1981, Knick and Rotenberry 1995). Bare ground near nests may provided nearby foraging opportunities (Petersen and Best 1991).

Dominant Plant Species Composition. The Sage Thrasher is almost always associated with shrubsteppe communities dominated by big sagebrush. In the northern Great Basin, breeding and feeding habitats are primarily tall sagebrush/bunchgrass, juniper / sagebrush / bunchgrass, mountain mahogany/shrub, and aspen/sagebrush/bunchgrass communities (Maser et al. 1984). In central Montana, Sage Thrashers were found in areas dominated by big sagebrush, and other dominant shrubs such as broom snakeweed and rubber rabbitbrush, which occurred at lower densities (Feist 1968).

Vegetation Physiognomy/structure. Sage Thrasher nest-site selection is very specific within sagebrush stands. Nests are almost always located either within or beneath sagebrush shrubs. Most nests are located in shrubs with a high foliage density (75-100% live) and many branches within 30 cm of the ground. Nests located on either the ground or a branch are usually placed toward the main axis of the shrub (Petersen and Best 1991). The density of foliage shading or covering a nest appears to be important in nest placement (Reynolds and Rich 1978). Nests are usually oriented southeast, perhaps to maximize morning sun and afternoon shade, and for protection from prevailing winds (Petersen and Best 1991). In Oregon, Sage Thrashers were not present in habitats dominated by crested wheatgrass or annual grasses and forbs, but may be found once sagebrush covers 2% to 5% of the area (Pers. comm. from A. Baumman to C. Paige).

Amount of Habitat. Few data are available. Territory size averaged 0.96 ha in Idaho (Reynolds and Rich 1978). In Montana, Thrasher nesting density averaged a low of 2.5 breeding pairs/100 ha (Feist 1968). Sage Thrasher densities during the breeding season in the Great Basin have been as high as 30 individuals/100 ha (Wiens and Rotenberry 1981) and 40 individuals/100 ha (Medin 1992). Manage for maintaining large patches (100 ha) of big sagebrush.

Adjacent Habitat Matrix. Concern for the introduction and spread of noxious weeds that may compete with native vegetation and thus, decrease the suitability of thrasher nesting habitat. The effects of fragmentation and, therefore, include a potential increase in predation of adults and nest contents.

Abiotic factors. Sage Thrashers are usually found nesting at elevations between 1300-2000 m (Bent 1948).

Management Issues. Large, contiguous stands of tall, dense clumps of big sagebrush interspersed with native bunchgrasses and forbs are vital. Some studies have shown that fragmentation and alteration of sagebrush stands have negative impacts on Sage Thrashers. Areas where crested wheatgrass has been planted as livestock forage have experienced a significant reduction in the number of Sage Thrasher nests (Reynolds and Trost 1980). Alteration and destruction of sagebrush habitat promotes the establishment of exotic grasses, primarily cheatgrass. The dominance of cheatgrass encourages annual wildfires, which converts shrubsteppe to annual grasslands (Knick and Rotenberry 1995). Edge effects due to fragmentation may increase the potential for predation and parasitism. Rich and Rothstein (1985) documented Thrashers ejecting eggs of Brown-headed cowbirds from their nests.

C Loss and fragmentation of Sage Thrasher habitat through conversion and alteration of big sagebrush stands is a major threat.

C Livestock grazing can have a positive or negative effect depending on the plant community composition, timing, and duration.

C Prescribed burning can have a negative effect (particularly in the short term) if there is significant shrub canopy cover reduction. There can be some positive long-term effects if the fire is cool and spotting, and creates openings amid really dense sagebrush stands.

C Off road vehicle use can negatively impact nest sites as well as plant species composition (spread of noxious weeds).

Research/Monitoring Needs: Due to the lack of data on Sage Thrashers in Montana, steps should be taken to gather baseline information on habitat use, quality and amount of big sagebrush habitat, and a fine scale systematic survey of breeding birds.

Population Objective. Analysis of Breeding Bird Survey Data indicates Sage Thrasher population trends are stable in Montana and the western region. Our objective is to maintain this stability over time.

Lark Sparrow

Priority Level: III MT Score: 16 AI: 3

Reason for Concern. This species was selected by the Montana PIF shrubland committee as a non-obligate of sagebrush steppe which would nonetheless benefit from conservation efforts in sagebrush habitat. Populations are currently stable or increasing slightly in Montana.

Distribution. The Lark Sparrow is found in suitable habitat throughout the western U.S., from Texas to Canada. They are found throughout eastern Montana, but very local west of the continental divide.

Habitat Requirements. The Lark Sparrow is a grassland edge species. They are associated with mosaics of grassland with nearby trees including ponderosa pine, juniper, green ash and other deciduous trees. Shrubs including chokecherry, serviceberry, sage and hawthorn are also utilized. Gap analysis identified 24 million ha of habitat in the state (Redmond et al. 1998).

Management Recommendations. No specific recommendations have been developed for the Lark Sparrow.

Habitat and Population Objectives: Sagebrush Shrubsteppe

Habitat Objectives:

C Maintain healthy sagebrush communities within site potential on all Sage Grouse habitats. As a general guideline, communities should provide a minimum sagebrush canopy 10-15%, representing 20-30% of the plant composition, with an average sagebrush plant height greater than 12 inches.

C Understory herbaceous compositions should be diverse with approximately 40% forbs, dependent on site potential. Sagebrush age classes and structure should be fairly homogenous in individual stands.

C Manage sagebrush communities around leks to provide 15-25% canopy with a moderate understory coverage of herbaceous grasses and forbs.

C Allow no sagebrush disturbance or alteration within one mile radius of leks to accommodate nesting and protect male day-use areas.

C Disturbance should be minimized in an additional one mile secondary buffer to accommodate more dispersed nesting and potential brood-rearing. This buffer may be skewed substantially away from the lek depending on site-specific topography, available habitat, and migrational patterns.

- Manage sagebrush communities on crucial winter habitats for maximum sagebrush plant height and density to accommodate Sage Grouse foraging and thermal cover.

- Manage livestock grazing to allow no more than 35% herbaceous utilization (by weight), and defer use, particularly by sheep, until after June 10 to avoid nest trampling.

- Plant community composition, structure and interspersion will provide optimum conditions for Sage Grouse on 75% of seasonal habitats.

- Where practical, initiate restoration of healthy sagebrush communities within historic Sage Grouse habitat that are capable of supporting self-sustaining grouse populations.

- Provide an extensive interspersion of sagebrush communities with diverse plant compositions and stand structures in association with wet meadows and riparian areas.

- Over time, maintain at least 50% of existing sagebrush stands 30 years of age or older.

- Provide >300 feet of healthy sagebrush habitat at habitat type edges around meadows and riparian habitat

- Maintain a minimum 15% sagebrush canopy in sagebrush communities in shallow drainages and on productive sites to provide crucial foraging and thermal cover on winter habitat where snow depths exceed twelve inches.

- Identify and maintain sagebrush communities that provide travel corridors between winter/breeding and summer habitats.

- Manage adjoining habitats to maintain healthy, natural plant communities

- Minimize habitat fragmentation and conversion unless development can provide additional habitat suitable for Sage Grouse (irrigated lands capable of supporting brood-rearing).

- Maintain diverse habitat structure, including mature stands of sagebrush, throughout the known range of the priority species in the state.

- Provide variations in grass understory, through grazing management. Long-term heavy grazing will probably reduce prey availability and diversity.

- Discourage the use of pesticides, particularly dieldrin, in areas known to support Loggerhead Shrike populations. Encourage the development of alternative (biological) methods of pest control whenever possible.

- Encourage the use of native, thorny shrubs (e.g hawthorn) in shelterbelts in agricultural areas; in grasslands where the placement of shelterbelts may introduce unwanted habitat for other predators, focus efforts on the maintenance of natural woody cover elements (riparian areas, woody draws, xeric shrubland).

- Maintain dense clumps of tall, big sagebrush shrubs with other shrubs, grasses and forbs beneath the canopy for nesting habitat.

- Sagebrush shrubs should be at least 50 cm in height with high foliage density and branches within 30 cm of the ground.

- Suppress wildfires in areas dominated by exotic grasses.

- Maintain patches of 'openness' by promoting and retaining native grasses and bare ground interspersed within sagebrush stands for foraging habitat.

- Promote grazing plans that encourage a mosaic of sagebrush, native grasses and forbs.

- Integrate Sage Thrashers into pest management plans for control of Mormon crickets and other grasshoppers.

Assumptions:

- Improving sagebrush habitat characteristics will enhance re-establishment and expansion of Sage Grouse populations.

- Management of sagebrush communities to provide wildlife habitat will be emphasized through landscape/ecosystem planning on all land ownerships.

- It is assumed that in most sagebrush habitat managed according to the recommendations for Sage Grouse, the heterogeneity and habitat structure provided will also provide suitable nesting habitat for Loggerhead Shrikes, Brewer's Sparrows, and Sage Thrashers.

- Distribution of sagebrush communities will be maintained at the landscape level.

- Natural events and human activities that alter stand characteristics and influence patchiness will continue or increase.

- Conversion and fragmentation of sagebrush habitat adversely affects Sage Grouse distribution and production, and such modification efforts will continue.

- Improving altered sagebrush habitat and conserving existing sagebrush habitat will aid in maintaining current, stable Sage Thrasher populations.

- Habitat patches of at least 100 ha of suitable big sagebrush habitat will support nesting Sage Thrashers populations.

- Existing big sagebrush stands are suitable for nesting habitat.

- Conversion and fragmentation of big sagebrush habitat negatively impacts Sage Thrasher habitat and survivorship.

- Evaluation of suitable habitat and breeding bird surveys will provide baseline data from which managers can monitor changes in Sage Thrasher populations.

Research/Monitoring Needs:

- Develop correlations between habitat characteristics and seasonal Sage Grouse uses that can be used to identify crucial habitats at the landscape scale.

- Where practical, initiate restoration of healthy sagebrush communities within historic Sage Grouse habitat that are capable of supporting self-sustaining grouse populations.

- Establish and compile information on extent and availability of suitable Sage Grouse habitat at landscape level.

- Investigate how other biological factors such as invertebrate availability in seasonal use areas may be influencing Sage Grouse production, and how habitat manipulations may influence that availability.
- Investigate methods and products that may modify sagebrush canopy without reducing herbaceous composition and distribution.
- Implement a statewide inventory and collect baseline data on size, amount, and configuration of big sagebrush stands.

- Evaluate suitability of stands for Sage Thrasher nesting habitat.

- Study the effects of livestock grazing and subsequent vegetational changes on shrubsteppe bird communities.

- Identify priority areas for restoration.

- Collect data on habitat use, nest success, and territory size of breeding Sage Thrashers in Montana.

- Determine the effects of noxious weed species on the native plant community within Sage Thrasher nesting habitat.

Population Objectives:

- Manage Sage Grouse population numbers and distribution to encourage at least 70% occupancy of all suitable habitat.

- Where occupancy is less than 70% and suitable habitat is available, initiate reintroductions to establish self-sustaining populations of Sage Grouse.

- Implement within- and among-habitat monitoring to provide better population trend data, and demographic monitoring in a variety of occupied habitats, to better delineate factors affecting nest success of priority species.

- Continue monitoring population trends through BBS and develop a more fine scale population survey method.

- Identify the distribution and abundance of breeding Sage Thrashers in Montana.
- Assess nesting success, adult survivorship, and determine causes of mortality.

Assumptions:

- Numbers of Sage Grouse will vary with location, habitat availability and quality, and individual population dynamics.

- Continued hunting of this Sage Grouse will influence population dynamics.

- BBS data are accurate in reflecting a stable population of Sage Thrashers.

Research/monitoring needs:

- Establish current occupancy of existing habitats with focus on identifying winter/lek complexes and movement/migration corridors. Identify migratory/nonmigratory populations.

- Conduct Sage Grouse genetic testing to determine risks or compatibility of using various genetic stocks in reintroduction projects.

- Continue comprehensive monitoring of number of males on leks as an index to population trends.

- What are the continuing insidious influences on Sage Grouse from past habitat alteration and conversion?
- How significant are changes in plant communities on historic ranges that may be inhibiting recolonization?

- Why are regional Sage Grouse populations remaining stable at a low level or continuing to decline despite the availability of apparently suitable habitat?

- Are existing Sage Grouse populations and habitat conditions resilient enough to positively respond to the widespread use of fire to restore ecosystem function at the landscape level?

- Is continued hunting compatible with recovering reduced Sage Grouse populations?

Montane Shrubland

Description. Mountain and foothill shrublands where mesic or xeric shrubs are dominant and shrub cover ranges from 20-100%. Dominant shrub species on mesic sites are generally serviceberry, mountain maple, ceanothus, shiny-leaf spirea, ninebark and alder. More xeric sites are characterized by bitterbrush, mountain mahogany, creeping juniper, and even greasewood and rabbitbrush on the driest eastern sites. Shrub cover in the latter more typically runs in the 20-50% range.

Geographic extent in the State. Redmond et al. (1998) estimate there are almost 950,000 ha of "Mixed Mesic Shrubs", and over 1.2 million ha of "Mixed Xeric Shrubs" in the state, comprising just under 6% of the state land base in combination. This estimate includes prairie shrubland dominated by greasewood, which in many cases is actually more similar to sagebrush steppe in structure and avifauna.

Importance. Montane shrubland areas are important nesting habitat for a wide variety of songbirds, although in many cases these birds are generalists and can nest in a wide variety of habitats as long as a well-developed shrub layer is present (e.g. MacGillivray's Warbler). In forested environments, mesic sites in particular can be important feeding areas for recently fledged young of forest-nesting species, due to the variety of arthropod prey available. They also serve as important seasonal habitats for other wildlife, including winter and early spring range for ungulates and grizzly bears (*Ursus arctos*).

Vegetation Structure. Vegetation structure is usually limited to a shrub layer with an understory of grasses and forbs. Western mesic shrublands may have fescue, elk sedge, beargrass, or arnica as dominant ground cover plants, while more xeric eastern is typically grassland understory (e.g. wheatgrass, blue grama).

Distribution and Configuration on the Landscape. Montane shrublands can occur across a wide range of elevations (528-3156m, Redmond et al. 1998). Mesic shrublands in western Montana are typically found on southeast- to northwest-facing slopes, and often as a transition from lower elevation grasslands to upslope coniferous forest habitats, and can occur as a seral stage of forest types which have undergone timber harvest. In the eastern part of the state, mesic shrublands are typically in draws or on north slopes, with the xeric shrublands in the valleys and lower slopes.

Management Issues. Because of the abundance of seral shrublands, and the limited number of higher priority species using the type, Montane Shrubland is considered to be a low priority habitat for conservation action. Patch size and proximity to environments that support cowbirds are perhaps the two issues of greatest concern, since they play a role in the source/sink potential of these habitats.

Calliope Hummingbird

Priority Level: II MT Score: 22 AI: 4

Reason for Concern. More than 3/4 of this species' population is found in physiographic area 64, which includes western Montana. Populations are increasing, but we have a responsibility for improved monitoring.

Distribution. Calliope Hummingbird is restricted to the montane regions of western and south-central Montana (Mont. Bird Distribution Committee, 1996) Only two records of occurrence within the isolated mountain ranges of central and eastern Montana have been documented. The Gap analysis (Redmond, et al., 1998) predicted 5.7 million ha (or 15%) of the state consists of potential breeding habitat for this species.

Habitat Requirements. Calliope Hummingbird is a montane species. In the Sierra Nevada Mountains

Calliopes occur between 1200 and 3400 m elevations (Bent, 1940). Hummingbirds in Montana (Saunders, 1921) use regrowth areas after logging or fire (shrub-sapling seral stage from 8 to 15 years after deforestation) for nesting and tend to establish territories in open shrub areas with viewing posts (Ryser, 1985). They also establish territories along open willow/shrub drainages.

Ecology. Males arrive on the breeding grounds before females. Males also begin south migration before females and usually while females are still caring for young. Females migrate south before juveniles. Calliope Hummingbird tends to be less aggressive than Rufous Hummingbird and where they overlap, tend to be higher on slopes (Saunders, 1921).

Calliope Hummingbirds forage on floral nectar and by hawking for small insects. The typical flower is a red tubular flower but they will forage on a variety of yellow, white, blue and purple flowers. Occasionally they will feed at sap wells created by sapsuckers.

Management Issues/Recommendations. We do not know if the floral composition of seral shrublands used by the species in a managed forest environment adequately mimic natural shrubland habitats in providing the nectar and insect resources needed by this species. Adequate monitoring to detect population change over time may require design of specific techniques for hummingbirds.

Nashville Warbler

Priority Level: III MT Score: 18 AI: 3

Reason for Concern. Physiographic area 64, which includes western Montana, supports nearly 32% of this species' populations. The western valley bottom shrubland slopes and riparian areas it inhabits are under tremendous pressure from residential development and other uses.

Distribution. The Nashville Warbler has two population: One east of the Mississippi River in northern U.S. and southern Canada, the other in Western U.S. from northern California up through Washington (in a narrow band) and into northern Idaho and western Montana. In Montana, they are restricted to the western one-fourth of the state, west of the continental divide.

Habitat Requirements. The Nashville Warbler is found in open deciduous or mixed species forests and shrub fields associated with those forests. They often use cut over areas or in second-growth forests with aspen, alder and shrub openings. They may also use open low elevation riparian zones, and ponderosa pine (or Douglas-fir) forests with open canopies, as long as a well-developed shrub layer is present. Gap analysis (Redmond, et al. 1998) predicted approximately 300,000 ha of suitable habitat within the state.

Ecology. Nashville Warbler is a ground nester. Nests are placed in shallow bowl under extensive (typically shrub) cover, often covered by grasses, leaves and mosses. Food tends to consist of insects and insect larvae. Approximately 90% of juvenile food is comprised of lepidoptera larvae. Both adults feed young.

Management Issues/Recommendations. Conservation easement programs designed to protect and enhance riparian and lower elevation shrubland habitat should include criteria based on the presence of this and associated species (Spotted Towhee, **Lazuli Bunting**, **Calliope Hummingbird**).

MacGillivray's Warbler

This species is found in a fairly wide variety of habitats, wherever some level of deciduous shrub cover is available. The species account is included in the Riparian Shrubland section of this plan.

Lazuli Bunting

Priority Level: II MT Score:19 AI:3

Reason for Concern. This species is particularly susceptible to parasitism by Brown-headed Cowbirds. One analysis of the Gap habitat layers indicated that only in a few wilderness areas in the western part of the state were suitable habitat patches also far enough from agricultural and urban landscapes to serve as potential source populations for the species (Greene et al. 1996).

Distribution. The Lazuli Bunting breeds across the western United States from the central Dakotas south to northern New Mexico, except for coastal Oregon and Washington, southern Arizona, and southeastern California. They also breed in the northern part of Baja California and in southern British Columbia, Alberta, and Saskatchewan. They winter in western Mexico. Lazuli Buntings breed in appropriate habitat throughout Montana (Montana Bird Distribution Committee 1996). The Montana Gap model (Redmond et al. 1998) predicts there are >8 million ha of suitable habitat in the state (21% of the state).

Habitat Requirements. Lazuli Buntings breed in brushy, early successional habitats up to 3,000 m (9,800 ft), especially arid brushy hillsides, riparian habitats, wooded valleys, aspen, willow, alder (*Alnus*), or cottonwood thickets, sagebrush, open scrub, recent postfire habitats, thickets and hedges along agricultural fields, and residential gardens (Greene et al. 1996). Although an abundant breeder in postfire habitats, they are found much less commonly in managed forest treatments such as clearcuts, seed tree cuts, and group-selection cuts (Hutto 1995).

Ecology. Lazuli Buntings eat seeds and fruits throughout the year. They glean arthropods from foliage, especially during the breeding season (Greene et al. 1996). They forage from the ground up to about 1.5 m (5 ft) among grasses, forbs, and low shrubs. They will also forage higher in cottonwoods, aspen, and willow in riparian thickets and woodlands (Greene et al. 1996).

Lazuli Buntings build open cup-shaped nests in dense vegetation but often at the edge of a shrub. A wide variety of shrub species are used. Nests are usually within 1 m (3.3 ft) of the ground (Greene et al. 1996). There is substantial variation in cowbird parasitism rates, ranging from 0 to 100% (Greene et al. 1996). In the Bitterroot Valley, MT, 100% of the nests were parasitized in riparian habitat while elsewhere in western Montana, >95% of the nests were parasitized close to a cowbird roost, but only 6% were parasitized away from roosts (Greene et al. 1996).

All foraging, nesting, courtship, and feeding of nestlings take place within the territory during the breeding season. Considerable variation in territory size occurs in different habitats: in Palouse prairie habitat near

Missoula, MT, the mean territory size was 1.4 ha (3.5 ac), ranging from 0.6-4.7 ha (1.5 to 11.6 ac); in grassland with large patches of wild rose (*Rosa woodsii*) farther north near Eureka, MT, the mean territory size was 5 ha (12.4 ac); and in dense aspen stands near Kananaskis, Alberta, mean territory size was 4 ha (9.9 ac; Greene et al. 1996).

Management Issues. Heavy parasitism by cowbirds on this species in some parts of its range greatly reduces reproductive success. This species occurs in naturally patchy habitats (brushy fields, open scrub, riparian). Loss of shrubs due to herbicide spraying or other control methods would be detrimental to this species. Lazuli Buntings are captured and sold as cage birds on the wintering grounds (Greene et al. 1996).

Management Recommendations. Integrated demographic monitoring is needed, in combination with landscape-level GIS analysis, to identify source-sink dynamics for this species.

Common Poorwill

Priority Level: III   MT Score: 19   AI: 3

Reason for Concern. The status of this unique species is poorly understood in the state because it is essentially unmonitored.

Distribution. The Common Poorwill is found from the southern border of the U.S. in Texas north to central Montana, west to central Washington, south to southern California and southeasterly to Texas. Within the state, their distribution extends from central Montana south to the Montana/Wyoming border and east to the southeast corner of the state. There are scattered records from western Montana.

Habitat Requirements. The Common Poorwill prefers semi- arid grassland or shrub-steppe habitats, including more open examples of Montane Shrubland. Typical habitat includes an interspersion of rocky areas. They will also use dry, fairly open canopy ponderosa pine forests (particularly in the southeast). The Gap Analysis (Redmond et al. 1998) predicted 6 million ha of appropriate habitat in the state.

Ecology. The Common Poorwill is a ground nester. They may choose gravel rock pine needles or form a shallow scrape in open country. They will use sparse ponderosa pine forests where nests are placed within shaded areas or close to trees. In treeless types they will nest on hillcrests with shrubby components to the vegetative community. Adults are nocturnal or crepuscular and forage for insects from the ground or a perch.

Management Recommendations. Nocturnal bird monitoring is needed in suitable Common Poorwill habitat to better understand its distribution and population status.

Green-tailed Towhee

Priority Level: III   MT Score: 19   AI: 3

Reason for concern. This characteristic species of drier montane shrub habitat is poorly monitored but likely to be sensitive to habitat changes.

Distribution. The Green-tailed Towhee occupies the middle latitudes of the U.S. West. They can be found from middle Oregon south to southern California east to Colorado and n. New Mexico, north to s. Montana and s. Idaho. Within Montana, they are found only in the southwest to south-central areas (n. to Helena).

Habitat Requirements. The Green-tailed Towhee seems to prefer shrub-steppe habitats with a species rich shrub component. They also can be found in montane forests that have been disturbed by fire. Dry shrubby hillsides and second growth following disturbances appear to be favorite habitats. Vegetation is characterized as low brush cover with very scattered trees. Gap analysis (Redmond, et al. 1998) estimated 6.8 % of the State (or 2.5 million ha) constitutes Green-tailed Towhee habitat.

Ecology. Towhees forage on seeds and insects. Foraging is by gleaning insects from foliage in low shrubs, or by scratching the ground for seeds. Nests are large and thick-walled, and well concealed in dense shrub stands. Nest cups may persist for five years with females building upon old cups.

Management Recommendations. Count-based monitoring in montane shrubland habitats should be implemented to better track this and associated species.

Clay-colored Sparrow

Priority Level: III MT Score: 19 AI: 3

Reason for Concern. This national Watch List species is actually showing population increases in the two physiographic areas overlapping Montana, although the species is not well monitored. There are threats to its preferred nesting habitat.

Distribution. Clay-colored Sparrow is found throughout Montana east of the divide. Populations west of the divide are much more local in the major valleys (Montana Bird Distribution Committee 1996). Gap analysis (Redmond et al. 1998) estimates 18.5 million ha (48% of the state) is Clay-colored Sparrow habitat.

Habitat Requirements. Clay-colored Sparrows are found mainly in uncultivated grasslands, with a variety of shrubs interspersed. The most common types of shrubs were wolfberry, snowberry, silverberry, and rose. Occasionally Clay-colored Sparrow will be found in grasslands with tall shrubs and or trees. Tall shrubs include chokecherry, hawthorn, aspen and poplar (Faanes 1983, Knapton 1978, Knapton 1994). Willow and birch stands in montane meadows are also used. Preferred grasslands are idle to lightly grazed with native vegetation extending from mid to tall in height. Most of the grassland used have a large amount of litter accumulated. Sparrows may also infrequently use open, shrubless grassland but only when tall forbs, song perches and nest substrate is present.

Ecology. Clay-colored Sparrows consume a wide variety of seeds and invertebrates. The species is monogamous, with high site fidelity. Pair bonds are stable throughout summer. Few birds mate in successive years although one pair did mate for three consecutive years. Nests are constructed by females; males may accompany them while gathering nesting material. Nests are placed within denser shrub areas. The most common shrub used is snowberry. Most nests are constructed close to the ground and are composed of grass, fine twigs, weed stalks, and are lined with fine grass and animal hair.

Most nest losses are due to predation. Nest predators include meadow vole (*Microtus pennsylvanicus*), deer mouse (*Peromyscus maniculatus*), long-tailed weasel (*Mustela frenata)*, short-tailed weasel (*M. erminea*), least weasel (*M. minimus*), striped skunk (*Mephitis mephitis*) and snakes.

Management Issues/ Recommendations. Much of the valley-bottom habitat of this species in western Montana has been converted to agricultural use or is under threat of residential development. Conservation programs with a focus on valley grasslands or riparian habitats should also include upland shrub areas. Better monitoring is needed.

Habitat and Population Objectives: Montane Shrubland

No specific habitat and population objectives were developed for this lower priority habitat for version 1.0 of this plan, in part because it appears that seral shrubfields in the managed forest landscape are distributed widely enough and vary enough in size and structure, to provide habitat for most montane shrub-dependent bird species. Count-based monitoring should be implemented for this habitat, both within montane shrublands and in the seral stands in forests. Special techniques will be needed to monitor Common Poorwill populations.

FOREST

The nine general forest types considered in this plan each support a variety of priority species (Table 6). They are listed in what the Montana PIF working group considered to be priority order, with fairly detailed recommended for the highest priority habitat, Dry Forest, and no proposed conservation actions for the lowest, Dry Fir - Lodgepole Pine. Many species will benefit from conservation efforts in more than one priority habitat (Table 6).

Table 6. Forest habitat associations, Montana PIF priority species.

Species	Priority	Dry Forest	Cedar-Hemlock	Burned	Moist Doug-fir	Whitebark Pine	Aspen	Wet Subalpine Fir	Juniper - Limber Pine	Dry Fir-Lodgepole Pine
Sharp-shinned Hawk	III	X			X					
Northern Goshawk	II	X			X			X		
Blue Grouse	III	X								
Flammulated Owl	I	X								
Great Gray Owl	III	X			X		X	X		X
Boreal Owl	III							X		X
Vaux's Swift	II		X		X					
Calliope Hummingbird	II		X		X					
Lewis's Woodpecker	II	X		X						
Red-naped Sapsucker	II	X	X		X		X			
Williamson's Sapsucker	II	X			X		X			
Three-toed Woodpecker	II			X	X			X		X
Black-backed Woodpecker	I			X						
Pileated Woodpecker	II				X					
Olive-sided Flycatcher	I			X	X			X		
Hammond's Flycatcher	II	X			X					
Clark's Nutcracker	III	X				X			X	
Chestnut-backed Chickadee	III		X		X					
Brown Creeper	I		X	X	X			X		X
Winter Wren	II		X					X		
Golden-crowned Kinglet	III		X		X			X		
Townsend's Solitaire	III	X	X	X	X					X
Varied Thrush	III		X					X		
Plumbeous Vireo	III	X			X					
Cassin's Vireo	III	X			X		X			
Warbling Vireo	III						X			
Townsend's Warbler	III	X	X		X			X		X
MacGillivray's Warbler	III				X		X	X		
Chipping Sparrow	III	X			X					X
Cassin's Finch	III	X		X						
Red Crossbill	III	X			X			X		X

Dry Forest (Ponderosa Pine/Douglas-fir)

Definition. Open, parkland-type stands composed exclusively of ponderosa pine, with an understory of shrubs and/or herbaceous vegetation, occur on the driest forested sites in Montana. On other dry sites, ponderosa pine occurs with a subdominant or codominant layer of Douglas-fir or grand fir. Dry forest sites composed exclusively of Douglas-fir occur on sites that are usually too cold for ponderosa pine. Dry sites dominated by grand fir represent an uncommon forest type in the state (Fischer and Clayton 1983; Pfister et al. 1977; UCRBDEIS 1997).

Distribution. Dry forest types are distributed widely throughout Montana except for the northeastern portion of the state, and are found at lower to middle elevations on both public and private lands. Timbered, dry sites comprise five million out of 25 million total acres in Forest Service Region One. Approximately four million of the dry site acreage resides in Montana.

Forests composed exclusively of ponderosa pine usually occupy the first forest zone above grasslands, except for some areas in southwestern Montana, at elevations ranging from 2,140 ft in extreme northwestern Montana to slightly more than 6000 ft in the central part of the state. In southeastern Montana, ponderosa pine forests represent the major dry forest type and are found at elevations near 4,000 ft (Hansen and Hoffman 1988; Pfister et al. 1977; Redmond and Prather 1996).

Dry forests composed of a combination of ponderosa pine, Douglas-fir, and on rare occasions grand fir are a common forest type of western and central Montana that occurs in the next forest belt above the ponderosa pine zone. These dry forest belts extend in elevation from 2142-3680 ft in northwestern Montana to 4600-6300 ft in south-central Montana, just north of Yellowstone National Park (Redmond and Prather 1996).

Dry forest sites dominated by Douglas-fir are distributed primarily east of the continental divide in a band running through southwestern, central and north-central Montana at elevations ranging from 5300 to 7350 ft. Grand fir-dominated dry sites occupy an extremely restricted geographical area, found only on western portions of the Lolo and Bitterroot National Forests at elevations between 4700-5300 ft (Arno 1979; Fischer and Clayton 1983; Pfister, et al. 1977; Redmond and Prather 1996).

Physical Features, Ponderosa Pine Sites. Forests composed exclusively of ponderosa pine (*var. ponderosa*) grow on warm sites at low elevations in the dry, relatively mild, Pacific-influenced climate of western Montana. The ponderosa pine variety of central and eastern Montana (var. *scopulorum*) is adapted to more extreme, continental-influenced climatic conditions (Arno 1979; Pfister et al. 1977).

Ponderosa pine stands are found primarily on moderate to steep south- and west-facing slopes in western Montana. Ponderosa stands in the gentler rolling terrain of eastern Montana are found on a greater variety of aspects, though the primary orientation is still south- and west-facing (Pfister et al. 1977).

Ponderosa pine habitat types vary with soil type. R. and J. Daubenmire (1968) described a "grassy" habitat type group of open stands with soils that were stony, coarse-textured, and shallow. The grassy group predominates in western Montana, and is common in eastern Montana. In addition, "shrubby" groups characterized by dense patches of trees and deep, heavy-textured, fertile soils are abundant in eastern Montana, (Pfister et al. 1977).

Physical Features, Mixed-Conifer Dry Forest Sites. Dry forests composed of a mix of ponderosa pine, Douglas-fir, and occasionally grand fir are found on sites that are slightly higher, cooler, and more mesic than adjacent ponderosa pine habitats, but still too warm and dry for most other conifers. Climate is Pacific-influenced in western Montana; central Montana sites are influenced by a continental climate (Fischer and Bradley 1987; Fischer and Clayton 1983). Mixed dry forest stands are also positioned mainly on south- and west- facing slopes; exceptions include northerly aspects at the higher elevation limits of this type. Most are located on moderate to steep slopes, though foothill and benchland stands, especially in central Montana, may be in more gentle terrain (Fischer and Clayton 1983; Pfister et al. 1977). The soils of mixed-species dry forest habitat types are consistently gravelly and acidic, except on calcareous substrates. Surface cover of rock and bare soil are relatively high and duff litter layer depth is low (Pfister et al. 1977).

Physical Features, Douglas-Fir- or Grand Fir-Dominated Sites. Cool, dry forest sites dominated by Douglas-fir are located primarily east of the continental divide, at mid elevations, on sites generally too dry for lodgepole pine and too cold for ponderosa pine. The climate is continental and not uncommonly associated with severe temperature fluctuations. Dry sites dominated by grand fir are a minor habitat type that represents the cold, dry limits of the grand fir habitat type series. In Montana, dry grand fir sites are located west of the continental divide and subject to a Pacific-influenced climate (Arno 1979; Pfister et al. 1977).

The topography of dry Douglas-fir forests is primarily moderate to steep, mid-slope sites that vary in aspect from southerly exposures at high elevation limits, to north slopes at lower limits (Pfister et al. 1977). The soils of dry Douglas-fir sites are mainly gravelly sandy loams to silts. Surface rock and bare soil exposure is moderately high; duff depth is low to moderate. Surface soils of dry grand-fir sites are also gravelly sandy loams to silts with little exposed rock or bare soil. Duff depth is low (Pfister et al. 1977).

Dominant / Subdominant Species. (summarized from: Fischer and Bradley 1987; Fischer and Clayton 1983; Hansen and Hoffman 1988; Pfister et al. 1977; Redmond and Prather 1996). Dominant dry forest vegetation is dependent on a combination of factors: site conditions, disturbance history, and human intervention. Human intervention, in the form of fire suppression, has had an especially dramatic effect on existing vegetation, allowing forest succession to progress unimpeded toward site potential vegetation.

Dry forest sites dominated by ponderosa pine usually belong to the ponderosa pine (climax) habitat type series. Understories tend to be open with variable grassy production and a sparse shrubs. Commonly associated understory plant species include bitterbrush in western Montana, snowberry in central Montana, Pennsylvania sedge in eastern Montana, and bluebunch wheatgrass and fescue species throughout the state.

Dry forest sites dominated by a combination of ponderosa pine, Douglas-fir, and grand fir usually belong to the Douglas-fir habitat type series. The absence of fire has permitted relatively shade-tolerant and fire-vulnerable Douglas-fir and grand fir to become a significant portion of the species composition of many of these sites. While bunchgrasses often dominate the understory, dense shrub patches are not uncommon for some habitat types. Commonly associated plant species of the dry Douglas-fir habitat types include bluebunch wheatgrass, rough fescue, and snowberry. Pinegrass, ninebark, bearberry, and dwarf huckleberry are less common associates that occur in dry phases of the moisture-variable Douglas-fir habitat types.

Dry forest types dominated by Douglas-fir or grand fir are represented by several Douglas-fir habitat types and one grand fir habitat type. Seral communities, with or without the influence of fire, are commonly dominated by only one tree species as succession proceeds toward climax. Undergrowth is generally sparse with a poorly developed shrub layer. Commonly associated plant species for the dry monospecific Douglas-fir habitat types include Idaho fescue, elk sedge, heartleaf arnica, mountain snowberry, and common juniper.

The grand fir habitat type plant associates include beargrass and pinegrass.

Natural Disturbance Regimes; Warm, Dry Forest Types. Pre-European-settlement fire intervals in the warm, dry forest types of Montana ranged from 5-25 years. While most fires were probably initiated by natural causes, Native Americans did use fire regularly for hunting purposes as well. These frequent fires were usually of low intensity and promoted a forest structure of open, uneven-aged stands dominated by: (1) large ponderosa pines in ponderosa pine habitat types, or (2) large ponderosa pines and less numerous large Douglas-firs in dry Douglas-fir habitat types. Losensky (1993) estimated that Douglas-fir normally represented 20 % of dry forest mixed-species stands in western Montana.

In the warm, dry mixed-conifer forests of western and central Montana spatial and temporal fire patterns permitted the periodic establishment of young ponderosa pines and Douglas-firs. In rare, prolonged fire-free periods, Douglas-fir regeneration could have become established as thickets of saplings and poles beneath the canopy, providing a fuel ladder to greatly increase the chances of an intense stand-replacement fire. Usually, however, frequent, low-intensity fires maintained the dominance of ponderosa pine by selectively killing the more fire-sensitive young Douglas-fir. Understory development was dominated by grass species with shrub undergrowth generally sparse, except where local conditions had extended fire frequency (Fischer and Bradley 1987; Fischer and Clayton 1983; Gruell 1983; Arno et al. 1997).

Fire and vegetation dynamics in pure ponderosa stands were similar to dry mixed-conifer habitat. Successful tree regeneration, however, was composed of ponderosa pine, and occasionally Rocky Mountain juniper (Fischer and Clayton 1983). In eastern Montana, historic fire regimes may have had the additional effect of significantly restricting the presence of ponderosa forest on the landscape. In the absence of fire, it appears that ponderosa pine/Rocky Mountain juniper stands now occupy significant areas that were historically non-forested grassland (Dibenedetto 1999; Losensky et al. 1995; McCarthy 1999).

Natural Disturbance Regimes; Cool, Dry Forest Types. Fire intervals in cool, dry forest types dominated by either Douglas-fir or grand fir averaged 35-45 years in pre-European-settlement stands in western and central Montana (Fischer and Clayton 1983; Fischer and Bradley 1987). Though fire occurred less frequently than in ponderosa pine and warm, dry Douglas-fir habitat types, it is still hypothesized that fires were of low to moderate intensity and served primarily to thin younger stands and maintain mature stands in an open, park like condition (Arno and Gruell 1983). In Douglas-fir dominated sites a mosaic of fire conditions may have maintained pre-European-settlement stands as scattered groves on the landscape (Fischer and Clayton 1983). Longer than average fire intervals would permit shrub and seedling/sapling undergrowth development and serve to make these forest types susceptible to stand-replacement fires.

Historical Conditions. Stands of large ponderosa pine historically dominated most dry forest sites in western Montana. Losensky (1993) estimated that in 1900, 55% of dry ponderosa pine/Douglas-fir cover types in western Montana were maintained in potential old-growth status (180+ years), while mature, but non-old-growth, stands accounting for another 16% of the total. Large portions of currently non-forested valley bottoms were covered with fire-maintained, seral old-growth ponderosa pine forests as well (Leiberg 1899).

Ponderosa pines (var. *scopulorum*) on dry, eastern sites were smaller in stature than their western Montana counterparts (var. *ponderosa*), and largely restricted to slope edges and ridge lines. Fire maintained the openness of these stands and suppressed the establishment of trees onto adjacent grasslands (Dibenedetto 1999; Losensky et al. 1995; Gruell 1983).

Historically, frequent ground fires in the dry, cool Douglas-fir habitat types favored the maintenance of open stands of mature trees. Stands were patchily distributed and restricted to moist microsites, rock outcrops, talus slopes, and stony ridges with sparse grassy fuels. Douglas-fir encroachment into grasslands was rare and limited to time periods with long fire intervals (Gruell 1983).

Land Use History. Low-elevation, dry forest types (especially ponderosa pine communities) were among the first trees to be harvested in Montana in the late 1800s (Daniels 1991). In western Montana, the majority of the early logging occurred on private lands in valley bottoms, primarily in support of the railroad and mining industries (Losensky 1993). Large portions of these valley bottoms were covered with fire-maintained, seral old-growth ponderosa pine forests (Leiberg 1899). Except for small, forested remnants, conversion of these valley-bottom forests to agricultural and residential uses has been complete.

Logging on low-elevation mountain slopes (primarily on USFS land) in western Montana continued throughout the 20th century with a peak in ponderosa pine cutting occurring in the 1960s (Daniels 1991). As a result of logging, few old-growth structured ponderosa pine/Douglas-fir stands remain in Montana. In fact, ponderosa pine is the most endangered old-growth forest type in Montana (Yanishevsky 1993).

Logging and grazing had significant impacts on the ponderosa pine and dry, cool Douglas-fir forests central Montana. Logging associated with mining operations and dependent communities was intensive at numerous locales from the 1870s through the mid-1900s. Grazing and fire exclusion promoted conditions conducive to forest encroachment into previously non-forested grasslands (Gruell 1983; Losensky 1993).

Reduced fire occurrence in Montana forests started in the late 1800s and had become organized and effective by the 1930s (Gruell 1983). The effectiveness of fire exclusion in dry forest types may be decreasing, however, as the canopy in these stands becomes increasingly crowded. Despite astronomical expenditures to exclude fire from dry forest types, roughly more than half of the three million acres that burned in wildfires in the western United States in 1994 were in these types, and the fires that burn now are stand-replacing rather than frequent low-intensity burns (Arno 1996).

Historic land use of ponderosa pine habitat in eastern Montana included logging, grazing, and conversion to cropland. The few existing land unit surveys from the early 1900s describe most stands as "stand initiation", indicating that clearcutting was a common practice. One land unit survey of 20,000 acres on the Sioux District records no stands in a mature or old-growth state. Numerous timber mills were kept active on the Ashland and Sioux Districts in the early 1900s providing lumber for local consumption and the regional railroad industry (Sandbak 1999). Competition from grasses, and fire, made it difficult for ponderosa pines to expand into adjacent grasslands (Arno 1999). Domestic livestock grazing has increased the opportunities for ponderosa pine regeneration in grasslands by: (1) decreasing the competitiveness of grass species vs. ponderosa pine , and (2) removing much of the herbaceous vegetation necessary to carry frequent, low intensity fires (Bock et al. 1992).

Current Conditions. Changes in fire regimes among dry forest types in Montana have resulted in losses in shrub understories and increases in closed multistory canopies, creating stands susceptible to stand replacement fires. In warm, dry Douglas-fir habitat types of western Montana, logging and fire suppression has resulted in the replacement of old single- and multiple-layer forests dominated by ponderosa pine by mixed ponderosa pine/Douglas-fir stands in stem exclusion and other young structural stages. Douglas-fir regeneration in the understory creates a fire ladder, greatly increasingly the potential of stand-destroying crown fires (Fischer and Bradley 1987; Saab and Rich 1997).

In central and eastern Montana, the successful suppression of surface fires in open, fire-maintained ponderosa pine stands over the last few decades has altered sites toward a more flammable condition. Forests that were historically single- and double-storied are currently almost exclusively multi-storied (3 or more levels). These stands now have a well-developed understory of ponderosa pine and, in some cases, Rocky Mountain juniper. In addition, the ponderosa pine forests of eastern Montana have expanded dramatically into adjacent grasslands. Forests that had been primarily open and limited in range, have been replaced by more dense forests extending over a greater landscape (Fischer and Clayton 1983; Gruell 1983; Losensky et al. 1995; Sandbak 1999).

In the absence of fire, the cool, dry Douglas-fir forests of central Montana have expanded dramatically into previously non-forested grasslands and sagebrush habitats. Aspen stands have deteriorated due to competition from Douglas-fir and the absence of fire's rejuvenating influence. Douglas-fir forests that were previously open and distributed in groves on the landscape are now often dense and relatively continuous across the landscape. Old-growth conditions have declined due to the logging of older trees, though probably not to the extent of more accessible, low-elevation ponderosa pine forests (Fischer and Clayton 1983; Gruell 1983; Losensky 1993).

Current Land Use. While dry forest types have undergone drastic land conversion in large valley bottoms, they remain largely intact on montane public and private holdings despite dramatic alterations in age-class distribution and physical structure.

As the largest land manager of timberlands in Montana, the U.S. Forest Service has the greatest potential effect on the quantity and quality of dry forest types. Under the increasing sway of a philosophy of ecosystem management, logging activities in dry forest types have moved away from the cutting of large trees, toward the restoration of historical age classes and structure (Bollenbacher 1998). From FY 1997 to 1998, the number of acres treated with logging and underburning increased from approximately 45,000 acres to 60,000 with increased activity planned for the next two decades (see Habitat Objectives section for details). Most planned restoration activities to date have focused on western and central Montana; logging and prescribed burning in eastern Montana have been primarily for fuel reduction, not prescriptively for restoration purposes (Bollenbacher 1998; Dibenedetto 1999).

In contrast, management of the substantial dry forest acreage on low elevation private lands in Montana has taken a very different turn. Management of these lands, especially for smaller landowners, has increasingly shifted toward commodity production, i.e., the logging of larger trees. Timber production in Montana for 1996 on non-industrial private landholdings actually exceeded timber production on national forest lands (USDA Forest Service 1997). Higher prices, increased demand, and lack of available supply on public lands indicate a continuation of this trend for the foreseeable future (Western Wood Products Association 1998). Educational programs geared toward private landowners, such as the Montana Forestry Stewardship Program, have the potential to ameliorate some of the unsustainable practices associated with this trend (Ellingson 1998).

Grazing continues to be a prominent use of dry forest lands in Montana, but several factors have worked to reduce grazing pressures. First, grazing-allotment management plans are being reviewed throughout the region. On the Helena National Forest, reviews of grazing allotments have resulted in reduced animal use in approximately one half of the cases (Douthett 1999). Regionally, overall grazing pressure has been reduced slightly and animals are more consistently moved among pastures to reduce overgrazing. Second, the reduction of the forage base on dry forest lands, due to closed tree canopies, has resulted in a reclassification of many dry forest sites as "secondary" rangeland. Little or no grazing occurs on these sites that were historically grazed, though grazing could be reinitiated on sites that are successfully restored (Douthett 1999).

Regional and National Importance and Change. Dry forest habitat types historically and currently represent a major forest cover type in Montana and the American West. Forest stands dominated by ponderosa pine represent approximately 35% of the commercial forest land in the American West, or about 30 million ac (Barrett 1979, Schubert 1974, Shepperd et al. 1983). Ponderosa pine is one of the most highly valued commercial tree species (Western Wood Products Association 1998). While conversion activities have been destructive in localized areas, at a large scale there has been little loss of these cover types. Indeed, at low-elevation forest/grassland interfaces there has even been, due to fire suppression, an increase of dry forest types into historically treeless grassland and shrubsteppe habitats.

The major change common to most dry forest types (especially ponderosa pine) in Montana and elsewhere in the American West is a profound alteration in age-class structure, physical structure, tree density, and tree species composition as a result of logging and fire suppression (Barrett 1979, Schubert 1974, Shepperd et al. 1983). Stands that were largely dominated by mature and old-growth trees in an open-parkland setting have been changed to abnormally dense stands dominated by younger trees.

Montana Restoration Efforts. Ongoing restoration efforts in Montana (see Habitat Objectives for more detail) take on greater importance considering the almost complete continental alteration of ponderosa pine habitat. Viewed within the geographical context of the American West, restoration activities and plans in Montana provide leadership and a model for the appropriate application of ecosystem management (EM) principles throughout the American West. Properly applied, EM can demonstrate how an intensive and sustained effort can facilitate a return to historical ecological processes, patterns, and functions, and the bird communities they support.

Bird Species' Associations. Priority bird species associated with late-successional forest (Table 7) were likely affected the most by changes in habitat conditions that have occurred in dry forests over the past 100 years (UCRBDEIS 1997). Species closely associated with old forest stages and snags, such as the Lewis's Woodpecker, Pileated Woodpecker, Olive-sided Flycatcher, Flammulated Owl, White-breasted Nuthatch, and Williamson's Sapsucker are believed to have decreased because of the reduction of old forest stages. Some bird species commonly found in more moist coniferous habitats, including Townsend's Warbler, Hammond's Flycatcher, and Ruby-crowned Kinglet, have likely increased in dry forests due to increases in tree density and tree cover strata. The Chipping Sparrow, a relatively common yet consistently declining species throughout the American West (Dobkin 1992) is likely to benefit from restoration efforts that open up forest structure.

Table 7. Relationships of Montana PIF priority species to vegetative structural components, Dry Forest habitat type.

Species	Area Dep.	Canopy: Open	Canopy: Closed	Old Growth	Understory: Patchy	Understory: Open	Understory: Closed	Large Snags	Large Trees	Large Logs	Comments
Blue Grouse		x			x						
Flammulated Owl	x	x		x		x		x			roosting thickets
Lewis's Woodpecker		x		x			x	x			soft snags

Hammond's Flycatcher				x							
Chipping Sparrow		x			x						nesting thickets
Cassin's Finch		x									
Red Crossbill											cones

Flammulated Owl

Priority Level: I MT Score: 24 AI: 4

Reason for Concern. Little was known of the distribution and habitat needs of this species in Montana until recent years. Its preference for mature open dry forests means it has probably declined in population during this century, although the species is poorly monitored.

Distribution. Flammulated Owls breed primarily in open, mature montane pine forests from southern British Columbia to Oaxaca in southern Mexico (McCallum 1994). In the American West, ponderosa pine and Jeffrey pine forests are the preferred habitat though mixed coniferous stands are occasionally used as well (Verner 1994). Winter range records for this species are sparse; probable winter distribution for this insectivorous, migratory owl stretches from the southwestern United States to Central America.

Flammulated Owls were widely considered rare in the American West until the use of callback surveys became a common tool in the past several decades (McCallum 1994). In Montana, the first nesting record was not documented until 1986 (Holt, et al. 1987), and Flammulated Owls were not found regularly until the 1990s. Wright (1996) was especially successful in locating birds in the mountains bordering the southern part of the Bitterroot Valley. Most Montana breeding records are from west of the continental divide, though eastside observations of breeding owls have been made in the Big Belt and Crazy Mountains (Montana Bird Distribution Committee 1996). While seemingly appropriate ponderosa pine habitat is abundant east of the Rocky Mountains in central and eastern Montana, no Flammulated Owls have been recorded in these areas (Montana Bird Distribution Committee 1996). This may, however, be due to a lack of sampling. Surveys utilizing callback methods are needed to clarify the distribution of Flammulated Owls in central and eastern Montana.

Ecology. The Flammulated Owl is a tiny, insectivorous owl of montane pine forests of North America and Mexico. It feeds almost entirely on arthropods, especially moths and beetles, and appears to be highly migratory, at least in the United States and Canada (McCallum 1994). Flammulated Owls are uniquely adapted to foraging in open forest conditions (Goggans 1986, Reynolds and Linkhart 1992). Adults use four foraging tactics well suited to such habitat. Hawk-gleaning and hover -gleaning, the most frequently used tactics in a Colorado study (Reynolds and Linkhart 1987), utilize the open lower two-thirds of tree crowns. Adults and fledglings pounce-drop on arthropods in late summer in the understory. Hawking occurs in the spaces within or between tree crowns. Flammulated Owls nest primarily in cavities excavated by woodpeckers in large trees and snags. Ecological factors positively affecting owl occurrence also include large-scale open forest, forest openings, and small patches of dense vegetation.

Habitat Requirements, General. (summarized, in part, from Hart, et al. 1998) Breeding habitat for Flammulated Owls in North America and Mexico consists primarily of mid-elevation, open ponderosa pine/Douglas-fir or similar forests, e.g., dry montane conifer or aspen forests. They usually occur on on lower and middle southern slopes, and occasionally on ridgetops. The species is strongly associated with mature to old-growth ponderosa pine and Douglas-fir forests throughout the northern and central Rocky Mountains (Linkhart 1984, Bull and Anderson 1978, Goggans 1986, Holt and Hillis 1987, Howie and Ritcey 1987, Reynolds and Linkhart 1987, Atkinson and Atkinson 1990, Bull et al. 1990, Reynolds and Linkhart 1992, V. Wright 1996).

Habitat Features. Flammulated Owls consistently select habitat that combines open forest stands with large trees and snags for nesting and foraging, occasional clusters of thick understory vegetation for roosting and calling, and adjacent grassland openings that provide optimum edge habitat for foraging.

Most studies to date have focused on the microhabitat and home-range variables associated with site occupation. In northeastern Oregon, stands of large-diameter (>50 cm dbh) ponderosa pine and Douglas-fir or grand fir with ponderosa pine in the overstory were identified as nesting habitat (Bull and Anderson 1978, Bull et al. 1990). Preferred nest sites were old woodpecker holes created by Pileated Woodpeckers, and to a lesser degree northern flickers. Similarly, Goggans (1986) described nesting habitat in eastern Oregon as stands of ponderosa pine/Douglas-fir, 30-50 cm DBH, with less than 50% canopy closure. Owls foraged on arthropods along the forest/grassland edge, as well as in ponderosa pine/Douglas-fir forests of low or moderate density. Prey items were 2.7 times as numerous in ponderosa pine/Douglas-fir forest, and 8.7 times more abundant in grasslands than in nearby mixed conifer stands. A crucial aspect of roosting habitat in this study appeared to be tree density; owls roosted in mixed conifer patches within these stands, in close proximity to the nest site, and avoided pure ponderosa stands.

In Colorado, Reynolds and Linkhart (1987, 1992) found a strong association between Flammulated Owls and old-growth ponderosa pine/Douglas-fir habitat, noting that such forests were used more than expected for nesting, foraging, and singing. They speculate that the presence of cavities and snags, the abundance of arthropods, and an open stand structure suitable for foraging may be factors in this preference. Males were also observed calling from pockets of dense foliage in what were otherwise open stands. Thickets of dense foliage were also used for calling and roosting in a study in New Mexico (McCallum and Gehlbach 1988). Owls have also been found to nest in live aspen (n = 3) in Colorado (Richmond et al. 1980).

At the northern edge of the owl's range in British Columbia, Howie and Ritcey (1987) identified mature/old-growth (> 100 year-old) Douglas-fir and Douglas-fir/ponderosa pine stands as nesting habitat, finding that owl densities were highest in stands 140-200+ years old. Owls were restricted to open stands with multi-layered canopies and an abundance of large, well-spaced trees interspersed with grassy openings up to two ha in size. Regenerating thickets within stands were used for roosting. Although they found a clearer association with mature/old-growth Douglas-fir than with ponderosa pine, they stated that "...the open nature of the fir forests coupled with natural or artificial openings created by logging probably resembles the physical structure of preferred forests in the southern portion of the owl's range."

In Central Idaho, territorial owls occupied relatively open, multi-storied Douglas-fir, ponderosa pine, and mixed conifer stands with some mature trees usually present (Atkinson and Atkinson 1990). Territories were often near more open areas, including old burns, grassy hillsides, natural clearings, or clearcuts. Atkinson and Atkinson (1990) also noted a clumped distribution of territorial males, along with unoccupied areas of apparently optimal habitat.

A recent study conducted by Wright (1996) in Montana's Bitterroot Valley indicated that Flammulated Owls select for appropriate microhabitat features (large trees and large snags), but only within an appropriate landscape context. The owls were not present unless the larger landscape consisted of low-canopy-cover ponderosa pine/Douglas-fir forests, and then only where grassland or xeric shrubland openings were present at a home-range scale. Flammulated Owls were not found on otherwise suitable sites when the surrounding landscape was predominantly moister coniferous forest types, and they were less abundant in ponderosa pine/ Douglas-fir landscapes that were heavily logged (even-aged cuts). Other ostensibly suitable but unoccupied sites were explained by the presence of moist understory vegetation other than grassland; for example, old-growth ponderosa pine stands with a *Vaccinium* understory were not occupied.

Current Habitat Condition and Opportunities. The conversion and expansion of mature, dry forest stands to second-growth throughout the range of the Flammulated Owl has created undesirable, high-density vegetation conditions (McCallum and Gehlbach 1988). Currently, blocks of suitable habitat for Flammulated Owls are rare in Montana. Historically, seral stands of large ponderosa pine dominated most dry forest sites in western Montana (Losensky 1993). However, a major restoration of the ponderosa pine and other xeric forest ecosystems is currently underway in western Forest Service Regions generally, and within Region One (northern Idaho and Montana) specifically. Ambitious plans in Region One project that 50% of dry ponderosa pine and Douglas-fir habitat, approximately 2 million acres, will be restored in the next 20 years to more natural, open parkland conditions dominated by large, mature trees (USDA Forest Service 1998; Meuchel 1998). The Forest Service has an opportunity to manage restored acres to meet both the microhabitat and landscape parameters of identified wildlife species, including the Flammulated Owl.

Distribution/Configuration/Management of Habitat Blocks. An effective conservation strategy for Flammulated Owls in Montana should take into account the species' needs at multiple spatial scales (Hutto 1985, Wright 1996). In addition to meeting microhabitat needs, suitable habitat at the home-range and landscape levels must also be provided. At the home-range level, mean territory sizes reported in the literature were 14.1 ha by Reynolds and Linkhart in Colorado (1987) and 10.3 ha by Goggans in Idaho (1986). Owl management units should be large enough to include multiple home-range areas, with suitable habitat elements, within larger areas of suitable forest types.

Flammulated Owls often demonstrate a clustered distribution across the landscape with large unoccupied spaces in between (Howie and Ritcey 1987, Atkinson and Atkinson 1990, Reynolds and Linkhart 1992, Wright et al. 1997). In Montana, 90% of Wright's owl observations were clustered (>3 owls per transect) along only 18% of the study's transects. This is probably a consequence of owls occupying appropriate microhabitat only when the larger area is also suitable (Wright 1996). It has also been speculated that clustering may be a reflection of social requirements, such as mate selection (Winter 1974). In either case, it may be possible that habitat would only be suitable when it is abundant enough to accommodate a cluster of territories. Owl management units containing a high percentage of low canopy-coverage ponderosa pine and xeric mixed forest should therefore be as large as possible, in order to support multiple territories, instead of managing for more numerous smaller units.

Dry forest habitat at lower montane elevations in western Montana is common, widely distributed, and relatively continuous (Pfister et al. 1977) providing many opportunities to manage habitat for Flammulated Owls. Small, patchily distributed stands of dry forest would have lesser value for restoration as Flammulated Owl habitat. It appears the species is well adapted to the historic stand components and structure that existed before large scale logging and fire suppression. Historically; frequent, low intensity fires within dry forest types created a landscape dominated by stands of large trees and maintained as open, seral old growth. Management geared toward the restoration of pre-European settlement habitat structure and stand distribution is an excellent prescription for Flammulated Owls based on our knowledge to date.

One caveat must be considered seriously concerning the use of logging and controlled burning to restore sites for wildlife. Flammulated Owls have indeed been found to occupy, and sometimes nest in, selectively-logged sites in the northern Rockies (Howey and Ritcey 1987; Wright 1996). It needs to be assessed, however, whether logged sites are serving as "ecological traps": areas to which species are differentially attracted but where reproductive success and/or adult survival is low (Hutto 1999). Of particular concern is the retention and recruitment of large snags in logged areas. Since dry forest restoration could create significantly more habitat (or at least habitat that elicits a settling response) for Flammulated Owls than currently exists, it is crucial to collect demographic information to evaluate habitat quality. Ongoing and future restoration activities in Montana will provide excellent research opportunities to assess habitat quality in logged and unlogged sites (Wright et al. 1997).

Individual Species Needs: Unique Features. Flammulated Owls are obligate cavity nesters that use natural cavities, or more commonly, old woodpecker holes. Most commonly used cavities were mid- to large-sized: Pileated Woodpecker, Northern Flicker, and sapsucker cavities were occupied in northern and central Rocky Mountain study sites (McCallum 1994). Large snags provided the most important nesting substrate for Flammulated Owls in two Oregon studies (Goggans 1986, Bull et al. 1990), with 85% percent of Goggans' nests located in ponderosa pines. McCallum (1994) believes that the most immediate threat to the species in North America may be the elimination of snags through firewood gathering and other logging. Wright et al. (1997) found very low snag densities in ponderosa pine forests exposed to management activities. McCallum and Gehlbach (1988) inferred a preference for open, mature vegetation in the nesting vicinity from their comparison of vegetation around occupied and unoccupied cavities. In related findings, McCallum and Gehlbach (1988) and Bull et al. (1990) noted lower shrub densities in front of nest cavity entrances than behind.

Flammulated Owls strongly prefer open forest and edge habitat for foraging during late summer, rarely venturing into dense forest stands to hunt (McCallum 1994). Grassland edge habitat may have special foraging importance. Goggans (1986) found edge habitat to be used disproportionately for foraging, especially in late-summer pounce-dropping by adults and fledglings. Grassland edge habitat also contained three times the number of prey items than the adjacent open forest areas. Habitat types with an open forest overstory, but a closed, shrubby understory were not occupied by Flammulated Owls in Montana (Wright 1996). In order to provide suitable foraging habitat throughout the breeding season, Flammulated Owls appear to need both open overstory and understory. Nonetheless, it does appear that Flammulated Owls use, and perhaps need, a limited amount of clustered, dense vegetation in their breeding territory. Dense trees were used preferentially for roosting and calling in studies in Idaho and Colorado (Goggans 1986, Reynolds and Linkhart 1987). Roost sites were located in close proximity to nests (20-100 m; <20m pre-fledging). Thick regeneration was used for roosting in British Columbia (Howie and Ritcey), and was commonly available on sites in New Mexico (McCallum and Gehlbach 1988).

Lewis's Woodpecker

Priority Level: II MT Score: 22 AI: 3

Reason for Concern. Based on BBS data, Lewis's Woodpecker populations in North America have declined 60% from 1966 to 1991 (Tashiro-Vierling 1994). In Montana, trends are strongly downward for the same time period but the number of survey routes are insufficient for statistical analysis (Dobkin 1992). Local declines were reported in the Fortine area of Lincoln County, Montana (Weydemeyer 1975), though local changes must be interpreted against the relatively uncommon status and sporadic distribution of this woodpecker species (Bock 1970; DeSante and Pyle 1986).

Distribution. The breeding range of the Lewis's Woodpecker extends north to southwestern Canada (southern British Columbia, southwestern Alberta), south to southern New Mexico and Arizona, west to western California, and east to eastern Colorado, approximating the distribution of ponderosa pine in North America (Short 1982; Tobalske 1997). The Lewis's Woodpecker generally winters in the southern portion of its breeding range north to southwestern Oregon, central Utah, and central Colorado (Tobalske 1997). Winter occurrence as far north as British Columbia, and as far south as northwestern Mexico and western Texas is irregular in frequency and abundance (Short 1982; Tobalske 1997).

Range contractions in the 20^{th} century have occurred in the western and southern extremes of historic range: western British Columbia, including Vancouver Island; northwestern sections of Washington and Oregon; and portions of southern California (Gilligan et al. 1994; Siddle and Davidson 1991; Small 1994). Range expansion, attributable to the presence of mature cottonwoods and cultivated corn, has been documented in prairie riparian and agricultural areas of southeastern Colorado (Hadow 1973; Andrews and Righter 1992).

Lewis's Woodpeckers have been recorded during the breeding season in all parts of Montana except the northeastern quarter (Montana Bird Distribution Committee 1996). Whether the absence of birds in northeastern Montana is due to unused habitat, lack of suitable habitat, or a paucity of bird sampling is not clear; competition with the Red-headed Woodpecker may play a role. Winter records of Lewis's Woodpeckers occur along the western and southern peripheries of the state.

Ecology. The Lewis's Woodpecker is a medium-sized, migratory woodpecker of open forests and post-fire habitat. It is the most specialized of North American woodpeckers in the development of flycatching behavior. Foraging behavior is opportunistic and includes shrub foliage gleaning; efforts are focused on insect populations during spring and summer, and on ripe fruits, mast, and corn during fall and winter. Mast and corn are stored in the bark of live trees, usually oaks and occasionally cottonwoods (Hadow 1973). It excavates and reuses nest cavities in the soft wood of dead and decaying trees (Bock 1970).

Habitat Requirements, General. The three primary breeding habitats of Lewis's Woodpeckers in Montana and elsewhere are open ponderosa pine forest, burned coniferous forests, and open riparian woodland (particularly cottonwood). Although used primarily in winter, oak woodlands and, less commonly, orchards also provide breeding habitat elsewhere in the West. Lewis's Woodpeckers occasionally use a variety of other habitats for breeding, including pinon pine-juniper woodland, other pine and true fir forests, and agricultural areas (Bock 1970, Raphael and White 1984, Linder 1994, Vierling 1997, Cooper et al. 1998).

Habitat Features. Lewis's Woodpeckers are commonly associated with an open forest canopy that permits flycatching, a dense understory shrub coverage to generate an abundance of insects, and large snags for nesting (Bock 1970; Raphael and White 1984; Linder 1994). In unburned forests necessary snag and understory conditions are generally found in older, open stands that lack a dense layer of sub-canopy trees.

Burned-forest sites are rarely occupied until the development of a significant shrub layer. Based on the geographic region, specific habitat, and the intensity of the burn, site occupation by Lewis's Woodpeckers may range from 5-22 years post-fire (Bock 1970; Raphael and White 1984; Block and Brennan 1987; Linder

1994; Caton 1996), though the species was abundant 2-3 years after fire in a large, high-intensity burn in western Idaho (Saab and Dudley 1996). After 2-3 decades post-fire, the development of young, second-growth forest again creates conditions unsuitable for Lewis's Woodpeckers.

A status report on Lewis's woodpeckers in British Columbia found them confined to relatively few habitats at lower elevations with a strong link to the distribution of older-aged, open-canopied ponderosa pine stands and riparian stands of large black cottonwood trees (Cooper, et al. 1998). In addition, Lewis's woodpeckers were abundant in an 18-year-old burn of mature Douglas-fir forest. The authors emphasize that the quantity and quality of habitat continues to decline in British Columbia for what are already small and declining populations of Lewis's Woodpeckers.

On the east side of the Sierra Nevada Mountains in California, Bock (1970) studied a breeding population of Lewis's Woodpeckers in open ponderosa pine forest that contained shrubby vegetation in the understory. Birds nested in dead and partially decayed pines. Also in the Sierra Nevada Mountains, Raphael and White (1984) investigated the use of snags by cavity-nesting birds in burned and unburned forest. Observations of Lewis's Woodpeckers and nest occurrences were almost exclusively within burned forest sites. All nests (n=37) were located in snags, most of which were large (>38 cm DBH) and in a relatively advanced state of decay. Nest site areas were further characterized by a relatively high percentage of shrub cover and a tall snag and tree canopy.
In a comparison of burned and unburned forest habitat on the Modoc Plateau, CA (Block and Brennan 1987), breeding Lewis's Woodpeckers were only observed on burned sites. Unlike most studies of Lewis's woodpeckers, neither site type had the extensive shrub layer usually associated with the species occurrence. In addition, both site types were open-canopied and had an abundance of snags, indicating that additional factors affected habitat selection.

Woodpecker nest trees were comparatively taller and larger diameter than random trees in southeastern Colorado riparian woodland and foothill sites (Vierling 1997). All nest trees (n=47) were in dead or decaying broadleaf cottonwoods. Woodland nest sites were located in open cottonwood stands near lightly to moderately grazed fields. Nests were not located in dense tree stands or adjacent to heavily grazed areas. Ponderosa pine habitat was not occupied during the breeding season, probably due to the dense forest structure precipitated by fire suppression.

Current Habitat Conditions and Opportunities. Current habitat conditions in Montana for the three major breeding habitats for Lewis's Woodpecker are significantly inferior in quantity and quality to historic conditions. In dry forests opportunities are present to significantly improve habitat over coming decades. Opportunities in burned forest and riparian cottonwood habitat, however, will require major shifts in policies and actions before benefits can be realized.

Dry Forests. The conversion and expansion of mature, dry forest stands to second-growth throughout the range of the Lewis's Woodpecker has created undesirable, high-density vegetation conditions (McCallum and Gehlbach 1988). Currently, blocks of appropriate ponderosa pine habitat for Lewis's Woodpecker are rare in Montana. However, a major restoration of the ponderosa pine and other xeric forest ecosystems is currently underway in western Forest Service Regions generally, and within Region One (northern Idaho and Montana) specifically. Ambitious plans in Region One project that 50% of dry ponderosa pine and Douglas-fir habitat, approximately 2 million acres, will be restored in the next 20 years to more natural, open parkland conditions dominated by large, mature trees (USDA Forest Service 1998; Meuchel 1998). The Forest Service has an opportunity to manage restored acres to meet the habitat needs of identified wildlife species, including the Lewis's Woodpecker.

Post-fire Habitat. While low-intensity underburning is prescriptively being reintroduced to dry forest habitats, potential stand-replacement fires are routinely extinguished except in national wilderness areas. In contrast, most of the forested landscape of the northern Rockies evolved under a regime of large, high-intensity fires every 50-100 years (Fischer and Bradley 1987). Those areas now burned by stand-replacement fires constitute a small proportion of historic levels of post-fire habitat (Gruell 1980; Gruell 1983). The results of effective fire suppression policies for species closely associated with stand-replacement post-fire conditions, such as the Lewis's Woodpecker, are potentially devastating. Compounding the lack of post-fire habitat is post-fire timber harvest on those few areas that do burn. A recommendation by Hutto (1995) to log trees from part of a burn and leave other areas untouched has been implemented on some Region One salvage sales (Hillis 1998) but is still a relatively uncommon practice.

Riparian Cottonwood. Riparian cottonwood habitat is in a state of decline throughout the American West due to the effects human activities and the suppression of natural disturbance regimes. Habitat elements crucial to the needs of Lewis's Woodpeckers appear to be especially affected. Cavity-nesting habitat has decreased due to snag attrition, historic and current logging of large cottonwoods, and farmland conversion (Sedgewick and Knopf 1992; Hansen et al. 1988), and competition with European Starlings may further limit nesting opportunities. Understory shrub conditions have been degraded due to intensive grazing. And a new, increasing threat comes from the explosion of residential developments in valley floors of the intermountain west (Tobalske 1997). The future viability of cottonwood habitat is threatened due to flood control, irrigation, and grazing; that combine to thwart cottonwood regeneration dependent upon periodic flooding and resultant disturbed substrates (Snyder and Miller 1991). Significant changes in grazing and irrigation policies, water release schedules, and residential planning are needed to ameliorate current conditions, and to slow or reverse continuing trends of habitat degradation.

Distribution/Configuration/Management of Habitat Blocks. Dry forest habitat at lower montane elevations in western Montana and on the rolling terrain of eastern Montana is common, widely distributed, and, at times, relatively continuous (Pfister et al. 1977), providing many opportunities to manage for Lewis's Woodpeckers. A territory size of 6.1 ha per pair was reported in ponderosa pine habitat in the Blue Mountains of Washington and Oregon (Thomas et al. 1979). Bock (1970), however, reported that Lewis's Woodpeckers defend only the immediate area around the nest site and, in winter, around the stored food. It is possible that small, patchily distributed stands of appropriate dry forest may have value as breeding habitat, but this is largely speculative until landscape-level work is done. Conveniently, management for Lewis's woodpeckers in dry forests would fit under the umbrella of management needs for Flammulated Owls (see Flammulated Owl report). Objectives based on the landscape-level needs of the Flammulated Owl most probably accommodate any habitat-area needs of Lewis's Woodpeckers. Specific needs of the Lewis's Woodpecker could be met at the microsite and site level in the form of interspersed zones of shrubby understory within the overall habitat mosaic.

A habitat suitability index model developed for the Lewis's Woodpecker (Sousa 1983) did not define a minimum habitat area, based on the assumption that any habitat of a suitable cover type that is large enough to map (not defined) would provide potential habitat; but considering the proportion of unused snags (16:1 ratio of unused/used) in Thomas et al's. study (1979) in the Blue Mountains, habitat area may be a valid concern for any cavity-nesting species. Thomas et al. (1979, from review) argued persuasively that the absence of suitable nest sites is the usual limiting factor for cavity-nesting birds. In as much as snag abundance is dependent, in part, on the size of appropriate habitat patches, site-specific management can be geared to provide a distribution and configuration of habitat that meets this most limiting factor. Thomas et al. (1979) provided specific recommendations for snag retentions in forest management plans of the Blue Mountains: a maximum density of Lewis's Woodpeckers (16.6 pairs/100 ha) may be maintained with a snag density of 249/100 ha that are $\geq$30.5 cm dbh and $\geq$9.1 m in height. The appropriateness and effectiveness of these measures, however, have not been rigorously tested anywhere (Tobalske 1997).

Individual Species Needs: Unique Features. Appropriate nest site characteristics are an extreme limiting factor due to their specificity and rareness. Lewis's Woodpeckers are obligate cavity nesters that use other woodpecker species' holes and natural cavities, or excavate their own in the soft wood of dead and decaying trees (Bock 1970). A weak excavation morphology may preclude them from excavating hard snags or trees; indeed they often select cottonwood snags over conifers in mixed-forest burned stands. Lewis's Woodpeckers commonly reuse old nest cavities, a possible indicator of weak excavation morphology and a lack of appropriate nest trees. They show a preference for large diameter nest trees/snags: in studies in California, Colorado, and Wyoming the mean nest tree/snag dbh ranged from 47.8 to 112.8 cm (Raphael and White 1984; Linder 1994; Vierling 1997).

Lewis's Woodpeckers are unique among woodpecker species in their strong dependence on flycatching as a foraging method, especially during the breeding season. The proportion of foraging time spent flycatching in pine forests, oak woodlands, and cottonwood riparian areas of California and Colorado during the breeding season ranged from 45-76% (Bock 1970; Raphael and White 1984; Tobalske 1997, from review). Lewis's Woodpeckers catch flying insects by both hawking from perches, and by "direct" long-duration foraging flights (Bock 1970). Both methods require an open habitat to allow for sufficient visibility and movement. Studies have associated flycatching foraging activity with a shrubby understory (Bock 1970; Raphael and White 1984), that presumably supports an abundance of insect prey. Lewis's Woodpeckers have rarely (if ever) been observed drilling for sub-surface insects.

Management Issues. Lewis's Woodpeckers avoided buildings and heavily grazed fields on the plains of Colorado (Vierling 1997). They may also abandon nests because of prolonged human disturbance near the nest site (Bock 1970), although Cooper et al. (1998) reported stable populations coexisting with heavy tourist pressure in British Columbia. Human impacts are likely to continue to increase due to the residential development of riparian cottonwood and ponderosa pine habitat in the American West. Comprehensive planning efforts should take into account wildlife habitat values and potential development impacts in determining development suitability; approved developments should avoid direct interference with nesting areas (especially bottomland forests) in order to minimize the destruction of appropriate habitat elements, especially snags.

Research Needs. One caveat must be considered seriously concerning logging and controlled burning to restore sites for wildlife. Lewis's woodpeckers have been reported to nest in cut areas (Bock 1970). It needs to be assessed, however, if logged sites are serving as "ecological traps": areas to which species are differentially attracted but where reproductive success and/or adult survival is low (Hutto 1999). Of particular concern is the retention and recruitment of snags in logged sites. Since dry forest restoration could potentially create significantly more habitat (or at least habitat that elicits a settling response) for Lewis's Woodpeckers than currently exists, it is crucial to collect demographic information in order to evaluate habitat quality. Ongoing and future restoration activities in Montana will provide excellent research opportunities to assess habitat quality in logged and unlogged sites.

The European starling, an introduced species, is a potential nest-cavity competitor of the Lewis's

Woodpecker. Lewis's Woodpeckers, however, appear to dominate competitive interactions, rarely losing nest cavities (Tashiro- Vierling 1994, Cooper et al. 1998). Possibly of greater concern is the energy expended in nest defense, and the potential decrease in reproductive success and survivorship. Demographic research is needed, especially in riparian cottonwood habitat, a common habitat of Lewis's Woodpeckers and European starlings.

Blue Grouse

Priority Level: III MT Score: 21 AI: 3

Reason for Concern. This game bird has declined in the northern Rockies (p.a. 64), according to BBS data.

Distribution. Blue Grouse are restricted to the mountainous areas of western and central Montana (Montana Bird Distribution Committee). Gap analysis (Redmond et al., 1998) predicts that 9.38 percent of the state or about 3.5 million ha of Blue Grouse habitat can be found within Montana.

Habitat Requirements. The Blue Grouse during the breeding season is a bird of the open coniferous forests, including forest edges, openings and aspen groves. Breeding territories are established in open xeric forest associated with forest edge and openings. They have been found as far as 2 km from forest edges (Zwickel, BNA, 1992). They tend to avoid denser forest canopy areas (Bendell and Elliott, 1967), except in winter, when preferred habitat consists of denser conifer (primarily Douglas-fir, and true firs). Usually this is accomplished by an elevational migration- winter habitats are found at higher elevations than spring and summer habitat types.

Ecology. Food habits vary by season. A wide variety of plant material including leaves, flowers and berries are consumed during spring and summer. Winter diet consists of all most exclusively coniferous needles. Juveniles consume a large number of invertebrates, especially grasshoppers. Free water is used during spring, summer and fall but may not be required if succulent plants are available.

Blue Grouse are ground nesters. The female usually will produce a scrape (approximately 17 cm in diameter and 4-5 cm deep) and line the nest with small amounts of vegetation. The nest is seldom located within the male's breeding territory and seldom within 50 m of another nest. Nestling usually hatch within 24 hours of each other.

Management Issues/Recommendations. Nest failure is usually the direct of predation. Mammals are the most likely cause of nest predation followed by other birds. The reverse is true of predation on the young of the year. In this case, raptors may cause up to 75% of the lose where as mammals cause 25%. Better monitoring is needed to determine population trends in the state.

Chipping Sparrow

Priority Level: III MT Score: 16 AI: 3

Reason for Concern. The Chipping Sparrow declined in some western regions between 1961 and 1994, including significant declines in physiographic area 39, as well as in Montana. It is a classic example of an abundant species which is nonetheless declining regionally. It is probable that the Chipping Sparrow was particularly abundant in open, old-growth ponderosa pine forests, and may have decreased from pre-settlement populations. Inclusion in this habitat will help ensure that heterogeneity is considered in habitat prescriptions.

Habitat Requirements. Open forest and edges. Shrubs or trees for nesting combined with open ground for foraging. This combinations seems to be adequately provided by a variety of habitats.

Associated Species. As a common bird throughout open forest and other habitats, the Chipping Sparrow is associated with many other bird species. It is especially likely to respond favorably to management actions that create open, dry forests with grassy understories and some clumped stands of conifer regeneration, , which would also favor Flammulated Owls.

Recommendations. Restoration of old-growth ponderosa pine stands for other species will almost certainly benefit the Chipping Sparrow, particularly if there is some heterogeneity of understory conditions. Otherwise, no additional measures are thought to be needed by this species. Populations should be monitored to determine if declines continue, but this species should be adequately monitored by any comprehensive point-count program, in conjunction with the BBS. As a commonly recognized bird, this species offers a good opportunity to illustrate the PIF objective of "keeping common birds common".

Cassin's Finch

Priority Level: III MT Score: 19 AI: 3

Reason for Concern. Montana has a high responsibility for this species, as 60% of its population is found in p.a. 64. Trend data are inconclusive, but Hutto and Young (1999) have identified this as one of many species for which an attraction to managed forest stands may serve as "ecological traps", or population sinks.

Distribution. Cassin's Finch is distributed throughout the west from eastern Montana and Wyoming though central Colorado and just into northern New Mexico westward to the Pacific Coast with the exception of most of California. In Montana, the Cassin's Finch is found in central mountain ranges and throughout the west beyond the continental divide (Montana Bird Distribution Committee 1996).

Habitat Requirements. The Cassin's Finch is a bird of open relatively dry coniferous forests. Hutto and Young (1999) found that they were predominately within open ponderosa pine forests and secondly in Douglas-fir types or mixed coniferous forests. Post-fire habitats and selectively logged sites are used extensively. Gap analysis (Redmond 1998) estimated 1.2 million ha of habitat available within the state.

Management Recommendations. Because of their apparent tolerance for a wide variety of habitat conditions, Montana PIF developed no specific recommendations for this species. Count-based monitoring in dry forest habitats should continue to provide information on their distribution and trend.

Red Crossbill

Priority Level: III MT Score: 16 AI: 3

Reason for Concern. More than 40% of this widespread species' population is found in the northern

Rockies. Its nomadic nature makes it hard to monitor and to manage for. Habitat manipulations that influence cone production have implications for the species' productivity. Montana has potential as an excellent area to investigate the relationships between crossbill races, tree species forest management.

Distribution. The Red Crossbill is distributed throughout the west from eastern New Mexico north to Alaska then east across southern Canada (north of the Great Plains region) and northern United States. Breeding has been documented throughout most of Montana with the exception of the northeast corner (Montana Bird Distribution Committee 1996).

Habitat Requirements. The Red Crossbill is found within a wide variety of mature coniferous forests and mixed deciduous/coniferous forest. Usually they are associated with mature open canopy tree stands. They have been found in types ranging from dry savannah ponderosa pine, Douglas-fir, up to grand fir and subalpine fir types. Gap analysis (Redmond et al. 1998) identified 6.5 million ha of Crossbill habitat in the State.

Ecology. The Red Crossbill is a very nomadic species with its distribution and reproduction tied to the coniferous seed crop production. Breeding can occur at almost any time of the year. Research has indicated that there are up to 6 distinct forms of Red Crossbills, which differ in song type and in morphology. Though little is known of the individual distribution of these types in the state, each is apparently adapted to feed on the cones of a different tree species. Several of these (potential species) do occur in Montana.

Management Recommendations. Any silvicultural treatments which emphasize seed production in conifers are likely to improve habitat suitability for this species. In Dry Forest, maintaining some element of Douglas-fir is important for those crossbills adapted to feed on its smaller seeds, in addition to those adapted to feeding on ponderosa pine. Douglas-fir is also most likely the preferred tree for nesting.

Habitat and Population Objectives: Dry Forest

Mature Ponderosa Pine Restoration. Restoration activities in dry forest habitat types are important due to the dramatic changes in tree species composition and stand structure that have affected most dry forest habitat in western North America. An awareness and understanding of these changes, and the desirability of restorative activities in ponderosa pine habitat, is ubiquitous in Forest Service regions in the American West. The political will (or feasibility) and financial resources to accomplish restoration, however, vary throughout the West (Amundson 1998; Denton 1998; Dick 1998; Shafer 1998)

Habitat Objectives for Dry Forest

- Retain all current old-growth stands that meet minimum regional old-growth characteristics (Table 8). Restore historic structural characteristics with no elimination of large trees or snags.

- Manage for the long-term maintenance of 25% of dry forest habitat (per 4th order watershed) as old growth based on mean values of regional old-growth characteristics (Table 9). Values for old-growth characteristics should be no lower than 25% below mean values; and 50% of old-growth stands should meet or exceed regional mean values for old-growth elements.

Table 8. Minimum values of old-growth characteristics, Dry forest habitats (ponderosa pine and Douglas-fir), USFS Region 1 (Green et al. 1992)

Forest Types	**Ave. Age of Large Trees**	**# Large Trees**
Warm, dry ponderosa pine (west side)	170 yr	8 trees/ac ≥ 21 in dbh
Cool, dry Douglas-fir (west side)	170 yr	8 trees/ac ≥ 21 in dbh
Warm, dry ponderosa pine (east side)	180 yr	4 trees/ac ≥ 17 in dbh
Cool, dry Douglas-fir (east side)	200 yr	5 trees/ac ≥ 19 in dbh

C Restore the role of fire, and use thinning as necessary, to restore historic conditions.

C Retain all snags and broken-top trees ≥ 9 in dbh and all large trees ≥ 17 in dbh in harvest units.

C Manage for single- and double-storied stands with open conditions (<50% cover) in dry forest habitat of all age classes.

Table 9. Mean values of old-growth characteristics, Dry forest habitats (ponderosa pine and Douglas-fir), USFS Region 1 (Green et al. 1992)

Forest Type	**Ave. Age of Large Trees**	**# of Large Trees**	**# Standing Dead Trees**
Warm, dry ponderosa pine (west side)	246 yr	17 trees/ac ≥ 21 in dbh	6 trees/ac ≥ 9 in dbh
Cool, dry Douglas-fir (west side)	232 yr	18 trees/ac ≥ 21 in dbh	7 trees/ac ≥ 9 in dbh
Warm, dry ponderosa pine (east side)	215 yr	24 trees/ac ≥ 17 in dbh	7 trees/ac ≥ 9 in dbh
Cool, dry Douglas-fir (east side)	229 yr	31 trees/ac ≥ 17 in dbh	10 trees/ac ≥ 9 in dbh

C Manage for a variety of habitat conditions at the landscape level, particularly varied understory conditions, to meet the needs of the Flammulated Owl and Lewis's Woodpecker:

Priority Species Objectives.

The absence of suitable nest sites is usually considered the limiting factor for cavity-nesting species (Thomas et al.1975). Retention of all existing large snags and broken-top trees, and management for adequate numbers over the landscape is a critical objective in order to maintain viable populations of Lewis's Woodpeckers and Flammulated Owls. The retention of all snags and broken-top trees ≥ 9 in. dbh and all large trees ≥ 17 in. dbh in harvest units would help meet the current and future needs of all cavity-nesting species in dry forests. Retention and recruitment of large snags is especially important for the Lewis's woodpecker: mean nest tree/snag dbh ranged from 19 to 44 in. across the American West (Raphael and White 1984; Linder 1994; Vierling 1997).

In a number of studies, the Flammulated Owl has demonstrated a clustered distribution on the landscape (Howie and Ritcey 1987; Atkinson and Atkinson 1990; Reynolds and Linkhart 1992; Wright 1996). The provision of large, continuous blocks of open, mature and old-growth habitat on the landscape could potentially accommodate multiple Flammulated Owl home range areas.

The Flammulated Owl and Lewis's Woodpecker generally benefit from the open habitat conditions provided by prescribed burning and appropriate thinning in dry forest types (McCallum 1994, from review; Tobalske 1997, from review). However, foraging preferences of the two species differ. The Lewis's Woodpecker is more often associated with a dense, shrubby understory while the Flammulated Owl prefers a grassy understory. Nonetheless, those divergent needs can met within the normal range of habitat heterogeneity that existed historically on dry forest landscapes.

Dry Forest Habitat Objectives for Flammulated Owl. Wherever possible, management of dry forest sites should address the needs of Flammulated Owls by incorporating structural and component complexity at the microhabitat and home-range scale in the form of suitable nest snags and trees; open, mature vegetation around the nest site; small clearings; and roost sites in relatively close proximity to each other.

- Maintain all existing large snags and broken-top trees ≥ 12 in dbh for current and future nesting purposes.

- Within blocks, provide thickets of sapling/pole tree regeneration for roosting purposes; thickets within 100 m of, but not directly adjacent to, potential nest sites.

- Within blocks, provide open understory conditions immediately surrounding nest tree or potential nest tree sites.

- Provide foraging habitat of large blocks of grasslands adjacent to home range habitat.

Dry Forest Habitat Objectives for Lewis's Woodpecker

- Do not log in old-growth ponderosa pine forest and burned coniferous forest;

- Manage for open, park like stands of ponderosa pine and lightly-burned forest using selective thinning and periodic burns.

- Do not densely replant trees after cutting.

- Maintain all existing large snags and broken-top trees ≥ 20 in dbh for current and future nesting purposes.

- Recruit for a minimum of 1.0 snag ≥ 30 in dbh/ac; create snags through blasting tops or inoculation with heart rot if size of trees meets species requirements.

- Provide foraging habitat of interspersed patches of dense shrub understory (2.5-15.0 ac) in the vicinity of large, soft snags.

Evaluation of Habitat Objectives

Based on historic logging and assessments of current conditions it is unlikely that much dry forest old-growth remains in Montana, and that current levels are significantly below the historic (Gruell 1983; Fischer and Clayton 1983; Fischer and Bradley 1987; Daniels 1991; Losensky 1993; Yanishevsky 1993; Saab and Rich 1997; Sandbak 1999). Until a comprehensive inventory of dry forest old-growth is undertaken it is incumbent to retain existing stands. Funding and on-ground efforts should emphasize restoring these stands first.

The maintenance of 25% of dry forest habitat in an old-growth condition would represent approximately half of historic old-growth levels. This is an achievable goal that provides significantly more habitat for old-growth associated species than currently exists, and still permits a sustained timber harvest over time. Stands that meet minimum age characteristics for old growth do not necessarily contain old-growth conditions; tying age standards to prescribed levels of old-growth elements assures that: 1) a stand is truly in old-growth condition, and 2) management emphasizes quality old-growth, i.e., not managing merely for minimum characteristics.

Potential for Implementation of Conservation and Restoration Recommendations

Restoration. Under the tentative plans in USFS Region One, approximately half of the estimated 4.2 million dry forest acres on USFS land in Montana would be treated to restore historic conditions during a 20-year cycle. These major restoration activities in Montana and northern Idaho are complemented by similarly well-financed, and regionally coordinated efforts in Regions 2,5, and 6 (Colorado, California, Washington, and Oregon) (Bollenbacher 1998; Denton 1998). Small, localized ponderosa pine restoration projects in Regions 3 and 4 (Arizona, New Mexico, Nevada, Utah, western Wyoming, southern Idaho) have not shared the same level of regional direction and financing as in the northern USFS regions but this appears to be changing (Amundson 1998; Dick 1998; Shafer 1998).

Stewardship/Education: Private Lands. Increasing numbers of private landowners in Montana are participating in educational programs on sustainable forest land management. The most prominent of these is the Montana Forestry Stewardship Program (MSF) run by the Montana State University Extension Service (Ellingson 1998). Landowners develop stewardship plans geared to the management goals of their land. These goals can be as varied as wood product maximization to the replication of pre-settlement conditions.

To date, stewardship plans have been developed for more than 740,000 acres in Montana (Logan 1998). MSF does not advocate a specific type of management; however, they do educate landowners on the ecology of forest ecosystems and the consequences of management activities.

Montana's Forest Legacy Program. The federal Forest Legacy Program was established to promote the long-term integrity of forest lands. Its specific intent is to identify and protect environmentally important private forest lands that are threatened by conversion to non-forest uses. The U.S. Forest Service implements the program through close cooperation with a lead state agency designated by the Governor. Montana Fish, Wildlife and Parks is the lead agency in Montana. The overall goal of the Montana Forest Legacy Program is to conserve and enhance land, water, wildlife and timber resources while providing for the continued working of Montana's forest lands and the maintenance of natural and public values. This is accomplished through the purchase of conservation easements or fee title on private forest lands threatened with conversion to non-forest uses.

Education programs such as MSF could also have the added benefit of increasing communication and cooperation between private landowners and public agencies. Management with an eye toward ecosystem stewardship on private lands will hopefully be compatible with Forest Service EM efforts on public lands. Logging and prescribed burning in dry forest habitat have the potential to bring together common public and private interests in a program of management that : 1) decreases fire risk to homes in the interface zone with public lands, and 2) creates forest structure and function similar to pre-settlement conditions.

Roadblocks (And Potential Remedies) to Conservation and Restoration Implementation

Public attitudes toward logging and burning are an essential element critical to the enactment of policies directing restoration of dry forest habitat. Public opinion polls in Montana have demonstrated widely divergent attitudes toward the use of prescribed fire (Manfredo et al. 1990). In a poll of "opinion leaders" in the Bitterroot Valley (Canton-Thompson 1994) approximately one half of the respondents favored the use of management ignited prescribed fire (MIPF) as a tool to restore ecosystems. Support ranged widely among sub-groups: "neutral" group - 70% support, "amenity" group – 50% support, "commodity" group – 20% support**;** with all groups agreeing that "education" was the critical factor in determining the public's acceptance/rejection of a prescribed fire policy.

Oregon's Blue Mountains contain fire-suppressed ponderosa pine forests with the same problems prevalent in Montana's dry forests, e.g., overstocking, changes in tree species composition, high catastrophic fire danger, and insect infestations. A random survey of area citizens there found overwhelming support for the use of MIPF and selective thinning as Forest Service management tools (Shindler and Reed 1996). Predictably, support for the use of prescribed fire did vary based on a question's context. It should be kept in mind that the use of prescribed fire as a tool for ecological restoration must be understood in the context of the complex tradeoff issues of forest health, wildfire occurrence, visibility degradation, and human health (Ottmar et al. 1996).

Restored, open-parkland sites will present a very different aesthetic picture of dry forest types than the public has become accustomed to over the past several decades. This should not assume, however, a negative public response. "Scenic Beauty Estimations" performed on Arizona ponderosa pine sites indicate that careful tree thinning, compatible with ecological restoration objectives, can actually enhance public perceptions of a site's scenic value (Brown and Daniel 1984).

A new paradigm of "beauty" that differs from the current picture of densely forested, Douglas-fir encroached-upon stands can also be facilitated by an appreciation of restored ecological integrity. Public education programs can emphasize the "naturalness" that will be restored with logging and burning, and illustrate the benefits to wildlife and plants. Public suspicions that this is just another "excuse" to log can be allayed with defensible management plans based on the benefits resulting from replication of historic conditions. The logging of old-growth trees in projects that emphasize restoration goals would only increase public cynicism to otherwise justifiable USFS intentions.

Ponderosa pine and Douglas-fir continue to be two of the three most valuable tree species for lumber production in the western United States (Western Wood Products Association 1998). Demand and prices are especially high for ponderosa pine. While overall timber harvest on private lands in Montana has remained stable over the past ten years, almost half of the production now comes from non-industrial, individual landowners (Boettcher 1997). Most of these private landholdings are low-elevation sites that fall within the dry forest zone. Cutting practices that emphasize the logging of large, economically valuable old-growth ponderosa pines would run counter to the conservation and restoration of the dry forest environment. Properly planned commercial logging, however, could complement restoration activities.

Benefits to Other Species. Many additional primary and secondary cavity nesters stand to gain from the accomplishment of habitat objectives; but particularly Pygmy Nuthatch, Red-breasted Nuthatch, White-breasted Nuthatch, and Hairy Woodpecker. Ground and open-cup nesters that are strongly associated with open, dry forest conditions and should benefit from restoration efforts include: **Hammond's Flycatcher**, Hermit Thrush, and Western Tanager (Hutto and Young 1999).

Dry forest stands tend to be in closer proximity to agricultural areas than other coniferous forest types. Brown-headed cowbird parasitism of open-cup nesting species could increase as a result of more open forest conditions (see "ecological trap" issue in Assumptions/Research Needs, below).

Assumptions

- Restoration of dry forest habitat will meet associated bird species needs. "Ecological trap" issues (species are differentially attracted to restored areas but reproductive success and/or survival are low) are generally not a concern.

- Measurable objectives will meet priority bird species needs.

- Historic dry forest age-class structure estimations are reasonably accurate to be used in the development of habitat objectives.

- Historic estimates of the physical structure of stands are reasonably accurate.

Research Needs

C How well do restored sites meet needs of associated bird species? Need presence/absence data from comparative studies of treated and control sites, and from sites before and after restoration. Demographic information needed to answer "ecological trap" questions. Data on cowbird presence and effects especially important.

C Quantifiable elements in the habitat objectives are based on simplified formulas from studies outside of Montana. Data are needed on nesting ecology and habitat use by priority species in Montana, particularly for the Lewis's Woodpecker.

C Reasonably good information exists to estimate age-class and physical structure of historic dry forests in western Montana. Estimates for central and eastern Montana, however, are largely educated speculation. More research needed.

C Presence and distribution of Flammulated Owls, especially in central and eastern Montana, should be determined through the implementation of stratified callback surveys in potential habitat statewide.

C Use of ponderosa pine habitat in central and eastern Montana by Lewis's Woodpeckers is poorly known, as is the relative importance of ponderosa pine habitat vs. riparian cottonwood.

Cedar-Hemlock

Distribution. Western redcedar grows along the Pacific coast from northern California to southeast Alaska and extends inland through northern Idaho into western Montana. Pure stands of western redcedar cover some small areas, but it is usually associated with other tree species. Western hemlock similarly thrives in humid areas of the Pacific coast and northern Rocky Mountains (Packee 1990). The range of western hemlock extends from central California north along the Coast Range to the Kenai Peninsula in Alaska. Inland, it grows along the western and upper eastern slopes of the Cascade Range in Oregon and Washington and east through northern Idaho into northwestern Montana.

The mixed conifer, western white pine, and western redcedar forest cover types (listed by the Society of American Foresters (Eyre 1980) as types 215 and 228) occupy about 5 million acres (2.0 million ha) in the Northern Rocky Mountains (Graham et al. 1983). The type is found in northwestern Montana, northern Idaho, eastern Washington, northeastern Oregon, and adjacent parts of British Columbia (Chojnacky and Woudenberg 1994). Elevations vary from 1,500 feet (460 m) to 6,000 feet (1,830 m).

The western redcedar and western hemlock habitat types occupy moist areas within the maritime-influenced climatic zone of the northern Rocky Mountains (Pfister et al. 1977). They occur extensively in northern Idaho (Daubenmire and Daubenmire 1968), but diminish eastward in northwestern Montana. Less than 10% of the area dominated by one of the three major tree species occurs in Montana, where it makes up only about 2.2% of the total timberland (Chojnacky and Woudenberg 1994). This may be an underestimate of the importance of these species because many stands with significant amounts of cedar or hemlock are dominated by other species. Cedar/hemlock forests in Montana are generally on bottomland or northern exposures 2,000-5,000 ft in elevation on sites where average annual precipitation exceeds 31 inches (Pfister et al. 1977). They are bordered on drier sites by the grand fir zone and on colder sites (at higher elevations and frost pockets) by the subalpine fir zone.

Both the cedar and hemlock series are most common in the extreme northwestern portion of Montana but extend eastward sporadically almost to the Continental Divide in Glacier National Park (Pfister et al. 1977), especially in the McDonald Valley. Isolated stands of hemlock also occur locally in the Swan Valley, but generally hemlock is confined to the vicinities of Libby and Thompson Falls westward to Idaho. The cedar series occurs more extensively in the Swan Valley and Mission Range; it extends eastward locally to Missoula, and forms small riparian stringers along major streams in the Bitterroot Range west of Hamilton (Pfister et al. 1977). Inventories have estimated that there are 121,885 acres of the cedar forest type in Montana, 30,172 acres dominated by Tsuga, and 32,039 acres dominated by white pine (Chojnacky and Woudenberg 1994).

Description. Cedar and hemlock are shade-tolerant climax conifers that grow in similar environments (Pfister et al. 1977). Cedar, however, extends locally onto slightly drier sites than hemlock, in addition to spreading farther south and east in Montana (Pfister et al. 1977). Hemlock is usually capable of attaining dominance over cedar and other species at climax because it is better able to reproduce under a dense canopy. Sometimes cedar and hemlock are codominants. They often occur together, or either species with white pine, but rarely do all three species occur in one plot (Chojnacky and Woudenberg 1994). Most stands contain other tree species as well; Douglas-fir, western larch, and Engelman spruce are major seral species in both habitat type series (Pfister et al. 1977). Lodgepole and western white pines, and paper birch are minor components of seral stands. Grand fir and subalpine fir are either minor seral or minor climax components (Pfister et al. 1977). Undergrowth is composed of many moist-site shrubs (e.g., huckleberry, twinflower, menziesia, and yew) and forbs (e.g., heart-leaf arnica, Clintonia) (Pfister et al. 1977).

Importance. These habitats have the highest timber productivity of all Montana forest types (Pfister et al. 1977). Maximum production is usually found in stands dominated by seral species. They also support a number of bird species that are near obligates for this habitat (Table 10).

Table 10. Relationships of Montana PIF priority species to vegetative structural components, Cedar/Hemlock habitat type.

Species	Area Dep.	Canopy:		Old Growth	Understory:			Large Snags	Large Trees	Large Logs	Comments
		Open	Closed		Patchy	Open	Closed				
Vaux's Swift				x					x	x	large hollow trees
Ch.-backed Chickadee			x					x	x		other snags
Brown Creeper	x		x	x				x	x		dying, recently dead
Winter Wren	x		x	x	x			x	x	x	
Golden-cr. Kinglet			x	x							
Varied Thrush	x			x							

Historical Status. Historically, cedar/hemlock occupied only 0.07-0.49% of the land base in the interior Columbia River Basin (Hann et al. 1996) . In specific physiographic areas of western Montana, Hann et al.

(1996) estimated that cedar/hemlock occupied 0 - 0.59% the northern glaciated mountains (2/3 in Montana); 0 - 2.58% in the lower Clark Fork area (½ in Montana); and 0% in the upper Clark Fork (all in Montana). Historically, however, western white pine was much more prevalent in the Columbia River Basin and many of these lands would now be designated cedar/hemlock. Western white pine occupied 1.77 - 2.43% of the total basin; 3.80 - 8.94% of the northern glaciated mountains; 14.36-26.89% of the lower Clark Fork area; and 0 - 2.53% of the upper Clark Fork area.

Losensky (1993) also described the historic acreages and conditions of forest stands in Montana and Idaho. He predicted that 5.1% of the forest in western Montana was western white pine and 0.4% was cedar/hemlock/grand fir in 1900. Within western white pine forests, approximately 22% were mature forests and 23% were old-growth forests in northwest Montana, and 17% were mature and 81% were old growth in southwest Montana.

Current status. Cedar is dominant on 36,339 ha, or only 0.10% of Montana (Hart et al. 1998), and hemlock on an additional 20,940 ha, or 0.05% of the state. However, these two species (especially cedar) can be significant components of many of the mixed mesic forests stands that make up 3.2% of the state (1,227,309 ha).

Brown Creeper

Priority Level: I   MT Score: 17   AI: 3

Reason for Concern. Although the Brown Creeper does not score high in the PIF prioritization scheme, it is a near-obligate old-growth associated species, particularly in cedar-hemlock forest. Research has shown the species to be highly intolerant of logging at bot the local and landscape scale.

Distribution. The Brown Creeper is found breeding in the western one-third of the state primarily from the Rocky Mountain Front westward. It's distribution stretches eastward into the central reaches along Montana's southern border and through several of the isolated mountain ranges east of the divide (Montana Bird Distribution Committee, 1996). Gap (Redmond et al. 1998) modeling for the state indicates 1.7 million ha of habitat or about 5 % of the state can be considered suitable for Brown Creepers. This resident species is more widespread during winter, when it can be found in a wide variety of habitats with mixed species flocks.

Habitat. Brown Creeper is strongly associated with old growth coniferous forests. Creepers seem to prefer mixed-coniferous stands with a varied structure. Mariani and Manuwal (1990) found that Creeper abundance was highly correlated with vary large DBH Western Hemlock trees. Adams and Morrison (1993) found low Creeper abundance in forests characterized by low diversity of stand structure and tree species. Hutto (1995) found that they were closely associated with undisturbed forest types, predominantly cedar-hemlock, but also in spruce-fir, ponderosa pine, mixed conifer, Douglas-fir and lodgepole pine. Only about two percent of the Brown Creeper sightings in the USFS Region 1 landbird monitoring program occurred within harvested forest types (Hutto 1995). Hejl and Paige (1994) and Hejl et al. (1995) also found that Creepers were much less abundant in clearcuts or partially logged forests. Both Aney (1984) and Franzreb (1985) considered Creepers to be sensitive to be a forest interior nesting species forest fragmentation during the breeding season.

Management Issues. The primary reason for this species' selection of older forest types is the availability of decadent trees. Not a cavity-nester in the truest sense, Brown Creepers place their nests behind the peeling bark of dead and dying trees. Harvest regimes which take all decadent trees, regardless of the size and variety of the trees left standing, will lessen habitat suitability for creepers.

Vaux's Swift

Priority Level: II   MT Score: 21   AI: 3

Reason for Concern. This species is uniquely dependent on very old, large hollow snags for nesting and roosting. These components are increasingly rare in the riparian and cedar-hemlock habitats favored by the species. Montana and the rest of the northern Rockies (p.a. 64) support over 40% of the population of this species. Most populations are declining throughout species range (Bull and Collins 1993). Numbers declined significantly in Oregon in 1980s (% annual change -8-9%), declining trend also in Washington (annual change -11.2%). Census numbers generally low (average < 1 per BBS route), however, so conclusions on trends may be difficult. The species is poorly monitored in Montana.

Distribution. Restricted to west of Continental Divide (Montana Bird Distribution Committee 1996). Never detected in eastside National Forests on 6738 point counts over three years (Northern Region Landbird Monitoring Program).

Habitat requirements. Very strong old-growth associate. In the southern Washington Cascades (Manuwal 1991), where the species was relatively common, their abundance in old growth (> 200 years) Douglas-fir stands was 4.5 times that of mature stands, and 7-9 times that of young stands. Abundance was most strongly correlated with total live trees > 100 cm dbh, but also with other old-growth elements and total live trees (Lundquist and Mariani 1991). In the Oregon Cascades (Gilbert and Allwine 1991), they were relatively uncommon, but still a significant old-growth associate. Even in the Oregon Coast Range, where rare, 56 of 61 detections were in old growth (Carey et al. 1991). A previous study in the southern Washington Cascades produced similar results (Manuwal and Huff 1987). Nests (n =21) in northeastern Oregon were typically in old-growth forest, with an average canopy closure of 71 % (Bull and Cooper 1991). Mannan and Meslow (1984) found most swifts in old growth stands, and very few individuals in mature, managed stands, although overall numbers were low. Montana data are limited. There were only 41 detections in three years of data from the Northern Region Landbird Monitoring Program, many of birds foraging over clearcuts or other logged stands. Of 14 detections in uncut forest, only 2 were in old growth (J. Young, pers. comm.).

Individual Species Needs: Unique Features. Nests in live or dead trees with decayed heartwood that has left hollow interior (Bull and Cooper 1991). Nest trees (n = 21) averaged 67.5 cm dbh and 25 m tall (Bull and Cooper 1991). Broken tops allow entrance of fungal decay agent as well as entrance to cavity for nesting or roosting swifts. Otherwise, Pileated Woodpeckers may provide entrance hole. Grand firs usually used in northeastern Oregon because is the species most susceptible to heartwood decay with sapwood remaining intact, but western larch provides similar decay pattern in Montana (McClelland 1977). Additional large, hollow trees may be required in area for alternative roosts (Bull and Blumton 1997). In Montana, 3 natural nest sites were found in old, topped western hemlock (Baldwin and Zackowski 1963). Foraging habits are also probably facilitated by the canopy structure of by old-growth forest conditions (Lundquist and Mariani 1991).

Ecology. A small, non-passerine bird superbly adapted for continuous and agile flight. Forages almost entirely on insects in flight, usually over the forest canopy (Bull and Collins 1993), and sometimes dives through canopy near foliage. Flies constantly except to nest or roost, probably even mating on the wing. Nests and roosts in large, hollow trees (live or dead). Nest attached to inside of hollow tree with saliva. Normally one nesting attempt of 5-7 eggs per season. Long-distance migrant to central Mexico and south.

Associated Species. Management for large snags will benefit many large cavity-nesters, especially **Pileated Woodpecker**. Management for cedar-hemlock old-growth conditions will also benefit the **Brown Creeper**, **Winter Wren**, and other associated species.

Management Recommendations. All of the largest snags must be retained in occupied or forest stands. Large trees must be maintained to replace snags that fall. Because of colonial habits, we do not know what typical, average, or maximum densities would be in forest stands. Population assessment or monitoring is necessary, and may require determining the location of nest and or roost trees.

Winter Wren

Priority Level: II   MT Score: 15   AI: 3

Reason for Concern. This is one of a suite of species which are near obligates for cedar-hemlock habitat in the state. They rely heavily on downed woody debris. Snags, downed logs, and large trees (often old-growth components) are increasingly scarce in western North America (Hejl 1994).

Distribution. The Winter Wren is generally resident throughout its range. It occurs throughout North America from Alaska to Mexico and the Palearctic region. In Montana, it is a year-round resident in western Montana east to Toole and Choteau Cos. (Bergeron et al. 1992).

Habitat Requirements. Winter Wrens are primarily found in moist coniferous forests, from sea level up to 11,000 ft (Bent 1948), often near water (Peck and James 1987, Peterjohn and Rice 1991, Brauning 1992, McGarigal and McComb 1992, Waterhouse 1998). In the drier parts of the inland West, wrens breed in riparian shrublands, cottonwoods, and aspens (Hutto and Young 1999). In the Rocky Mountains of Idaho and Montana, they are relatively restricted to uncut conifer forest types, especially western redcedar-hemlock and spruce-fir, but are also found in mixed conifer, Douglas-fir, and lodgepole. In drier parts of the northern Rockies, they are more restricted to riparian conditions. In the Pacific northwest, population densities are high, and they are found in all stand ages, but are most common in moist, old-growth stands (Carey et al. 1991, Manuwal 1991). This increased abundance is most likely due to increased canopy heterogeneity and greater openings, affecting understory cover. USFS Region 1 monitoring data revealed this species to occur three times more frequently in old growth than in mature and young forests, and rarely in seed-tree and clearcut openings (Hutto and Young 1999).

Ecology. Winter Wrens belong to the ground-foraging guild (Holmes et al. 1979). They tend to occupy areas with dead wood in the form of fallen logs, standing dead trees (snags), stumps, and slash piles (Hagar 1960, Laughlin and Kibbe 1985, Bevier 1994, Waterhouse 1998). They often occur where natural disturbance has created small openings or edges in the forest (Godfrey 1986, Holmes and Robinson 1988, Brewer et al. 1991, Peterjohn and Rice 1991) and open understories (Waterhouse 1998). They use crevices in snags, downed logs, and large trees for nest sites, large downed logs for travel lanes, and nest sites as roosting sites in winter. They are sometimes present in slash following logging operations (Brewer et al. 1991, Erskine 1992, Tobalske et al. 1991). In coastal British Columbia, 55% of nests were found < 5 m from riparian systems, and areas > 8 m from riparian systems were avoided (Waterhouse 1998). Nesting sites are highly variable, from using an existing hole (e.g., old woodpecker cavity) to creating a hole (e.g., bank) to adding to a surface (e.g., rootwad) to creating an entirely free-hanging structure (e.g., on tree limbs).

Management Issues. Old-growth forests are a small percentage of what they were pre-settlement (Hejl 1992) due to logging. In general, clearcut and partial logging decrease habitat suitability for this species (Hejl et al. 1995). Slash piles may contribute substantially to the quality of postharvest habitat (Hagar 1960, Erskine 1992, Laughlin and Kibbe 1985, Tobalske et al. 1991). Remnant rootwads from large downed logs and slash piles (Tobalske et al. 1991) have been used for nesting, foraging, and perching in clearcuts and partial cuts. Manuwal (1991) predicted that the combined effects of forest fragmentation and simplification of forest structure through even-aged management will probably result in decline of species closely associated with the forest floor. Due to their obvious dependence on moist habitats, the health of coniferous riparian systems is an important factor in maintaining Winter Wren populations. Human development and grazing may affect these habitats on valley floors, since development often occurs along riparian areas.

Research Needs. Very little information is available concerning the effects of various human activities on Winter Wrens during the breeding, migratory, or winter seasons. Effects of grazing are unknown, but need to be examined (Manuwal 1986) in conifer forests and in riparian woodlands. The most important research question for the near future is: do western forest management practices (especially silvicultural and landscape changes) negatively affect breeding populations, resulting in negative population trends? If so, what changes in land management practices can nullify or substantially modify these effects? Land management practices in the West seem to negatively affect breeding occupancy and success. Almost no detailed information from North America is available describing migration or dispersal of Winter Wrens in general or habitat relations for migration stopover locations or wintering areas; we need specific data for each metapopulation. In addition, we need a monitoring system for each of the separate populations.

Chestnut-backed Chickadee

Priority Level: III MT Score: 21 AI: 3

Reason for Concern. This species is a near obligate for cedar-hemlock forests. Population trends from Christmas Bird Count data indicate that Chestnut-backed Chickadee populations have increased slightly in Montana from 1944-1985 (Brennan and Morrison 1991). Generally, however, the species is poorly monitored.

Distribution. Chestnut-backed Chickadees are permanent residents and common throughout most of their range in the Pacific Northwest along the Cascade Range, south along the California coast west of the Sierra Nevada Range, northern Idaho, and southeastern Alaska (Price et al. 1995). In Montana, Chestnut-backed Chickadees are permanent residents in northwest Montana south into Ravalli and Deer Lodge counties and east into Flathead and Powell counties (Bergeron et al. 1992).

Habitat Requirements. In the Oregon Coast Ranges and the Washington Cascade Ranges, Chestnut-backed

Chickadees are positively correlated with high densities of large (>100 cm dbh) snags and trees (Carey et al. 1991, Lundquist and Mariani 1991). Large, live trees (>50 cm dbh) are important for foraging, particularly Douglas-fir and western hemlock. When available, western hemlock are used more often in winter for foraging perhaps because their high cone crop provides a more reliable food source when insects are scarce (Huff et al. 1991, Lundquist and Manuwal 1990). Due to the Chickadees role as a foliage insectivore, large conifers, particularly the dominant conifer species, provide an "optimum foraging environment" due to the abundance of insects and cones (Lundquist and Mariani 1991).

Old-growth and second-growth forests provide more suitable habitat due to the Chickadee's reliance on large snags for nesting and roosting. In Oregon, the average number of Chickadees per 40 ha ranged from 52-101, the number increasing with stand age (Carey et al. 1991), so stands of suitable habitat of at least 40 ha are necessary to maintain stable populations. Large snags are selected disproportionately to their availability, even when abundant, smaller snags are available (Nelson 1989). The majority of snags used for nesting have a dbh occurring in trees > 80 years old. Young stands developing after the harvest of old-growth stands have some suitable remnant snags for nesting; however, harvesting of second-growth stands would leave the developing young stands without suitable snags (Carey et al. 1991).

Ecology. Chestnut-backed Chickadees are foliage-gleaning insectivores that forage high in the forest canopy, often on the outer branches (Lundquist and Manuwal 1990). In the Cascade Ranges of the Pacific Northwest, they are most often found in moist, old-growth or second-growth forests dominated by Douglas-fir and western hemlock. In Montana and in the Northern Rockies in general, Chestnut-backed Chickadees are most abundant in forests affected by the Pacific-maritime climate of the Cascade Ranges. These forests include western hemlock, western red cedar, grand fir, and pacific yew (Hejl et al. 1995). They forage almost exclusively on live trees with a dbh of >50 cm (Lundquist and Manuwal 1990). Chestnut-backed Chickadees tend to nest in large, decaying, broken-top snags that are easily excavated. In the Cascade Ranges, Chickadees nest primarily in large Douglas-fir snags in the forest interior (Nelson 1989). They nest in stands of all ages, but nests found in young stands (55-80 years old) were in large, old-growth remnant snags (Lundquist and Mariani 1991, Nelson 1989). In northern Idaho, this species nests primarily in large Western Hemlock trees (x=58 cm dbh) (Hejl unpubl. data). They usually excavate their own nest cavity, but will also re-use older cavities. In Montana, Chestnut-backed Chickadees were found in western red cedar/western hemlock forest types, although the number of individuals was quite small (0.003/100 m radius) (Hutto 1995). There is no foraging/nesting information for Montana populations.

Management Issues. Since the Chestnut-backed Chickadee is a permanent resident throughout its range, maintaining for both suitable foraging and nesting habitat are of equal importance. Managing for even-aged stands reduces canopy heterogeneity, affecting canopy patchiness, the distribution of snags, and possibly prey availability; all important variables for this and other cavity-nesting birds (Carey et al. 1991, Manuwal 1991). Longer rotation regimes are necessary in order to create or retain large snags (Nelson 1989, Huff et al. 1991). Managing for snags using mean nest-tree diameters as snag-retention guidelines, as opposed to the minimum diameter, will help maintain populations of cavity-nesters (Huff et al. 1991).

Golden-crowned Kinglet

Priority Level: III MT Score: 18 AI: 4

Reason for Concern. The northern Rockies are an important region for this species, but it is poorly monitored by BBS. They have shown national declines. Regional data indicate a preference for mature, uncut and old growth forests (Hutto and Young 1999).

Distribution. The Golden-crowned Kinglet is found across northern U.S. and Canada to the Great Plains states. Its western distribution extends from New Mexico north into Alaska. Within the West, the Great Basin region and much of California outside of the Sierra Nevada Mountains do not usually have Kinglets present (Price et al. 1995). Montana Bird Distribution Committee (1996) indicated that Kinglets are found breeding from the mountains of central Montana west across the divide to the Idaho/Montana border.

Habitat Requirements. The Golden-crowned Kinglet is a bird of the coniferous forest. They are most abundant in cedar/grand fir and spruce/fir types, where most of their time is spent in the upper canopy. They also can be found in old growth Douglas-fir and mixed conifer (Hutto and Young 1999). Kinglets are characteristically an interior old growth forest species and are much less common in cut or partially cut forests. Gap analysis (Redmond et al. 1998) predicted 1.5 million ha of habitat present in the state.

Ecology. Golden-crowned Kinglet places nests high in conifer trees. Nests are usually within stands that exhibit high amounts of canopy closure. Preferred foraging tends to be in grand fir or western larch (Redmond et al. 1998). Habitat use is very similar to that of the Ruby-crowned Kinglet, however Golden-crowned Kinglet is more of a foraging specialist and adapted for hanging on tips of coniferous branches.

Management Recommendations. Any efforts to maintain and recruit mature stands of Cedar/Hemlock and moist grand fir habitats should maintain or improve habitat conditions for this species. No specific conservation actions are proposed for the species.

Varied Thrush

Priority Level: III MT Score: 20 AI: 4

Reason for concern. The Varied Thrush is a bird of dense, unlogged, older-aged, mesic conifer forests and is thus vulnerable to conversion of its habitat

Distribution. Breeds in moist coniferous forests of northwestern North America east to northern Idaho and northwestern Montana and south to the redwood/Sitka spruce forests of north coastal California. Also in boreal forest of western Canada and Alaska. Winters throughout most of its range and south to western Nevada and Baja California (George 1998 unpubl. data). Breeds in northwest Montana east and south to Glacier and Deer Lodge Cos. Winters throughout most of its range, and also reported in Phillips and Yellowstone Cos. (Montana Bird Distribution Committee 1996).

Habitat Requirements. In Montana, they are most abundant in forests affected by the Pacific maritime climate and dominated by western hemlock, western red cedar, grand fir, and Pacific yew (Hejl et al. 1995). They occur in all age stands, but are most abundant in mature and old-growth stands. The Varied Thrush has been positively correlated with dense berry-producing shrub and forb cover, indicative of moist habitats (Carey et al. 1991). Although Varied Thrushes use similar habitats during both breeding and winter, they use a broader range of habitats during the winter due to their heavy reliance on fruit. In Douglas-fir forests in the Coast Range of northwestern California, they were more common in recent clearcuts (1-7 years old) than old-growth forests during the winter due to an abundance of fruit crops (Hagar 1960).

Ecology. Varied Thrushes are primarily ground foraging insectivores in the forest floor litter, but also use a variety of fruits and berries in the shrub layer. Nests are usually place in understory vegetation of mature forests, generally in small conifers or deciduous trees, but occasionally in shrubs and vines. Usually placed within 2-4 m of the ground (George 1998 unpubl. data). Varied Thrushes apparently have a large territory size relative to other passerines of similar size. Distances between adjacent singing males and nesting pairs were observed 300 m apart (Dawson 1923).

Management Issues. They are less abundant in logged than unlogged forests. In western larch and Douglas-fir forests of northwestern Montana, there was a significant difference in Varied Thrush abundance between fragmented unlogged forests and more contiguous tracts (0.10 birds/count vs. 0.38 birds/count respectively) (Tobalske et al. 1991). In redwood forests of California, breeding Varied Thrushes occupied forest stands >16 ha, but rarely occupied tracts <16 ha (Hurt 1996). Brand and George (1998 unpubl. data) found that Thrushes tended to avoid forest edges during the breeding season. In a study in the Oregon Coast Range, Varied Thrush densities ranged from 4.82 ind./40 ha in young stands (40-72 yr. old), 15.12 ind./40 ha in mature stands (80-120 yr. old), and 14.75 ind./40 ha in old-growth stands (200-525 yr. old) (Carey et al. 1991). Managing for large, contiguous tracts of mature and old-growth stands of at least 16 ha would aid in maintaining suitable breeding and wintering habitat.

In Montana, the highest breeding densities occur in mature and old-growth forests. Logging and the creation of forest fragments could severely reduce densities by making the remaining habitat unsuitable. Even-aged forest management that simplifies forest structure would also be expected to significantly reduce densities of Varied Thrushes. BBS data from 1980-1994 indicate a significant decline throughout its range (George 1998 unpubl. data). This species is a rare host of the Brown-headed Cowbird perhaps due to its tendency to nest in the forest interior (George 1998 unpubl. data). More information is needed on the Varied Thrush's sensitivity to forest fragmentation and its possible dependency on mature and old-growth stands.

Habitat and Population Objectives: Cedar/Hemlock

- Retain all existing old-growth cedar and/or hemlock stands (meeting Green's definition).
- Double the existing acreage of this habitat (targeting stands currently in other cover types that were historically in cedar-hemlock) in each 4th-order drainage, especially in areas adjacent to existing old-growth stands.
- Manage mature cedar and/or hemlock stands for old-growth recruitment, towards the goal of 35% of habitat in old-growth condition.
- Overall goal is to expand size of existing stands as well as total acreage.
- Aggregate human-development and agriculture by land-use planning, to help achieve above goals in valley bottoms as well as upland areas.

Following disturbance:

- Allow shade intolerant trees to grow, especially paper birch, without weeding to favor climax species;
- Leave all downed wood, for wildlife (e.g . Winter Wren) use, and for regeneration of conifer seedlings, especially cedar and hemlock.

Burned Forest

Description, Status and Importance in Montana

Fire has historically been the most prevalent major disturbance factor in the Rocky Mountains (Gruell 1983). For mid- to high-elevation forest types within this region (i.e., Douglas-fir, spruce, and subalpine fir), the predominant fire regime was one of infrequent, intense, stand-replacement fires, rather than one of frequent, low-intensity, understory burns (Fischer and Bradley 1987, Barrett et al. 1991). In fact, the origin of most Rocky Mountain forest stands can be traced to stand-replacement fires (Arno 1980, Heinselman 1981). This implies that the variety in forest cover types across the northern Rocky Mountains is as much (or more) a product of the presence of a variety of successional stages following stand-replacement fires as it is a product of the presence of a multitude of climax community types.

Stand-replacement fires occurred in more mesic forests, which were less likely to dry out enough to burn even in the driest years. These forests were more likely to achieve older age classes and to accumulate large amounts of dead and live woody fuels, not burning until sufficient fuels and conditions produced a crown fire. The importance of stand-replacement fires in this forest system is beginning to make the maintenance of such fires a high priority in land management agencies, especially since policy during the past 50 years has encouraged widespread fire suppression and post-fire salvage logging. The high density of standing dead trees (snags) that remain after stand-replacement fires makes this a unique habitat for birds, one that has similarities across several forest cover types that warrants a separate discussion in this section.

Description. Stand-replacement fires kill most if not all of the trees in a forest, but leave most of the dead trees standing. They therefore create well-defined fragments of early successional-forest dominated by standing-dead trees. The immediate aftermath of the fire may look like a lifeless scene, but there are two factors that soon make this an area of high productivity for birds and all life. Of the most immediate importance for birds is the short-term abundance of foraging and nesting opportunities provided by the standing dead trees. Secondly, there is a rapid profusion of new growth from the forest floor as succession gets under way.

The cambium of most of the fire-killed trees remains intact after a fire, depending on the heat of the fire and the thickness of the bark (Agee 1993), which depends in part on tree species (Ryan and Reinhardt 1988). Although it is an ephemeral resource, this cambium is rapidly exploited by wood-boring beetles (Evans 1971), some of which are restricted to freshly dead wood (Fellin 1980). These beetles provide an abundant food source to timber-drilling woodpeckers for the first few years after a fire, and woodpeckers have long been known to concentrate in post-fire habitats to feed on these larvae (Blackford 1955, Koplin 1969). Many cavity nesters respond positively to post-fire habitats (Taylor and Barmore 1980, Harris 1982, Hutto 1995, Caton 1996). Although there is an obvious benefit of abundant snags for nesting, the tremendous increase in foraging opportunities is the likely reason why cavity-nesters reach such high densities in burned forests in both winter and summer (Caton 1996).

Some other bird species may do well in burned forests because of the numerous perches that provide vantage points for aerial capture of insects (e.g. Olive-sided Flycatcher, Mountain Bluebird). Ground and aerial foragers that are also cavity nesters (e.g. American Kestrel, Northern Flicker, Tree Swallow, Mountain Bluebird) are likely drawn to burned forest because of the unique combination of open foraging habitat and many more nest sites than are typically found in open areas (Caton 1996).

The regrowth of new vegetation may begin rapidly after a fire (Christensen et al. 1989). Stand-replacement fires open the forest floor to light and give the soil a variable pulse of nutrient-rich ash, depending on the severity of the fire and erosion (Woodmansee and Wallach 1981; Agee 1993, pp. 160-171). The nature of these early successional communities depends on survivors and seed sources (Stickney 1990). This surge in plant productivity will eventually result in higher invertebrate productivity, providing abundant food for ground and aerial foragers. As succession progresses, the ensuing shrub layer will provide foraging and nesting resources for a new array of early-successional bird species. As the snags fall over the years, the vegetation of the area may appear to converge on that following other disturbances such as clearcuts, but there may be legacies of fire that make even later successional stages unique. Fire affects tree species composition, favoring shade-intolerant species such as western larch, ponderosa pine, and lodgepole pine (Agee 1993). Fires may burn unevenly, leaving large surviving trees (and perhaps snags) to enrich the diversity of the young stand. We need more research on the lasting legacies of fire in nutrient retention, productivity, and vegetation components of forest stands throughout later succession.

Historical Status. The combination of dry summers, dry forests, and numerous lightning strikes in the northern Rockies resulted in a historical landscape dominated by fire. Twenty to thirty percent of the moist conifer forest habitat types was typically in an early-seral structural stage due to lethal crown or mixed fire events (Hann et al. 1996, p. 488). Barrett et al. (1997) estimated that historically, fires burned an average of almost six million acres per year in the Columbia River Basin between 1540 and 1940, primarily during drought periods that averaged about 12 years apart and may have seen up to 6 percent of the entire basin burn in a major fire year. Most of this acreage, however, was burned by low-intensity fires in ponderosa pine, sagebrush and grassland communities. Averages in forest types that were more likely to have stand-replacement fires were 360,000 acres per year in Douglas-fir and larch, and 150,000 acres per year in lodgepole pine (Barrett et al. 1997). Although much of this acreage was burned by "mixed-severity fires," in which local patterns ranged from non-lethal underburns to stand-replacement fires (Barrett et al. 1991, Arno et al. in prep), it is clear that a large amount of standing-dead timber was regularly produced on the landscape.

Current Status. Fire suppression became increasingly effective in the northern Rockies from the 1930's onward (Arno 1980, Barrett et al. 1991). In many areas that had heterogeneous landscapes, fire suppression has converted a mosaic of forest stands from a variety of age classes into a more homogeneous expanse of mid-successional mature forest (Hann et al. 1996). Aspen stands, old-growth ponderosa pine and larch, meadows, and patches of standing-dead timber are important wildlife habitats that have been reduced by fire suppression.

Timber harvesting has replaced fire as the major disturbance returning conifer forests to early successional stages. The current areal extent of early successional forests has been estimated to be at the low end of the historic range in moist forests (20% vs. 20-30% historically), and higher than historical (33% vs. 23-25%) in upper-elevation cold forests (Hann et al. 1996). There are great differences, however, in the landscape pattern and structural characteristics of these disturbances. Clearcuts do not retain the remnant trees or snag structure typical of post-fire forests, nor do they create an environment that could maintain the historical complex community composition and structure. Consequently, most of the early-seral forest stands within this type are very different in composition and structure relative to the native conditions (Hann et al. 1996). Partial-cut harvest practices are becoming more widely used, and may better mimic some mixed-severity fires, but still without the snag structure. They are also usually used in a very regular prescription, which still creates a simplified and homogeneous landscape, even if fine-scale patterns are more varied than with clearcuts.

Brown et al. (1994) estimated that stand-replacement fires burned 1.5 times the acreage in the Selway-Bitterroot acreage in presettlement times relative to the recent period, when some natural fires were allowed to burn in the wilderness. Non-wilderness areas with more aggressive fire suppression would show a greater difference.

Recent increases in burned acreage may be due to fuel buildups from fire suppression, or to a current drought cycle (Agee 1993), but probably both. Even if the recent increase in fire acreage were to result in stand-replacement post-fire habitats approaching historical levels, there is still a major concern from the strong pressure for salvage logging.

Salvage-logging. When fires do occur, there is a high likelihood that the trees will be quickly "salvaged," because of the perception that the forest has been destroyed and the dead wood will go to waste. Salvage-logging removes the very element that makes this habitat a uniquely productive resource for many bird species. Post-fire salvage logging may make some patches unsuitable by reducing nest sites and food resources (Raphael and White 1982, Caton 1996, Hitchcox 1996, Hejl unpublished data). Data on reproductive success of Mountain Bluebirds in unlogged and salvage-logged post-fire forests (Hitchcox 1996) suggest that both abundance and nest success may be lower in salvage-logged areas. Nesting success of Northern Flickers was also significantly lower in salvage-logged areas. House Wrens were three times less abundant in salvage-logged plots, but their nest success was no different (Hitchcox 1996).

Salvage logging may have a negative effect on species that are either relatively restricted to, or are most abundant in, early post-fire conditions because those bird species depend to a great extent on standing dead trees in burned forests for feeding and/or nesting purposes (Hutto 1995, Caton 1996, Hitchcox 1996, Saab and Dudley 1998). The presence of such narrowly distributed habitat specialists leaves little doubt that the clearcutting style associated with a large portion of post-fire salvage logging is in direct conflict with the needs of some of these bird species.

Post-fire Bird Communities. Stand-replacement fires create well-defined fragments of early successional forest dominated by standing dead trees. This is the earliest and most ephemeral habitat in post-fire succession. It is also a habitat that cannot be reproduced by timber-harvesting methods. These sites provide nesting opportunities for many primary and secondary cavity nesters, and timber drillers are attracted by the abundant beetle larvae. Such post-fire habitats are a naturally fragmented system, but decades of fire suppression have decreased the total area involved and increased the isolation of each burn (Baker 1994). Bird species restricted to such ephemeral, early post-fire patches would have to be adapted to a fragmented system (they must be good at quickly colonizing new patches), but increasing isolation may place a strain on their populations. In addition, post-fire salvage logging may diminish the suitability of some patches by reducing nest sites and food resources (Caton 1996, Hitchcox 1996, Saab and Dudley 1998).

Numerous bird species, including several of our priority species (Table 11) use burned forests for breeding purposes (Davis 1976, Taylor and Barmore 1980, Harris 1982, Saab and Dudley 1998). In a geographically extensive study involving 33 recently burned forests, Hutto (1995) detected 87 species, and found nests of nearly half of those species. Even more importantly, both a synthesis of published literature (Hutto 1995) and results from field surveys associated with a U.S. Forest Service regional landbird monitoring program (Hutto and Young 1999) revealed that 14 species are equally or more abundant in recently burned forests than in any other vegetation cover type in the northern Rocky Mountains, and some species are even relatively restricted to such conditions. Among the species that were most commonly found in burned forests were the Hairy Woodpecker, Mountain Bluebird, American Robin, and **Cassin's Finch** (Hutto 1995). Ideal conditions for woodpeckers occur only within a narrow window of time after a fire (the first 4-6 years). The Black-backed Woodpecker has been designated a "sensitive species" in several regions by the U.S. Forest Service for precisely that reason.

Table 11. Relationships of Montana PIF priority species to vegetative structural components, Burned Forest habitat type.

Species	Area Dep.	Canopy:		Old Growth	Understory:			Large Snags	Large Trees	Large Logs	Comments
		Open	Closed		Patchy	Open	Closed				
Lewis's Woodpecker		x					x				shrubs
Three-toed Woodpecker	x		x					x			dying or recently dead
Black-backed Woodpecker	x		x					x			dying or recently dead
Olive-sided Flycatcher		x			x						shrubs, edges
Townsend's Solitaire		x									bare ground

Black-backed Woodpecker

Priority Level: I MT Score: 22 AI: 4

Reason for Concern. Although the Black-backed Woodpecker is rare in most of its range (Short 1982), it can be locally common in burned, flooded or windthrow areas (Bock and Bock 1974, Short 1974). It is considered a sensitive, special concern or management indicator species by most Montana PIF agencies, because of its close ties to burned forests.

Distribution. Black-backed Woodpeckers occur from New England and eastern Canada, across Canada to southern Alaska and south in the Rocky Mountains to Wyoming. They are resident in the forested habitats of Montana from the Rocky Mountain Front westward.

Habitat Requirements. The Black-backed Woodpecker is found in association with subalpine fir/ Engelman spruce in higher elevations, and ponderosa pine, Douglas-fir and lodgepole pine forests at lower elevations (Jackman 1974, Short 1982). Bock and Bock (1974) describe the habitat as closed boreal and montane coniferous forests. They characterized as a species only of denser forests, containing a diverse mixture of conifer species, no one of which is essential (Bock and Bock 1974). A Montana/Wyoming study conducted by Hutto (1995) after the widespread fires of 1988, revealed that Black-backed Woodpeckers were essentially restricted to early-post fire habitats. In northern Idaho, 30 to 40 percent of sightings (n=18) were associated with burned areas (Taylor 1994), at a wide range of elevations(<3000 - >5000 ft). It may be more accurate to describe them as a fire-associated species. Like other members of the *Picoides* family, Black-backed Woodpeckers respond positively to fires and other large scale disturbances.

Ecology. Black-backed Woodpeckers are primary excavators creating nest and roost sites for themselves and other cavity-associated species in forested habitats. They may be more limited by foraging resources than nesting or roosting resources. Both Goggans et al. (1987) and Caton (1996) concluded that managing snags for nesting alone does not provide for the habitat needs for Black-backed Woodpeckers. Black-backed Woodpeckers feed mainly on bark beetles (Goggans et al. 1987, 1989) and wood-boring beetles (Beal 1911, Bent 1939, Bock and Bock 1974): Scolytidae, Cerambycidae and Buprestridae. Wood-boring beetles are described as an efficient , abundant food source in areas that have undergone disturbance or in patches in mature and old-growth forests (Goggans et al. 1987). Steeger and Machmer (1995) observed that foraging Black-backed Woodpeckers in the Nelson Forest Region of British Columbia appeared to specialize on mistletoe-killed western larch which had been attacked by flat-headed and round-headed wood-boring beetles.

Black-backed Woodpeckers generally forage on trees with bark that is flaky and can easily be removed by scaling or pecking (Jackman 1974, Marshall 1992). A recent study in a burned area on the Idaho-Montana border, however, found that Douglas-fir snags were the preferred foraging substrate (H. Powell, pers. commun. 1998). Kreisel (1998) also observed Black-backed Woodpeckers foraging on fire-killed Douglas-fir trees. Black-backed Woodpeckers forage primarily by scaling (72% of the time) and gleaning (Bull et al. 1986). They foraged in all forest types, on both live and recently (<2yr) dead trees averaging 34 cm dbh. Other studies have shown use of fallen logs (e.g. Villard 1994).

Black-backed Woodpeckers apparently have relatively large (>350 ha) home range sizes (Goggans et al. 1987).

Nest tree characteristics vary, but they nest in a variety of coniferous trees <50 cm dbh (McClelland 1977, Lester 1980, Raphael and White 1984, Bull et al. 1986, Bevis 1994) Bull et al. (1986) observed nest trees (60% snags) with a mean dbh of 37 cm. Goggans et al. (1987) observed that all nest trees in their area were lodgepole pine with heartrot. Saab and Dudley (1997), in contrast, observed nesting in the hardest snags available, often with intact tops. It may be possible that these trees contained undiscernible heartrot.

Management Issues/Recommendations. Their strong association with dying or dead trees infested with beetles may be a key to Black-backed Woodpecker management. It is the conservation of specific forest seral stages (mainly mature and old-growth), therefore, that may ultimately determine the baseline populations and viability of Black-backed Woodpeckers. Focusing only on burned areas as a management approach may jeopardize their long-term viability. Mature and old-growth forests containing patches of beetle infested trees may provide adequate habitat to support baseline populations of Black-backed

Woodpeckers when burned areas are not available (Goggans et al. 1988). In mature and old-growth lodgepole pine forests, bark-beetle outbreaks occur every 30-40 years, killing proportionately more large-diameter than small-diameter trees (Cole and Amman 1969, Amman 1977, Lester 1980). These trees are likely to be more valuable for Black-backed Woodpeckers. It is important to recognize though, that large-scale disturbances may be more important in maintaining their populations now, then in historical times, due to the reduction of all old-growth forests and the increase in "salvage" logging techniques which remove dying, and recently killed, trees throughout North America.

Recent studies of the effects of salvage logging in burned areas has shown that Black-backed Woodpeckers can be found in relatively high numbers in unlogged early post-fire habitats (Hutto 1995, Caton 1996, Hitchcox 1997, Saab and Dudley 1997, Kreisel 1998). Saab and Dudley (1997) observed that Black-backed Woodpeckers nests were typically found in unlogged units (n=13) with high tree densities. Hitchcox (1997) did not find any Black-backed Woodpeckers nests in salvage-logged burned areas in Montana, whereas 10 where found on the control unlogged sites. Hoffman (1997) states most of the economic loss that occurs with lodgepole is a result of the tree being dead vs. alive. She states that only gradual economic losses occur in the two-three years after a fire and these trees should be left as an important foraging resource to *Picoides* woodpeckers. This may be important for the long-term viability of this sensitive species. Harris (1982) observed that the decline of woodpeckers from a burn coincided with the emergence of wood-boring beetles three years post fire. Hoffman (1997) recommended for management to "ensure that fire, insect, or wind are allowed to regularly disturb habitat throughout space and time." Habitats should be protected for at least three years after disturbance occurs (E.C. Murphy and S.H. Lehnhausen, unpubl. data).

Olive-sided Flycatcher

Priority Level: I MT Score: 19 AI: 3

Reason for Concern. Based on BBS data, populations of Olive-sided Flycatchers appear to have suffered widespread declines (average of 3.9% per year) from 1966 to 1996 (Sauer et.al. 1997). The apparent decline has increased in the recent past (1980-1996), although the greatest change occurred in eastern North America, with western North America remaining about the same between early (1966-1979) (2.8% decline) and recent periods (2.9% decline) (Sauer et.al. 1997). Olive-sided Flycatcher populations appear to have declined approximately 3% in the northern Rocky Mountains physiographic region from 1966 to 1996, and approximately 5.8% within Montana over the same period (Sauer et al. 1997).

Initial speculation on the reasons for relatively consistent declines across the breeding range has focused on habitat alteration on the wintering grounds (Altman 1997), but it has not been clearly demonstrated that habitat changes in the breeding grounds have not contributed to these declines. A lack of data correlating declines in the breeding grounds with wintering populations and areas makes it difficult to determine whether declines are due to changes breeding or wintering habitat (Altman 1997), although declines in Olive-sided Flycatchers have occurred in the absence of changes in habitat on the breeding grounds (Marshall 1988). Speculation that the reason for the declines can be pinned on the wintering grounds is supported by the fact that Olive-sided Flycatchers have been identified as one of 45 nearactic migratory landbirds most likely to be adversely affected by destruction of tropical forests (Petit et.al. 1995), including one of the 12 most highly vulnerable species (Petit et.al. 1993). Finally, Diamond (1991) calculated that Olive-sided Flycatcher wintering habitat would decline approximately 39% between 1980 and 2000 due to tropical deforestation.

On the breeding grounds, conversion of forest to non-forest as a result of urbanization and residential development poses a threat to Olive-sided Flycatcher habitat, although this threat was greatest during settlement of the west and today occurs to a lesser degree (Altman 1997). It has been suggested that in eastern North America, Olive-sided Flycatcher habitat has likely been lost due to the closing of forest openings from fire suppression, urban sprawl into forest edges, loss of wetlands and their associated forest edge habitats, and reforestation of abandoned farms (Peterson and Fichtel 1992). Hutto (1995) has speculated that Olive-sided Flycatchers are an early post-fire dependant species that is lured into managed forest types which have similar structural conditions but may function as ecological sinks.

Distribution. Although Olive-sided Flycatchers have been detected from sea level to timberline, they usually occur in mid-to high elevation (920-2,130 m) throughout the mountains of western North America (Altman 1997). The species breeds throughout western Montana, with unconfirmed breeding in some of the central mountain ranges.

Habitat Requirements. Olive-sided Flycatchers generally breed in montane and boreal forests in the mountain west of North America, as well as throughout the boreal forests of Canada (Kaufman 1996). Olive-sided Flycatchers are most often associated with forest openings, forest edges near natural (i.e. meadows, wetlands, canyons, rivers) or man-made openings, or open/semi-open stands with a low percentage of canopy closure (Kaufman 1996, Altman 1997). Hutto and Young (1999) found Olive-sided Flycatchers were more abundant in early post-fire habitats than in any other major cover type, although they had similar occurrence in seed tree cover types, and were only slightly less common in clear-cut and shelterwood cover types, occurring more frequently in disturbed than in undisturbed forest in the northern Rocky Mountains. In Douglas-fir forests of west-central Idaho, Olive-sided Flycatchers were found to be more abundant in forest types created by logging methods such as diameter-cut and single tree selection that retain residual medium and large trees (moderate to high canopy height) and low canopy closure (Medin 1985, Medin and Booth 1989). In northwestern Montana, Tobalske et.al. (1991) found Olive-sided Flycatchers to be more abundant in logged (clear-cut and partial cut) than in unlogged forest.

Olive-sided Flycatchers have been classified as common in spruce and aspen forest types, uncommon in mixed conifer, ponderosa pine, pine-oak, and cedar-hemlock forest types, and rare in lodgepole pine and pinyon-juniper (Hejl et.al. 1995). In the northern Rockies, Hutto (1995) found that among undisturbed types, Olive-sided Flycatchers occurred most often in spruce-fir, marsh-wetland, and mixed conifer types, with some occurrence in riparian shrub, cedar hemlock, Douglas-fir, lodgepole pine, and ponderosa pine types. Although Olive-sided Flycatchers are more common in disturbed, early successional types, they appear to require residual large snags and/or live trees for foraging and singing perches (Altman 1997). Tall canopy height and low canopy closure have been found to influence Olive-sided Flycatcher occurrence(Sallabanks 1995), and they were significantly more abundant in watersheds with clearcuts than in untreated watersheds (Evans and Finch 1994).

Management Issues/Recommendations. Developing guidelines for the management and conservation of Olive-sided Flycatchers is hampered by the lack of knowledge about the species' habitat use relative to reproductive success. If Olive-sided Flycatchers are adapted to stand replacing fire regimes, than forest management approaches that approximate the structural conditions created by those fire regimes, both within a stand and at the landscape scale, should benefit Olive-sided Flycatchers. Olive-sided Flycatchers appear to benefit from the creation of edge and forest openings and therefore should be most common in managed forests of the northern Rocky Mountains.

Re-creation of a landscape condition (patch size and amount of edge) within the range of natural variation should benefit Olive-sided Flycatchers. This may involve the creation of more edge in areas where fire suppression has reduced the heterogeneity of the forest, reduced the amount of edge, and increased the average patch size; or it may involve finding ways to reduce "fragmentation" (i.e. increase average patch size, decrease the amount of edge) of forests in managed lands.

C Logging methods that retain medium to large trees with relatively open canopy closure, as well as treatments that create forest edge will benefit Olive-sided Flycatchers.

C Retention of forested edge habitat around riparian and wetland features will also benefit Olive-sided Flycatcher habitat.

C Reintroduction of fire into western Montana may also benefit Olive-sided Flycatchers by creating post-fire habitats that were historically more common.

C Retention of snags and large trees post harvest within regeneration methods such as clearcutting and seed tree harvests will benefit Olive-sided Flycatchers by retaining important foraging and singing perches.

C Partial harvests positioned where ecologically defensible and which retain trees of varying heights to provide nesting sites as well as trees near or above the canopy height of the surrounding forest to provide sallying space and height for foraging will benefit Olive-sided Flycatchers.

C Post harvest broadcast burning, especially when it fits with the desired silvicultural regime, will potentially create ecological conditions most similar to historical Olive-sided Flycatcher habitat.

Assumption. It is possible to determine, and then re-create, a landscape condition that more closely resembles the conditions prior to European influence.

Research/Monitoring Needs: Research needs to be conducted to determine the success of Olive-sided Flycatchers in managed forests in the breeding grounds. This information would hopefully help determine the relatively contribution of forest management to population declines. If Olive-sided Flycatchers are successfully breeding to an acceptable level in managed forest types (have comparable productivity in managed and unmanaged forest types of similar structure), then conservation concerns relating to forest management in Montana and elsewhere would be reduced. Concern would still exist, however, for the long term sustainability of Olive-sided Flycatcher populations due to impacts to habitat in wintering grounds.

- Research should be conducted into the difference between historic and existing landscape conditions with emphasis on the differences in habitat conditions that can be considered conducive to breeding Olive-sided Flycatchers..

Population Objective. The objective for Olive-sided Flycatchers should be to reduce and if possible, reverse the current population trend. If the declines are found to be due to habitat changes in the wintering grounds, then the potential to influence the trend through manipulation of habitat in the breeding grounds is reduced.

- Research is needed to assess the effectiveness of BBS and other large scale censusing methods in detecting changes in population levels.

- Count-based monitoring across habitats should provide adequate additional monitoring information for this species in the state.

Three-toed Woodpecker

Priority Level: II   MT Score: 18   AI: 3

Reason for Concern. Although not as much a fire obligate as the Black-backed Woodpecker, this species is also highly reliant on burned, insect-killed and decadent timber stands. It is poorly monitored in the state.

Distribution. The Three-toed Woodpecker is circumboreally distributed coincident with the range of spruce (Bock and Bock 1974). They range up to the northern limit of trees in North America, south into Oregon and Idaho in the western U.S. Within the Rocky Mountains, their range extends further south into New Mexico and Arizona (Short 1982). Three-toed Woodpeckers breed in montane areas of western Montana; in winter range they may be more restricted to northwestern Montana (Montana Bird Distribution Committee 1996).

Hogstad (1970) describes the Three-toed Woodpecker as not a complete resident. He wrote that “the general lack of information on the degree of residency outside the breeding season may be a result of their quiet behavior or else may indicate that the birds disperse over large areas.” Jackman (1974) described the Three-toed Woodpecker as nomadic, breaking up from family groups and shifting about in large numbers outside of the breeding season. Hogstad (1970) suggested that population build-ups of Three-toed Woodpeckers due to insect epidemics may result in their subsequent migrations outside of their typical home ranges (Yunick 1985).

Habitat Requirements. Three-toed Woodpeckers occur in dense coniferous forests, and are associated with subalpine fir and Engelmann spruce in higher elevations; they occur mainly in lodgepole pine forests or in mixed-conifer forests with a lodgepole component at lower elevations (Short 1982). They seem to prefer disturbed coniferous forests with trees that exhibit thin, flaky bark such as spruce and lodgepole pine. Like other members of *Picoides*, Three-toed Woodpeckers respond positively to landscape disturbances such as fire, wind, and droughts and floods that subsequently result in insect epidemics (Blackford 1955, Yeager

1955, Koplin 1969, Goggans et al. 1988, Hutto 1995, Hoffman 1997).

Goggans et al. (1988) observed that in central Oregon, Three-toed Woodpeckers preferred foraging in mature and "overmature" stands and avoided stands with seedling-, sapling- or pole-sized trees. Ninety-seven percent of their (493) observations were in unlogged forest stands, although 17% of these had some evidence of fire wood cutting; 3% were in thinned or partial cut stands. Multi-storied and cut areas were also avoided. Three-toed Woodpeckers foraged in mixed-conifer (55%), mixed-conifer dominated by lodgepole (20%) and lodgepole (14%) forest stands (Goggans et al. 1988).

Ecology. Three-toed Woodpeckers are primary excavators creating nest and roost sites for themselves and other cavity-associated species in forested habitats. In Colorado, Koplin (1969) observed that the abundance of Three-toed Woodpecker was correlated with the abundance of spruce bark beetles (*Dendroctomus obesus*). Densities increased from 1-2 birds per 40 hectares up to between 30 and 45 birds/ha during beetle epidemics.

Three-toed Woodpeckers are foraging opportunists and there is evidence to suggest that the abundance of the species may be driven more by foraging, rather than nesting, resources (Blackford 1955, Koplin 1969, Yunick 1985). They are highly specialized at scaling bark, gleaning and excavating to obtain insects and their larvae (Jackman 1974, Short 1982, Goggans et al. 1988). About 75% of their diet is comprised of wood-boring insect larvae (Bent 1939). They mainly scale and peck on trees, preferring scaly barked trees such as spruces, hemlocks, lodgepole pine and larch. Harris (1982) observed them foraging by pecking, scaling, and probing, in a burned forest of Montana. Goggans et al. (1988) describe the Three-toed Woodpecker as a relatively sedentary foraging bird; Hogstad (1970) observed single birds feeding on the same tree for 3-4 hours. Consequently, they select areas, trees, and parts of trees with relatively high concentrations of prey.

Three-toed Woodpeckers feed in smaller diameter trees more frequently than Black-backed Woodpeckers, perhaps a consequence of their evolutionary development in spruce dominated taiga forest and their tendency to forage in relatively low brush (Bock and Bock 1974). Goggans et al. (1988) documented use of lodgepole pine (63%) and Engelmann spruce (25%) for foraging. Dead trees were used on more than would expected based on their availability (88% of the time). Most snags (77%) used for foraging (mean, 39 cm dbh) were recently dead.

Three-toed Woodpeckers will use a variety of species for their nest trees (Jackman 1974, M. Machmer; pers. comm. 1998). In unburned forests of British Columbia this species first targeted areas with beetle infestations during the breeding season, and then subsequently selected nest sites within these areas (M. Machmer, pers. comm., 1998). Goggans et al. (1988) also observed that 80% of stands containing multiple nests in central Oregon (n=20) were infested with mountain pine beetles. All nest trees (n=20) were in lodgepole pine that displayed heartrot; seventy-five percent were in snags and 25% were in live trees. Stands selected for nesting had a mean stem dbh of 20 cm and about 17% of the ground was covered by logs.

In burned forests of Montana, Harris (1982) observed three nests of Three-toed Woodpeckers. Nest trees had a mean dbh of 21 cm although the majority of trees were smaller than this. McClelland (1980) located Three-toed Woodpecker nests in western hemlocks and lodgepole pines in unburned forests of western Montana.

Three-toed Woodpeckers generally (88% of the time) select cavities for their roost sites, typically in snags in more advanced stages of decay compared to those selected for nesting (Goggans et al. 1988). One roost was under bark. Lodgepole pine forest types were avoided and mountain hemlock forests were selected for roosting. Tree species used for roosting varied: lodgepole pine, fir species, mountain hemlock, and Engelmann spruce. Roost stands also were denser and had greater canopy closure than did nest stands.

Management Issues/Recommendations. This species is dependent on fire and/or insects to provide preferred nesting and feeding habitat. They are instrumental in controlling outbreaks of bark and wood beetles. Koplin (1969) documented a large increase in Three-toed Woodpeckers in Colorado forests that burned unevenly and then subsequently became infested with spruce bark beetles. Taylor and Barmore (1980) studied bird response to fires in the Yellowstone N.P. area. The most obvious change in species composition was the presence of Three-toed and Black-backed Woodpeckers the first three years after fire, and their absence or very low density thereafter. Both species were also present in adjacent unburned spruce-fir forest, although in low densities.

Goggans et al. (1988) report that mature and over-mature forested stands are important habitats for Three-toed Woodpeckers because the abundance of wood-boring insects increases with increasing tree size and age. They suggested that each pair of Three-toed Woodpeckers in central Oregon should have 214 hectares set aside for their home ranges. Hoffman (1997) also found evidence that Three-toed Woodpeckers are more likely to use mature/overmature forests for nesting habitat.

Three-toed Woodpeckers may be negatively affected by salvage logging. For example, Goggans et al. (1988) observed that nest success (n=12) in unlogged areas was 58%, whereas in logged areas, nest success (n=3) was only 33%. Hitchcox (1996) observed that although Three-toed Woodpeckers nested in unlogged burned areas in northwestern Montana in low numbers (n=9), they were absent from salvage-logged areas. Hoffman (1997) recommends that salvage logging operations in burned habitats be postponed until wood-boring beetle emerge to provide adequate foraging and nesting habitat for this woodpecker. This usually occurs three years post-disturbance (Harris 1982). Caton (1996) also observed that intense logging practices had adverse effects on Three-toed Woodpecker nesting abundance. No nests were located in clearcut units.

Townsend's Solitaire

Priority Level: III MT Score: 21 AI: 4

Reason for Concern. This species shows a positive population trend in p.a. 64, which supports nearly one-fourth of its population. Significant declines in Montana are unexplained, highlighting a need for demographic monitoring in managed and post-fire forests.

Distribution. The Townsend's Solitaire is found from New Mexico west to California and north into southern Alberta, and north again through British Columbia into Alaska (Price et al. 1995). In Montana, they can be found as breeders throughout the state with the exception of the northeast quarter (Montana Breeding Bird Distribution Committee 1996). Gap analysis (Redmond, 1998) identified 2 million ha of habitat within the state.

Habitat Requirements. Hutto and Young (1999) noted the broad habitat tolerance of this species, which occurs in both dry and moist, cut and uncut forests. Since the nest is often placed on cutbanks, bare ground, or stumps, burned forest is logically the preferred natural habitat type. Solitaires were also one of a 15 species to frequent habitat immediately post-burn (Hutto and Young 1999). But managed stands often produce similar structure and are heavily used.

Ecology. Townsend's Solitaire is a ground nester. Often, the nest is placed on a ledge associated with a vertical bank. They will also place ground nests near tree roots or other forms of shelter. Winter territories are formed usually at lower elevation within juniper or mixed conifer/juniper habitats. They may also use steep-walled canyons during the winter (Sullivan 1976).

Management Issues/Recommendations. This species should be well monitored by count-based monitoring. Demographic monitoring should be undertaken to assess breeding success in post-fire and various managed forest types.

Habitat and Population Objectives - Burned Forests

- Expand the opportunity for allowing lightning fires to burn or igniting fires when conditions permit.

- Provide a continual supply of burned areas – acreage targets over 5-year blocks.

- Goal: 1-2% of landscape in recently burned conditions at any point in time. At least 1% left untreated.

To achieve targets we should be creating more habitat, so it would be counter-productive to also be salvage-logging. However, because it is recognized that salvage logging will occur:

- Leave large (>100 ha) portions unlogged (and unthinned) in each burn (100? 200 acres?).

- Leave large snags throughout even the logged portions of burns.

- In decisions regarding where to burn or which burns should be left unsalvaged, preference should be given to mature or older stands of ponderosa pine, western larch, or Douglas-fir.

Research Needs. More research needs to be done on the effects of stand structure and stand isolation on the use of burned patches by various species. Mitigation and restoration efforts need to be based on a solid understanding of the extent to which local and landscape conditions determine the suitability of a given patch to potential occupants. Post-fire habitats are a naturally fragmented system, but decades of fire suppression have decreased the total area involved and increased the isolation of each burn. Should managers be concerned about the placement of a prescribed fire, or should they be concerned about vegetation structure within the patch itself, or both? After an era of fire suppression, land managers need to know (1) where to reintroduce fire, (2) which fires to let burn, (3) which fires to leave unsalvaged, and (4) how to conduct salvage logging operations in a manner that least affects the species most restricted to those burned stands being salvaged.

Moist Douglas-Fir/Grand Fir

Description, Status and Importance

Douglas-fir forests are difficult to classify and describe, because interior Douglas-fir (var. *glauca*) has the broadest ecological amplitude of any western tree (Arno 1991). It is moderately shade-tolerant, so it can be a climax species in some areas as well as being a common seral species in many habitat types. It was present on about 2/3 of forests stands in all forest types sample by Pfister et al. 1977). Like all trees, however, Douglas-fir and grand-fir have zones of abiotic conditions where they are most dominant. Douglas-fir is considered to be more drought resistant than Engelmann spruce, western hemlock and the true firs, and less drought resistant than ponderosa pine and lodgepole pine (Minore 1979). Therefore, Douglas-fir is dominant in the middle zone of the elevation-topographic moisture gradient, and grand-fir is dominant and somewhat wetter areas. Douglas-fir can be a climax species on quite dry sites; these forests were typically maintained by frequent non-lethal fires, and were dominated by ponderosa pine when warm enough for this species. These forests are covered in the section on Dry Forest.

This section covers the more mesic Douglas-fir habitat types, and some of the warm-moist subalpine fir habitat types on which Douglas-fir is a common seral species. On most of these areas Douglas-fir is commonly associated with western larch. Because western larch is an indicator of more mesic sites, and because it is a key tree species for cavity-nesting birds, this section will focus on larch-Douglas-fir cover types. Because grand fir prefers warmer and moister sites, it is most prevalent west of Montana, in northern Idaho and northeastern Oregon. It is a the potential climax species in some areas of northwestern Montana, from the Swan Valley to the north and then west, but much of this area is dominated by mixed conifer stands of seral Douglas-fir, larch, and lodgepole pine. As a cover type it is largely restricted to riparian conifer zones and to far northwestern Montana. For this reason this section will be primarily focussed on the Douglas-fir-Larch cover types.

Distribution and Status. Forests of Douglas-fir sufficiently mesic to include western larch only occur west of continental divide, where larch is widespread. Grand fir is a minor component in most National Forests of western Montana. Larch-Douglas-fir (as defined by > 10% larch and > 75% larch + Douglas-fir) cover types historically covered 17.3 % of all lands in western Montana (Losensky 1993), according to the Forest Survey inventories conducted in the 1930's. This survey indicated only a fraction of 1% in grand fir mixtures.

In another summary of forest surveys through 1980, Green et al. (1985) estimated that 4.9 million acres of forest were dominated by Douglas-fir in Montana, over half of which occurs west of the Continental Divide; 637,000 acres of forest were dominated by Western larch (some in cedar/hemlock and spruce/fir zones), and 211,000 acres of forest were dominated by grand fir. Thus, a total of over 3 million acres of forest land (almost 25% of total Montana forest lands) occur west of the Divide and are dominated by these species.

Stands are usually relatively dense and may contain a wide mixture of conifer species. Besides Douglas-fir and western larch (and grand fir in some areas), there is commonly lodgepole pine, ponderosa pine and variable minor amounts of spruce or subalpine fir (mixed-conifer).

The Montana Gap Land Cover Atlas (Redmond et al. 1998) has calculated the following coverages:

Mixed Mesic Forest, all west of Divide (may include cedar and hemlock):	1,227,309 ha
Douglas-fir (1,329, 994 ha, less than half west of the Divide), so approx:	600,000 ha
Larch, northwestern Montana only	90,437 ha
Grand Fir, northwestern Montana only	22,017 ha
Total	1,939,763 ha
	(4,850,000 acres)

Disturbance Regimes. Fire has historically been the most prevalent major disturbance factor in the Rocky Mountains (Gruell 1983). Douglas-fir-larch forests occur in a wide variety of moisture regimes, so fire regimes vary accordingly. Prior to 1900, warm-dry western larch sites were codominated by open park like stands of seral larch and ponderosa pine, maintained by frequent surface fires at intervals averaging about 10 to 30 years (Arno and Fischer 1995, Arno et al. 1997). On sites too cool for ponderosa pine, stands were codominated by larch, Douglas-fir, and/or lodgepole pine and experienced a mixed-severity fire regime. On the more mesic end of the Douglas-fir-larch zone (on the wetter grand fir and subalpine fir habitat types as well as cedar-hemlock) forests burned primarily as stand-replacement fires at mean intervals of 120-320 years (Arno and Fischer 1995). Because western larch is the most fire resistant tree in the inland Pacific Northwest, scattered individuals or groves often survived fires even within the stand replacement fire regimes (Arno and Fischer 1995), and these legacies can be very important for cavity-nesting birds throughout succession (see old-growth section below).

Mixed-severity fire regimes are marked by variability - frequent non-lethal fires and infrequent stand-replacement fires may occur in the same region depending on weather and fuel accumulations, or individual fires may be of "mixed severity", with many trees dying and many surviving (Brown 1995, Arno et al. in prep). Mixed-severity fire regimes were found across a broad range of forest types and covered sizable areas (Arno et al. in prep). This especially occurred in mid-elevation, mixed-conifer forests, where moisture regimes and topography were variable, and fire-resistant tree species (especially larch) occurred. Fires occurred at intervals averaging between 30 and 100 years (Arno 1980, Barrett et al. 1991, Brown et al. 1994, Arno and Fischer 1995, Arno et al. in prep.). Such fires typically leave a patchy erratic pattern on the landscape that fosters development of highly diverse communities (Barrett et al. 1991, Arno et al. in prep), at both a fine-grained (within forest stands) and broader scale. As a result of the relatively frequent and highly variable fire treatments, stands often formed complex and intricate mosaic on the landscape (Arno et al. in prep).

Management Issues: The combination of logging and fire-suppression has produced a more homogeneous landscape dominated by mid-seral forests, as opposed to historical conditions where more young and old-growth forest existed. Losensky (1993) estimated that historical age distributions in larch-Douglas-fir forests contained 25% of area under 60 years, and 31% over 170 years. Similarly, the Columbia River Basin assessment (Hann et al. 1996, pp. 488-91) estimated that historically:

early-seral forest varied between 20 -30 % of Moist Forest
mid-seral forest varied between 40 -50 % of Moist Forest
late-seral forest varied between 20 -30 % of Moist Forest

Currently, about 20% of forest is early-seral (Hann et al. 1996), which is at the low end of the historical range, but most of these early successional stands were produced by even-aged timber harvest, which did not retain the snags and other features of a natural, young forest. 70% of forest is mid-seral, with much higher tree densities and higher fuel loadings than were typical present in the native system. 11% of forest is late-seral, with most of difference from historical due to shade-intolerant types (old growth ponderosa pine and larch maintained by non-lethal underburns).

Old-growth Forests. Old-growth forest in the northern Rockies are of two general types: 1) late-seral stands that have escaped major disturbance for long periods, and 2) open stands of shade-intolerant and fire-resistant species (ponderosa pine and western larch) that are maintained by frequent understory fires. Because the moist Douglas-fir zone typically has a mixed to high intensity fire regime, both types are relatively restricted on the landscape in this zone. Late-seral forests are more common in the more mesic cedar-hemlock zone (see that section), where fires are very infrequent. Fire-maintained old-growth is more common in the dry forest zone (see that section), where extensive stands of open ponderosa pine once occurred. Nevertheless, some Douglas-fir and mixed-conifer forests escape fire for long enough to achieve old-growth characteristics, and some larch forests in this zone were maintained by frequent underburning. Both types of old-growth forest have in common the large trees and snags that are important to many bird species.

Old-growth Douglas-fir and Mixed Conifer. Most of the moist Douglas-fir and grand fir forests in western Montana are characterized by a mixed-severity or stand-replacement fire regime, with mean fire intervals ranging from 70 - 250 years (Arno 1980, Arno in prep). Therefore, all stands are subject to eventual disturbance that returns them to early-successional stages. Under this scenario, the development of old-growth stands is a matter of chance for a stand to escape fire for a sufficient length of time. For example, Lesica (1996) used a mean fire interval of 186 years (from Barrett et al. [1991]) and a negative exponential model to calculate the proportion of stands in each age class, and estimated that under such a fire regime about 34% of the forest would be > 200 years old (the range for 100-250 year fire intervals would be about 15-45%).

Not all stands are equally likely to be burned, however. Topography and species composition affects the spatial pattern of burning (Turner and Romme 1994, Camp et al. 1996). Topography affects moisture retention, ignition sources, and fire spread. Some areas will be more likely to escape fire for long enough to become old growth. Camp et al. (1996) found the highest probability for the occurrence of late-successional forest refugia in central Washington to be north-facing aspects above 4000 ft, especially at the confluence of two perennial streams, within a valley bottom, on a flat bench, or within a drainage headwall.

Old-growth stands may be small, relatively isolated, and surrounded by other stands of varying age-classes.

They may be highly heterogeneous and uneven-aged if resulting from mixed-severity fires that kill some trees and leave a mosaic of surviving old-growth remnants (Arno et al. In prep).

Brown Creeper, Winter Wren, Varied Thrush, probably Golden-crowned Kinglet and Pileated Woodpecker are associated with old-growth forest to varying degrees. Even common species such as red-breasted nuthatch are probably more common there.

Old-growth Larch. Warmer and drier, low-elevation sites in western Montana experienced frequent fires prior to European settlement (Arno 1980). The most extensive stands were dominated by ponderosa pine, but western larch was also important on cooler and moister sites. Western larch is the most fire-resistant tree species in the northern Rocky Mountains (Fischer and Bradley 1987). Although strictly a seral species, it is very long-lived, reaching several centuries in some areas of western Montana (Fischer and Bradley 1987). These characteristics make fire-maintained larch old growth a distinct possibility wherever fire occurs frequently enough to remove shade-tolerant successional species. However, western larch sites usually are more moist and productive than many of the ponderosa sites without larch, so most of these standshave a mixed severity fire regime (Arno et al. 1997). Old growth larch stands on sites too cold or moist for ponderosa pine generally had a history of either (1) mixed-severity fires at intervals of 30 to 75 years, or (2) stand-replacement burning at mean intervals of 120 to 350 years (Arno and Fischer 1995, Arno et al. 1997). In stands that escape fire for long periods, the impressive height and age span of this species make it an important component of older-aged stands.

Losensky (1995) estimated that about 31% of the Douglas-fir-larch stands in western Montana were potential old-growth (> 170 years) in 1900, but the nature of stands that included old-growth larch varied greatly. Open-grown stands of almost pure mature or old-growth larch were common in the larger valley bottoms (Losensky 1993), but old-growth stands in other areas may have been mixed-conifer sites that escaped fire. Western larch comprised the majority of trees on 2.7 million acres of commercial forest land in 1970 (Schmidt et al. 1976). About 60 % of this area was uncut, most of it in western Montana, and most of it is overmature (McClelland 1977). This is valuable timber targeted for heavy cutting. Timber harvest and subsequent regeneration are steadily converting the type to younger age classes (Schmidt et al. 1976). Harvesting in combination with fire suppression, which will eventually lead to the conversion of forests to shade-tolerant species and/or result in more intense fires that may burn even fire-resistant larch, old-growth larch will continue to be reduced on the landscape.

Western larch is an important tree for cavity nesting birds. The heartwood decays before the sapwood (unlike in Douglas-fir), so that cavities may be excavated and yet retain coherence (McClelland 1977). It is one of the few such tress that typically achieves sizes useful to the largest cavity nesters, especially the Pileated Woodpecker. This species may use ponderosa pine (Bull 1987), grand fir or large deciduous trees where available, but over a large area of moist mixed-conifer forest, old-growth larch components may be the only trees usable by cavity nesters, especially in areas of mixed-severity fire regimes where larch may be the only survivors in an uneven-aged stand (McClelland 1977).

Fire Suppression. Fire suppression became increasingly effective in the northern Rockies from the 1930's onward (Arno 1980, Barrett et al. 1991),altering stand structures and landscape patterns at lower and middle elevations throughout the northern Rockies (Tande 1979, Arno 1980, Barrett et al. 1991). It has generally led to a more homogeneous landscape in the moist Douglas-fir zone. There has been a reduction of early successional acreages, affecting both stand structure and species composition, resulting in a loss of seral tree species. Western larch, a highly shade intolerant species that is widely used by cavity-nesting birds, has diminished on the landscape, as seral stands are replaced and remnant old trees are killed by abnormally intense fires. Hann et al. (1996) estimated that the western larch cover type has decreased by 36% throughout the Interior Columbia Basin.

Fire suppression has converted a mosaic of forest stands from all age classes into a more homogeneous expanse of mid-successional mature forest (Hann et al. 1996). Because succession changes forest structure most rapidly in the early decades, it has only taken a few decades for fire suppression to allow large expanses of continuous forest to form across the landscape as most stands reach a closed-canopy stage (Tande 1979). A mosaic of age classes may still exist, but the continuous forest canopy makes a homogeneous landscape for most generalist forest bird species.

Fire suppression has altered mixed-severity fire regimes (open old-growth pine and larch) and is producing a shift toward stand replacement fire regimes (Hann et al. 1996; Arno et al. in prep). Hann et al. (1996) estimated that 19 percent of the Upper Columbia River Basin has changed to a lethal fire regime from mixed or non-lethal. This trend reduces natural biodiversity, replacing complex uneven aged stands containing fire-resistant trees with even-aged post-fire stands that cover large areas of the landscape (Arno et al. in prep). The intricate, fine-grained landscape mosaic of diverse stand structure and compositions will be replaced by a coarser pattern of even-aged stands (Arno et al. in prep). Although so far the main documented change has been from nonlethal to mixed-severity fire regimes (Morgan et al. 1998), the continued buildup of fuels and homogeneity of the landscape allows for the easier spread of fires, such that fires that do inevitably occur will be larger and more homogeneous, so that the homogeneity will be self-perpetuating (Arno 1980, Barrett et al. 1991, Arno et al. in prep).

Partial cutting. The effects of timber harvesting on landbird species is a major concern in the northern Rockies, as elsewhere, and yet surprisingly little study of such effects has been conducted (Hejl et al. 1995). Most of the information that is available pertains to harvesting practices of the past (even-aged systems such as clearcuts and seed-tree cuts). Moreover, under so-called "new forestry" practices (Gillis 1990, Swanson and Franklin 1992), increasing acreages of forest are coming under partial-cut (uneven-aged) silviculture systems. There have been too few studies to provide a satisfactory synthesis of any partial timber harvesting method. Hejl et al. (1995) found 13 studies in the Rocky Mountains, most with very few replicates, which included group selection, overstory removal, and shelterwood cuts. Species they found with the most consistent negative associations with partial cutting were **Brown Creeper**, Hermit Thrush, Mountain Chickadee, Red-breasted Nuthatch, **Golden-crowned Kinglet**, Pygmy Nuthatch, and **Varied Thrush**. Species most often associated positively with partial cuts were House Wren, **Olive-sided Flycatcher**, **Chipping Sparrow**, **Cassin's Finch**, and Mountain Bluebird.

Bird species that were significantly more abundant in mature, uncut than in partial-cut stands in all three years of the Northern Region Landbird Monitoring Program (Hutto and Young in press) as well as in a focussed study (Young and Hutto in review) were **Golden-crowned Kinglet** and **Winter Wren**. The **Townsend's Warbler** and **Varied Thrush** were also negatively affected by partial cutting. Species more abundant in partial-cut sites in all three years of the region-wide data as well as the present study were Dark-eyed Junco, **Chipping Sparrow**, and nearly the **Townsend's Solitaire**. Mountain Chickadee, Orange-crowned Warbler, Western Tanager, **Warbling Vireo**, and Dusky Flycatcher also showed positive relationships with cutting.

Table 12. Relationships of Montana PIF priority species to vegetative structural components, Moist Douglas-Fir/Grand Fir habitat type.

Species	Area Dep.	Canopy:		Old Growth	Understory:			Large Snags	Large Trees	Large Logs	Comments
		Open	Closed		Patchy	Open Closed					
Sharp-shinned Hawk			x								dense pole timber
Northern Goshawk	x		x	x					x		
Williamson's Sapsucker									x	x	aspen, heart rot
Pileated Woodpecker	x			x				x	x	x	
Olive-sided Flycatcher		x									
Cassin's Vireo					x						patchy shrubs
Townsend's Warbler	x		x								

Bird species that are more abundant in partial-cut stands ("open canopy" species) are often more abundant (overall) than most of the "closed canopy" species. This suggests that it is the latter species we should be most concerned about, especially since it is mature forest that is more likely to be converted to partial cuts in the future, rather than vice versa. Furthermore, we still do not know if the species that seem to prefer the open forests are doing as well in these newly created habitats, as their abundance suggests, or if these artificial habitats represent an ecological trap, providing the birds with cues for settling in the habitat without providing all of their needs.

Partial-cut timber harvesting does not change forest structure as much as clearcutting. Virtually all conifer forest bird species occur in both uncut and partial-cut stands, although we know little about their relative success in these forests. However, some significant changes in abundance do occur, and this may strongly affect regional bird populations when summed across a new landscape of increasing partial-cut forestry (Thompson et al. 1995). The reduction of closed-canopy forests and associated species is not the only concern, however. Uneven-aged "new forestry" practices were developed in the Pacific Northwest, where they were intended to mimic the historically prevalent old-growth forests of that region (Swanson and Franklin 1992). Forests in the northern Rockies are more susceptible to stand-replacement fires, and historically many types of forests cycled between even-aged, mature stands and early successional conditions (Fischer and Bradley 1987). Such post-fire habitats are very important to many bird species (Hutto 1995; see separate section of this plan). Although clearcuts are not as useful to cavity-nesting birds and snag foragers because of the lack of standing-dead timber, clearcuts are heavily used by shrub-nesting species such as Dusky Flycatcher, **Warbling Vireo**, and **MacGillivray's Warbler**. These species are much less common in partial cut forests (Hutto and Young, in press). Widespread replacement of clearcuts by partial-cut harvesting regimes will further reduce the amount of habitat for these species beyond that already reduced by fire suppression. Mixed-severity fire regimes did produce highly uneven-aged stands, however, so use of partial cuts and other uneven aged management is appropriate in such areas. The key is to provide a diversity of stand structures (Brown 1995).

Northern Goshawk

Priority Level: II MT Score: 18 AI: 3

Reason for Concern. The Northern Goshawk has long been considered an "indicator species" for old growth coniferous forests. Some biologists no longer believe this, due to the goshawk's use of forests other than old growth during the nesting season and changes in the definition of old growth in the region (Maj 1996). No downward trend in population or habitat availability was found during evaluations conducted to determine sensitive species status, 1988-1991 and currently. But low elevation late successional mixed forests and cedar/hemlock forests used by goshawks for nesting have declined from historical levels.

Habitat Requirements. Northern goshawks in western Montana and northern Idaho have been found to nest in mature to old growth conifer forest with high canopy closure on moderately sloping north aspects at or near the bottom of the slope (Hayward and Escano 1989). Nest sites have been found to occupy the older stands within a landscape while nests were generally found within 0.5 km of water and large forest openings (Hayward and Escano 1989). Active nest sites in the USFS Northern region have been located in mixed conifer, Douglas-fir, lodgepole pine, Engelmann spruce/subalpine fir, ponderosa pine, western larch, grand fir, cedar/hemlock, and to a lesser extent aspen cover types (Maj 1996). Douglas-fir and western larch seem to be the preferred species for nesting in the northern Rockies (Hayward et.al. 1990). Lodgepole pine may be used for nesting when in pure stands (Hayward 1983 in Hayward et.al. 1990). A survey of 316 nests in northern Idaho, Montana, western North Dakota, and northwestern South Dakota indicated that 60% of nest sites were in the Douglas-fir forest type, followed in order of prevalence by lodgepole pine (16%), ponderosa pine (14%), hemlock/spruce (4%), and small percentages of hardwood and mixed conifer types (USFWS 1998).

Marked differences in nest sites appeared between those in moister pacific NW forests (Bailey 1976) and those in the drier Rocky Mountain forests (Hayward and Escano 1989). In the latter, nest sites occupied relatively small diameter, predominantly even-aged stands with little shrub development in contrast to more uneven-aged, multi-storied stands in the Columbian Highlands of the northwest. Nest sites in the Rocky Mountains had significantly higher stem densities of 17.8 to 30.4 cm trees (Hayward and Escano 1989). Several potential biases may occur in goshawk habitat studies. In some studies, nests were located during preparation of timber sales which typically occur in older forest stands. Hayward and Escano (1989) urge caution in interpreting their results due to this bias. Other studies have relied on nests located by observers that only searched areas that met their preconceived notion of "suitable" habitat, which typically was biased toward older forest types. Therefore, the knowledge of goshawk nesting habitat characteristics may be biased toward older forest types (Squires in prep in USFWS 1998). However, recent work in northeastern Oregon found little difference in the canopy closure and the density of large trees between nests found systematically and those found opportunistically (Daw et al. 1998). Canopy closure has been found to be one of the most uniform habitat characteristics at goshawk nest sites in western Montana and northern Idaho (Hayward and Escano 1989). Nest sites in this study averaged 80% (+/- 2.71%) canopy closure (Hayward and Escano 1989). Nest characteristics in western Montana and northern Idaho were found to have an average nest tree height of 26m, a nest height of 12.5m, and a nest tree diameter of 50cm (dbh) (Hayward and Escano 1989). In the Rocky Mountains, wintering goshawks use cottonwood riparian areas (Squires and Ruggiero 1995) aspen, spruce/fir, lodgepole pine, ponderosa pine, and open habitats (Squires and Reynolds 1997).

Ecology. Goshawks hunt in a diverse array of cover types from open steppe to dense forests (USFWS 1998). Although conducted in northern Arizona, recent research has indicated that goshawks do not select foraging sites based on prey abundance, rather they select foraging sites that had higher canopy closure, greater total tree density, and greater density of large trees (Beier and Drennan 1997). These results support the hypothesis that goshawks are adapted to hunting in moderately dense, mature forests and that prey availability is more important than prey density in habitat selection (Beier and Drennan 1997). Forest stands can generally be considered suitable foraging habitat if a stand is open enough to allow a goshawk unimpeded flight through the understory (Maj 1996).

Research/Monitoring Needs: More information is needed to determine landscape metrics that are important to goshawk nesting success. This includes measures of fragmentation, changes in forest cover types from historical conditions, and responses of nesting goshawks to various landscape features and cover types within a nesting territory.

Management Issues/Recommendations. The primary management issue relates to forest management activities that remove or reduce the quality of potential goshawk nesting habitat. Little is known about the amount, distribution, or configuration of habitat needed to insure a sustainable goshawk population. Management of goshawk habitat should focus on retaining and creating mature and older coniferous stands with high canopy closure distributed across the landscape. Retention of these types of stands in low elevation, and located on the lower third or bottom of slight to moderately sloping terrain with a northerly aspect, preferably near a water source, should retain goshawk nesting opportunities. Timber harvesting that reduces canopy closure in mature and old forest types will have a negative affect on the potential of that stand to be used by goshawks for nesting. Some loss of goshawk nesting habitat is occurring on west-side forests due to increasing understory cover (Maj 1996). Management prescriptions that remove understory but retain adequate overstory levels should reduce this concern.

Population Objective. Regional Forest Service biologists no longer believe that the goshawk warrants sensitive species status in Region One; it appears that goshawk populations in Region one are stable or increasing in most Forests (Maj 1996). These assessments are not based on large scale surveys or quantifiable monitoring efforts, however.

Assumptions:

C Habitat definitions based on opportunistic or subjective habitat definitions accurately represents goshawk habitat needs.

Research/monitoring needs:

C Systematic surveys for nesting goshawks are needed to investigate whether current habitat definitions are accurately representing goshawk nesting habitat needs within Montana. In addition, more information is needed on the landscape conditions conducive to successful goshawk reproduction.
C More information is needed to determine the amount and types of forest structural stages needed to insure successful reproduction of goshawks in Montana.
C More information is needed to determine landscape variables that are important to goshawk nesting success, including measures of fragmentation, changes in forest cover types from historical conditions, and responses of nesting goshawks to various landscape features and cover types within a nesting

territory.

Williamson's Sapsucker

Priority Level: II MT Score: 21 AI: 3

Reason for Concern. Nearly half of the global population of Williamson's Sapsucker inhabits the northern Rockies (p.a. 64). They are poorly sampled by BBS, so population trends are unknown. Regional point count data indicate heavy use of harvested forest stands, but it is unknown if such habitats provide adequate recruitment over the long term.

Distribution. The Williamson's sapsucker inhabits mainly mature and old-growth mixed conifer and ponderosa pine forests, as well as aspen stands during the breeding season (Crockett and Hadow 1975, McClelland et al. 1979, Smith 1982, Madsen 1985, Bock and Larson 1986, Bull et al. 1986, Conway and Martin 1993, Bevis 1994). In Montana, their range is restricted to the main chain of the Rocky Mountains (Montana Bird Distribution Committee 1996; as cited by Tobalske). During the nonbreeding season they migrate latitudinally from Montana to southwest U.S. and into Mexico. There is little overlap between summer and winter ranges (Crockett 1975).

Ecology. Williamson's sapsuckers are primary excavators creating nest and roost sites for themselves and other cavity-dependent species in forested habitats. They forage by pecking, gleaning, and feeding at sap wells during the breeding season (Crockett and Hadow 1975, Jackman 1975, Bull et al. 1986). In Colorado, upon first arriving on the breeding grounds, Williamson's Sapsuckers fed primarily on the sap and phloem of live conifers (Stallcup 1968, Crockett 1975). Crockett (1975) observed each pair establishing four to five sap trees during the breeding season, noting that sap trees were significantly smaller in height and diameter compared to what was available. Ants, mainly carpenter ants, represent the majority of their prey items (Beal 1911), especially after the young hatch (Crockett 1975; as cited in Sousa 1983). Whereas paired males fed almost exclusively on ants once the young were hatched, bachelor males continued to feed on sap and phloem suggesting the shift from sap to ants was related to the needs of the nestlings (Crockett 1975; as cited in Sousa 1983). Carpenter ants (*Camponotus* spp.) are more likely to be found in large, rather than small, snags (Cline et al. 1980). Furthermore, Sanders (1980; as cited in Miller and Miller) observed that carpenter ants were especially abundant in trees that had contracted heartrot.

Stallcup (1968) observed them foraging primarily for ants on the trunks of live ponderosa pine trees; in late summer, however, Stallcup (1968) found Williamson's Sapsuckers foraging on phloem by removing a thin layer of bark. In the Blue Mountains of Oregon, Bull et al. (1986) observed that Williamson's sapsuckers preferred to feed on live (93%) Douglas-fir and western larch that were about 21 cm in diameter and 10 m in height. They foraged by sapsucking 75% of the time and pecked or gleaned the remainder of the time.

Nesting and Roosting Habitat Requirements. Williamson's Sapsuckers seem to be severely restricted to large diameter trees and snags for their nesting (and roosting?) requirements, except when nesting in aspen. Bevis (1994) reported the mean dbh of nest trees as 92 cm (n=4); three were in live western larch and one was in a Douglas-fir snag. Three were alive and one was dead. In Oregon, Bull et al. (1986) observed

Williamson's sapsuckers nesting primarily in grand fir forest types, in large snags (mean dbh = 70 cm). They nested in both dead (51%) and live trees (49%): mostly in western larch (62%). They are considered a poor excavator and the trees selected for nests had advanced heartrot (64% had broken tops) with most of the snags having died in the past three years. In central Washington, Madsen (1985) found 20 Williamson's sapsuckers nests. They were also were located in both dead (n=7) and live trees (n=13). The majority (n=10) of the live nest trees were visually defective; all of these were in western larch trees. Six nests were located in dead ponderosa pine snags. The mean dbh was also 70 cm and the mean nest height was 28 m.

Williamson's sapsuckers preferred stands with less than 75% canopy closure. Basal area (34 m^2/ha) was the best discriminator between used and unused habitat (Bull et al. 1986). Their nest sites were located in stands with two or three canopy layers and >10 snags/ha. Both McClelland (1977) and Madsen (1985) observed similar basal area values surrounding nest trees (34 m^2/ha and 29 m^2/ha, respectively).

In studies conducted in Colorado and Wyoming, Crockett and Hadow (1975) observed no significant difference between nest-site selection for the Williamson's (n=57) and Red-naped (n=46). Both selected aspen infected with the fungus *Fomes* (heartrot); nest trees averaged about 23 cm dbh. They excavated low to the ground which is indicative of the pattern of heartrot decay in aspen which typically starts low and moves up the bole. Crockett and Hadow (1975) observed that although Williamson's sapsucker nests were generally excavated in aspen, they were always situated near open stands of ponderosa pines trees where they foraged by gleaning and sapsucking. The only area where Williamson's sapsuckers nested in pines were in areas where there was no aspen.

In Arizona, Conway and Martin (1993) studied habitat suitability for Williamson's sapsuckers at 99 4-ha sites (33 nest sites, 66 non-use sites) in mixed-conifer forests in a one-year study. They found a high rate of nest success (93.2% nest success) for Williamson's sapsuckers, and observed that Williamson's sapsuckers preferred tall ($P < 0.05$) aspen snags ($P < 0.001$) near the bottom ($P = 0.012$) of snow-melt drainages. Canopies were dominated by aspen (0-20%) for their nesting habitat. They also selected areas that had both higher live and dead aspen trees than what was locally available. This study suggests that topography may be important in determining habitat suitability because drainages were preferred over ridgetops for nest sites. Conway and Martin (1993) suggest that "future habitat models for Williamson's sapsucker should continue to stress snag density, but should consider aspen snag density separately from density of other snags, incorporate height and diameter of aspen snags, and use a more liberal definition of aspens contributing to overstory canopy cover."

Management Issues. Williamson's sapsuckers use both live and dead trees for nesting and foraging. Current habitat models (Thomas et al. 1979) recommending 3.7 snags and partially dead trees > 30cm dbh perhaps do not take into account their need for large trees with heartrot. For example, studies in coniferous forests conducted within the Columbia River Basin Region show that Williamson's Sapsuckers are extremely restricted to large diameter trees for their nesting needs compared to what is locally available in the absence of aspen trees. Bull et al. (1986) observed that these birds primarily selected grand fir habitat types in the Blue Mountains. Forest conditions surrounding their nest trees were similar to those of Pileated Woodpeckers in the same area.

Pileated Woodpecker

Priority Level: II MT Score: 16 AI: 3

Reason for Concern. The Pileated Woodpecker is an old-growth associate requiring large areas for territories, so it is especially vulnerable to both local and landscape-scale alterations.

Distribution. These woodpeckers are widely distributed in forests of the eastern U.S., but are confined in the west to Washington, Oregon, northern California, and the northern Rocky Mountains. Their absence in the central and southern Rocky Mountains is due to a lack of dense, highly productive forests with rapid maturation and decay (Bock and Lepthien 1975, Schroeder 1981). In Montana, the species is restricted to forested areas west of the Continental Divide (Montana Bird Distribution Committee 1996, Bull and Jackson 1995), eastward to the edge of large trees on the east slope of the Rockies (McClelland 1977). In three years of data from the Northern Region Landbird Monitoring Program, the species was detected at only 19 points east of the Divide (J. Young, pers. comm.) Nonmigratory, but may move to lower elevations in winter.

Habitat Requirements. The Pileated woodpecker inhabits both coniferous and deciduous forests, but is restricted to areas containing mature, dense, productive stands (Bock and Lepthien 1975). It is a strong old-growth associate in Oregon Coast Range (Carey et al. 1991), where all 33 foraging observations were in trees greater than 40 cm dbh. Weak old-growth associate in Oregon Cascades (Huff and Raley 1991), but in the Washington Cascades (Manuwal 1991), abundance was similar in young, mature and old growth, although it should be noted that all stands were naturally regenerated and even young stands had large residual snags. In western Washington, most radio-telemetry locations were in old growth (Aubry and Raley 1993).

Among nine areas studied by Bull and Holthausen (1993), the density of snags > 50 cm was the best predictor of density of this species (1-7 pairs). Pileated Woodpecker abundance increased as the amount of forests with no logging, >60% canopy closure, and old growth increased. Within home ranges, all birds used stands with old growth, grand fir, no logging, and >60% canopy closure more than expected based on availability. In western Oregon (Mellen et al. 1992), -radio-collared individuals used all age classes of conifer forests as well as deciduous riparian vegetation, with forests < 40 years used significantly less often. All nests (n=18) were in conifer forest > 70 years old.

Ecology. Very large woodpecker with large home range. Bull and Holthausen (1993) found home ranges to be 321-630 ha (mean= 407 ha, 364 forested) for 7 pairs, and 200-1461 ha (mean = 597 ha, 540 forested) for 9 unmated birds. Mellen et al. (1992) measured 267-1056 ha (mean = 478; with 55-405 ha of forest > 70 yrs) in western Oregon. Forages on or near ground, on fallen logs or low on snags, consuming primarily carpenter ants and beetle larvae. Bull and Holthausen (1993) recorded 38% of foraging observations on logs, 38% on snags, 18% on live trees, and 6% on stumps. This primary cavity nester, excavates nest and roost holes in large snags that are later used by many other species. The Pileated Woodpecker requires large snags for nesting and downed logs for foraging. All but one of 105 nest trees in northeastern Oregon were in dead trees (Bull 1987). Average dbh was 84 cm. Ponderosa pine and western larch was favored over Douglas-fir and grand fir. They preferred snags with less bark, but did not require decayed wood. Fifty-five percent of nest trees had broken-off tops. In western Montana (McClelland 1977), 13 of 22 nests were in western larch (ponderosa pine was rare in the study area). Average dbh was 80 cm (range 39 - 109 cm). Of 18 nests in western Oregon (Mellen et al. 1992), average dbh was 71 cm (range 40 - 138).

Associated Species. Because it is the largest woodpecker, management for large snags suitable for the Pileated Woodpecker will benefit all other primary cavity nesting birds. Additionally. presence of a productive nesting population will provide a supply of cavities for numerous secondary cavity nesters.

Management Recommendations. It is important to provide this species with extensive areas of old-growth in the landscape so that it can have enough resources within its large home range.

- We need to provide clustered or continuous areas sufficient for multiple (3+) pairs (3 x average home range size of 364 ha = 1092 ha of forest);
- Within each block 75% is should be grand fir habitat type, at least 25% old growth and the remainder mature;
- At least 50% of each block should have > 60% canopy closure, at least 40% unlogged and the rest only partial overstory removals;
- Within designated blocks, maintain > 100 logs/ ha (especially > 38 cm, long dead, and not lodgepole), and at least 8 snags/ha (at least 20% > 50 cm).

Sharp-shinned Hawk

Priority Level: III   MT Score: 16   AI: 3

Reason for Concern. The northern Rockies (p.a. 64) are a center of abundance (>32%) for this species, but they are essentially unmonitored except at migration counts.

Distribution. Sharp-shinned Hawk is found across the northern U.S. and Canada west and north to Alaska. They occupy most of the western U.S. from central New Mexico north. Montana birds are distributed from the west across the continental divide eastward along major river drainages and within isolated mountain ranges of central and eastern Montana (Montana Bird Distribution Committee 1996).

Habitat Requirements. The preferred habitat for the Sharp-shinned Hawk is dense stands of trees with openings. Coniferous forests or mixed coniferous/deciduous habitats appear to be preferred in the west. Birds from eastern Montana use wooded and brushy riparian floodplains and hardwood draws. Gap analysis (Redmond et al. 1998) identified 6 million ha of habitat available within the state.

Ecology. Sharp-shinned Hawk nest in closed canopy coniferous forests often close to or surrounded by deciduous habitat (Redmond et al. 1998). They often nest in dense Douglas-fir that exhibits a canopy closure of 80 %or greater.

Management Issues/Recommendations. No specific management recommendations were developed for the Sharp-shinned Hawk.

Plumbeous / Cassin's Vireos

Priority Level: III MT Score: 19/20 AI: 3

Reason for Concern. Physiographic are 64 supports >40% of the Plumbeous Vireo's population. Trend data are inconclusive for that species, although significant increases have been noted for the Cassin's Vireo. Both species are common cowbird hosts which can be highly susceptible to landscape level changes in habitat.

Distribution. These two species were formerly considered to be subspecies of the Solitary Vireo. Cassin's Vireos breed from southern California north to central British Columbia, and east as far as western Montana. Plumbeous Vireos breed through the southern Rockies from northern Mexico to southcentral Montana. The zone of overlap of these two species in Montana is poorly defined (Montana Bird Distribution Committee 1996).

Habitat Requirements. Both species are most common in ponderosa pine, according to regional point count data (Hutto and Young 1999). Cassin's are more tolerant of other forest types, and are relatively common in the moister mixed forest of northwestern Montana. Both species can use deciduous shrubland and riparian forests heavily during the post-breeding and migration periods.

Ecology. "Solitary" Vireos are insectivores, with caterpillars being the food of choice. They feed by gleaning the foliage of both coniferous and deciduous shrubs and trees. Nests are placed in the fork of a branch, usually in a conifer, 4-30 ft above the ground (Ehrlich et al. 1988). Like other vireos, the species is highly susceptible to cowbird parasitism.

Management Issues/Recommendations. Hutto and Young (1999) found the Cassin's Vireo to be increasingly less common with higher levels of canopy removal, although older cuts with well-developed shrubs may be used heavily as foraging habitat. No specific management recommendations have been developed for either species. Any widespread monitoring efforts should focus on delineating the ranges of these two species in the state. Demographic monitoring is also needed, to assess the relative effects of parasitism at various landscape scales.

Townsend's Warbler

Priority Level: III MT Score: 20 AI: 4

Reason for Concern. Townsend's Warblers have shown significant population increases in the northern Rockies. Yet they appear to be quite sensitive to timber harvest in their preferred mature forest breeding habitat.

Distribution. The Townsend's Warbler breeds from southeastern Alaska, south through western Canada to central and northeastern Oregon, northern Idaho, northwestern and southcentral Montana, and northwestern Wyoming. In Montana, it only breeds in the western quarter of the state (Montana Bird Distribution Committee (1996). It winters in central and southern California, western Mexico, and the highlands of Central America.

Habitat Requirements. Townsend's Warblers nest in coniferous forests or mixed coniferous/deciduous forests where coniferous trees comprise a predominant feature of the habitat (Bent 1953, Erskine 1977). Surveys in northern Idaho and Montana detected them most frequently in cedar-hemlock forests, followed in order by mixed conifer, spruce-fir, Douglas fir, riparian shrub (probably adjacent or within forest), lodgepole pine, and ponderosa pine (Hutto 1995). In those surveys, they were less abundant in drier and more open forest cover types and in forest patches that have been harvested. They were more likely to occur on points with a few or lots of snags within 10 m (30 ft) of the survey points and were nearly 5 times more common on points with a lot of dead and down material (Hutto 1995). In a review of several studies, Hejl et al. (1995) listed the Townsend's Warbler as an old-growth associate in studies in Montana, Idaho, and Oregon, although another Idaho study found them present but not clearly associated with old-growth, mature, or immature forests. Hejl et al. (1995) found Townsend's Warblers to be less abundant in clearcut or partially cut forest than in uncut forest.

Ecology. Townsend's Warblers build cup-shaped nests in and near the tops of coniferous trees on a branch well away from the trunk. They feed mostly on insects (e.g., weevils, bugs, leafhoppers, caterpillars) and spiders, gleaning them from the foliage or hawking them from the air (Ehrlich et al. 1988, Groves et al. 1997). Herman and Bulger (1979) found breeding densities of 10-47 pairs/40 ha (100 ac) in Oregon mixed-coniferous forests.

Management Issues. Hutto (1995) stated that the Townsend's Warbler is probably one of the more sensitive species to timber harvesting activity as evidenced by a continuous decline in probability of occurrence with increasing amounts of timber removed. It appears from Hutto's data that they are found more frequently on points where no edge is within 100 m (305 ft). Management at the landscape level should allow for retention and recruitment of mature mixed conifer stands.

Habitat and Population Objectives: Moist Douglas-fir and Grand fir

Habitat Objectives - Old Growth:

- Existing old-growth stands (> 170 years, meeting minimum criteria for region and forest type: Green) should be retained whenever possible, especially in areas that are in likely refugia from stand-replacement fires.

- Maintain mature or overmature stands for recruitment into old growth, toward goal of 20% of the habitat type managed for old-growth conditions; these should be located in likely refugia from fire or in areas providing connectivity to isolated old-growth stands.

- Abnormally dense young to mature stands surrounding old growth could be targets for forest health treatment (thin-from-below or partial cut) to reduce the risk of fire spread into old-growth stands.

- Old-growth should be well-scattered throughout forest lands rather than grouped into adjacent areas (McClelland et al. 1979); stands may be of variable size but most should be at least 50-100 acres (McClelland et al. 1979), imbedded within an area of 364-1000 acres of mature or partial cut forest managed snag and log retention (McClelland et al. 1979, Bull and Holthausen 1993). Some larger blocks, especially in mesic areas where historically more likely (see Pileated Woodpecker).

- Encourage retention of snags and logs in all silvicultural treatments [Bulland Holthausen recommended > 8 snags/ha, at least 20% of which are > 50 cm, and . 100 logs/ha, with a preference for logs > 38 cm]

- Refrain from sanitation cutting of insect-killed trees within the 20% of lands managed for old-growth; limit firewood cutting to snags less than 40 cm and discourage use of larch, ponderosa pine, and broadleaf species (McClelland et al. 1979).

Prescribed Fire: (see also section on Burned Forests)

- Expand the opportunity for allowing lightning fires to burn.
- Re-ignite suppressed lightning fires when conditions come back into prescription.
- Use broadcast burning to restore normal fuel conditions so that lightning fires can be allowed to burn.
- Capitalize on opportunties to develop stand conditions that approximate those created by stand-replacement fire regimes.

Timber Harvest:

- Vary timber harvest methods, using more even-age prescriptions ("messy" clearcuts and seed-tree cuts) in more mesic sites that would have historically had stand-replacement fire regimes. Retain seed trees permanently, preferably large larch (> 40 cm), and retain snags and occasional clumps of green trees.

- Produce a diversity of stand structures in mixed and variable fire regime types. Some regular thinning methods may be appropriate, but vary with more heterogeneous stand prescriptions. Leave clumps of intact forest, snags, and large logs.

- Consider burning after partial cutting, to further mimic mixed-severity fires and to recruit snags.

Whitebark Pine

Dominant Plant Species Composition. Whitebark pine is a relatively cold tolerant, non-competitive tree species that occurs in a continuum of environmental situations in subalpine and timberline zones, resulting in a mosaic of cover types and forest communities with various proportions of whitebark pine (Arno and Weaver 1989). On drier sites in arid mountain ranges, whitebark pine habitats are abundant (Arno and Weaver 1989), while whitebark pine is a potential climax species in several, and a seral dominant in most other, upper subalpine and timberline forest types (Pfister et.al. 1977).

Vegetation Physiognomy/Structure. In the lower subalpine zone, whitebark pine is a minor seral species, associated with lodgepole pine, with minor inclusions of Douglas-fir and Engelmann spruce, and Subalpine fir as the climax species (Arno and Weaver 1989). Whitebark pine cannot become a climax forest dominant where its tolerant associates such as subalpine fir and Engelmann spruce are capable of forming a closed canopy (Arno and Hoff 1989).

In the upper subalpine zone, whitebark pine is a dominant seral species in association with Engelmann spruce and lodgepole pine, with subalpine fir as a climax species (Arno and Weaver 1989). On the best sites in mixed stands, whitebark pine trees are tall (35 to 65') with single boles and broad crowns and has a life span of 500 year or more (Arno and Hoff 1989). Upward through the timberline zone, whitebark pine becomes progressively shorter and assumes multi-stemmed growth forms (Arno and Hoff 1989).

In the alpine timberline zone, where conditions for tree growth are severe, whitebark pine occurs in pure groves forming tree islands as well as in mixed groves associated with subalpine fir, alpine larch, and minor inclusions of Engelmann spruce (Arno and Weaver 1989). At these higher elevations, whitebark pine ranges in structure from shrub-like krummholz growth forms on the harshest sites, to relatively short trees with large branches on more moderate sites (Arno and Hoff 1989).

At the highest elevations in cold-moist situations, the undergrowth is usually dominated by grouse whortleberry, while under progressive drier conditions, elk sedge, Parry rush, heartleaf arnica, and finally, Idaho fescue dominates (Arno and Weaver 1989). In average mountain conditions, undergrowth ranges from smooth woodrush in moist settings, to beargrass, grouse whortleberry, and elk sedge in drier sites (Arno and Weaver 1989).

Management Issues. An assessment of the interior Columbia River basin found that the amount of area in whitebark pine cover type has declined by 45% since the turn of the century (Keane 1995). Most of this loss occurred in the more productive, seral whitebark pine types, of which 98% has been lost. Prior to the early 1900's whitebark pine was apparently more abundant in the subalpine forest as a result of natural fires, which favor whitebark pine regeneration and survival in comparison with subalpine fir and spruce (Arno and Hoff 1989). As a result of fire suppression during the 1900's, natural fire cycles in seral whitebark pine communities were disrupted, resulting in this species being replaced by competitors (Arno and Weaver 1989). The frequent low intensity fires the occurred under the natural fire regimes in the whitebark communities prevented or slowed the replacement of whitebark pine by more shade tolerant species, thereby aiding the regeneration and long-term maintenance of seral whitebark pine forests (Morgan and Bunting 1989). As stands advance successionally, stands become more susceptible to high intensity stand replacing fires (Morgan and Bunting 1989). Although whitebark pine regenerates readily following high intensity, stand replacing fires, the trees are not likely to survive subsequent fires that occur while the trees are still small and easily killed by fire (Morgan and Bunting 1989).

Mountain pine beetle (*Dendroctonus ponderosae*) is by far the most damaging insect in mature stands of whitebark pine (Arno and Hoff 1989). A large proportion of the mature whitebark pine in the northern Rockies was killed by an outbreak of this insect between 1909 and 1940 (Arno 1970 in Arno and Hoff 1989). Mountain pine beetle epidemics spread upward from the lodgepole pine forests, as evidenced in a 1970's epidemic which developed in lodgepole pine on the Flathead National Forest, resulting in most of the whitebark pine in areas being killed (Arno and Hoff 1989).

The disease that has the most impact on whitebark pine is White Pine Blister Rust (Hoff and Hagle 1989). Blister rust is a stem rust limited to the white pines originating in Eurasia which was accidentally introduced to North America in 1910 (Hoff and Hagle 1989). Whitebark pine is highly susceptible to blister rust, which is particularly destructive where ranges of whitebark pine overlap areas of adequate moisture which permits infection of currants and gooseberry (*Ribes* spp.), which serve as the alternate host for blister rust (Arno and Hoff 1989). Efforts to reduce the occurrence of the alternate host have been relatively futile (Hoff and Hagle 1989). In northwestern Montana, an estimated 40 to 100% of whitebark pine are dead in existing stands and 50-100% of the live trees are infected with rust and have lost their capacity to produce cones (Kendall and Schirokauer 1997). In southern Montana, whitebark pine health improves due to drier climate (Kendall and Schirokauer 1997).

Dwarf mistletoe, a parasitic plant, can cause severe local mortality in whitebark pine (Arno and Hoff 1989). Limber pine dwarf mistletoe, which infects and sometimes kills whitebark pine and occurs in scattered locations in Montana, has been documented to have caused heavy mortality around Mount Shasta, where surveyed stands averaged 96% infection rates with 58% mortality (Hoff and Hagle 1989).

Wide scale grazing, especially by large numbers of sheep, historically reduced the reproduction of whitebark pine, however current grazing may be less of an issue due to reduced animal numbers and scientific grazing plans (Willard 1989).

Geographic Extent in the State. Whitebark pine occurs in most high elevation forest zones (subalpine and timberline zones) in the mountains of western Montana as well as in Yellowstone National Park. Whitebark pine sites occupy about 10 to 15% of the forested landscape in the Rocky Mountains of Montana, Idaho, and northwestern Wyoming (Arno 1986). In 1995, a three year project was begun to document the current status of whitebark pine in National Parks in the Rocky Mountains and to determine the historical distribution of whitebark pine in Glacier National Park. It has been estimated that whitebark pine as a cover type has declined by 45% over the past 100 years (Keane 1995) and existing stands have high levels of dead and dying trees (Kendall and Schirokauer 1997).

Importance. Whitebark pine is associated with federally listed species through the reliance of grizzly bears on whitebark pine nuts in some ecosystems (Mattson and Jonkel 1989, Mattson et.al. 1992). Whitebark pine seeds are also an important food source for many small mammal and bird species. Red squirrels (*Tamiasciurus hudsonicus*), chipmunks (*Eutamias* spp.), and golden-mantled ground squirrels (*Citellus lateralis*) are known to forage on whitebark pine seeds, with red squirrels demonstrating a high dependence on whitebark pine seeds in subalpine habitats (Hutchins 1989). Steller's Jays, Common Ravens, Hairy Woodpeckers, Williamson's **Sapsuckers**, Mountain Chickadees, Red-breasted Nuthatches, Cassin's **Finches**, Red **Crossbills**, and Pine Grosbeaks have all be documented to forage on whitebark pine seed (Hutchins 1989). Of these species, Steller's Jays, Common Ravens, Mountain Chickadees, Red-breasted Nuthatches, **Cassin's Finches**, and Pine Grosbeaks have a low dependence on whitebark pine in subalpine areas, while the dependence of Hairy Woodpeckers, **Williamson's Sapsuckers**, White-breasted Nuthatches, and Pine Grosbeaks is unknown (Hutchins 1989). Only **Clark's Nutcracker** has been determined to be highly dependent on whitebark pine seed.

Clark's Nutcrackers harvest and store whitebark pine seeds in the late summer and fall of each year, utilizing the seed caches throughout the winter until the new cone crop is available in the summer (Tomback 1982). Clark's Nutcrackers have been found to be heavily dependent on whitebark pine seeds during the postfledging period (Vander Wall and Hutchins 1983). Whitebark pine may benefit directly from a mutualistic relationship with Clark's Nutcrackers through enhanced dispersal and seedling success resulting from germination of unretrieved nutcracker caches (Tomback 1982). Due to this mutualistic relationship, it has been suggested that nutcrackers have had a profound influence on the ecology and evolution of whitebark pine, which may be dependent on the nutcracker for successful regeneration (Hutchins and Lanner 1982).

Clark's Nutcracker

Priority Level: III MT Score: 17 AI: 3

Reason for Concern. This is perhaps the strongest example of a bird species selected by the Montana PIF based on the designation of its habitat as being a high priority, because the nutcracker plays such an important role in the ecology of whitebark pine. Populatoins have increased over time in the northern Rockies, which supports >39% of this species' population.

Distribution. Clark's Nutcrackers are a resident throughout the Rockies, from central British Columbia and southwestern Alberta south to Arizona and New Mexico, west to eastern California and central Washington. They breed throughout the western half of Montana, primarily at higher elevations. They often frequent lower elevations during winter.

Habitat Requirements. Clark's Nutcrackers generally breed in upper montane forests in open or broken forest of pine, spruce, or Douglas-fir, and may also breed in lower-elevation limber pine or juniper woods when there is a good seed crop (Madge and Burn 1994, Kaufman 1996). In the fall and winter, they may move to lower elevations where they utilize a variety of habitats (Johnsgard 1986, Madge and Burn 1994, Kaufman 1996). Clark's Nutcrackers have been detected in a wide variety of structural stages of forest, although they are closely linked to areas of high conifer seed production such as early post-fire habitats (Hutto 1995). There do not appear to be any landscape features that influence habitat use other than availability of seed sources.

Ecology. Clark's Nutcrackers forage in trees or on the ground for a wide variety of foods, however they are heavily dependant on conifer seeds from whitebark and limber pine(Tomback et.al. 1990), especially during the post-fledging period (Vander Wall and Hutchins 1983). They nest in a coniferous tree, usually away from the trunk on a horizontal limb from 8 to 40 ft above the ground (Kaufman 1996).

Management Issues/Recommendations. Habitat objectives developed for whitebark pine should benefit Clark's Nutcrackers. Due to the wide ranging nature of Clark's Nutcrackers, landscape configurations appear to have limited impact, and concerns regarding adjacent habitats are minimal, other than in their potential to facilitate disturbance (fire and disease) in whitebark stands.

Population Objectives. Clark's Nutcracker populations appear to be stable, with a distrubution that is widespread and locally common over most of its range (Madge and Burn 1994). Therefore, population objectives are difficult to develop. As with habitat concerns, the widespread declines in stone pines (whitebark and limber pine specifically) has the potential to be of concern. If Clark's Nutcrackers are able to successfully reproduce in the absence of whitebark and limber pine forests, then conservation concerns are greatly reduced.

> **Assumption.** The most important limiting factor for Clark's Nutcrackers is the long term viability of whitebark and limber pine forests.
>
> **Research/Monitoring Needs.** Research needs to be conducted to determine the success of Clark's Nutcrackers in the presence of widespread declines in conifer seed sources. Custom population trend and demographic monitoring may be needed to assess population response to changes in food crop availability.

Habitat and Population Objectives - Whitebark Pine

Habitat Objectives

- Maintain existing and reestablish pure and mixed stands of whitebark pine dominated by blister rust resistant trees with reduced potential of stand-replacement fire.
- Efforts should be made to maintain and reestablish whitebark pine communities throughout the geographical and elevational range inhabited in the naturally functioning system prior to the introduction of blister rust.
- Adjacent habitat conditions that facilitate mountain pine beetle and blister rust should be reduced where possible to maintain existing stands.

- Whitebark pine should exist in a variety of life forms and in a variety of settings; habitats should range from islands of pure whitebark pine to mixed stands of whitebark pine, spruce, and subalpine fir.

- Develop and implement approaches to reintroduce natural fire regimes into whitebark pine systems.

- Develop methods to minimize or eliminate the impacts of livestock grazing on whitebark pine regeneration.

Assumptions:

- Maintaining target conditions across the species' range will benefit grizzly bear recovery and avoid the possibility of future declines in Clark's Nutcracker, while providing values to other bird species that utilize whitebark pine seeds.

- If whitebark pine is eliminated from the ecosystem, Clark's Nutcrackers will not be able to readily shift their foraging to other sources for food and the structure provided by whitebark pine will not be readily replaced by another tree species.

- It will be possible to develop management programs to enhance rust resistance and reduce fire risks so that the vigor and longevity of existing whitebark pine stands can be improved and the range can be expanded with reintroduced stands of whitebark pine.

Research/Monitoring Needs:

- Research and monitoring efforts should be directed at developing rust resistant whitebark pine seed for use in reestablishment projects.

- More needs to be learned about methods for successfully regenerating whitebark pine.

- Silvicultural methods need to be developed that will improve the vigor and reduce the disease/fire risk within whitebark pine dominated stands.

- Research needs to be conducted into the natural disturbance processes in whitebark pine types as well as the landscape dynamics of whitebark pine forests.

- More rigorous research needs to be conducted into the use, and especially any dependence, of whitebark pine by other bird species including species that forage on whitebark pine seeds as well as species that utilize the vertical structure provided by whitebark pine trees, especially seasonal use and use by species during migration.

Aspen

Description. Aspen is the most widely distributed native tree species in North America (Fowells, 1965). It ranges from Newfoundland, west across the Lake States and into Alaska, and south through the Rocky Mountains, Cascades and Sierra Nevada into Mexico (Fowells, 1965).

It often occurs in essentially pure stands at mid-elevations throughout a large portion of the western United States, particularly western Wyoming, western Colorado, Utah and northern New Mexico. Elsewhere, it occurs as isolated pure stands, in aggregate with conifers or along water courses. Throughout much of the interior west, it is the only upland broad-leafed tree species within the coniferous forests. It is often, but not always, associated with riparian or more mesic upland sites.

Aspen stands are relatively rare in Montana when compared to the other Rocky Mountain states, but where they occur they support a diverse avifauna. Large stands of pure aspen can be found in southwestern Montana, primarily on the Beaverhead and Gallatin National Forests and in the Beartooth Mountain portion of the Custer National Forest. Relatively large stands of aspen also occur along the Rocky Mountain Front of the Lewis and Clark National Forest and east of the Continental Divide in Glacier National Park and the BlackftIndian Reservation. Aspen exists in isolated mountain ranges throughout the remainder of the state, often occurring in mixed stands with other tree species.

Importance to Region. Aspen is an important component of the vegetation of Montana. Although it is relatively rare when compared to other states in the Rocky Mountains, its rareness actually adds to its importance. Aspen, whether in pure stands or mixed with conifers, provides habitat for a wide variety of wildlife and adds to habitat diversity. It is often the only broad leafed tree within coniferous forests and therefore provides unique foraging substrates for a variety of insectivorous birds. Its suckers, twigs and bark are used by wintering ungulates, particularly deer, elk and moose. Snowshoe hares and cottontail rabbits feed on its twigs and buds, while ruffed grouse are highly dependent on aspen buds in winter. Aspen also provides cavities and snags for cavity dependant wildlife.

In western Colorado, Scott and Crouch (1988) found that aspen stands do not provide habitat for more species or higher densities than do conifer stands . They did find that "Aspen did, however, support some birds and mammals that might otherwise be absent or present in low numbers." Data from Montana suggests that numerous species of birds are commonly found in aspen stands, including several priority species (Table 13).

Aspen is also important to recreation and tourism. Its visual variety and autumn colors add significantly to the already magnificent Montana landscape. Its unique presence adds to the value of scenery based real estate. Certainly, aspen trees add to the habitat variety and add an element of interest to nature study and wildlife viewing. Aspen trees are certainly an asset to the region, and in the opinion of some, Montana would be a much poorer place if aspen trees were no longer part of the landscape.

Table 13. Relationships of Montana PIF priority species to vegetative structural components, Aspen habitat type.

Species	Area Dep.	Canopy: Open	Canopy: Closed	Old Growth	Understory: Patchy	Understory: Closed	Understory: Open	Large Snags	Large Trees	Large Logs	Comments
Ruffed Grouse	x		x				x			x	sapling stands
Red-naped Sapsucker	x	x	x	x				x	x		heart rot, near conifers
Warbling Vireo		x	x		x		x				
MacGillivray's Warbler		x	x		x		x				
Ovenbird			x								

Dominant Species and Vegetation. Aspen is commonly a highly variable associate with other plant communities. In the western United States it is commonly found in association with Engelmann spruce, Douglas-fir, true firs, ponderosa pine, lodgepole pine, cottonwood, willow, sagebrush and grassland communities (Flack 1976). It also exists in pure stands with grass, forb, and/or shrub understories primarily in western Colorado, Utah and northwestern Wyoming (Flack, 1976).

Aspen reproduction from seed is rare in the Rocky Mountains (Fowells, 1965). Vegetative reproduction from existing clones is the common form of regeneration (Fowells, 1965). Following a disturbance such as fire, windthrow and timber harvest, profuse suckering from existing individual trees or clones normally gives rise to dense young stands of aspen. As the stands mature, self thinning gives rise to dense even-aged stands. As the stands continue to develop, mature tree density continues to decline resulting in either multi-storied stands or stands of progressively declining density.

Aspen trees are fast growing, but short-lived (Fowells, 1965). Mature stands consist of trees 75-100 ft tall (Fowells, 1965) with crowns of varied density that rarely touch (Flack, 1976). Older stands are characterized by a high incidence of disease and rot (Fowells, 1965).

Fire is the primary factor in perpetuating aspen on a site (Fowells, 1965). The normal successional path is for aspen to become established following a disturbance, function as a cover species for shade tolerant conifers and eventually be replaced by coniferous forest. Periodic fire sets back succession and maintains aspen on the site. In the absence of fire, remaining aspen trees eventually lose vigor, fail to sucker and are eliminated from the community.

Timber management can be used to maintain aspen. Clearcutting of aspen and associated conifers can simulate wildfire conditions resulting in profuse suckering from young healthy aspen clones (DeByle, 1981). However, old clones and remnant individual trees often fail to respond favorably to timber harvest presumably because less vigorous trees fail to produce sufficient suckers. Where regeneration areas are small in size, browsing and physical damage by livestock and wildlife, particularly elk, frequently result in regeneration failures.

Historical Condition/Land Use. The establishment of most of the aspen stands in the Rocky Mountain west is speculated to have originated from massive wildfires at the turn of the century. However, since then, aspen has been declining at a rapid rate (USDA, 1997). In Arizona and New Mexico, for example, aspen acreage declined from 486,000 acres to 263,000 acres between 1962 and 1986 (Cartwright and Burns, 1994).

Although aspen is not a major component of the forests in Montana when compared to other western states (Flack, 1976), aspen in Montana probably has shown similar declines in relative abundance over the same period. This is reasonable to assume since policies of fire suppression have followed an identical pattern throughout the western United States. Since it is well known that aspen is highly dependant on fire for successful regeneration. aspen has most likely declined throughout its range in the west.

Recent policy changes that permit greater use of prescribed fire, combined with increased frequency in uncontrollable wildfire during the past decade (1988 fire season and Shepherd Mountain Fire outside of Red Lodge, MT in 1996), have resulted in some reestablishment of aspen in Montana. These increases of aspen are relatively small, however, considering the size of the state as a whole. With more access to prescribed fire as a management tool and the concern over the apparent decline of aspen over time, the USDA, Forest Service is giving greater attention to aspen regeneration within Montana (Regional Forester, personal communication). Therefore, it should be expected that increased treatment and recovery of aspen in Montana will become more evident.

Aspen has never been a significant commercial timber species in the Western United States. With the exception of minor uses for palates, match sticks and packing material, there has been little economic incentive to maintain aspen on a site. Existing stands are probably the result of wildfires that occurred prior to the development of effective fire suppression, the result of occasional recent wildfires that were not effectively suppressed, and the result of incidental logging activities.

Current Status and Land Use. Aspen trees are in poor condition over most of Montana. Most of the aspen remaining in the state are in the older age classes and are in critical need of regeneration. Older stands are usually less vigorous and least likely to regenerate successfully. Many of these stands are currently being crowded out by competing conifers and aspen will eventually be lost from the site. In addition, pure and mixed stands in the older age classes are of low vigor and are often heavily infested with pathogens. Effective fire suppression over the past 50 years has permitted competition and disease to reduce clone vigor to levels lower than would be expected under natural conditions. Compounding the situation, fire suppression has drastically reduced fire induced regeneration in recent years resulting in few young aged stands.

Aspen has long been recognized for providing quality wildlife habitat and recreational and scenic values. However, it has been only relatively recently that land managers have identified aspen as a priority for forest management. A focus toward ecosystem restoration, the realization of its recreation, landscape and tourism values and the fact that aspen abundance is declining, all have contributed to the increased interest in aspen management (Cartwright and Burns, 1994).

Forest Service managers in Montana are discussing aspen regeneration more frequently (Regional Forester, personal communication) as are wildlife organizations such as the Ruffed Grouse Society and the Rocky Mountain Elk Foundation. Aspen regeneration projects for elk and ruffed grouse habitat improvement have been implemented on the Custer National Forest over the past several years and have been described as highly successful (Clint McCarthy, personnel communication). In order to increase the awareness to manage aspen for wildlife purposes, the Washington Office of the Forest Service has identified a minimum of $600,000 for aspen work nationally in Fiscal Year 1999. All of these actions indicate a greater awareness of aspen conservation needs.

Potential for Conservation and Restoration. The conservation and restoration of aspen habitats fits extremely well with recent trends toward ecosystem management and sustainability. Current emphasis is on restoring the process and function to ecosystems over large landscapes in order to approximate conditions that existed prior to the settlement of the west. Since fire was a dominant process historically, fire-dependent aspen communities stand to benefit greatly as this policy is implemented. The use of logging, logging combined with prescribed fire, prescribed fire and prescribed natural fires will be the major methods to restore aspen ecosystems in Montana. Whenever these activities occur in areas with residual aspen, aspen should increase significantly. In some cases, the presence of residual aspen should weigh heavily toward establishing priority for the use of limited prescribed burning funds. Although aspen stands will only occasionally be the primary purpose for treatment, thousands of acres will be treated, resulting in tremendous potential to regenerate aspen clones. Since fire and logging is expected to be used over broad areas, aspen should become more prevalent across the landscape where currently only a few remnant trees are present.

Aspen restoration should be feasible across all land ownerships in the state. National Park policy currently uses natural processes, including fire, to determine how vegetation changes in Glacier and Yellowstone National Parks. The use of ecosystem restoration principals in the management of National Forests, BLM and tribal lands is currently being practiced to a limited extent with much more emphasis expected in the near future. Private timber companies in the Northwest, including Plum Creek Timber Company in Montana, subscribe to the principals of ecosystem restoration and are using some restoration practices on their commercial Forest lands. Most smaller private landowners have not yet embraced these concepts, but are expected to get more involved as they continue to work with the State Forester and private forestry consultants. Comprehensive conservation and restoration of aspen over entire landscapes has tremendous potential to increase as collaborative land management programs across all land ownerships becomes more common.

Private organizations such as the Rocky Mountain Elk Foundation, Wild Turkey Federation and Ruffed Grouse Society have the potential to be major players in the restoration of aspen habitats. Their political and financial support of restoration activities will go a long way to help gain public acceptance and improve the economic feasibility to implementing on the ground restoration activities.

Challenges. There are a number of potential roadblocks to restoring aspen in Montana. These include acceptance of the use of fire in land management, smoke management, housing development near aspen stands, physical damage to regenerated aspen clones and grazing in riparian systems.

Since the use of fire is the most reasonable method to restore aspen on a large scale, public acceptance to prescribed burning is essential. However, this hurdle has yet to be overcome completely. Although there appears to be general acceptance of burning grasslands and shrublands, especially for wildlife purposes, there is strong opposition to burning commercial timber species. People have not yet accepted the notion that some pre-commercial timber should be burned prior to reaching merchantable size. Likewise, many do not accept burning any commercial species that may result in a loss of potential wood products regardless of tree size, accessibility or economics . In many cases, however, these are the areas that should be burned in order to achieve ecological and restoration objectives.

Smoke is a natural product of prescribed burning and poses potential health hazards, physical discomfort and reduced visibility, all of which are unacceptable to many people. Although major efforts are made to coordinate burning with meteorological conditions that favor rapid smoke dispersal, weather conditions do not always develop as expected. This is further complicated by the fact that in most cases fires need to be hot during periods of low fuel moisture to achieve successful regeneration. Unless the public begins to accept smoke under planned conditions in preference to smoke from unplanned wildfires, smoke production will continue to be a roadblock to aspen restoration.

Producing profuse suckering from aspen regeneration practices does not ensure the reestablishment of new aspen stands. Suckers are highly palatable to some wildlife, such as elk and moose, and entire stands of young aspen can be lost to browsing. In addition, young aspen are quite fragile and susceptible to physical damage caused by trampling from hoofed animals, particularly livestock. For these reasons, efforts to reestablish aspen in small localized areas often fail. Isolated pockets of young aspen tend to draw elk, moose and deer to these areas resulting in unacceptable levels of browsing. Similarly, efforts to reestablish aspen in areas of heavy livestock use often results in excessive damage to young trees. To minimize these negative impacts, regeneration efforts should encompass areas large enough to compensate for local damage from browsing and trampling. The use of fencing and other physical barriers to livestock and wild ungulates is sometimes effective in resolving these problems also.

Grazing by domestic livestock in riparian areas can also be a roadblock to reestablishment of aspen. The livestock impacts are similar to those mentioned previously, however, they are aggravated in areas where aspen occur only in riparian areas. In such situations, since livestock congregate in valley bottom riparian areas, physical damage and browsing is almost impossible to avoid. Often, the only solution to this problem is to either fence out the cattle or reduce the number of cattle using the aspen sites.

Ruffed Grouse

Priority Level: II   MT Score: 18   AI: 3

Reason for Concern. Although grouse populations are notorious for being cyclic, Ruffed Grouse have shown a significant long-term decline (PT/PTU = 5/1) in the northern Rockies (p.a. 64). There is no current monitoring in system in Montana for this popular gamebird.

Distribution. The Ruffed Grouse is found throughout western Montana west of the divide. East of the divide, Ruffed Grouse are restricted to the isolated mountain ranges and major drainages of central and southcentral Montana (Montana Bird Distribution Committee, 1996). Gap analysis (Redmond, et al.,1998) predicted the occurrence of 6.1 million ha of Ruffed Grouse habitat in the state.

Habitat Requirements. Ruffed Grouse is found in early successional forests with deciduous trees (Johnsgard 1973, Brenner 1989). Within western Montana, Grouse are occupy habitats that are typically dense mixed conifers with deciduous trees and brush. This type is often associated with stream bottoms

(Mussehl et al. 1971). they are also found in deciduous or mixed riparian lowland valley or in early successional forest stages with developing shrub cover (Champlin 1979). Grouse populations in eastern Montana occupy drier montane woodlands closely associated with aspen parklands (Aldrich 1963). Populations appear to be largest in areas that have young and old forest stands distributed throughout an area. Cade and Sousa (1985) recommend that all necessary habitats be located within a 4 ha area. Large contiguous blocks of habitat have considerably greater potential for grouse than isolated fragmented woodlands. Good Ruffed Grouse habitat has vertical structure. They seem to prefer forests with a high density of shrubs taller than 1.5 m and tree seedlings, saplings, and sprouts taller than 4.5 m (Kubisiak In Ruffed Grouse 1989). Good vertical structure (20,000 stems/ha with overstory 4.5 m tall) provides shelter and protection from predators. Horizontal cover is most beneficial if it occurs only in small areas or clumps and doesn't impede Grouse movements. Large tracts of mature forest are not adequate habitat for Ruffed Grouse. Aspen stands are important habitats for Grouse but may not be useable as mature stands. The historic fire regime is important in maintaining aspen stands as good Ruffed Grouse habitat.

Ecology. Ruffed Grouse have two main periods of activity- early morning just after sunrise and again just before night fall. Most of the day is spent at roost. During winter months they will use snow roosts when snow depth exceeds 10 inches. Birds will burrow or plunge into the snow and hollow out a space slightly larger than their bodies. They will stay just below the surface or occasionally their head and upper body may be exposed.

Ruffed Grouse males establish a territory that is variable but in excellent habitat is approximately 3 ha. in size. Under optimum conditions males may be spaced 140 m apart. Drumming will occur within the territory. Drumming may occur on a variety of substrates although downed logs are most commonly used. The drumming platform has two primary characteristics-level surface and height above the forest floor. The height above the forest floor is not consistent; the view of the surrounding area is the important aspect of height.

In late May to early June female Ruffed Grouse will excavate a shallow bowl-like nest structure in the ground. The may be placed next to a solid structure such as a tree or stump. The nest bowl may be lined with vegetation but only things found locally. Females apparently will not bring nest material in from other areas. Nests are not necessarily placed within the territory of the male. But, nests are usually distant from other females and nests. (Usually nests will be at least 500 feet apart.) Nest failures are usually due to predation. For example, of 1400 nests surveyed, approximately 40% were broken before hatching with about 90 % of the loss due to predators (Johnsgard P.A and S.J. Maxson, In Ruffed Grouse 1989). Grouse will renest if the first attempt fails.

Management Recommendations. No standardized monitoring is currently in place for this gamebird species. This should be the first priority for its conservation.

Red-Naped Sapsucker

Priority Level: II MT Score: 20 AI: 4

Reason for Concern. This species is almost uniquely dependent on aspen and birch for nesting, occurring in most forested habitats if these trees are present. Populations have increased over time in p.a. 64, which supports >59 % of the species' population, and in Montana. We have a responsibility to continue monitoring the species in the state, particularly if losses of aspen habitat are not reversed.

Distribution. The Red-naped Sapsucker and the Red-breasted Sapsucker were once considered subspecies of the of the wide ranging yellow bellied sapsucker. According to Udvardy (1977), the Red-naped Sapsucker is a species of the Rocky Mountains and Great Basin, while the Red-breasted ranges from the Alaska Panhandle, down the coast to the redwoods of California and into the Cascades and Sierra Nevada and the Yellow-bellied occurs in the prairies east of the Rockies. There is one record of the latter from extreme eastern Montana

Dobkin (1992) considers the red-naped sapsucker a summer resident in Montana and documents breeding distribution across the western two-thirds of the state. Documentation of breeding red-napeds in the remainder of eastern Montana is uncertain, although there is documentation for the area bordering North and South Dakota (Dobkin 1992). Red-naped sapsuckers are migratory and winter in the southwestern portion of the United States and Mexico. They return to their breeding grounds from March to April (Walters 1996).

Habitat Requirements. Bate's (1999) review of the literature documented that this species occurs primarily in deciduous habitats in the Columbia River Basin and the Rocky Mountains, although they can occur in coniferous forests that have a deciduous component. She cites Jackman (1974) as stating that the species prefers aspen, alder, cottonwood, ponderosa pine, Douglas-fir and larch. Dobkin (1992) considers mature coniferous forests with aspen and montane riparian woodland as preferred habitat with the species being most strongly associated with mature aspen especially in riparian environments. Bate (1999), however, found from personal observation That Red-napeds were the most commonly detected sapsucker in north Idaho despite the fact that the coniferous forest were devoid of deciduous trees.

From an investigation in south-central British Columbia (Keisker, 1987), reported that all but 13 of 159 Red-naped Sapsucker nests were found in aspen. Although sapsucker can excavate through sound wood, they prefer to use trees with decayed heartwood for nesting. Bate (1999) cites Walters (1996) as reporting that 98% of the aspen trees that were used for nesting had evidence of heartrot, and they selected trees that were larger and stands that were denser relative to their availability.

Dobkin (1992) states that Red-naped Sapsuckers do not reuse nest cavities, but that they may excavate a new cavity in the same tree in following years. When the species does reuse old cavities, increased predation results in lower productivity (Eberhardt, 1994 as cited by Walters (1996) and reported by Bate (1999). This suggests that productivity may be higher where there is an abundance of large, old, Fomes spp. infested aspen.

Ecology. Because of their role as primary cavity-nesters, Dobkin and Wilcox (1986) consider sapsuckers as a "keystone" species. Daily et al. (1993) consider them as a "double-keystone" species for their roles in both providing cavities for secondary cavity nesters and their role of creating sapwells that provide nourishment for numerous other species. Bate (1999) reports that Foster and Tate (1966) documented ", 20 species of birds, five species of mammals, and 30 groups (species and families) of butterflies and moths associated with sapsucker feeding trees". "Tate and Foster (1966) concluded that the ""summer feeding trees of the (Yellow-bellied) Sapsuckers have a significant effect on the local ecosystem.""

Sapsuckers feed on a variety of items over the course of the year. According to Dobkin (1992), sapsuckers feed on insects, sap and pitch and fruits and berries. Wasps, beetles, moths and ants are the major insect foods They forage by sapsucking, flycatching, gleaning and pecking. Since no single food source is available throughout the year, they feed on a variety of sources sequentially throughout the season. Dobkin (1992) reports that they rely heavily on the sap of conifers on arriving at their breeding grounds in the spring. They switch to the sap of aspen and birch only after the buds on these trees have opened. Insects increase in the diet as they become more available (e.g. carpenter ants during the summer months).

Management Issues/Recommendations. Aspen in Montana has declined in abundance by one-half to two-thirds since pre-settlement times (Bollenbacher, pers. comm. 1999), and recruitment of younger trees remains low. Therefore, it is logical that the availability of preferred Red-naped Sapsucker habitat continues to decline. However, by reinitiating fire into the ecosystem, some recovery and reestablishment of aspen stands is expected.

Since excessive grazing by livestock and wintering big game can curtail the successful reproduction of aspen, the use of fire alone can not assure the successful reestablishment of aspen stands throughout its range in Montana. The use of fire, in combination with appropriate grazing controls by wildlife and livestock, may achieve the desired results. In order to assure that this occurs, however, it will be necessary to treat relatively large acreages of potential aspen habitat. By providing significant amounts of aspen regeneration, the probability of having sufficient amounts of young trees survive grazing pressures is increased.

It is difficult to speculate on the desired amount and distribution of various age classes of aspen that would be most appropriate across Montana. However, since red-naped sapsuckers prefer older aged stands with relatively large trees that have evidence of fungal conks and heartrot (Walters 1996), it is apparent that all age classes of aspen need to exist across the landscape. Since Walters (1996) determined that home ranges averaged 13 ha, treatments should attempt to achieve units of at least this size as a minimum.

In the western part of Montana, where aspen exists in association with coniferous forests, it would appear reasonable that small inclusions of aspen within the coniferous forest matrix would be adequate. Tobalske (1992) found that nest stands were small (<16 ha), while Walters (1996) reported that aspen trees used for nesting were mostly in valley bottom riparian areas. Therefore, within the coniferous forest zone, it would be reasonable to assume that regenerating remnant clones of aspen in riparian situations would be a desirable goal for management.

In the more arid portions of Montana, however, where aspen naturally occurs in larger stands, regenerating larger units of aspen is probably more appropriate. Treating larger acreages of aspen across the landscape would not only more closely approximate the size of existing stands, but would also tend to compensate for heavy grazing pressures that would be expected from livestock and wildlife.

Ovenbird

Priority Level: III MT Score: 19 AI: 3

Reason for Concern. This ground-nesting warbler is highly dependent on aspen and riparian habitat with a well-developed understory. It is essentially unmonitored in the state.

Distribution. Ovenbirds breed throughout the eastern United States and Canada, south to the southern Appalachians, north and west to northern Alberta. Most breeding in Montana is along the Rocky Mountain Front and eastward along the major river corridors. There are only scattered records west of the continental divide.

Habitat Requirements. Nests in habitats with a strong deciduous tree component, including upland and riparian aspen stands, cottonwood gallery forests, mixed deciduous/conifer stands, and hardwood draws. Prefers heavy deciduous leaf litter for foraging and nesting.

Ecology. Forages and nests on the ground in heavy litter, where is builds an oven-shaped domed nest. In spite of the nest type, the species is heavily parasitized by cowbirds.

Management Issues/Recommendations. Maintenance and recruitment of mature aspen stands, in combination with efforts at riparian deciduous forest conservation, should provide for long-term habitat suitability for the species. This will only be true if suitable stands occur in a landscape which does not facilitate cowbird parasitism. Demographic monitoring in various landscape contexts would help to clarify the specific management scenarios needed for the long-term viability of the species in the state.

Habitat and Population Objectives: Aspen

Habitat Objectives. Maintain natural disturbance regimes and the dynamic nature of aspen communities at the landscape level. Where fire cannot be used, mechanical treatment should mimic natural fire conditions. Treat sufficient areas to ensure that regeneration will be adequate to overcome grazing by livestock and big game.

- Double the acreage of aspen where it presently occurs.
- Maintain 20% of aspen stands in overmature (decadent) condition.
- Use fire and log cutting to regenerate aspen that exceeds overmature guidelines.
- Develop treatment schedules to achieve equal acres of all age classes of aspen over each 4th order watershed.
- Give priority to regeneration in areas where aspen are in jeopardy of being lost in conifer types.
- Regenerate older stands that have sufficient vigor to develop young stands.

C Where all else fails, reestablish aspen throughout transplant stock.

C Provide aspen regeneration in approximately 40 acre blocks in conifer complexes.

C Regenerate entire aspen clones where aspen occurs as aspen/grass, aspen/forb or aspen/shrub complexes.

Wet Subalpine Fir (Spruce-fir)

Description, Status and Importance. This lower priority habitat corresponds with the Mixed Subalpine Forest of the Montana Gap project (Redmond et al. 1998). Dominant tree species include subalpine fir and Engelman spruce, with lesser amounts of Douglas-fir. In certain cases, seral stands of lodgepole pine may persist as the dominant canopy layer. This habitat generally occurs on north, east and northwest aspects at elevations of 750 - 3330 m. Canopy cover is typically high, often approaching 80%. Common understory shrubs include huckleberry, menziesia, and bearberry. Few priority species are primarily dependent on this habitat (Table 14).

Table 14. Relationships of Montana PIF priority species to vegetative structural components, Moist Subalpine Fir / Spruce habitat type.

Species	Area Dep.	Canopy: Open	Canopy: Closed	Old Growth	Understory: Patchy	Understory: Open	Understory: Closed	Large Snags	Large Trees	Large Logs	Comments
Great Gray Owl				x				x	x		openings
Boreal Owl								x			
Three-toed Woodpecker	x										dying or recently dead
Black-backed Woodpecker	x										dying or recently dead

Because they occur at higher elevations and are less preferred tree species for lumber, the availability of mature spruce-fir stands in the managed forest landscape is probably higher than that of higher priority forest types. In addition, Glacier National Park and the Bob Marshall wilderness complex offer significant "undisturbed" acreages in this type. For these reasons, the Wet Subalpine Fir habitat type was not considered a conservation priority at this time by Montana PIF.

Great Gray Owl

Priority Level: III MT Score: 19 AI: 4

Reason for Concern. The Great Gray Owl is one of several forest-dwelling owl species breeding in

Montana whose distribution, habitat needs and population status are poorly known. Better monitoring is needed.

Distribution. The Great Gray Owl is found from eastern Canada westward and northward into Alaska. Its distribution also extends southward in the Rocky Mountains to Wyoming and into California in the Sierra Nevada Mountains. Within Montana the bird is found throughout the area west of the divide; east of the divide records of its presence has been documented from the isolated mountain ranges of central Montana (Montana Bird Distribution Committee). The Gap analysis (Redmond et al. 1998) predicts 7 million ha of habitat within the state (approximately 20%).

Habitat Requirements. The Great Gray Owl occupies coniferous forests up to 2800 m in elevation (Bull and Duncan, 1993). The preferred habitat appears to be associated with meadows or mixed deciduous/coniferous forest. In addition to subalpine fir, Douglas-fir and ponderosa pine are frequently used types. The Great Gray Owl frequently uses forest openings, forest edges, and montane meadows.

Ecology. Great Gray Owls use existing nest structures. Nests constructed by Osprey, Northern Goshawk and Common Raven have been used. They will often use the same site for a number of years. Broken-topped snags, and human made nest platforms have also been utilized. Owls prey mostly on small mammals. Voles, shrews, gophers, and red squirrel are the main prey. They generally hunt from perches by listening and watching the ground. Individual owls can locate prey below snow surfaces. They have been known to capture prey up to 45 cm below the surface.

Management Issues/Recommendations. No habitat recommendations were developed for this species. It si one of several owl species which have been surveyed haphazardly on Montana forest lands. A unified monitoring effort for all owl species is needed to identify important areas and develop recommendations for nesting habitats.

Boreal Owl

Priority Level: III MT Score: 18 AI: 3

Reason for Concern. The Boreal Owl is one of several forest-dwelling owl species breeding in Montana whose distribution, habitat needs and population status are poorly known. Better monitoring is needed.

Distribution. The Boreal Owl is found in forested habitats across Canada, Alaska and southward through the Rocky Mountains into Colorado. Montana Boreal Owls are found west of the divide with the exception of the extreme southwest corner (Montana Bird Distribution Committee 1996). Usually Boreal Owls are year around residents within their home range.

Habitat Requirements. The Boreal Owl prefers to use boreal and subalpine habitats within the Rocky Mountain states (Hayward et al. 1987, Holt and Hillis 1987). Hayward et al. (1993) found that they preferred mature stands, particularly Engelmann spruce and subalpine fir, but tended to use deciduous (in particular aspen) stands and mixed deciduous/coniferous types for nesting. Other habitats used include Douglas-fir, Lodgepole, and mature mixed conifer. Hayward et al. (1993) also found that no breeding male owls were found below 1292 m, and 75% of the Owls were above 1584 m. Gap analysis (Redmond, et al. 1998) identified 5 million ha of the state as Boreal Owl habitat.

Ecology. Foraging areas are predominantly spruce/fir habitats. Boreal Owls hunt from perches usually after dark. They fly from perch to perches at approximately five minute intervals (Hayward and Hayward 1993). Prey consists of small mammals (e.g. red-backed vole), birds (especially thrushes) and insects during summer months.

Management Issues/Recommendations. No habitat recommendations were developed for this species. It is one of several owl species which have been surveyed haphazardly on Montana forest lands. A unified monitoring effort for all owl species is needed to identify important areas and develop recommendations for nesting habitats.

Habitat and Population Objectives: Spruce / Fir

No specific management guidelines or recommendations were developed for this lower priority habitat. Our objective is to implement count-based monitoring, incorporating nocturnal birds, in conjunction with partners in adjoining states and provinces.

Limber Pine / Juniper

Description, Status and Importance. This habitat was identified to incorporate several, generally lower elevation habitats dominated by limber pine and juniper. The Limber Pine type identified by the Montana Gap project occurs at a wide range of elevations (620 - 3350m), and is dominated by limber pine with 20-50% cover. Juniper species occur in association, with a grass-forb dominated understory. Higher elevation examples of this type are more similar to our whitebark pine type. Juniper dominated types include Rocky Mountain Juniper, found statewide (570-2460m), often in association with sagebrush types, and Utah Juniper, limited to the small portion of the Wyoming Basin physiographic area (86) in southeastern Montana. In aggregate, these 3 Gap types comprise about 250,000 ha, or less than 1% of the state (Redmond et al. 1998).

Limber pine plays an important role in the ecology of the Clark's Nutcracker, especially in areas where whitebark pine is unavailable. Otherwise, these low-structured woodlands do not support significant numbers of priority bird species and are therefore a low priority habitat.

Habitat and Population Objectives: Limber Pine / Juniper

No specific management guidelines or recommendations were developed for this lower priority habitat. Our objective is to implement count-based monitoring, in conjunction with partners in adjoining states and provinces.

Dry Subalpine Fir / Lodgepole Pine

Description, Status and Importance. This low priority habitat type corresponds to the Lodgepole Pine and Douglas-fir/Lodgepole Pine types in the Montana Gap report. These types are found on mid- to upper elevations (550-3200m), primarily in the western and south-central part of the state (Redmond et al. 1998). Lodgepole pine is the dominant tree species, although the climax type is subalpine fir. Huckleberry, spirea and pinegrass are common understory associates. Lodgepole pine forests generally support the lowest species diversity of birds of any Montana forest type, but can be important to a few of our priority species (Table 15).

Table 15. Relationships of Montana PIF priority species to vegetative structural components, Dry Subalpine Fir / Lodgepole Pine habitat type.

Species	Area Dep.	Canopy: Open	Canopy: Closed	Old Growth	Understory: Patchy	Understory: Open	Understory: Closed	Large Snags	Large Trees	Large Logs	Comments
Great Gray Owl				x				x	x		openings
Three-toed Woodpecker	x										dying or recently dead
Townsend's Solitaire		x									cut/burned
Townsend's Warbler			x	x							
Chipping Sparrow					x						cut/burned

Those species most common in this forest type are mostly generalists, or are more dependant on a different type (e.g. Moist Douglas-fir) previously covered in this plan. In many instances, lodgepole pine stands occur as a result of stand-replacing fires. Residual snags may be adequate to support priority cavity-nesting species in such cases, if timber harvest and prescribed fire are applied in a way that protects the snags. Three-toed Woodpeckers, Townsend's Solitaires, and Chipping Sparrows have all showed positive responses to such management at one study area on the Flathead National Forest (Casey, unpubl. data).

Habitat and Population Objectives: Dry Subalpine fir / Lodgepole

No specific management guidelines or recommendations were developed for this lower priority habitat. Our objective is to implement count-based monitoring, in conjunction with partners in adjoining states and provinces.

RIPARIAN

Riparian habitats typically support more species of breeding and migratory birds than any other terrestrial habitats in the West. They support far and away the most priority species (Table 16) among the habitats considered in this plan. Because most riparian habitats occur as a limited element in the landscape, even positive population trends of riparian-dependent species can be quickly reversed by changes in riparian habitat availability and management.

Table 16. Occurrence of Montana PIF priority species by riparian habitat type and successional stage (E=early, M=mid, L=late)

SPECIES	Priority	Deciduous Forest			Coniferous Forest			Riparian Shrub			Woody Draws			COMMENTS
		E	M	L	E	M	L	E	M	L	E	M	L	
Harlequin Duck	I					X	X							Overhanging trees
Barrow's Goldeneye	II			X			X							
Hooded Merganser	II			X			X							Tree cavities
Sharp-shinned Hawk	III		X	X		X	X	X	X	X	X	X	X	
Bald Eagle	II	X	X	X	X	X	X							
Swainson's Hawk	III			X									X	
Peregrine Falcon	II	X	X	X				X	X	X				Mature trees
Ruffed Grouse	II	X	X		X	X								
Col. Sharp-tailed Grouse	II										X	X		Shrubs (winter)
Piping Plover	I	X												
Killdeer	III	X												Gravel Bars
Interior Least Tern	I	X												
Black-billed Cuckoo	II	X	X									X	X	Dense shrubs
Yellow-billed Cuckoo	II	X	X									X	X	Dense shrubs
E. Screech-owl	III			X									X	Tree cavities
W. Screech-owl	III			X			X						X	Tree cavities
Vaux's Swift	II			X			X							Snags, old growth
Black Swift	II													Waterfalls, cliffs
Calliope Hummingbird	II							X	X	X				P.A. 64 only
Rufous Hummingbird	III								X	X				
Downy Woodpecker	III		X	X						X		X	X	
Lewis's Woodpecker	II			X										
Red-headed Woodpecker	II			X										
Red-naped Sapsucker	II			X										
Willow Flycatcher	II		X						X	X				
Least Flycatcher	III		X											
Hammond's Flycatcher	II		X											
Cordilleran Flycatcher	II			X			X							
American Dipper	III		X	X		X	X							
Red-eyed Vireo	II			X									X	
Warbling Vireo	III		X	X								X	X	
Veery	II		X	X		X								
Gray Catbird	III								X	X		X	X	

SPECIES	Priority	Deciduous Forest E	Deciduous Forest M	Deciduous Forest L	Coniferous Forest E	Coniferous Forest M	Coniferous Forest L	Riparian Shrub E	Riparian Shrub M	Riparian Shrub L	Woody Draws E	Woody Draws M	Woody Draws L	COMMENTS
Nashville Warbler	III								X	X				
Ovenbird	III		X	X		X	X					X	X	
MacGillivray's Warbler	III		X	X					X	X				
American Redstart	III		X	X					X	X				
Lazuli Bunting	II								X	X				
Orchard Oriole	III			X										Very open stands
Song Sparrow	III	X	X	X				X	X	X				
Brewer's Blackbird	III		X	X								X	X	lowest priority
Red-winged Blackbird	III	X	X					X	X	X				lowest priority

Riparian Deciduous Forest (Cottonwood/Aspen)

Description. Riparian Deciduous Forest is used here to describe the gallery forests and woodlands of (generally) lower elevation floodplains, along with the complex riverine habitats they are associated with (gravel bars, sloughs, etc.). The dominant tree species are generally poplars, with black cottonwood dominant in western Montana, plains cottonwood in the east, and narrowleaf cottonwood in the upper Yellowstone system. Aspen can also be a dominant species, especially on higher elevation tributaries.

Geographic Extent in the State. Cottonwood and/or aspen forests can be found in the floodplain of all the major rivers of the state, and their tributaries. In most of the major river valleys, there have been significant declines in the extent of this habitat, primarily due to agricultural conversion.

Importance. Riparian habitats, and those dominated by deciduous trees in particular, are known to support the highest diversity of breeding birds of any habitats in the western U.S. They also serve as critically important migration corridors for a wide variety of bird species, from waterfowl to canopy-dwelling warblers. At least 134 (55%) of Montana's 245 species of breeding birds (Appendix B) use riparian forests during all or part of the year, including 54 (50%) of the 107 priority species identified in this plan. Twenty of these (Table 17) are considered in the conservation recommendations presented herein.

Vegetation Structure. Mature stands are dominated by cottonwood, with a well-developed canopy. In many cases, there can be a coniferous component to the canopy as well, with Engelman spruce, Douglas-fir, or even pines. In western Montana, moist low elevation sites can have western redcedar, western hemlock or paper birch as a canopy element. Common understory shrubs include red-osier dogwood, alder, willow and serviceberry. In ungrazed or lightly grazed areas, this shrub layer can be nearly continuous. Generally, this habitat is naturally fragmented or linear in nature, with bands of mature trees interspersed with open areas of riparian shrub or flood-influenced areas of grasses/forbs. In natural flow regimes, there is a mix of age structures corresponding to different flood events and periods of regeneration. Lower elevation reaches with low gradients typically have braided river channels, which add further complexity to the habitat structure.

Amount of Habitat. The Montana Gap model predicts there are just under 200,000 ha of "Broadleaf Riparian" habitat in the state, or about 0.5% of the land base (Redmond et al. 1998), and <40,000 ha of

"Mixed Broadleaf & Conifer Riparian" forest. The amount of associated gravel bars and other riverine habitats cannot be extracted from the Gap summaries.

Table 17. Relationship of Montana PIF priority species to vegetative and structural components, Riparian Deciduous Forest habitat type.

Species	Snags	Large Trees	Sand/Gravel Bars	Dense Shrubs	Dense Saplings
Barrow's Goldeneye	x	x			
Hooded Merganser	x	x			
Bald Eagle		x	x		
Ruffed Grouse		x		x	x
Piping Plover			x		
Killdeer			x		
(Interior) Least Tern			x		
Black-billed Cuckoo				x	x
Yellow-billed Cuckoo				x	x
Eastern Screech-Owl	x	x			
Western Screech-Owl	x	x			
Downy Woodpecker	x	x			
Lewis's Woodpecker	x	x			
Red-headed Woodpecker	x	x			
Least Flycatcher		x		x	x
Cordilleran Flycatcher		x			
Veery				x	
Red-eyed Vireo		x		x	x
American Redstart				x	x
Ovenbird		x			

Management Issues. The habitat integrity and availability of those habitat components most important to birds have been compromised in many parts of the state, and there are continued threats to this habitat. Generally, degradation has resulted either through interruption or alteration of natural flood processes, or through direct removal of vegetation through grazing, clearing or logging. Changes in flow regimes can have a profound effect on the mix of seral stages present along river reaches, as cottonwoods require flooding and silt deposition for germination. In many cases where the seasonal pattern of high flows has been removed or stabilized, there is a threat of inadequate recruitment to replace older trees as they die. In the most extreme examples of flow alteration, dewatering on the one hand, and inundation through damming on the other, all riparian habitat values can be lost.

Most other management issues involve the removal of one or more layers of vegetation, in which case entire suites of breeding birds and significant value to migrants can lost. Examples include over-grazing, clearing for agricultural use, and residential development. Invasion of exotics, notably Russian olive, can also change the habitat suitability of this type. Lowland riparian often traverse a matrix of agricultural or suburban habitats. Because of their linear nature, edge effects such as increased predation and parasitism of nests are serious problems for many of the species using this habitat. Research in western Montana (Tewksbury, pers. comm.) Has shown that landscape patterns within a 1 km radius can have a significant effect on breeding bird success within a stand, particularly if farms with waste grain, feedlots, pasture, or even ranchettes with horses are in the vicinity. The presence of residences increases the demand for flood control, in addition to the introduction of predators (primarily house cats). The use of valley bottoms as transportation corridors (highways, railroads, transmission lines) has also caused incremental losses in riparian vegetation.

Specific activities which have the most direct effects on riparian deciduous forest and its bird communities include:

- Flood control and channelization through rip-rapping and other means;
- Dam construction and operation;
- Logging, particularly of older cottonwoods for lumber or pulp;
- Water diversion for irrigation;
- Clearing for agriculture (crops, hay, pasture);
- Grazing;
- Residential development;
- Recreational use.

Interior Least Tern

Priority Level: I MT Score: 17 AI: 3

Reason for Concern. The Least Tern has suffered both habitat and population losses throughout its range in North America, primarily due to recreational impacts and development of its preferred nesting habitat. The Interior Least Tern is listed as a Endangered subspecies by the U.S. Fish and Wildlife Service, due to declines throughout the Mississippi drainage. Riverine nesting populations are susceptible to nest flooding, and have lost habitat to dams and development. In some cases reservoirs have created suitable beach nesting habitat.

Distribution. Breeding range of the Interior Least Tern in Montana is restricted to the east and north-east along the Missouri River, Yellowstone River (lower reaches), islands in Fort Peck Reservoir and in the Medicine Lake-Plentywood area. Transient records are limited primarily to these same areas (Montana Bird Distribution Committee 1996). In most years, the highest nesting population (as many as >100) is found on the Missouri River below Fort Peck Dam, with lesser numbers (25 adults) on the Yellowstone River below Miles City.

Habitat Requirements. Interior Least Tern breed on flat, sparsely vegetated to barren sand and gravel bars associated with the Missouri and Yellowstone River systems. They are included here because these systems are dominated by deciduous riparian forests. Open, wide river channels and lake or pothole shorelines are characteristics of preferred nesting habitat in the state. The lower reaches of the Yellowstone River represent marginal habitat because of the silty, fine sand nature of the substrate, but Kreil and Dryer (1978) felt that Terns use these areas because of the limited developments/ human disturbance.

Nests are usually placed higher on the sandbars away from waters edge because of high water flows early in the year. They consist of shallow depressions often associated with conspicuous objects such as larger stones or woody debris. Interior Least Terns can nest solitarily or in colonies and are often found in association with Piping Plovers. Home range during the breeding season is usually limited to the margins of the sandbar or potholes. Reel et al. (1989) found that nest were often associated with shallow areas of lakes or backwaters that offer an abundant food source.

Population Status. The current nesting population of Interior Least Terns in Montana has been above the recovery plan goal for the state (50 breeding adults) in all recent years (A. Dood, pers. comm.), and has been as high as 175 adults.

Management Recommendations. *A USFWS recovery plan is already in place for this species.*

Barrow's Goldeneye

Priority Level: II MT Score: 22 AI: 3

Reason for Concern. This cavity-nesting duck is poorly monitored in the state, and is not typically a target species for waterfowl habitat conservation projects. More than 1/3 of its population is found in the northern Rockies (p.a. 64).

Distribution. The Barrow's Goldeneye breeds in the western U.S. from western Montana west into Oregon, north through western Canada into Alaska. They are found throughout Montana west of the continental divide (Montana Bird Distribution Committee 1996). They overwinter in small numbers at lower elevations, though most migrate to the coasts.

Habitat Requirements. This species prefers small subalpine lakes or backwater sloughs. They nest in cavities (e.g. Pileated Woodpecker, Northern Flicker), usually within 100m of water, but sometimes much further (1500 m, Bellrose 1978). Broods are reared on small lakes, ponds or sheltered backwaters.

Ecology. They may be limited by food resources, which are mainly insects, crayfish, and aquatic plants.

Management Issues/Recommendations. Although this species will accept nest boxes, management to provide natural snags will provide for the needs of a wider range of species.

Hooded Merganser

Priority Level: II MT Score: 21 AI: 3

Reason for Concern. This cavity-nesting duck is poorly monitored in MT, and is not typically a target species for waterfowl habitat conservation projects. Nearly 1/4 of its population resides in physiographic area 64.

Distribution. Hooded Mergansers nest throughout the northeastern United States, and across Canada, and in the northwest from Washington into western Montana. They breed primarily west of the continental divide in Montana (Montana Bird Distribution Committee 1996). They overwinter in small numbers in the state.

Habitat Requirements. Wooded streams and riparian forests are the preferred nesting habitat. Suitability of nesting habitat is dependent on suitable nest trees, shallow clear water, and high fish and invertebrate prey densities (Dugger et al. 1994). They will move into a variety of wetlands to raise their broods.

Ecology. Hooded Mergansers feed primarily on small fish, crustaceans, molluscs, and insects. The nest is usually in a cavity directly over or immediately adjacent to water.

Management Issues/Recommendations. Larger riparian stands or braided stream channel complexes are probably most important as a buffer to human disturbance. Retention of snags in riparian areas is crucial to nesting success.

Bald Eagle

Priority Level: II   MT Score: 18   AI: 3

Reason for Concern. After serious population declines in the late 1960's and 1970's, the Bald Eagle was listed as a threatened species in the Rocky Mountain states. Montana has a high responsibility for the species, with over 225 occupied nesting territories in 1999. The species has been proposed for delisting, but it is important to continue monitoring its breeding success in the state, in part as a requirement of the delisting process.

Distribution. Transient records of Bald Eagle exist throughout most of the State. Breeding records are concentrated in the western one-third of the state and eastward along the Yellowstone River. Additional breeding records have been documented in the central portion of the state in association with the Missouri River. Gap (Redmond et al. 1998) modeling predicted approximately 900,000 ha of habitat (2% of Montana).

Habitat Requirements. Bald Eagles seem to prefer late successional forests and shorelines adjacent to open water lakes and rivers. The Montana Bald Eagle Working Group (MBEWG 1991) characterized quality habitat as mature forest stand of low to moderate canopy closure consisting of cottonwood, Douglas Fir, Ponderosa pine or mixed conifer. Forest stands with nest sites should be 20 ac or larger and be located within one mile of open water. The stand should contain at least two suitable nest trees and more than three perch trees. Harmata (Clark et al., 1998) indicated that the birds in the Greater Yellowstone area breed in riparian or lacustrine areas and selected large trees for nesting within 1.5 km of river or lake shores.

Bald Eagle nest site management decisions must take the prey base into account. Because young birds are especially susceptible to food deprivation, the Montana Bald Eagle Working Group (1991) recommends feeding habitat be greater than 80 ac with shallows, grasslands and meadows intermixed. Outside of the breeding period, distribution and abundance of eagles reflects food supply and available roost trees (Johnsgard, 1990).

Management Issues. Bald Eagles are sensitive to human disturbance particularly if activity occurs after nest initiation and prior to fledging. For this reason, the Montana Bald Eagle Working Group prepared a management plan outlining recommendations for minimizing disturbance within and near nesting territories during the nesting season (MBEWG 1991). These include strictly limiting human activity within 0.25 mi of the nest site from February through June, and they recommended that no more than 10 percent of the shoreline be developed on lakes within occupied nesting territories. Montana PIF members recommend the continued use of the MBEWG guidelines.

Black-billed Cuckoo

Priority Level: II MT Score: 19 AI: 2

Reason for Concern. Both cuckoo species in Montana are highly reliant on healthy riparian ecosystems, and both are essentially unmonitored.

Distribution. Montana is on the western edge of the Black-billed Cuckoo's range. They breed from eastern Alberta across to the Atlantic coast, south through central Montana and eastern Wyoming and as far south as Oklahoma. In Montana, they breed or are suspected to breed throughout the state except for the far western latilongs, but the only confirmed breeding is in the southern tier of the state, primarily within the Yellowstone River corridor (Montana Bird Distribution Committee 1986).

Habitat Requirements. Black-billed Cuckoos breed in forests and open woodlands, generally at lower elevations, in prairie thickets, and shelterbelts (Ehrlich et al. 1988; Dobkin 1994). Woodlands should have a shrubby understory (Baicich and Harrison 1997). Terres (1980) noted that this species "...lives in more extensive woodlands than yellow-billed and tends to be more abundant in northern part of range often shared by both species..."

Ecology. Little appears to be known about Black-billed Cuckoo ecology or habitat requirements. They nest in a tree or shrub, in a vine tangle, on the ground, or occasionally on a log. Black-billed Cuckoos primarily eat insects. Their populations tend to vary in response to tent caterpillar densities. Spencer (1943) observed several nests and noticed that insect larvae made up 90% of the food brought to the nest; the other 10% was miscellaneous insects.

Management Recommendations. Black-billed Cuckoos should benefit from any efforts to maintain the mature canopy component of cottonwood forests, especially in areas where the understory is protected from overgrazing. Count-based monitoring is needed to track populations of this species in the state.

Yellow-billed Cuckoo

Priority Level: II MT Score: 18 AI: 2

Reason for Concern. Both cuckoo species in Montana are highly reliant on healthy riparian ecosystems, and both are essentially unmonitored. Yellow-billed Cuckoo populations elsewhere in the West (e.g. AZ, CA) have undergone drastic population declines due to habitat loss and degradation.

Distribution. The Yellow-billed Cuckoo breeds from interior California, east to northern Utah, Minnesota, and New Brunswick, and south to southern Baja California, Mexico, and the Gulf Coast. It winters in Central American and South America. In Montana, there are suspected breeding records only in southeastern

Montana and in latilong 38 (Montana Bird Distribution Committee 1996).

Habitat Requirements. An overstory of tall deciduous forest (especially cottonwood) with canopy closure is a necessary constituent of Yellow-billed Cuckoo habitat. Cuckoos will also use deciduous shrubs (e.g., willow, alder), but only if there are adjacent tall trees present. The tall trees are used for foraging and song perches. A midstory of deciduous shrubs is a necessary constituent of Yellow-billed Cuckoo habitat. Cuckoos nest in low to mid layers. A thick understory is beneficial. Old successional stage of forested riparian is better habitat.

Water, in the form of large, slow moving stream, or of ponds and lakes, is usually present at most nest territories. Territories are usually along flood plains of larger streams at lower elevations.

Ecology. Yellow-billed Cuckoos build nests in trees or shrubs, and occasionally use the nests of other species. Their nests usually are 1.2 to 2.4 m (4 to 8 ft) high in the tree or shrub, ranging from 0.9 to 6 m (3 to 20 ft; Ehrlich et al. 1988). Cuckoos are rarely hosts to Brown-headed Cowbirds. Yellow-billed Cuckoos generally have large home ranges, around 16 ha (40 ac); smaller areas do not contain nesting cuckoos. Yellow-billed Cuckoos eat mainly caterpillars, and their populations tend to vary in response to tent caterpillar densities. They will also eat other insects, some fruits, and occasionally small lizards and frogs (Ehrlich et al. 1988). They glean food from foliage, or hover and glean.

Management Issues. Loss of mature cottonwood forests, and lack of recruitment have decreased suitable and future habitat for this species. Fragmentation of cottonwood forests has resulted in many areas with patch sizes below the recommended minimum. Forested riparian patches should be larger than 16 ha (40 ac), with a minimum of 20-25% of this area having tall trees with a closed canopy. The tall tree corridor should probably be more than 1 or 2 tree wide. Riparian areas with tall trees, but incomplete mid and lower stories will probably be used as movement corridors, but will not attract nesting cuckoos. Urban areas adjacent to dense forested riparian habitat maybe reduce cuckoo use, as cuckoos are susceptible to human disturbance. Pesticides have been a problem for Yellow-billed Cuckoos. Pesticides reduce potential prey items and egg shell thinning has been reported. While egg shells are thick enough to withstand breakage, embryos can be killed because the thin shell loses water too rapidly.

Red-headed Woodpecker

Priority Level: II MT Score: 19 AI: 3

Reason for Concern. This national Watch List species is another riparian associate which is essentially unmonitored in Montana, but which relies on mature trees for nesting.

Distribution. Evidence of breeding has been recorded throughout the eastern one-half of the state. Transient (including older historical records have been documented everywhere in the state with the exception of the extreme northwest and extreme southwest (Montana Bird Distribution Committee, 1996). Gap (Redmond et al., 1998) modeling predicted 500,000 ha of habitat within the state (or about 1.3% of Montana's landmass).

Habitat Requirements. Red-headed Woodpeckers tend to inhabit open and park-like areas of forest. Scott et al. (1977) found that the species required many snags, lush ground cover, and open canopy. In

Montana Red-headed Woodpeckers are found primarily along major rivers within the associated riparian forest. They are also present in open savannah country as long as adequate ground cover, snags and canopy cover can be found. Large burns are also utilized (Bent 1939, Ehrlich et al. 1988).

Management Recommendations. Provision of a decadent tree element over the long term should maintain habitat suitability for the species. This requires limiting cutting of larger trees, and allowing for recruitment of older trees/snags over time.

Cordilleran Flycatcher

Priority Level: II MT Score: 21 AI: 3

Reason for Concern. Nearly 40% of this species' population inhabits the two physiographic areas overlapping the state. We therefore have a high responsibility for the species. Population trend data are inconclusive.

Distribution. The Cordilleran and Pacific-slope Flycatchers were formerly lumped as one species, the Western Flycatcher, and were split in 1989. According to the range map in Griggs (1997), the line separating the two species runs from the middle of British Columbia down through the middle of Washington and Oregon and along the western border of northern California. The Cordilleran Flycatcher breeds from southeastern Washington, southwestern Alberta, northern Idaho, western Montana, Wyoming, and western South Dakota, south (generally east of the Cascades and Sierra Nevada) to northern California, Nevada, portions of Arizona and Mexico, western Texas, and western Nebraska. It winters from southern Baja California and northern Mexico, south through its breeding range. In Montana, it breeds in appropriate habitat throughout the western 2/3 of the state (Montana Bird Distribution Committee 1996). There are no records of the Pacific-slope Flycatcher in Montana.

Note: *Because of the recent split of the Western Flycatcher, determining the difference between published information on Cordilleran and Pacific-slope Flycatcher ecology and habitat requirements is difficult. Where it isn't obvious, from range distribution, to which species authors probably referred, the old species name of Western Flycatcher is used herein.*

Habitat Requirements. Cordilleran Flycatchers breed in montane forests and woodlands near cliffs, in shady canyon bottoms, and near streams (Dobkin 1988, DeGraaf and Rappole 1995). They are found in dense second growth aspen and riparian woodlands. However, Hejl et al. (1995), in a review of several studies in coniferous and aspen forests, found Cordilleran Flycatchers common in mixed conifer forests (primarily dominated by Douglas fir) and lodgepole pine forests, and uncommon to rare in 6 other forest types, including aspen. Hejl et al. (1995), found that Cordilleran Flycatchers were similarly abundant in partially cut vs. uncut forests. Grinnell and Miller (1944) describe habitat in California (so referring to the Pacific-slope Flycatcher) as characteristically near running water; water and shade are considered factors limiting the range of the Western Flycatcher (NV--Van Rossem 1936, CA--Grinnell and Miller 1944, West--Peterson 1961, CA--Zeiner et al. 1990). Edge habitat is important for feeding, specifically trees along shrubs, grass, or water edges (Timossi 1990).

Manuwal (1991), in the southern Washington Cascade Range, found the Western Flycatcher positively correlated with snags and live trees together. Balda (1975) stated that the presence of Western Flycatchers in an area appears to be dependent on the presence of shaded areas and some thick underbrush, as well as snags with cavities or other appropriate nest sites. He calculated that to maintain the observed density of 7 pairs/40 ha (100 ac), 15.3 snags at least 25 cm (10 in) per 40 ha (100 ac) per year would be needed, assuming an 82% snag nest site use, 2 nesting attempts/year, and no reuse of nesting snags.

Ecology. Western Flycatchers nest in cavities of live trees and snags, in exposed root wads of fallen trees, on stream banks, and on rock ledges (Ehrlich et al. 1988). They feed mostly on insects, but also eat some berries and seeds. They capture insects by sallying out from a perch, or by hovering or gleaning.

Balda (1975) estimated that 2 Western Flycatcher pairs in Arizona had an average territory size of 0.57 ha (1.41 ac). In Colorado, in aspen-conifer habitat, there was a density of 6.9 and 1.2 birds/10 ha (25 ac) in 2 consecutive years. Balda (1975) reported a density of 7 pairs/40 ha (100 ac) in each of 3 ponderosa pine sites and densities of 30, 5, and 17 pairs/40 ha (100 ac) in 3 mixed conifer sites in Arizona.

Management Issues. Loss of snags due to timber harvest or firewood cutting would mean fewer nesting sites. Any activity that would remove the dense understory preferred by this species would be detrimental. Use of cutbanks and other physical cover features may make them particularly vulnerable to damage to streambanks from overgazing.

Veery

Priority Level: II MT Score: 18 AI: 3

Reason for Concern. The Veery is a national Watch List species that has shown significant population increases in the northern Rockies. But its preference for large riparian stands with dense understory, and its susceptibility to cowbird parasitism, make it vulnerable to landscape changes. It is poorly monitored in the state.

Distribution. The Veery breeds from southern British Columbia, east across southern Canada to Newfoundland, and south to Oregon, Colorado, portions of the Midwest, and southern Appalachians. They breed in appropriate habitat throughout Montana (Montana Bird Distribution Committee 1996). They winter in northern South America.

Habitat Requirements. Veerys breed in moist, low elevation deciduous forests with a dense understory. They are also found in very thick and wide willow or alder shrub riparian habitat near water. Dominant plant species include willow, alder, water birch, dogwood, currant, rose, aspen, and cottonwood. Results of an Idaho study indicated that in a cottonwood forest, Veerys showed a preference for dogwood subcanopies (Saab 1996). The probability of finding Veerys present in cottonwood riparian forest increases with patch size (Saab 1996).

Ecology. The Veery builds a cup-shaped nest, preferably on moist substrate, on the ground or in a shrub (Groves et al. 1997). Veerys feed on insects, and some fruit and spiders. They mostly feed on the ground, will swoop from a perch to the ground to capture prey, foliage glean, and occasionally hawk insects from the air.

Management Issues. The Veery is a fairly common cowbird host. Results of an Idaho study indicated that numbers were significantly reduced in grazed areas and campgrounds compared to relatively undisturbed sites (Saab 1996). However, it may select for disturbed forests where the understory is denser than in non-disturbed forests. Mosconi and Hutto (1982) found a negative response to grazing when comparing heavy vs. light grazing intensity.

Red-eyed Vireo

Priority Level: II MT Score: 16 AI: 3

Reason for Concern. The Red-eyed Vireo is essentially a riparian obligate in Montana. Populations show significant downward trends in both p.a. 64 and 39, but interestingly, an upward trend (PT/PTU = 2/2) in Montana. The species is vulnerable to fragmentation and subsequent nest parasitism.

Distribution. The Red-eyed Vireo breeds from British Columbia and probably southeastern Alaska, east across portions of Canada, and south to northern Oregon, northern Idaho, eastern Colorado, Texas, the Gulf Coast, and southern Florida. It winters in South America. In Montana, it breeds in appropriate habitat throughout the state (Montana Bird Distribution Committee 1996).

Habitat Requirements. Red-eyed Vireos breed in aspen, poplar, or other deciduous forests and woodlands, riparian woodlands, and suburban/urban shade trees. Hutto (1995) considered this species restricted to aspen/cottonwood bottomland forests, or other types (marsh/wetland, riparian shrub) when cottonwoods or aspen was present. They also nest in coniferous forests, second growth woodland, scrub, and thickets (AOU 1983).

Ecology. Red-eyed Vireos build cup-shaped nests in deciduous shrubs or in deciduous trees with sapling undergrowth. They mostly eat insects, but also eat some fruit, snails, and spiders. They feed by hover-gleaning or by gleaning insects from foliage. Territories average about 0.53 ha/pair (1.3 ac/pair) and can vary from 0.4 to 4 ha/pair (1 to 10 ac/pair; Williamson 1971). This species is one of the most frequent cowbird hosts.

Management Issues. Grazing in riparian forests or adjacent affects them by removing the shrub understory and by attracting cowbirds. Protection of the canopy layer and provision for cottonwood recruitment need to be combined with livestock management to provide for this species over the long term.

Killdeer

Priority Level: III MT Score: 18 AI: 3

Reason for Concern. Due to their tolerance for a wide range of nesting habitat, the Killdeer population of North America is now relatively stable, but records show that the population has declined in North America over the past 25 years (Redmond, et al.1998). Killdeer have been identified as "declining in world population" (Harrington and Perry 1995). This very common bird has shown significant declines in Montana.

Distribution. The Killdeer is widespread throughout North America and Canada, from coast to coast. Typically found at the water's edge, they also inhabit uplands, mudflats, coastlines, and urban areas; in Montana they are confirmed breeders in almost every latilong block (Montana Bird Records Committee

1996). They winter throughout Montana in low numbers, and throughout much of North America. They are often picked up on Christmas Bird Counts, though they tend to move south with inclement weather (Kaufman 1998).

Habitat Requirements. Killdeer are highly adaptive birds and will nest in many different areas. Often the nest site is far from water. The main requirement for nest site selection seems to be a large open space with sparse vegetation for good viewing, such as gravel bars in riparian systems. The most successful nest locations are near water as to provide good foraging for chicks (Kaufman 1998). This species is also much more adapted than other plovers to nesting in areas highly used by humans, including roadsides, gravel parking lots and rooftops, mowed fields, pasture lands, large lawns and golf courses. In the southern extent of their range, they are resident year round. Northern migrants often do not move farther than they have to as influenced by weather.

Ecology. Killdeer are primarily insectivorous, but will eat just about anything they can find. They consume beetles, centipedes, caterpillars, grasshoppers, fly larvae, spiders, and earthworms. Also forage in wetlands at water's edge, taking crustaceans, aquatic insects, crayfish, and snails. Killdeer have also been know to eat small amounts of seeds as well (Kaufman 1998, Redmond, et al.1998). Spring migration is earlier than many other shorebirds; they often return to breeding grounds as early as February and March. (Kaufman 1998). Nest sites are open areas or areas with short, sparse vegetation, including fields, shorelines, mudflats, and such urban areas as large lawns, roadsides and gravel rooftops (Kaufman 1998). Areas of extended view are a requirement for nesting (Ehrlich et al 1988). Nest structures are simple scrapes lined with local substrate, occasionally lined with grasses. Incubation is by both parents, 24-28 days (Kaufman 1998). In drier environments, Killdeer may cool eggs by soaking belly feathers in water. (Paulson 1993). Young feed themselves but are tended by both parents. First flight around 25 days. In ideal habitats, Killdeer my raise two broods per year. (Ehrlich et al 1988).

Management Issues. Some regional populations may be vulnerable to livestock trampling, as heavily grazed areas of prairie or pasture are often used for nesting (Dobkin 1994, Page and Gill 1994). Their propensity to nest in highly modified habitats near man probably increases the risk of predation, as well as exposure to harmful pollutants.

Management Recommendations.

- Develop outreach materials using this easily-recognized and familiar species to illustrate the concept of "keeping common birds common".

Eastern Screech-owl

Priority Level: III MT Score: 19 AI: 3

Reason for Concern. Both screech-owl species were designate as local interest species by Montana PIF because monitoring is needed to clarify their distribution, habitat use and population status in the state.

Distribution. This species breeds throughout the eastern U.S., as far west as the Great Plains, including eastern Montana. Confirmed and suspected breeding areas in the state are primarily in the southeast (Montana Bird Distribution Committee 1996), although they may occur as far up the Missouri River as Great

Falls (S. Martin, pers. comm.).

Habitat Requirements. Within Montana they are probably restricted to riparian habitats along the Missouri River and Yellowstone River corridors, and their major tributaries such as the Milk River. Use of other forested habitats is poorly known. They are also often found associated with shelterbelts situated near farmsteads, and probably use a variety of urban/suburban habitats where suitable nesting habitat is available.

Ecology. Eastern Screech-owls forage in woodland understory and along habitat edges with meadows. Insects and small mammals form the bulk of their diet. They are secondary cavity nesters, and snags as small as 6" dbh are probably acceptable, as long as flicker holes or other cavities are present.

Management Issues/Recommendations. As a cavity-nesting predator, this species is dependent on a component of dead and dying trees, in combination with habitat conditions suitable to sustain an adequate small mammal prey base. Integrated monitoring is needed to delineate its range and determine its population status.

Western Screech-owl

Priority Level: III MT Score: 18 AI: 3

Reason for Concern. Both screech-owl species were designate as local interest species by Montana PIF because monitoring is needed to clarify their distribution, habitat use and population status in the state.

Distribution. Western Screech-owls are found throughout the western U.S., from the Pacific eastward to the Rocky Mountains and western Great Plains. In Montana, the easternmost records are from the Bozeman area.

Habitat Requirements. Within Montana, the Western Screech-owl is most common in riparian gallery forests. They are probably associated closely to black cottonwood and aspen (Holt and Hillis 1987), however they have also been documented using mixed conifer forest.

Ecology. Western Screech-owls forage in woodland understory and along habitat edges with meadows. Insects and small mammals form the bulk of their diet. They are secondary cavity nesters, and snags as small as 6" dbh are probably acceptable, as long as flicker holes or other cavities are present.

Management Issues/Recommendations. As a cavity-nesting predator, this species is dependent on a component of dead and dying trees, in combination with habitat conditions suitable to sustain an adequate small mammal prey base. Integrated monitoring is needed to delineate its range and determine its population status.

Downy Woodpecker

Priority Level: III MT Score: 13 AI: 3

Reason for Concern. Downy Woodpeckers are declining (PT/PTU = 5/2) in the northern plains (p.a. 39), but probably stable or increasing in Montana (2/4). They were designated as a local interest species due to their reliance on smaller snags and woody material in riparian systems.

Distribution. The Downy Woodpecker is found throughout the U.S., although its distributions is more patchy in the Rockies than either to the east or west (Price et al. 1995). Although they are found throughout Montana, most confirmed breeding is in the more forested south and western portions of the state (Montana Bird Distribution Committee 1996). They can be found in cottonwoods along all waterways in Montana.

Habitat Requirements. Although they are usually found in riparian habitats, Downy Woodpeckers will also use other types, including aspen groves, burned forests and mid-successional clearcuts (Hutto 1995). Deciduous riparian habitats around lakes and ponds are frequently used, as are mixed coniferous/ deciduous habitats and urban/suburban areas.

Ecology. This species is our smallest primary cavity nester, and as such provides suitable nest sites for such secondary nesters as Black-capped Chickadee, Red-breasted and White-breasted Nuthatch, and even **Cordilleran Flycatcher**. Foraging is by both excavation or pecking/gleaning on a wide variety of substrates, including trunks, large branches, small branches, shrubs, cattails, and forb stalks.

Management Issues/Recommendations. Although no specific conservation actions are proposed for this species, their needs could be addressed by protecting snags of all sizes (no minimum) in riparian systems.

Least Flycatcher

Priority Level: III MT Score: 17 AI: 3

Reason for Concern. This riparian obligate has shown significant population increases in p.a. 39, although Montana data are inconclusive. Their reliance on a multi-storied riparian forest makes them vulnerable to landscape change.

Distribution. The Least Flycatcher breeds throughout the northern U.S. and Canada. They can be found along rivers throughout the state.

Habitat Requirements. The Least Flycatcher inhabits deciduous and mixed forests, occasionally conifer groves, burns, swamp and bog edges, orchards, and shrubby fields. In riparian areas, the dominant plant species composition is cottonwoods with an understory of willows, alder. In eastern Montana, they use low elevation gallery cottonwood forest. On the Bitterroot and Flathead Rivers in western Montana, they are tied to successional stage, using tall gallery trees in semi-open, second growth and mature riparian forests. They are often found near open spaces--forest clearings and edges, water, roads, and cottage clearings, although they are also reported to be more abundant in dense and closed canopy forests away from disturbances and openings.

Not small, isolated patches. Does get parasitized by cowbirds. Positive response to grazing when comparing heavy to light grazing (Mosconi and Hutto 1982 cited in Saab et al. 1995).

Ecology. The Least Flycatcher nests in a notch of a small tree or sapling or on a limb or larger branch, mostly using deciduous trees or shrubs. Least Flycatchers eat insects, which they catch by hover-gleaning and by hawking, primarily in the lower portions of the canopy. They also eat berries and some seeds. The area used for foraging generally exceeds that defended by a territorial male. Territory sizes recorded: Ontario-- 0.13 ± 0.1 ha (0.32 ± 0.27 ac); New Hampshire-- 0.18 ± 0.01 ha (0.44 ± 0.02 ac); and Michigan-- 0.07 ha (0.17 ac). Territories are distributed in dense aggregations or "colonies," leaving apparently adjacent suitable habitat unoccupied. In Michigan, the amount of forest occupied by aggregations averaged 18.05 ± 3.38 ha with range of 1.65 to 38.5 ha (44.58 ± 8.35 ac with range of 4.08 to 95.1 ac).

Management Issues. The Least Flycatcher is parasitized by cowbirds, so hostile habitat would be areas of high cowbird abundance such as riparian areas contiguous with feedlots. Habitat fragmentation is also a concern; settled areas bring in magpies, skunks, cats, raccoons as predators. The introduction of gray squirrels increases predation. Mosquito control decreases prey base.

American Redstart

Priority Level: III MT Score: 15 AI: 3

Reason for Concern. No trend is indicated by Montana or regional BBS data, but this species' susceptibility to parasitism and reliance on a dense shrub layer make it potentially vulnerable to landscape change.

Distribution. American Redstarts breed across the northern tier of states in the U.S., and across Canada. They are found throughout the state of Montana, but are most common west of the divide.

Habitat Requirements. Dense riparian shrubs, either as an understory, as openings in a forest mosaic, or as contiguous riparian shrubland stands, are used for nesting.

Ecology. American Redstarts are insectivores that forage by sallying in the shrub and lower canopy layers, primarily in broad-leaved vegetation. They build an open, cup-shaped nest in tall shrubs or small trees.

Management Issues/Recommendations. Fragmentation and proximity to agricultural land can greatly increase the likelihood of cowbird parasitism. Tewksbury et al. (1998) recorded rates of 40% parasitism for this species along the Bitterroot River.

MacGillivray's Warbler

Priority Level: III MT Score: 20 AI: 4

Reason for Concern. Physiographic area 64 supports 36% of this species population. No strong population trends are indicated by BBS data. Reliance on a dense shrub layer in a wide variety of habitats may be a successful strategy for the species, unless attraction to seral shrubfields acts as an "ecological trap" in managed forests (Hutto and Young 1999).

Distribution. MacGillivray's Warblers occur from low to moderate elevation (1,370- 2,440 m; 4,500 - 8,000') throughout the western two-thirds of Montana (Montana Bird Distribution Committee 1996). In North America, they breed from southeastern Alaska and western Canada, east to eastern Montana and southwestern South Dakota, and south (mainly in the mountains) to southern California, central Arizona, and southern New Mexico. They winter in portions of Mexico and on the Pacific side of Central America.

Habitat Requirements. MacGillivray's Warblers nest in shrubby riparian areas and wet thickets, coniferous forest clearcuts, mid-seral cool, moist grand fir habitat types in west-central Idaho (Sallabanks 1997), and coniferous forest openings created by avalanches. The overstory usually is mixed conifer (Douglas-fir, grand fir, Engelmann spruce, etc.) and the understory includes serviceberry, willow, currant, rushes, cottonwood, elderberry, dogwood, hawthorn, chokecherry, alder, spiraea, huckleberry, and rose.

The riparian habitat used by this species can be described as late-seral. Overstory canopy closure ranges from 0 to 25%. Midstory cover (3-4.6 m; 10-15') is about 80%, understory cover (shrubs) is about 50%, and ground cover ranges from 1-20%. The understory structure was found to be the most significant habitat variable driving distribution of MacGillivray's Warblers in the interior Pacific Northwest (Sallabanks 1997); it was the only species found to significantly prefer forest habitats with >670 stems/ha (271/ac; includes shrubs, seedlings, and saplings).

MacGillivray's Warblers in riparian habitat prefer contiguous shrub habitat; 0.4 linear km (0.25 linear mi) of contiguous riparian habitat would support one breeding pair. Seral shrubfields in coniferous forests are also acceptable habitat. Approximately 4 ha (10 ac) patches of suitable forest (e.g., moist clearcut or mid-seral cool, moist grand fir habitat types) would support several pairs. MacGillivray's Warbler distribution on the landscape tends to be patchy because of patchy distribution of riparian (and clearcut) habitats. They frequent habitats with a high component of natural edge (e.g., riparian areas, brush-meadow, and brush-forest ecotones), therefore they are likely to be tolerant of some matrix component. Breeding and foraging habitats are in the same location.

Ecology. MacGillivray's Warblers build cup-shaped nests low in thick shrubs. Pairs hold individual territories. They feed on insects, which they obtain by foraging close to the ground in dense vegetation. Density will vary with elevation, season, habitat quality, and geographical location, but should probably be approximately >1 pair/ha (1 pair/2.5 ac) for source populations.

Management Issues. Grazing intensity is a concern in riparian areas because excessive grazing removes the dense understory preferred by this species; parasitism by cowbirds may increase with increasing grazing pressure, although generally parasitism is not considered a serious threat to this species. Vegetation management consisting of shrub removal (e.g., prescribed burning) or herbicidal treatment would be deleterious. Increased fire frequency and severity is likely to reduce the amount of suitable habitat. Water division (irrigation of agricultural lands, etc.) would result in loss or degradation of shrubby riparian habitats. Non-native plants that out compete native shrubs would decrease the suitability of the habitat. This species is a good candidate for demographic monitoring, to sort out the question of population sources and sinks, because of its wide habitat tolerance and apparent response to seral habitats in managed forests (Hutto and Young 1999). Can such habitats function as replacements for lost or altered riparian habitat?

Orchard Oriole

Priority Level: III MT Score: 18 AI: 3

Reason for Concern. This riparian obligate of eastern Montana is essentially unmonitored in the state and physiographic area (39).

Distribution. The Orchard Oriole breeds from the southeastern U.S., up through the central Great Plains, and into the eastern 1/3 of Montana (Price et al. 1995, Montana Bird Distribution Committee 1996).

Habitat Requirements. Orchard Oriole is found primarily within the deciduous riparian forests associated with the major rivers, and their tributaries, shelterbelts, farmsteads and hardwood draws. They are also found in deciduous trees near lakes and ponds. Gap analysis (Redmond et al. 1998) identified about 90 thousand ha of habitat in the state.

Ecology. Nests are usually placed in deciduous trees from 4 to 50 feet off the ground and consists of a suspended basket. Orioles can nest colonially in excellent habitat but tend to nest as isolated pairs in marginal habitats (Scharf and Kren 1996).

Management Issues/Recommendations. Protection of riparian forest should include those areas within the range of this species in the state, and should be designed to emphasize mature stands. Better monitoring of eastern Montana riparian bird communities is needed.

Habitat and Population Objectives: Riparian Deciduous Forest

Wherever possible, maintain the dynamic nature of floodplains to accommodate all successional stages of cottonwood forest. Over time, this will require both protection of existing stands and recruitment of younger trees.

- Mimic natural flow regimes with releases from dams, or where rivers remain undammed (e.g. the Yellowstone River), maintain the hydrograph at as close to natural as possible.

- Cottonwood forests should be managed to preserve mature trees and snags; such management may involve substrate-scouring using periodic floods or mechanical disturbance, limiting grazing, and increasing levels of water flow (Tobalske 1997, from review).

Protect late successional forest stages (decadent trees, snags, lots of large downed material, wide tree spacing). In many instances, the chance to restore historical levels of riparian forest has passed. Steps should be taken to protect the best of what remains in each major drainage in the state.

- Encourage a policy of no net loss for mature cottonwood forests.

- Identify and survey intact blocks of mature cottonwood forest, using agency or citizen scientists. Work with agency or private land conservation efforts to place easements on, or implement management changes on the largest or most threatened blocks within the next 2 years. Designate suitable areas as IBA's to foster community interest.

- Try to provide continuity in habitat quality by connecting protected/managed parcels via easements, cooperative agreements or acquisition from willing sellers.

- Protect, reclaim, or re-create oxbow sloughs, braided stream reaches and backwater areas.

- Strive to incorporate and implement appropriate management guidelines for snags, decadent trees, downed trees, shrub cover, ratios of successional stages and other habitat variables, in public and private land management programs/decisions.

We need to develop further, specific guidelines for each of the following habitat factors:

Large, Decadent and Dead Trees: screech-owls, Lewis's and Red-headed Woodpeckers, Vaux's and Chimney Swifts, Red-naped Sapsucker; Pileated Woodpecker, Wood Duck, goldeneyes, Hooded Merganser.

Gravel Bars: Interior Least Tern, Killdeer.

Mature, Live Trees: Bald Eagles, Red-eyed Vireo.

Dense, Tall Shrub Understory: Cuckoos, Veery, Gray Catbird, Warbling Vireo, American Redstart, MacGillivray's Warbler, Song Sparrow.

Spatial Heterogeneity: Ovenbird, Lazuli Bunting.

Multi-storied, Multi-aged Canopy: Cuckoos, Least Flycatcher, Orchard Oriole

Assumptions:

C A natural flow regime will maintain habitat quality for high priority species.

C Larger stands support more species than smaller stands.

C In lieu of direct action, continued development, fragmentation and incompatible management activities will further reduce both the quantity and quality of riparian deciduous forest habitat.

Research/Monitoring Needs:

C Implement special riparian monitoring (count) techniques to provide trend data for riparian deciduous forest species.

C What were the historical amounts various seral stages of this type in each of the major drainages in the state, and how much remains in each?

C Determine what constitutes source and sink areas in this habitat, by combining demographic monitoring with local and landscape-scale habitat measurements.

.

C Determine what mitigation measures are most effective at replicating the effects of natural flows (scouring, planting, water diversion).

Riparian Shrub

Distribution. Riparian shrubland is closely associated with major rivers, streams, lakes, ponds and marshy areas throughout the state. The type is commonly found along the Missouri, Yellowstone, and Clark Fork

River systems, and is especially prevalent along other rivers in the western portion of the state.

Importance. Riparian shrublands are important component of riparian systems, because they provide both nesting and foraging habitat for a wide variety of bird species, including at least 15 or our priority species (Table 18). Some species which nest in forest stands use shrubland for foraging (e.g. Sharp-shinned Hawk, Red-eyed Vireo), while others such as the Columbian Sharp-tailed Grouse rely on riparian shrub cover during winter. Several species are essentially riparian shrub obligates (e.g. Willow Flycatcher).

Table 18. Relationship of Montana PIF priority species to vegetative and structural components, Riparian Shrub habitat type.

Species	Dense Shrubs	High Patchiness	Dense Ground Cover	Prey Density
Sharp-shinned Hawk				x
Peregrine Falcon				x
(Col.) Sharp-tailed Grouse	x		x	
Calliope Hummingbird		x		
Rufous Hummingbird	x			
Willow Flycatcher		x		
Gray Catbird	x			
Warbling Vireo	x	x		
Nashville Warbler	x		x	
American Redstart	x			
MacGillivray's Warbler	x	x		
Lazuli Bunting		x		
Song Sparrow	x		x	
Red-winged Blackbird	x	x	x	
Brewer's Blackbird	x	x	x	

Description. Riparian shrubland is a relatively restricted habitat in the state, due to its linear nature, comprising only about 486,000 ha or approximately 1.3 % of the state (Redmond et al. 1998). Cover densities vary greatly and may range from 15 to 100 percent. Most riparian shrublands have both a dense shrub canopy and dense grass/forb ground cover. Open water is frequently part of the type, whether as streams or rivers, or shallow lakes and ponds where open water is surrounded by a margin of shrub cover. The dominant plant species present are typically tall shrubs such as alder, willow, birch, or red-osier dogwood, particularly in the western part of the state. The overstory can reach heights of several meters. Typical understory consists of low shrubs such as thimbleberry, honeysuckle, snowberry, rose, and currants. Riparian shrubland in eastern Montana is drier, with hawthorn, serviceberry and chokecherry replacing alders and willows. Eastern low shrubs consist mostly of rose and snowberry, with dogwoods only in the wettest areas. When cottonwoods and other deciduous trees are present, canopy cover rarely exceeds 10 to 15 percent cover.

Willow Flycatcher

Priority Level: II MT Score: 19 AI: 4

Reason for Concern. In other portions of the arid West, the (Southwestern) Willow Flycatcher has been listed as an endangered species, due primarily to habitat loss and parasitism. Though the species could be prone to the same fate here, populations have shown an upward trend in both the northern Rockies (PT/PTU = 2/1), and in Montana (2/2). The species merits continued monitoring attention in the state.

Distribution. Willow Flycatchers breed from central British Columbia, east to southern Minnesota and Nova Scotia, and south to southern California, western and central Texas, Arizona, and portions of southeastern United States. They winter from central Mexico to Columbia. In Montana, they breed throughout the western two-thirds of the state, and are suspected to breed in several latilongs in northeastern and southeastern Montana (Montana Bird Distribution Committee 1996). They are most common at lower elevations (< 1700 m; <5500 ft).

Habitat Requirements. Willow Flycatchers breed in riparian habitat that has a midstory of willows or alders and an intact lower layer (ground to 1.5 or 1.8 m; 5 or 6 ft). The shrubs should be 1.8-2.1 m (6-7 ft) tall at a minimum. Shrub thickets interspersed with openings are used more than large continuous stands (Sanders and Flett 1988; Harris et al. 1987). An overstory of large trees such as cottonwood is not necessary and a dense overstory may discourage use by Willow Flycatchers. Willow patches should be thick and contain scattered openings. Willow Flycatchers nest near openings; large continuous patches will be used mostly around the edges. In one study, most nests were found in willow patch size of 20 or more acres; patches 10 acres or less were seldom used (Serena 1982; Harris et al. 1988).

In the Tobacco Plains of extreme northwestern Montana, Willow Flycatchers can be found in upland rose-snowberry patches in a grassland setting (Casey, unpubl. data). How widespread this habitat association might be elsewhere in the state or region is unknown.

Ecology. Willow Flycatchers eat insects, which they catch in the air or take from foliage. They feed over willows and adjacent openings. Open water or saturated soils are found on most territories (Harris et al. 1988; Sanders and Flett 1988). Willow Flycatchers build cup-shaped nests in forks of shrubs or deciduous trees. Nests generally are in willows at least 2 m (6.6 ft) high, with a foliage density of approximately 50-70%, and with about 1 m (3.3 ft) of cover above them (Sanders and Flett 1988). Reported territory sizes range from 0.1 to 0.7 ha (0.25 to 1.75 ac; Walkinshaw 1966; Kings River Conservation District 1985; Sanders and Flett 1988).

Management Issues. Increased parasitism in fragmented habitat is probably the greatest threat to the species. Populations have increased in response to reductions in cattle grazing and willow control in riparian areas (Dobkin 1994).

Rufous Hummingbird

Priority Level: III MT Score: 21 AI: 3

Reason for Concern. The Rufous Hummingbird showed significant declines throughout the West from

1968 to 1991 (Hejl 1994), and it is one of several species Hutto and Young (1999) have suggested may incur population sinks when attracted to seral shrub habitats in managed forest.

Distribution. The breeding range of Rufous Hummingbird in the U.S. incorporates northern California, western Oregon and Washington, and the northern Rockies, including Montana west of the continental divide.

Habitat Requirements. Although found most commonly in willow/alder dominated riparian shrubland (Hutto and Youn 1999), this species is also found in seral habitats with a mosaic of open forest and shrubland (Calder 1993). Redmond et al. (1998) estimated there are over 2.5 million ha of suitable nesting habitat in the state.

Ecology. Hummingbirds are reliant on nectar, and prefer tubular flowers, but they also feed on insects by hawking and gleaning. Torpor is used to conserve energy in colder weather. Nests are on horizontal limbs or in small branch forks, and are made mostly of lichens and spider webs.

Management Issues/Recommendations. Demographic monitoring is needed to clarify whether seral shrubfields in managed forests function as well as riparian areas as breeding habitat for the species.

Gray Catbird

Priority Level: III MT Score: 15 AI: 3

Reason for Concern. This national Watch List species has shown upward population trends in Montana and elsewhere in the northern Great Plains. This common species is an example of a bird whose habitat needs might be considered in the design of conservation actions for higher priority species, but for which no more than local efforts are probably needed at this time.

Distribution. The Gray Catbird is most abundant throughout the eastern U.S., and into the Great Plains (Price et al. 1995). They have a patchy distribution in much of the northern Rockies, including Montana (Montana Bird Distribution Committee 1996).

Habitat Requirements. Catbirds are most common in riparian areas with a dense shrub layer, and seem to prefer areas with dense thickets of trees. They will also use aspen, mixed forests and man-made habitats, providing that thick shrubs are available for nesting.

Ecology. Gray Catbirds eat a wide variety of insects and fruit. Their nests are typically in dense shrubs, small trees or vine tangles, within 2m of the ground.

Management Issues/Recommendations. No specific management or monitoring tasks are proposed for this species. Riparian conservation efforts for higher priority species should encompass mosaics of shrub habitats suitable for the species.

Warbling Vireo

Priority Level: III MT Score: 17 AI: 3

Reason for Concern. Another common species which shows positive population trends in Montana (PT/PTU = 2/1) and throughout p.a. 64 (1/1), the Warbling Vireo is nonetheless susceptible to landscape changes. It is a common cowbird host, and its attraction to seral shrublands may make them ecological traps (Hutto and Young 1999).

Distribution. The species breeds throughout the northern 2/3 of the U.S. and well into Canada, although there are large unoccupied patches of unsuitable habitat (e.g. much of the Great Plains). They breed throughout western Montana, and in association with major river drainages and "island' mountain ranges in the eastern 2/3 of the state.

Habitat Requirements. Hutto and Young (1999) found that Warbling Vireos are strongly associated with deciduous shrubs. They nest in both riparian areas and seral shrubfields created through forest management activities. Any open forest cover type with a significant deciduous shrub component may support Warbling Vireos. The Montana Gap project estimated there are 1.6 million ha of suitable habitat in the state (Redmond et al. 1998).

Ecology. Caterpillars are a preferred prey of vireos, and are commonly gleaned from broad-leaved trees and shrubs. Nests are placed in the fork of a branch of a tall shrub or small tree, often in edge situations. The species is a frequent nest host of Brown-headed Cowbirds.

Management Issues/Recommendations. Demographic monitoring is needed in seral shrubland and riparian shrubland to compare and contrast rates of cowbird parasitism and productivity in different landscape contexts. Provision of tall shrub cover in managed forest stands may benefit the species if such sites allow for the recruitment of young into the population.

Song Sparrow

Priority Level: III MT Score: 12 AI: 3

Reason for Concern. A common, widespread species whose population response may serve as an excellent monitoring tool for implementation of "best management practices" in riparian shrub habitats. It is a frequent cowbird host whose populations have declined significantly in p.a. 64 (PT/PTU = 5/1).

Distribution. Breeds throughout the northern half of the U.S. and well into Canada, and can be found throughout the west with the exception of the desert southwest and portions of the Great Plains. It breeds in suitable riparian habitats throughout the state, and is a local winter resident, particularly west of the continental divide.

Habitat Requirements. Song Sparrows prefers shrubby areas along stream courses, ponds, lakes, and marshes. It also occurs as an edge species near farms, shelterbelts, and parks. Gap project estimates of suitable breeding habitat total 1.6 million ha in the state (Redmond et al. 1998).

Management Issues/Recommendations. Like the Killdeer, the Song Sparrow may work well as a species to profile in public outreach efforts, to illustrate the concept of "keeping common birds common". Because they are widespread and relatively abundant, they are easy to sample and should respond quickly to restoration efforts.

Habitat and Population Objectives - Riparian Shrub

- We assumed that riparian shrublands would be an integrated component of any riparian deciduous forest stands targeted for conservation efforts.

- Grazing should be managed or excluded as needed to provide and maintain the structure of riparian shrubland at all elevations.

- Maintenance of riparian shrub habitats should be emphasized in riparian conservation easement efforts.

- Bird monitoring this habitat should be part of a statewide, stratified, count-based effort specific to riparian systems, which should include demographic monitoring in various landscape contexts. This will allow us to develop specific population/demographic objectives for priority species.

Hardwood Draws

Distribution. Woody draws generally occur east of continental divide in Montana, and are most prevalent in the eastern 1/3 of the state. They are found in grasslands, along river breaks, badlands, mountain foothills, and within conifer forests. They are usually found as a linear feature on the landscape, but also occur in snow and frost pockets on hillsides and on benches and terraces. Some hardwood draws exit in intermountain valleys west of the divide. These are mostly shrub-dominated draws consisting of hawthorn, snowberry, serviceberry, or red-osier dogwood, though, and are treated under the Montane Shrubland section of this BCP.

Dominant Plant Species Composition. Green ash is generally the dominant species with co-dominants of bur oak, American elm, box elder, plains cottonwood, and quaking aspen. Some pure bur oak stands occur in extreme southeastern Montana. Pure buffaloberry draws also occur in extreme eastern Montana. Hawthorn communities occur throughout the state particularly in overgrazed areas. Common understory shrubs may include one or more of the following: chokecherry, serviceberry, snowberry, willow, and red-osier dogwood.

Vegetation Physiognomy/Structure. High vertical structural diversity exists relative to surrounding grassland vegetation. Within riparian types under undisturbed conditions, vertical structural diversity is generally lowest in early seral condition and highest in late seral condition. Horizontal patchiness is greater in early and intermediate seral condition and lower in late seral condition. Some types of disturbance may increase vertical and horizontal patchiness, including fire, grazing, and firewood cutting. Late seral condition stands in good to excellent condition generally consist of four layers: grass/forb, low shrub, tall shrub, and a moderate to full tree canopy closure. Early seral stands generally lack tall shrub and have little or no tree cover and hence low canopy closure.

Snag density is related to stand age with higher snag densities in older stands. Cavities in green ash and bur oak trees are mostly formed by large dead branches and less often by primary excavators, which can be rare (except for northern flicker) in pure stands of these tree species. Where aspen or cottonwood are present, primary excavators may play a more important role in tree cavity formation.

Role of Fire. Historical disturbance factors likely included prairie fires, insects, disease, and firewood cutting by Indians. Fire played a major role in rejuvenating green ash stands. The extent of fire disturbance was a function of weather, topography, and fine fuel buildup. Fire frequency was probably every ten years on gentle topography to 30 years in more dissected terrain. Green ash, with its relatively thin bark, is susceptible to fire damage but re-sprouts vigorously following disturbance. Stand replacement fires probably occurred during periods of drought and when fine fuels built up in the understory. Understory fires probably occurred in the spring and during cool, wet years.

Importance. Hardwood draws make up only one percent of the vegetation of the Great Plains but contain a large majority of its species diversity. This habitat type serves as breeding and wintering habitat, and stopover habitat during migration for many bird species. Specifically, this type provides cover and food and may be an important seasonal water source for birds particularly during migration and the brood-rearing stage of development. High plant species diversity, insect abundance, and berries also attract birds to this habitat type. Ten of our priority species occur commonly in this habitat (Table 19), although the species accounts for all but Swainson's Hawk appear elsewhere in this document.

Table 19 . Relationship of Montana PIF priority species to vegetative and structural components, Hardwood Draw habitat type.

Species	Snags	Mature Tree Cover	Dense Tall Shrubs	Dense Low Shrubs	Dense Ground Cover
Sharp-shinned Hawk		x			
Swainson's Hawk		x	x		
Black-billed Cuckoo			x	x	
Yellow-billed Cuckoo		x	x		
Eastern Screech-Owl	x	x			
Downy Woodpecker	x	x			
Gray Catbird			x		
Red-eyed Vireo		x	x	x	
Warbling Vireo			x	x	
Ovenbird					x

Management Issues. Hardwood draws on many private and some state and federal lands are in poor to fair condition. Loss of shrub layers and lack of overstory recruitment due to persistent grazing pressure is the major problem. Under this disturbance, Kentucky bluegrass replaces native grasses, and forb diversity is lost as yarrow and dandelion become the dominant species. As a result, these woodlands may be converted to grass or low shrub communities. Birds dependent upon the shrub component for nesting are directly affected but even ground nesting and tree nesting species are eventually effected. Cowbird parasitism related to intensive grazing is also a serious threat to birds in these habitats. Other problems include firewood cutting, development, and loss of natural disturbance factors, especially fire. Adjacent habitat is primarily grasslands, low-elevation conifer forest, rural or semi-rural development (ranches, farms, suburban housing development), and river bottomlands. Close proximity to farm and ranch buildings likely attracts exotic plants and non-native species such as house cats, dogs, House Sparrows, and European Starling that may effect nest success of native birds.

Amount of Habitat. Presence of habitat is influenced by soil moisture, fire frequency, and topography. In highly dissected and steeper topography most stands should be in a mid to late seral condition with a few early seral stands for landscape diversity. In more rolling and level terrain early to mid seral habitat should predominate.

Swainson's Hawk

Priority Level: III MT Score: 19 AI: 3

Reason for Concern. More than 20% of the population of this species is found in p.a. 39. Population increases in Montana (PT/PTU = 1/1) and elsewhere are encouraging, since significant mortality is known to occur on the winter range in South America.

Distribution. The Swainson's Hawk is a common and widely distributed breeder throughout Montana east of the continental divide. West of the divide they occur as a local breeder in some lower elevation valleys, and as irregular migrants. Swainson's Hawks are highly migratory, overwintering in South America, where large-scale mortality due to pesticide application has been reported in recent years.

Habitat Requirements. Swainson's Hawk are found in open habitats, where nesting is associated with isolated patches of primarily deciduous trees. Ehrlich et al. (1988) and Dobkins (1992) reported Swainson's use of shrub-steppe, prairie, open woodlands, shelterbelts, and some cultivated lands with scattered trees. In North Dakota, 75% of the area surrounding nests (within 1 km) was pasture or haylands (Gilmer and Stewart in England et al. 1997). Hendricks and Dueholm (1995) found them using open grassland, sagebrush, mixed and short-grass prairie during the breeding season in the Custer National Forest of southeastern Montana and southwestern North Dakota.

While foraging areas consisted of various open types, nesting habitat is predominantly associated with isolated stands of trees and hardwood draws in eastern Montana. Stewart (1975) and DeGraaf et al. (1991) documented nesting in trees and shrubs along drainages within shelterbelts and surrounding wetlands. Hendricks and Dueholm (1995) found nest in wooded draws in southwestern North Dakota. They also documented use of riparian willows as nesting habitat in the Centennial Valley of southwestern Montana. Hansen (1995) located 12 nests in deciduous trees within various habitats from southeastern Idaho.

Management Issues/Recommendations. Demographic monitoring should be implemented to document nesting success over time.

Habitat and Population Objectives: Hardwood Draws

Habitat Objectives:

C Hardwood draws across the geographic region should have all size/age classes of trees and shrubs represented to mimic the diversity resulting from natural disturbances.

- Late seral stands should have a relatively uniform canopy cover of at least 75% with an understory of tall shrubs (dbh> 2.5 cm) such as chokecherry at an average of about 390 stems/acre.
- Early to mid seral stands should have canopy cover of 35 to 60% respectively, and tall shrub stem densities from 50 to 150 stems/acre, respectively.
- Grazing in hardwood draws on public lands should be restricted when restoration is necessary to maintain the integrity of the plant community.
- Grazing should use management strategies such as rest-rotation, deferred rotation, off-site watering, fencing, and riparian pasture to promote desired objectives for seral condition in hardwood draws.
- Road building and logging within hardwood draws should follow state Best Management Practices.
- Overstory removal of trees (including logging and firewood cutting) should only occur in instances where understory is established and recruitment into overstory is possible.
- Prescribed burning should be considered as a management tool for restoration of hardwood draws.
- Hardwood draws should be managed on a landscape level with all adjacent habitats included in landscape matrix: addressing all management problems.

Relationships to Individual Species Needs/Unique Features:

- Retaining mature overstory and insuring tree recruitment would benefit tree nesters such as Red-eyed Vireo, Warbling Vireo, Black-billed Cuckoo, and Yellow-billed Cuckoo.
- Moving some stands towards late seral stages will increase cavity densities for Eastern and Western Screech-owls.
- Less intense grazing will help retain shrub and ground cover for species such as Gray Catbird, Ovenbird, and Veery.
- Both count-based and demographic monitoring are needed to verify positive results of conservation actions and clarify habitat relationships and population trends of priority species.

Time Frame:

- Some government agencies have grazing BMPs or are working on them; these need to be identified and the needs of priority species incorporated.
- Education should be strongly emphasized as part of conservation planning.
- Time is critical in order to reverse trend in losing this valuable habitat.

Assumptions:

- Managing grazing and logging better, and using prescribed fire will improve or restore hardwood draw habitat for birds.
- Managing these stands for the full range of seral classes based on historic conditions on public lands will increase and maintain bird diversity in hardwood draws and the Great Plains.
- Distribution of deciduous vegetation is related to available soil moisture in upland areas.
- Better grazing management will increase cover and meet species requirements.
- Management or mis-management of adjacent habitats affects breeding birds in hardwood draws.

Research/Monitoring Needs:

- Population and habitat monitoring needs improvement in this habitat. This habitat is under sampled in most existing monitoring programs (BBS, Landbird Monitoring Project, MAPS, etc.)

- Need to address historical condition and distribution, particularly areas that have been converted to non-native plant and shrub communities (i.e.- how much of this habitat has been lost due to grazing, fire suppression, development, etc.?).
- Investigate the effects of different grazing strategies and prescribed burning on hardwood draw vegetation and response by breeding birds.
- Investigate how habitat condition and fragmentation, and cowbird parasitism interact with breeding birds in hardwood draws.
- Monitoring of landscape level management is needed to determine benefits to breeding birds in hardwood draws.
- How do birds in naturally fragmented landscapes (such as hardwood draws in the Great Plains) deal with cowbird parasitism. Is cowbird predation naturally high in this area? If so, what defense mechanisms do birds use to compensate for nest losses?

Riparian Coniferous Forest

Description. This habitat is defined as floodplain and stream side forests dominated by coniferous tree species. In western Montana these typically include grand fir, subalpine fir, Engelman spruce, western redcedar and western hemlock in moister sites; and Douglas-fir, ponderosa pine, Rocky Mountain juniper in drier areas. The latter three species are also the more common dominants in eastern Montana versions of this type. Understory shrubs found across the state include red-osier dogwood, willows, serviceberry, chokecherry, western snowberry and rose. A wide variety of grasses and forbs can be found in this forest type.

Geographic extent in the state. Riparian conifer types are found throughout the state. The largest amounts in acreage and diversity are found in the moister forested regions west of the continental divide. The isolated mountain ranges of central Montana and the Missouri Breaks also contain significant coniferous riparian stands, as do other forested buttes and badlands throughout the eastern two-thirds of the state.

Importance. Riparian conifer types contribute to animal and plant diversity, out of proportion to their acreage within the landscape. They tend to have a more diverse forest structure than adjacent upland habitats, and therefore support higher bird species diversity. This is particularly true in drier regions at low to mid-elevations. Several species, including the Winter Wren, Brown Creeper, and Dipper are found almost exclusively in coniferous riparian stands (Table 20).

Vegetation Structure. Vegetation structure can be highly variable both across and within habitat types depending on seral condition and disturbance factors such as logging, roads, fire and grazing. In higher elevation areas, the understory may vary from a relatively open condition of pinegrass under a canopy of seral lodgepole pine, to a dense understory of huckleberry under spruce-fir canopy. Dense stands of willow, alder (Alnus spp.), or red-osier dogwood may be interspersed with the tree canopy. The amount and size of down and dead woody debris can also vary substantially.

Table 20. Relationship of Montana PIF priority species to vegetative and structural components, Riparian Coniferous Forest habitat type.

Species	Snags	Large Trees	Dense Shrubs	Dense Ground Cover	High Elevation Streams	Prey Density
Barrow's Goldeneye	x	x				
Harlequin Duck			x	x	x	
Hooded Merganser	x	x				
Bald Eagle	x	x				x
Sharp-shinned Hawk						x
Ruffed Grouse			x			
Western Screech-Owl	x	x				x
Vaux's Swift	x	x				
Cordilleran Flycatcher		x	x			
American Dipper					x	
Veery			x	x		

Amount of Habitat. The riparian zone typically comprises just 1 to 5% of the landscape. Older seral stages are probably the most limited types, particularly at lower and middle elevations. This is in part due to ease of access and logging. We have continued to access higher elevations since the 1960's, as forest road systems have been extended. Old-growth coniferous riparian stands remain susceptible to logging, although the application of Best Management Practices mitigates this risk somewhat. Even selective logging, however, can have detrimental effects on the bird community in old growth stands (Hejl and Paige 1994).

Distribution and Configuration on the Landscape. Although this type is generally confined to the riparian corridor, the adjacent upland habitat matrix can have a profound effect on the bird community. Leaving a narrow riparian buffer strip with a matrix of heavily cut forest, for example, may be detrimental to birds at the landscape scale (McCarigal and McComb 1992). Increased edge effect can increase predation and parasitism rates, for example, and windthrow can be increased dramatically. Riparian management for birds must therefore consider the entire landscape.

Management Issues. Many upper elevation reaches are in good to excellent condition due to inaccessibility. Fire suppression may be altering species composition in some areas, however, eliminating seral species such as western larch, subalpine fir and lodgepole pine, and favoring western redcedar, western hemlock and grand fir. Lower and mid-elevation reaches are more susceptible to the pressures of overgrazing, flood and erosion control efforts, irrigation withdrawals, road-building, logging, and firewood cutting. Long-term grazing impacts in low elevation stands have reduced shrub, forb and grass cover and created open understory conditions, and can de-stabilize stream banks and increase erosion. Windthrow in riparian zones due to adjacent logging in upland stands is a problem in some reaches, but particularly so in upper elevation basins where wind conditions can be severe. Dams, channelization, and rip-rapping for flood and erosion control disrupt natural stream dynamics, affecting successional patterns and resultant bird habitat. Water quality can be a concern in areas adjacent to intensive agriculture.

The major historical disturbance factors in this habitat type have been wildfire, insects and disease, and periodic flooding. Single treefall and stand blowdown are also fairly common disturbance factors. It is unclear if active management can mimic the effects of these disturbances.

Frequency and magnitude of flooding can determine both the extent and rate of change in riparian forest conditions. Large-scale flooding and deposition of new soil may result in a young forest dominated by deciduous species. Succession over time can lead to dominance by conifers. The full range of seral conditions implies that some of these areas would have to be in early successional deciduous cover. In riparian areas where frequent flooding occurs, it may be unreasonable to meet riparian conifer objectives.

Although riparian areas probably serve as a natural fire break on the landscape, their longevity in a particular seral condition is determined at least in part by the adjacent upland habitat types and fire regime. Moist habitat types within lethal fire regimes may contain an abundance of snags and dead and down material in the understory (Fischer and Bradley 1987). Stand replacement fires in these areas result in young conifer, young deciduous, or young mixed stands. Lower and middle elevation areas, in contrast, experience frequent non-lethal or mixed-intensity fires which generally burn individual or small clumps of trees and burn off the fine fuels. Many of the shrub and tree species in these stream reaches are fire-adapted and sprout vigorously following disturbance.

Seral aspen communities may have been an important transitional type between fires and re-establishment of riparian conifer forest, in all fire regimes. Shrub, grass and forb development also increase considerably following both stand replacement and non-lethal type fires. This increase in vegetation structure should enhance bird diversity, particularly in low to mid-elevation riparian reaches (Finch 1989).

Harlequin Duck

Priority Level: I MT Score: 21 AI: 4

Reason for Concern. Harlequin Ducks are considered to be a sensitive species by Montana PIF agencies, due to their dependence on clean headwater streams for nesting and brood-rearing. Habitat degradation from mining, logging and/or overgrazing has probably reduced the amount of suitable habitat for this species over the last century. The Harlequin Duck is the rarest "sea duck" identified in the North American Waterfowl Plan 1998 Update, with a continental population estimate of 200,000 birds; populations in eastern Canada have been classified as endangered. (NAWMP Committee 1998).

Distribution. Western populations are centered in British Columbia and Alaska. Harlequin Ducks breed locally on mountain streams in the western part of the state (Reichel and Genter 1995), including the Kootenai, Flathead, Clark Fork, and Blackfoot River drainages. Scattered breeding also occurs along the Rocky Mountain Front and the north edge of Yellowstone National Park.

Habitat Requirements. Forested banks of swiftly flowing mountain streams. In Montana, Wyoming, and S. Idaho the species uses willow shrub or pole or immature-sized lodgepole pine, Engelmann spruce, and Douglas-fir. In the Pacific Northwest, they are found in mature or old-growth western redcedar/western hemlock. Factors that may increase likelihood of use include: hiding cover along the stream (should include overhanging shrub vegetation), logjams, undercut stream banks, and woody debris. Instream loafing sites should include boulders or gravel bars adjacent to swiftly flowing water. They prefer stream size of second order or greater; stream gradients between 1% and 7%, and some areas of shallow water (riffles). They also prefer clear water, with gravel to boulder-size substrate. Factors that may also increase likelihood of use include absence of human disturbance (boating, fishing, residences); lack of access by road or trail. The likelihood of an area being used for breeding by Harlequin Ducks increases with proximity to occupied habitat.

Management Issues:

C Streambank or channel alteration that eliminates or reduces cover and food supply. These include channelization, damming, livestock grazing, brush removal, timber harvest, gravel extraction, logjam removal, dredging, bank rip-rap, and road construction.

C High water during nesting and brood-rearing can reduce or eliminate productivity. Low water will render feeding and brood-rearing habitats unavailable. These activities include hydropower development, stream diversion or damming, timber harvest, and road construction.

C Sedimentation and toxic chemical pollution may reduce supply of macroinvertebrates or reduce the ducks' ability to find prey. These activities include road construction, timber harvest, livestock grazing, toxic chemical spills, mining.

C Human activity, either instream or on the bank, may displace birds and indirectly impact reproduction. Activities include boating use, angler use, hiking, camping, and land management activities in and along streams during the breeding season.

Population Objectives:

C Continue survey efforts to find occupied streams throughout its range in the state, to develop and track a statewide population estimate.

C Maintain the state population at its current level.

Hammond's Flycatcher

Priority Level: II   MT Score: 23   AI: 4

Reason for Concern. Hammond's Flycatcher populations are increasing (PT/PTU = 2/1) in the northern Rockies, but the species' dependence on mature to old-growth forests (Hutto and Young 1999) means there may be a downward trend in suitable habitat.

Distribution. The Hammond's Flycatcher breeds throughout southcentral and western Montana (Montana Bird Distribution Committee (1996), and throughout the western United States from Alaska to northern New Mexico and Arizona. A neotropical migrant, this species winters from southeastern Arizona to Nicaragua.

Habitat Requirements. Hammond's Flycatchers breed in mixed coniferous forests, including Douglas fir, ponderosa pine, and western larch, and in aspen. Hutto (1995) reported that most occurrences were in ponderosa pine, western redcedar-western hemlock, riparian shrub, mixed conifer, Douglas fir, and cottonwood/aspen. In eastern Washington and northeastern Oregon, they are found in mixed coniferous/broadleaved forests (Mannan 1984; Larrison and Sonnenberg 1968). They are also found in aspen in Colorado.

Hammond's Flycatchers use mature to over-mature forests; they are found in areas with large, tall trees and nest in the mature trees. In Montana, Manuwal (1970) found that all territories contained at least one grove of tall (13-20 m; 43-66 ft) conifers, usually Douglas fir interspersed with deciduous vegetation and with numerous canopy openings. Davis (1954) in Montana also found them in fairly dense forest about 12 m (40 ft) tall. Timossi (1990) lists dense canopy closure as 60-100% for this species in California. Hutto (1995) found them in relatively uncut conifer forest types. Hejl et al. (1995), in a review of several studies, found the Hammond's Flycatcher less abundant in clearcut forests compared to uncut forests. Hejl and Woods (1991) found the Hammond's Flycatcher associated with old-growth forests in northern Idaho and western Montana, although some other studies in Idaho and Oregon reported them as present but not clearly associated with old-growth, mature, or immature forests (Hejl et al. 1995). Presence of tree layers is thought to be an essential feeding habitat element, and for cover and reproduction (Timossi 1990).

Ecology. Hammond's Flycatchers usually nest in conifers, but will also nest in deciduous trees. They build a cup-shaped nest on a horizontal limb of a tall tree. Nests may be closer to water than random. Manuwal (1970) described 22 nesting territories. All contained a portion of a creek bottom and 6 of 8 nests were located in a creek bottom. They appear to prefer nesting and roosting sites and foraging and singing perches which are well-shaded and cool (Verner and Boss 1980, Zeiner et al. 1990). They exclusively eat insects, which they catch by sallying out from a perch. The average territory size in Montana was 1 ha, range 0.6 to 1.5 ha (2.6 ac, range 1.5 to 3.8 ac; Manuwal 1970); population densities in the study area in each of two years were 7 and 6.9 territorial males per 40 ha (100 ac).

Management Issues. Logging, or stand replacement fires resulting from past fire suppression, that remove dense stands will negatively impact this species. Pesticides that target aerial insects will decrease their food supply. Stream dewatering will decrease the riparian component that is apparently important for this species.

American Dipper

Priority Level: III   MT Score: 21   AI: 4

Reason for Concern. The northern Rockies (p.a. 64) support >55% of the American Dipper's population, and trends are positive (PT/PTU = 2/2). Its unique habits make it a natural choice for public education and outreach highlighting the interrelated aspects habitat and water quality.

Distribution. The American Dipper is found throughout the Rocky Mountains from northern New Mexico well north into Canada. It breeds throughout the mountainous portions of western and south-central Montana. They move to lower elevations with open water in winter.

Habitat Requirements. Swift, clear streams <15m wide and <2m deep are preferred, with cobble, gravel or coarse rock substrate (Kingery 1996). Bank structure with overhangs, crevices, rock faces, logs and rocks provides nesting habitat, and instream boulders and logs are important perch sites while feeding.

Ecology. Dippers feed on aquatic insects by walking, swimming and diving underwater. Nests are usually 2-3m above the water (Bakus 1959), and are built primarily of mosses. They are typically under an overhang, on a ledge, or in a crevice.

Management Issues/Recommendations. While they will use man-made structures (e.g. bridges) for nesting, human developments which have an impact on water quality (e.g. roads, siltation, pollution) can effect habitat quality. Channelization and dewatering can also destroy habitat suitability. Protection of water quality and streamside habitats is crucial.

Habitat and Population Objectives: Riparian Coniferous Forest

- All habitat types should be represented by the full range of seral conditions following natural disturbance regimes.

- Manage coniferous riparian forest stands so as to preserve old-growth characteristics wherever possible, with a goal of 50% of remaining mid- to upper elevation stands in mature to old-growth condition.

- Select lower elevation stands for restoration aimed at moving them into later seral conditions, while emphasizing maintenance of understory shrub cover and tree recruitment into the overstory. This may involve removal of livestock.

- Manage lower elevation riparian stands to achieve a goal of 25 % in mature to old-growth condition, with the remainder spread among other seral stages, particularly aspen, cottonwood, and birch elements.

- Encourage revegetation as an alternative to rip-rapping for erosion control.

Assumptions:

- Both flooding and fire played a significant historical role in coniferous riparian systems.
- Mimicking natural disturbance patterns will provide the full range of seral conditions and structural attributes for the greatest number of bird species.
- Old growth coniferous riparian forests are limited by past and current human activities. This has decreased habitat availability for such species as Brown Creeper, Pileated Woodpecker, and the Harlequin Duck.

Research and Monitoring Needs.

- Is current habitat availability and condition limiting species diversity and/or individual species' population viability?
- What was the historical range of variability in distribution of seral types in this habitat?
- What is the role of fire in riparian types?
- How does single treefall influence stand structure and bird species diversity?
- What sylvicultural methods are appropriate for mimicking natural disturbances, and what are their effects on birds?
- Are there potential conflicts with fisheries management (bull trout, cutthroat trout, Streamside Management Act)?
- How wide a buffer strip is needed to protect riparian habitat and bird use in various landscape contexts?
- How does bird species diversity and productivity differ along elevational and moisture gradients in Montana's riparian conifer types?
- What patch size is required by priority species?

WETLANDS

General Description. Wetlands are a complex and diverse set of habitats defined as areas characterized by wetland hydrology (saturated soils or surface water for a certain portion of the year), wetland soils (soils formed under saturated conditions), and wetland plant assemblages (dominated by plants that are obligate wetland plants, or facultative wetland plants). Most wetland classification systems use specific wetland structures and functions that are not necessarily correlated with use by specific birds. Physical characteristics important to birds include wetland size, extent and type of open surface water, water depth, dominant vegetation type (sedges/rushes, shrubs, etc.), landscape setting and surrounding upland habitats (grasslands, shrubs, forest), annual water regimes (permanent stable, temporary wetlands that usually dry up in late summer, etc.), and presence of special physical features, such as islands or peninsulas. Cowardin et al. (1979) classified wetlands based on a combination of hydrology and vegetation. Many water bodies contain several different types of wetlands, as classified by Cowardin. For example, a typical prairie pothole wetland has temporarily flooded emergent wetlands, permanently flooded emergent wetlands, aquatic beds, and open water (unconsolidated bottom) wetland "types" as described by Cowardin. The classification system used here was based on a combination of the ecosystem landscape setting of the wetland, and general type of wetland, rather than specific wetland features, since most waterbirds use many different wetland features within the water body they occupy. Also, wetlands within these ecosystem groups tend to share similar bird species, threats, and management opportunities. Priority bird species (Table 21) are listed under the wetland type where they are most often found, although many bird species are found in several different wetland ecosystems.

Table 21. Wetland habitat associations, Montana PIF priority species (X= nesting, foraging, and migration; F = foraging only; M=migration only; NE= extreme northeast only).

PRIORITY SPECIES	Priority	WETLANDS				
		Prairie Pothole	Inter-mountain Valley	Irrigation Reservoirs > 640 acres	Reservoirs, Stockponds < 640 acres	High Elevation Wetlands
Common Loon	I	M	X	M	M (large)	X
Horned Grebe	ll	X				
Clark's Grebe	llI	X		X	X	
American White Pelican	III	X	X	X	F	F
American Bittern	III	X	X		X	
Black-crowned Night Heron	III	X	X		X	
White-faced Ibis	II	X	X			
Trumpeter Swan	I	X	X	M	M, F	F
Barrow's Goldeneye	ll		X			X
Hooded Merganser	ll		X			

PRIORITY SPECIES	Priority	WETLANDS				
		Prairie Pothole	Inter-mountain Valley	Irrigation Reservoirs > 640 acres	Reservoirs, Stockponds < 640 acres	High Elevation Wetlands
Bald Eagle	II	F	F	F	F	
Northern Harrier	lll	X	X	X	X	
Peregrine Falcon	II	F	F	F	F	F
Yellow Rail	III	X (NE)	X			
Piping Plover	I	X		X		
Killdeer	lII	X	X	X	X	
Black-necked Stilt	III	X	X	M	M	
Willet	lII	X				
Long-billed Curlew (Grassl.)	ll	X				
Marbled Godwit	ll	X				
Wilson’s Phalarope	lII	X				
Transient Shorebirds	II	X	X	X	X	X
Franklin's Gull	II	X	X			
Caspian Tern	II	X	X	X (islands)		
Common Tern	II	X	X	X (islands)	F	
Forster's Tern	II	X	X	F	F	
Black Tern	II	X	X	F	F, B	
Short-eared Owl	III	X	X		X	
Sedge Wren	III	X (NE)				
Le Conte's Sparrow	III	X (NE)	X (NW)			
Nelson's Sharp-t. Sparrow	III	X (NE)				
Bobolink	III					
Red-winged Blackbird	lll	X	X	X	X	
Yellow-headed Blackbird	III	X	X		X	

Conservation of wetland habitat for birds should not be confused with the legal aspects of the regulation of “jurisdictional” wetlands. Protection of a jurisdictional wetland from dredging and filling does not necessarily guarantee the wetland will be protected from other types of degradation that would reduce its suitability for bird use, such as pesticide pollution, or changes in adjacent upland cover. Also, the criteria used to define wetlands that are under the jurisdiction of the Army Corps of Engineers permitting process can be changed to serve political or other needs, resulting in the exclusion of some wetlands from protection. Conservation of wetlands for birds should always be tied in with conservation and management of surrounding uplands, which do not fall under the 404 permitting process.

Opportunities. Many different entities are involved in wetland protection and conservation. Site-specific or species-specific wetland conservation plans should be coordinated with other programs, when possible. In all cases, the full integration of other priority birds will strengthen the conservation benefits of these programs. Some of these include the North American Waterfowl Management Plan, U.S. Shorebird

Conservation Plan, U.S. Fish and Wildlife Service Partners for Wildlife, Montana Fish, Wildlife and Parks Waterfowl Stamp Program, and the Wetland Reserve Program. Other programs that work with wetland conservation in Montana are listed on the Montana Water Information System web page, which is located in the Montana Natural Resource Information System (http://nris.state.mt.us).

Prairie Potholes

Description. Glaciated prairie pothole wetlands are wetlands formed primarily by continental (or in some cases mountain) glacier activity. Most are small pothole wetlands in a matrix of grassland (or agricultural fields). Important cover types include marsh, mud flats, wet meadow, and open water. Hydrologic regimes vary, from permanent, semipermanent, or seasonal, to temporary. Most of those in eastern Montana tend to be saline in nature. Water levels in some are enhanced by irrigation runoff. Cattails, hardstem bulrush, and alkali bulrush are the most common emergent plant species. Salinity has a strong influence on the dominant plants, with cattails dominant in the fresh water, hardstem bulrush dominant in moderate salinity, and alkali bulrush dominant in higher salinity wetlands. Highly saline wetlands are usually characterized by a lack of emergent plants, and saline mud flats covered by greasewood, saltbush, or salicornia. These sometimes support high populations of salt-adapted invertebrates, such as brine shrimp, because predatory insects cannot tolerate the salt. Species such as Wilson's Phalaropes, Red-necked Phalaropes, and Eared Grebes are adapted to exploit these abundant invertebrates in supersaline water. Numerous temporary and seasonal (playa) wetlands in this region are filled with water in the spring, then become wet meadows with little open water by summer. Small islands and muskrat houses provide important nesting sites for some bird species.

Distribution. Most prairie potholes are found in northeastern Montana, north of the Missouri River and east of the Rocky Mountains. Northeastern Montana is the western extension of the large Prairie Pothole region of the Northern Great Plains, which is often referred to as the "duck factory" of the continent. Some glacial potholes are also found in the Palouse Prairie areas west of the divide, in the Flathead Valley near Polson.

Importance. Besides being the main breeding area for many duck species, the prairie pothole region supports the primary breeding populations for Eared, Horned, and Red-necked Grebes, Franklin's Gull, Forster's Terns, Black Terns, Yellow-headed Blackbirds, and Wilson's Phalaropes. The playa wetlands are important as pairing habitat for ducks and migration habitat for transient shorebirds, then later become important nesting and foraging habitat for species such as Short-eared Owls, Northern Harriers, Common Snipe, and in some cases, LeConte's Sparrows or Yellow Rails.

Status. Wetland losses in the Prairie Pothole region range from 30% to 90% throughout the Northern Great Plains, due primarily to draining and conversion to agricultural crops. Wetland losses in Montana probably range from 30-50%. They are also impacted by loss of surrounding uplands from conversion to croplands, degradation of uplands due to overgrazing, contaminated runoff from agriculture, selenium contamination from leaching due to irrigation or saline seeps, invasion by exotic plants (purple loosestrife), road building through wetlands, filling, industrial developments such as oil wells, and heavy recreational use (boating and fishing). Botulism is a recurring problem in some prairie pothole wetlands.

Piping Plover

Priority Level: I   MT Score: 25   AI: 2

Reason for Concern. The Piping Plover has suffered population and habitat losses throughout its range, primarily as a result of disturbance and development of its preferred beach nesting habitat. It is listed as a Threatened species by the U.S. Fish and Wildlife Service.

Distribution. Within Montana, Piping Plovers tend to use habitats that consist of sand, gravel or alkaline shores along lakes and rivers (Gaines and Ryan 1988, Reel et al. 1989). Breeding sites are typically composed of sand, pebbles or gravel on exposed beaches. Scattered clumps of vegetation can be present, but Wilcox (1959) found that nesting areas were abandoned if vegetation developed. Alkaline wetland shores with salt-encrusted, sandy to gravelly beaches along semipermanent potholes appear to be the main breeding habitat in Montana (Kantrud and Higgins 1992). Plovers tend to return to the same breeding areas year after year. Riverine habitats are also important; it has been estimated that 20% of the Great Plains populations utilize river islands and sandbars, including the Missouri River in Montana. Fluctuating water levels and wave action can eliminate breeding habitat in such cases, destroying establish nesting areas (Gaines and Ryan 1988, Haig and Plissner 1993). Piping Plovers have been found to loosely associate with Least Tern and American Avocet colonies. Outside of the breeding season, the species can be found using uplands, pothole margins, flooded fields, and mudflats.

Population Status. As recently as 1991, the population of Piping Plovers in Montana was a total of 308 birds, including 105 pairs at 79 sites (Haig and Plissner 1993). The current population goal for Piping Plovers in Montana is 60 nesting pairs, a total which has been exceeded in all recent years(A. Dood, pers. comm.).

Management Recommendations. A recovery plan is in place for this species.

Horned Grebe

Priority Level: II   MT Score: 16   AI: 3

Reason for Concern. Horned Grebes have shown significant population declines in the physiographic area that includes eastern Montana (p.a. 39).

Distribution. The highest reported breeding densities occur in the aspen parklands of southwest Manitoba. Transient records of the Horned Grebe have been reported statewide in Montana; breeding records are much more restricted, primarily from the northwest corner of the state. Additional breeding records are found north of the Missouri River to the eastern border, with one in the central portion of the state near Lewistown (Montana Bird Distribution Committee 1996).

Habitat Requirements. The Horned Grebe is found breeding on fresh to slightly brackish potholes, sloughs, marshes, ponds and lakes. Grebes seem to prefer small ponds, although they do use large lakes. Gap analysis (Redmond, et al. 1998) predicted 44,000 ha of Horned Grebe habitat in the state. Emergent vegetation around pond edges may be sparse, but the submergent vegetation is usually abundant.

Ecology. Their diet consists of aquatic insects, crustaceans and other aquatic invertebrates. Nests consist of floating platforms. Submerged vegetation is use to build a stable platform. Often the nest is attached to emergent vegetation.

Management Issues / Recommendations. Stable water levels are important both to nest success and to brood-rearing. Any wetland conservation efforts in occupied habitats should benefit the species.

Implementation of colonial waterbird monitoring on a statewide basis should provide ample opportunity to monitor the distribution and abundance of this species.

White-faced Ibis

Priority Level: II	MT Score: 16	AI: 2

Reason for Concern. This colonial species breeds at just a few known locations in the state; occupation and nesting success at these sites can be easily effected by water level changes. Populations are declining throughout N.A. (Ryder and Manry 1994).

Distribution. Transient records of White-faced Ibis have been recorded mainly from the southwest quarter of the state. However, a handful of transient observations have been recorded from eastern Montana. Breeding colonies are localized and known only from Red Rock Lakes NWR, Freezout Lake Wildlife Management Area, Benton Lake NWR, and Bowdoin NWR (Montana Bird Distribution Committee 1996). Gap analysis (Redmond et al. 1998) identified 41 thousand ha (or .1 %) of ibis habitat in the State.

Habitat Requirements. White-faced Ibis are closely associated with shallow wetlands with emergent vegetation or islands of emergent vegetation (Ehrlich et al. 1988, Ryder and Manry 1994). Colonies are limited to permanent wetlands. Marshes that suffer periodic drought or drainage will not provide adequate emergent vegetation. Vegetation common to nest sites consists of bulrush or cordgrass, while foraging sites are usually in shallows and contain short plants such as sedges, spikerushes, saltgrass. They also forage in irrigated crops such as hay meadows, alfalfa fields and barley.

Ecology. The diet is comprised of aquatic insects, crustaceans, earthworms and assorted other soft-bodied insects. They usually wash most of the soil from prey with available standing waters. White-faced Ibis are colonial nesters. The nest site can be variable with the usual site is dense stands of bulrush and cattail. However some colonies have been placed on bare dredge piles. Isolation appears to be important for colonies and night roosting.

Associated Species. Often the White-faced Ibis is associated with **Black-crowned Night Herons**, Great Blue Herons, **Franklin's Gulls** and Cinnamon Teal.

Management Recommendations. Continue to survey known and potential breeding locations to track the status of the species in the state on an annual basis. Provide stable water levels at colony sites during the duration of the nesting cycle.

Marbled Godwit

Priority Level: II	MT Score: 21	AI: 3

Reason for Concern. Marbled Godwits have been identified by the Western Hemisphere Shorebird Reserve Network as declining in world population (Harrington and Perry 1995). Former breeding habitats have been reduced with the conversion of native prairie and wetlands to agricultural use. The prairie pothole population appears stable for the past 25 years, despite habitat loss; this is attributed to the adaptability of the species. Nearly half the global population is found in physiographic area 39.

Distribution. The Marbled Godwit's primary breeding range is the moist grassland of the northern Great Plains of North America. Midcontinental populations are stable and number about 200,000 birds (Page and Gill, Jr., 1994). There are also isolated tundra-breeding populations in southwestern Alaska and at James Bay (Paulson 1993). They primarily winter on the coasts of the southern United States and Mexico. Known and suspected breeding in Montana has been mainly along the northern tier of latilong blocks east of the mountains, through the central portion of the state to the Centennial Valley (Montana Bird Record Committee 1996).

Habitat. Nesting habitat is the typical Great Plains prairie pothole, with native shortgrass prairie near wetlands. They forage in tideflats, ponds, shorelines and shallow wetlands (<12cm), and nest in drier grasslands. (Skagen et al 1998). During migration they stopover in wetland areas and shorelines. Post-breeders generally select wetland with more open cover in shallow water areas such as flooded livestock feedlots, then shift to alkaline wetlands, following water resources as drier conditions increase. Generally avoid tilled agricultural lands. Wetlands used for foraging may be fresh to strongly saline, and from seasonal to semi-permanent (Kaufman 1996).

Ecology. Marbled Godwits are loosely colonial nesters, and occasionally nest as far as 230 meters from water. Nest sites are usually a dry spot in shortgrass prairie wetlands, built of beaten-down grass or simple grass hollows in sparse cover. Eggs are incubated 21-23 days by both adults. Young are tended by both adults though they find all their own food and leave the nest soon after hatching, fledging in about 21 days. On the breeding grounds Marbled godwits consume mainly aquatic insects and grasshoppers, may also take some submergent aquatic vegetation. Feed by probing their slightly upturned bill nearly its entire length into the mud; also glean from vegetation. On the wintering grounds they congregate into large flocks and dine on insects, mollusks, and crustaceans. (Ehrlich et al. 1988).

Associated Species. Marbled Godwits show a natural tendency to flock together as a species as well as with other shorebirds, particularly Whimbrels and Long-billed Curlews. Other shorebirds using similar nesting habitats include the Willet and Long-billed Curlew.

Management Issues. Marbled Godwits depend on both wetlands and grasslands. Avian botulism can be a significant factor in receding wetlands, especially with young of the year birds in late summer. Land management practices aimed at producing undisturbed, tall, dense vegetation for waterfowl and upland gamebirds have reduced habitat, since Marbled Godwits nest in sparser, shorter vegetation. Livestock grazing is usually beneficial on breeding grounds, as historical bison trampling/ grazing and fire have been greatly reduced or eliminated (Ryan et al. 1994). Grazing, mowing, and fire are important tools which land managers can use in both wetlands and uplands to provide ideal breeding habitat (Ryan et al. 1994).

Franklin's Gull

Priority Level: II MT Score: 22 AI: 3

Reason for Concern. Franklin's gulls are a former C-2 ESA candidate species and a Species of Special Concern by TNC Natural Heritage Program. BBS data indicate significant population declines in the northern Great Plains over the past 30 years.

Distribution. Franklin's Gulls breed in Eastern Alberta, central Saskatchewan and southwestern Manitoba, to eastern North Dakota and western Minnesota across to north central Montana, Idaho, eastern Oregon, and northwestern Utah, northwestern Wyoming, and northwestern Iowa. They winter primarily along the Pacific coast of South America from Peru to northern Chile. Occasionally winters in southern California, and the south central United States. Migration is in small to very large flocks, primarily through the great plains (Burger and Gochfeld 1994). They are widely distributed in Montana during migration but breeding is limited to 6 latilongs. Five latilongs presently have nesting populations and include Benton Lake, Red Rock Lakes, and Bowdoin National Wildlife Refuges and Freezeout Lake WMA. Nesting records at Medicine Lake NWR are limited to a single year in 1985.

Habitat Requirements. Franklin's Gulls are over-water nesters that construct nests in stands of alkali and hardstem bulrush and/or cattail. Colony and nest site selection is dependant upon water levels and vegetation density. A key factor in nest site selection is that the floating nest be on water deep enough so that the marsh area does not dry completely before the young can fledge (this is a form of predator protection). Colony site shifts do occur from year to year, influenced by drought and fluctuating water levels.

Ecology. The average spring arrival data since 1971 at Benton Lake NWR is 4 April. Nests in colonies, numbering from a few hundred at Red Rock Lakes NWR to 25,000+ pairs at Benton Lake NWR. Territory acquisition begins as soon as the population decides on a colony site. The nest is anchored to surrounding vegetation and continually maintained. After a 24 - 25 day incubation period, the single brood of young stay on the nest for an additional 25 - 30 days. Family groups stay together after leaving the colony and disburse widely throughout breeding range before migration. The nesting colony is abandoned within 2 weeks of when the young can fly, usually mid - to - late August (Burger and Gochfeld 1994, Kaufman 1998).

Franklin's Gulls are primarily insectivorous, consuming aquatic invertebrates (especially midges and midge larva). They are also known to follow agricultural equipment and consume what is disturbed, including earth worms, grasshoppers, and small mammals. Will also consume grains and seeds (Burger and Gochfeld 1994).

Associated Species. Colony sites are often shared with other wetland colony nesting species, including White-faced Ibis, Black-crowned Night Herons and Eared Grebes. In the South American wintering grounds it inhabits coastal areas, lake shores, tidal flats and wetlands (Burger and Gochfeld 1994, Ehrlich et al 1988).

Management Issues/Recommendations. Management issues for this species are primarily concerned with providing ideal colony site conditions. This entails vegetation that is open enough for nest construction, and water level management so that nests remain afloat. Water level management also should be concerned with providing the invertebrate populations which make up a substantial part of the gull's diet. Providing wetlands with enough food resources through the Great Plains is necessary for shifting colonies and during migration (Burger and Gochfeld 1994). Colonies are very sensitive to human disturbance and caution must be used when studying them or working near them. Abandonment of nests is less likely with young than eggs but may still occur with repeated disturbance (Burger and Gochfeld 1994).

- The size and distribution of colonies should be monitored over time, throughout the range of the species in the state.

- Wetland management at known and potential colony sites should include vegetation management to provide fairly open vegetative cover over water.

C Minimize human disturbance to nesting colonies during the nesting season (April through August).

Forster's Tern

Priority Level: II MT Score: 20 AI: 3

Reason for Concern. Populations of this colonial nester are not adequately surveyed in the region or in the state, which is considered a species of special concern by Montana FWP and the Natural Heritage Program.

Distribution. Breeds throughout the central Prairie Provinces of Canada (Lake Winnipeg, Manitoba, to southeastern British Columbia) south to southern California, western Nevada, southern Idaho, northern Utah, northern and eastern Colorado, central Kansas, western Nebraska, northern Iowa, northwestern Indiana, to eastern Michigan; coastally from northeastern Mexico (Tamaulipas), southeastern Texas to southern Alabama; along the Atlantic coast from Long Island to (rarely) South Carolina. Breeding is known at 6 scattered locations in Montana; migration occurs throughout the state, although few are seen off the breeding areas (Montana Bird Distribution Committee 1996). Winters from central California and Baja California to Oaxaca and Guatemala, casually to Costa Rica; northern Veracruz to western Florida; Virginia to northern Florida; Bahamas and Greater Antilles.

Habitat Requirements. Primarily a bird of large marsh complexes, it is also occasionally found along marshy borders of lakes and reservoirs in Montana. This is also true in South Dakota, where is it reported to avoid small marshes (Johnsgard 1979). Forester's Terns nest on inland lakes and marshes, or on salt marshes (especially on wrack) along the coast. During migration and winter this tern also seeks seacoasts, bays, estuaries, rivers and lakes (AOU 1983).

Ecology. Usually found in small loose colonies in Montana. Forester's terns nest on a floating mass of marsh plants, on muskrat house, or old grebe's nest, or in a depression lined with grasses and pieces of shells (Johnsgard 1979, Godfrey 1986). Occasionally Forster's Terns will nest on islands or beaches like Common Terns, using a lined depression in the mud or sand (Johnsgard 1979, Ehrlich et al. 1988). At times, nests will be very close together on a favored site, such as a muskrat house, where up to five nests have been reported together (Johnsgard 1979). See Spendelow and Patton (1988) for further information on freshwater nesting habitats. During nonbreeding season, this tern is found singly or in small loose groups. Catches flying insects (e.g., dragonflies, caddisflies) or snatches up insects (e.g., dead beetles) off the surface of the water while in flight; dives into water for fishes (Terres 1980).

Management Recommendations. Threats include human disturbance and development of nesting areas and loss of nests to flooding (Byrd and Johnston 1991). Human-made nesting platforms made of bundles of Phragmites or Typha on floating base of styrofoam and wood or tires were readily used for nesting in Wisconsin (see Spendelow and Patton 1988).

C Survey known nesting colonies on an annual basis to determine status.

C Provide adequate water levels to protect nesting islands from mammalian predators.

C Manage water levels on lake and river nesting areas so as not to flood nest sites.

C Minimize human disturbance at nesting colonies during the breeding season.

Black Tern

Priority Level: II MT Score: 17 AI: 3

Reason for Concern. The Black Tern is a species of special concern in much of North America, due to continent-wide population declines since 1960 (Shuford 1999). Currently the species is listed as threatened or endangered in 6 states, and listed as a species of conservation concern in 18 other states and provinces. In Montana, the Black Tern is listed as a Species of Special Concern, but has not been consistently monitored. Breeding bird survey and other data indicate that most declines took place prior to 1980, but that North American populations have leveled off or increased slightly during the 1990's. The main causes of population declines in North America appear to be habitat loss and degradation on the breeding grounds, although introduced species, human disturbance, and contaminants may be contributing factors. Little is known about threats to the Black Tern during migration and winter.

Distribution. The Black Tern is a localized breeder throughout most of the northern Great Plains and Great Lakes states, the southern Canadian provinces, and northern Great Basin. The core of the breeding range is the prairie pothole area of the northern Great Plains, including Alberta, Saskatchewan, Manitoba, N. and S. Dakota, and Minnesota (Dunn and Agro 1995). Isolated breeding populations occur in California, New England, Kansas, and Indiana (Dunn and Agro 1995). Black Terns winter along the coasts of Central and South America, although the winter distribution is poorly documented. In Montana, the breeding distribution extends across the entire state, and breeding has been documented in 26 latilongs (Montana Bird Distribution Committee 1996). However, some historic breeding sites may no longer be occupied, and nesting sites used by Black Terns may change from year to year in response to water conditions. Rauscher (1997) surveyed 45 water bodies statewide in 1997, and found 320 Black Terns at 16 sites, and at 5 of 8 previously known sites. The largest known colonies are at Freezout Lake WMA, Benton Lake NWR, Blackfoot WPA, and on the Blackfeet Reservation (Rauscher 1997).

Habitat Requirements. Black Terns nest in shallow, freshwater wetlands in emergent vegetation. Most nests are in semipermanent wetlands, in open or forested country. They seem to prefer marshes or complexes greater than 20 ha, although ponds as small as 5.3 ha have been used (Dunn and Agro 1995). Nesting sites are usually in areas with 25%-75% of the surface covered with emergent vegetation. Vegetation varies from bulrush and cattails to burreed, sedges, reed canary grass, horsetail, and rush (Dunn and Agro 1995). In Montana, most breeding colonies are in dense stands of alkali bulrush, hardstem bulrush, or cattail. Black Terns have been reported to nest on algal mats in Ninepipes National Wildlife Refuge (Rauscher 1997). Water depths in nesting areas typically range from 0.5 to 1.2 m. Nests are usually within 0.5 to 2 m of open water, and are usually located away from shore. Emergent vegetation height varies from less than 0.5 m during nest-building to greater than 1 m by hatching (Dunn and Agro 1995).

Ecology. Black Terns nest semi-colonially in emergent vegetation in biologically rich wetlands (Dunn and Agro 1995). Nests are flimsy, often floating, and are easily destroyed by wind or changing water levels. Reproductive success is highly variable. Adaptations to marsh nesting include frequent renesting, low site tenacity, and eggshell morphology suited to damp conditions. Black Terns feed primarily on aquatic insects and small fish. Nesting colonies usually consist of clusters of 10 to 50 nests spaced from 5 to 20 m apart, although some pairs may nest solitarily (Dunn and Agro 1995). Incubation begins with the first egg, and is reported to be 19 to 21 days (Dunn and Agro 1995). In Montana, an incubation period of 19 days was observed in two nests at Freezout Lake which were visited during egg-laying and hatching. Earliest hatching is reported to be early June, but most hatch in late June through early July (Dunn and Agro 1995). Dunn and Agro reported that most young fledge from mid to late July. At Freezout Lake in 1996, most nests were initiated in early to mid-June, and most hatched in late June and early July. Fledging was estimated to peak in late July. However, hatching (pipping) nests were observed as late as 14 July, due to renesting attempts (DuBois 1996).

After hatching, tern chicks remain on the nest platform where they are fed by adults. Chicks typically leave the nest platform and hide in surrounding vegetation during threatening situations (DuBois 1996). Nesting birds are sensitive to disturbance, and will mob intruders in their nesting areas. Black Terns forage as far as 4 km from nesting areas, but most foraging takes place within 500 m of the nest when young are being fed (Dunn and Agro 1995).

Management Issues/Recommendations. Black Terns are adapted to handle small changes in water levels during their nesting (Dunn and Agro 1995). Chicks will move in response to changing water levels, and adult terns will construct feeding platforms for them, if the nest platform is no longer usable. However, the nest platforms can be flooded out by rising water levels. Low water levels may increase the likelihood of nest predation by raccoons and other mammals. After hatching, chick mobility can allow Black Terns to survive some changes in water levels, although more information is needed on the impacts of water fluctuations on chick survival.

Shuford (1999) identified monitoring, habitat protection and management, research, and education as actions needed to protect or enhance Black Tern populations. Specific management issues in Montana include water level fluctuations in nesting areas due to natural events or manipulation for other species, disturbance in nesting colonies, contaminants issues (high selenium levels in a few nesting areas east of the Divide), habitat loss (especially small pothole wetlands west of the Divide, and in the prairie pothole area in northeastern Montana), and predator management. Population trends in Montana are poorly understood.

C A monitoring program should be developed in cooperation with state, federal, and tribal entities who manage wetlands in Montana.

Water Management. Several of the larger tern colonies in Montana are in water units that are managed for waterfowl. In many cases, management of water levels for waterfowl maintains or enhances nesting habitat for Black Terns. For example, water management at Freezout Lake provides a buffer against water fluctuations caused by large storm events or severe drought, thus maintaining nesting habitat for Black Terns in very wet or very dry years. At Benton Lake NWR, few Black Terns nested during the late 1980s, but nesting increased dramatically in the 1990s after water management was changed to increase the amount of emergent vegetation in one of the pond units. On the other hand, the largest Black Tern colony in Montana was formerly at Red Rock Lakes NWR, which prior to the mid-1980s hosted 1000+ Black Terns. A dramatic decline in numbers followed the installation of a new dam structure in the late 1980s (Shuford 1999).

C In most cases, waterfowl production area managers can provide suitable nesting habitat for Black Terns, without any major changes to their water management.

C Provide managers with information on the specific habitat needs of Black Terns.

Disturbance in nesting colonies is a potential problem in colonies that are located on boatable/fishable waters in western Montana, such as Browns Lake near Ovando.

- Protect tern colonies by implementing a public education and signing program, similar to the program for Common Loon nesting areas.

High levels of selenium and other contaminants may influence reproduction in some nesting areas. Benton Lake NWR is implementing actions to address high selenium levels in their water units. Studies have been conducted at Freezout Lake WMA to evaluate both selenium and salinity in their units.

- Undertake continued management actions at waterfowl management areas to reduce salinity and selenium concentrations.

Pesticide contamination has not been evaluated in Montana. Most Black Tern nesting colonies are in wetlands surrounded by agricultural land, and vulnerable to contamination from agricultural runoff. Although Black Terns tend to nest in high-nutrient wetlands, excessive nutrients from agricultural or urban runoff can cause excessive growth of emergents and algae, making the wetland unsuitable for nesting or foraging.

- Take steps to reduce nutrient loading from runoff at known Black Tern nesting sites.

Loss of wetlands has resulted in direct loss of habitat, and fragmentation of existing habitat. Loss of potential nesting and foraging habitat for Black Terns is greatest in northeastern Montana and northwestern Montana.

- Incorporate Black Tern habitats (known and potential) into any wetland restoration programs.

Predator management is a concern in many waterfowl production areas. Low fur prices, habitat fragmentation, farming practices, introduction of nonnative predators, and enhancement of native avian predator populations (corvids and gulls) have contributed to increasing predation levels on birds nesting in fragmented wetlands.

- Predator management should be addressed, as needed, around wetlands where Black Terns nest.

Clark’s Grebe

Priority Level: III MT Score: 20 AI: 3

Reason for Concern. This species is poorly understood and poorly monitored in the state, although the Montana Natural Heritage Program has tracked the element occurrences of known nesting sites. It is one of several nongame colonial waterbirds whose habitat needs should be incorporated into the water level and habitat management decisions at the refuges and other management areas it occurs.

Distribution. The Clark's Grebe is found from southern Colorado to the eastern boundary of North and South Dakota and into Canada. Their distribution extends through Montana to southern Idaho and the eastern half of Oregon. From there its distribution continues south to southern California and Nevada. Their distribution in Montana is mostly made up of sightings from along the Rocky Mountain Front and south through the Big Belt Mountains. Occasional sightings have been recorded from west of the divide (Montana Bird Distribution Committee, 1996). They occur in small numbers at several large Western Grebe colonies (e.g Freezout Lake)

Habitat Requirements. The Clark's Grebe is a bird of open water habitats. Usually breeding takes place on lakes with at least several square kilometers of open water (Storer and Nuechterlein, 1995). Most lakes that contain Grebe colonies support emergent vegetation along shorelines.

Ecology. Nesting is colonial on semi-traditional sites. The water level may determine exact location of the site. Usually the first nests are at the center of the colony with new nests making the colony grow outward. Most colonies are placed in emergent vegetation. Most nests are placed in water that is 25 cm or deeper. Adjacent nests are spaced about 4 m apart.

Management Recommendations. All known grebe nesting colonies should be surveyed on an annual basis to track distribution and numbers of both Western and Clark's Grebes.

Black-crowned Night Heron

Priority Level: III MT Score: 15 AI: 3

Reason for Concern. Black-crowned Night Herons are sensitive to disturbance and water level fluctuations at nesting colonies. They were once placed on Audubon's "Blue List" of imperiled birds, but populations now seem to have stabilized across the continent (Davis 1993). They are poorly monitored in Montana.

Distribution. This species is more common in eastern, and especially northeastern Montana, with only a few breeding records in the western portion of the state (Montana Bird Distribution Committee 1996).

Habitat Requirements. They generally prefer bulrush or cattail marshes for nesting in Montana, but will also nest in cottonwoods, willows or other wetland vegetation (Burleigh 1972, Davis 1993). They prefer sites over water or on islands, for security from mammalian predators.

Ecology. Night herons forage primarily in wetlands and more rarely in grassland. Fish, insects, crustaceans and even small mammals are taken as food. They are crepuscular to nocturnal in their activity patterns.

Associated Species. In marsh environments, they often nest in close association with **White-faced Ibis** and **Franklin's Gull**. Will sometimes nest within heronries occupied by Great Blue Herons.

Management Issues/Recommendations. Habitat integrity of nesting colonies is essential to their continued use. If disturbance is minimized and water levels are consistent, some colonies have been used for 30 consecutive years or more (Davis 1993). Annual surveys should be conducted to track the occupancy of known and potential colony sites, and develop population trends.

Black-necked Stilt

Priority Level: III MT Score: 16 AI: 3

Reason for Concern. The Black-necked Stilt is one of several colonial waterbirds designated as local interest species by Montana PIF to emphasize the need to survey, manage and protect known colony sites.

Distribution. Range seems to be expanding; breeds locally in marsh habitats, throughout the northwest. Occurs as an uncommon to rare transient widely throughout Montana, except for the southeastern corner (Montana Bird Distribution Committee 1996). Benton Lake NWR has the largest reported breeding population in the state, with 100 nests in 1996 (Martin 1999). The average earliest known arrival date at BLNWR is 17April (n= 15 years). In Montana, breeding or suspected breeding has occurred in 8 latilong blocks, with widespread sightings reported during migration. Several sightings are reported in the western part of the state as transient migrants each year (Montana Bird Distribution Committee 1996). Winters in South America and the south- central United States; Gulf coast.

Habitat Requirements. Typically breed in shallow marshes that are likely to dry up in some years, and thus may move nesting sites from year to year (Paulson 1998). Often nests in alkali bulrush habitats among colony nesters such as Franklin's Gulls, Black Terns, Foster's Terns and American Avocets. Migrate in habitats that are similar to nesting habitats, ranging from mudflats, tidal pools, shorelines, and wetlands with sparse to dense vegetation and fresh to very saline water.

Ecology. Black Necked Stilts nesting occurs in wetland habitats with very specific water level requirements- they will move if the water level is too shallow *or* too deep (Paulson 1993). Forage most often in water, usually in deeper waters than other shorebirds due to their unusually long legs (Paulson 1993). Eats a variety of insects, including aquatic invertebrates, crustaceans, snails, grasshoppers, small fish, and the seeds of aquatic plants. (Montana Natural Heritage Program 1997). Black Necked Stilts are more tolerant of saline and alkali environments than other shorebirds and exploit such food resources as brine flies and brine shrimp that other shorebirds ignore (Ehrlich et al 1988). They nest in loose colonies, often intermixed with American Avocets. Nest structures are variable, ranging from a simple scrape in dry environments to substantial structures of vegetation in wetter conditions (Paulson 1993). Vegetation used for nesting at Benton Lake is primarily Alkali Bulrush. In hot, dry conditions, has the habit of soaking belly feathers in water and then sitting on eggs to cool them (Ehrlich et al 1998). Eggs are typically laid by 1 June. Young hatch in 25 days, and feed themselves while tended by parents. First flight around 30 days (Ehrlich et al 1998), meaning at Montana breeding sites, the young fledge on or around 25 July.

Management Issues. Key management practices aimed at providing the right level of water during the breeding cycle. Black Necked Stilts are more tolerant of habitat fluctuations than other species of shorebirds and this is most likely why their range seems to be expanding across the northwest. Additionally they are more likely to make use of man-made habitat, such as dikes and sewage pools. Will move their nesting site if water levels are too shallow or too deep (Paulson 1993).

Willet

Priority Level: III MT Score: 18 AI: 3

Reason for Concern. Appears to be declining both regionally and nationally, although long-term data are scant.(Dobkin 1992).The Canadian population considered stable with an estimated population of 15,000 birds (Erskine et al., 1992; Morrison et al., 1994a). Physiographic area 39, which includes eastern Montana, supports almost one-fourth of this Watch List species' range. Loss of habitat has had the effect of reducing the populations to some degree, but this species seems more adaptable and tolerant than other shorebirds (Kaufman 1998, Paulson 1993).

Distribution. North American Willets occupy two distinct populations: those that breed in the prairie wetlands of the great plains and southern central Canada, and those nesting on the Atlantic and Gulf coasts. Winters in southern U.S. to Brazil and Peru. In Montana, breeding has been documented 16 latilong blocks primarily east of the Continental Divide. Western Montana nesting limited to the Bozeman area and the

Centennial Valley. (Montana Bird Distribution Committee 1996).

Habitat Requirements. Willets, like the Marbled Godwit, require a mosaic of wetland types from ephemeral to semi-permanent, interspersed with short to moderate height grasslands for nesting and brood rearing. Feed primarily by probing for aquatic invertebrates in soft, usually moist substrates, less than 10cm but also pick items from the ground in upland nesting sites. Generally willets forage in water depths ranging from dry mud to 10cm deep, and will forage in sparse vegetation more readily than most shorebird species. Willets also seem to be more tolerant of saline water conditions than other shorebirds (Paulson 1993).

Ecology. On the Atlantic coast, willets may be colonial or semi - colonial. Little evidence for colonial nesting is seen in the great plains population. The average earliest known arrival date at Benton Lake NWR is 18 April (N=23yrs)with a range from 17 March to 26 April. Willet nesting at Benton Lake NWR begins in early May, with the first broods sighted on during the second week of June. Nests are built on the ground, usually among dense short grass. Usually the nests are well hidden; occasionally conspicuous. Nests are constructed of bent over grass, lined with finer grass, though some may be simple scrapes or shallow depressions. Incubation is 22 - 29 days; the female abandons male and brood 2 - 3 weeks after hatching, and the male attends the brood for 2 more weeks. The young find all of their own food. Both adults leave the breeding ground before the young are fully fledged. Willet nests are subject to predation by wetland mammals and avian predators, particularly crows and magpies (Ehrlich et al 1988, Paulson 1993).

Management Recommendations.

- Maintain wetland habitat and providing optimum (shallow but stable during nesting) water levels.

- Utilize habitat management tools such as spring flooding and controlled burning to provide optimum invertebrate populations and foraging habitat.

Wilson’s Phalarope

Priority Level: III MT Score: 21 AI: 4

Reason for Concern. Wilson’s Phalaropes have been identified as “declining in world population” (Harrington and Perry 1995). Although populations are doing well in both of the physiographic areas overlapping Montana, we include them as a local interest species because more than a quarter of their population breeds in p.a. 39, which includes eastern Montana, and because they are more reliant on saline wetlands than most other species.

Distribution. This species breeds in wetlands of much of western North America and Canada, and migrates often in one 57-hour nonstop flight to wintering grounds in Peru, Chile, Bolivia and northwest Argentina (Colwell and Jehl 1994).They nest in 22 Montana latilongs, including both eastern and western portions of the State.

Habitat Requirements. Wilson’s Phalaropes nest in sparse to dense vegetation in both upland and marshes, as well as roadside ditches. Nest sites in upland habitat are usually withing 100 meters of water. Nests are occasionally very close to water in marshy vegetation. This species is more tolerant of hypersaline water conditions than other shorebirds, and forages in water ranging from fresh to super-saline.

Ecology. Use of highly saline environments may play a role in external parasite control, and also allows the use of food resources that other species do not take advantage of. Feeds primarily on dipterans and crustaceans, as well as some terrestrial invertebrates.

Pairs arrive on the breeding grounds in late April to early May. The average earliest know arrival date at Benton Lake NWR is 30 April (N= 20yrs), ranging from 11 April to 9 May. Nest site selection is done by the female; male clears scrape and lines with grass. Female leaves nest and breeding territory after clutch is complete and heads to migration staging areas. The male alone incubates eggs for 23 days. Newly hatched young are fully feathered and feed themselves. Wilson's Phalaropes one of the earliest fall migrants, most being well on their way by mid- September and at the wintering grounds in early October. Females leave breeding ground in mid- June followed by males and juveniles.

Management Issues. Some loss of habitat occurred in the early part of the 20th century when areas of great plains wetlands were drained and converted to agricultural use. Loss of habitat however has not shown a significant change in population and the species seems apt at finding new nesting locations. The major management challenge is to control water inflow to saline lakes and wetlands to provide preferred habitat. Several important saline wetlands complexes have been named to the Western Hemisphere Shorebird Reserve Network, including Benton Lake NWR, Great Salt Lake NWR, Mono Lake, CA, and Laguna Mar Chiquita, Argentina. Observations at Benton Lake of California Gulls preying on phalarope chicks suggests that control of local gull populations needs to be a consideration in management efforts for Wilson's Phalarope (S. Martin, USFWS, pers comm).

Le Conte's Sparrow

Priority Level: III   MT Score: 22   AI: 3

Reason for Concern. Although (and it part because) it is essentially a peripheral species in the state, occurrence of the LeConte's Sparrow has traditionally been tracked by the Montana Natural Heritage Program. This poorly known wetland/grassland specialist is one of few passerines closely tied to rank sedge meadows.

Distribution. The LeConte's Sparrow is primarily a bird of the northern Great Plains and central Canadian provinces. They are known to breed in two disjunct areas in Montana: the extreme northeast corner, and a few sedge meadows in and near the west edge of Glacier National Park.

Habitat Requirements. They prefer wet meadows dominated by sedges or grasses, sometimes with a forb component, or lowland sites of taller grasses, often near or along intermittent wetlands or streamcourses. They have been found in alfalfa hay meadows and wheatgrass CRP lands in North Dakota (Lowther 1996).

Management Issues/Recommendations. LeConte's Sparrows are a logical inclusion in any conservation efforts aimed at grassland/wetland complexes in extreme northeast Montana, and for sedge meadows/fens in the northwest. Their populations may fluctuate wildly during wet and dry years. Some CRP seed mixtures may have promise as nesting habitat, and this should be tested. Known breeding sites in both populations in the state should be tracked through annual surveys/site visits.

Nelson's Sharp-tailed Sparrow

Priority Level: III   MT Score: 25   AI: 2

Reason for Concern. This species is even more peripheral than the preceding species, but is poorly monitored where it occurs.

Distribution. The primary breeding range of the Nelson's Sharp-tailed Sparrow is in the prairie potholes region of North Dakota, Saskatchewan and Manitoba. It is found only in the extreme northeast corner of the state.

Habitat Requirements. This species nests in grassland, marsh edges, and herbaceous wetlands, where they typically select bulrush or cattails for nesting. They are more of a true wetland species than the LeConte's Sparrow, but surprisingly more abundant during drought years (Stewart 1975).

Management Issues/Recommendations. Sharp-tailed sparrows respond negatively to any amount of livestock grazing in nesting habitat. They are a logical inclusion in any conservation efforts aimed at grassland/wetland complexes in extreme northeast Montana. Known breeding sites should be tracked through annual surveys/site visits.

Habitat and Population Objectives: Prairie Potholes

The primary conservation objective for prairie pothole wetlands is to identify, protect and manage pothole/grassland complexes wherever possible to provide for the needs of priority (and associated) species. The primary delivery mechanism for this type of conservation to date has been the Prairie Potholes Joint Venture, whose management board and technical committees work to bring funding to local partners to achieve waterfowl conservation objectives at key wetland complexes or sites. Montana PIF will work with the PPJV and other partners to strengthen existing wetland conservation efforts and identify additional opportunities to meet all-bird objectives. This effort will include establishing coordinated monitoring for colonial and grassland species, and outreach to landowners and public land managers regarding the needs of shorebirds and landbirds.

- Establish coordinated monitoring of colonial nesting sites throughout the pothole region.
- Identify and prioritize wetland/grassland complexes for protection through acquisition, easements, or management agreements.
- Develop materials for land managers, particularly private landowners, that highlight the importance of water level management, timing of haying/grazing, application of chemicals, controlled use of fire, and integration of wetland and grassland objectives. Provide these materials to local Conservation Districts.
- Work with the Prairie Pothole Joint Venture at the technical committee level to help incorporate all-bird considerations in their conservation efforts.

Intermountain Valley Wetlands

Description. Intermountain valley wetlands in Montana are mostly small, low-elevation wetlands in glaciated valleys. They are often associated with riparian systems, and many had their origin as river oxbows. Some are glacial potholes or large glacial valley lakes, and these are usually in a forested landscape (as opposed to prairie potholes in a grassland landscape). Intermountain valley wetlands are usually not saline, and generally have low conductivities. Important cover types include emergent marsh, aquatic beds, open water, shrub swamp, wooded swamp, wet meadow, and bog/fen. Hydrologic regimes include permanent, semipermanent, seasonal, and temporary. Islands, trees, and muskrat houses provide important nesting sites for some bird species.

Distribution. Distribution is primarily northwestern Montana, west of the Continental Divide, at low elevations. The Flathead Valley has the highest concentration of these wetlands.

Importance. These intermountain valley wetlands in Montana support the largest nesting population of the Common Loon in the lower 48 states west of the Great Plains. Historically, they supported a population of nesting trumpeter swans. They support nesting populations of many common waterfowl, shorebird, and waterbird species, as well as Short-eared Owls, and other upland species. They also support scattered populations of Black Terns, Common Terns, Yellow-headed Blackbirds, and American Bitterns. They provide important migration habitat for transient shorebirds, waterfowl, and Sandhill Cranes. They provide important foraging habitat for Bald Eagles, and Peregrine Falcons.

Status. Unquantified but substantial wetland losses in northwestern Montana have resulted mostly from filling or draining for subdivisions and agriculture. Intermountain wetlands have also been impacted by (often shoreline)development of surrounding uplands (especially cabins and rural subdivisions), contaminants (mainly pesticides and heavy metals from mining, agriculture, acid rain, and urban runoff), invasion of nonnative plants (purple loosestrife), introduction of nonnative fish (northern pike, which are predators on waterbird chicks), and disturbance from increasing recreational use (especially motorized boat use).

Common Loon

Priority Level: I MT Score: 19 AI: 3

Reason for Concern. The Common Loon, and particularly its mournful yodeling cry, has been romanticized as a voice of the northern wilderness. Throughout our culture, the loon's calls are used as a symbol of the wild, the unknown. Public interest in the conservation of this species is therefore high. It is considered a “sensitive species” by Region One of the Forest Service, a Species of Special Concern by MFWP, and a special status species by the BLM. Montana supports the only significant population in the U.S. west of the Mississippi.

Distribution. The Common Loon breeds throughout Alaska and Canada, and less commonly in the northern continental United States (AOU 1983). New England and the upper Midwest support the highest number on breeding loons in the lower 48 states, and northwestern Montana supports the highest density of nesting loons in the west. Most wintering birds are found on the coasts, though birds sporadically overwinter throughout the country on larger bodies of water, where they are typical during migration.

Common Loons occur throughout Montana during migration, but breeding is restricted to the northwestern corner of the state (Bergeron et al. 1992). The species has been recorded in 40 latilong blocks and is known to breed in 7 of these. About 200 loons, including about 65 nesting pairs, use the state on an annual basis. Most breeding occurs on lower elevation glacial lakes in the Stillwater, Swan, Clearwater and North Fork Flathead River drainages. Nests have also been found on a few lakes east of the continental divide in Glacier

National Park and the adjacent Blackfoot Indian Reservation.

During migration, a wide variety of open water habitats are used, but larger lakes and rivers are preferred. Loons occasionally spend the winter on larger lakes and reservoirs. Recent band returns indicate that Montana's breeding loons spend the winter on the California coast.

Habitat Requirements. In Montana, loons generally do not nest on lakes smaller than 13 ac in size or over 5000 ft in elevation (Skaar 1990). Indications in other states are that reproductive success is poorer on smaller (<25-acre) lakes; nests on larger lakes which are higher in alkalinity were more successful than those a smaller, more acidic lakes in Ontario (Alvo, et al. 1988). Loons require both nesting sites and nursery areas for successful nesting. Small islands (preferred) or herbaceous shoreline areas (esp. promontories) are selected for nesting, and sheltered shallow coves with abundant insects and small fish are used as nursery areas (Skaar 1990).Most lakes inhabited by loons are relatively oligotrophic and have not experienced significant siltation or other hydrological changes.

The loon population of northwest Montana is limited primarily by the quantity and quality of nesting habitat. Based in the number and size of lakes within the species breeding distribution, Skaar (1990) estimated the state's "carrying capacity" at 185 potential nesting territories. He assumed 100 ha of surface area per pair. Kelly (1992) documented a density of 72.2 surface ha of water per adult loon for the Tobacco, Stillwater, Clearwater, and Swan River drainages.

Ecology. Loons feed by diving from the surface and pursuing aquatic prey, primarily fishes, and occasional invertebrates and amphibians (Terres 1980). It has not been determined if loons select prey species in relation to their availability, or if any species preference is shown. Food abundance undoubtedly plays a role in limiting the distribution of loons in Montana, but this relationship has not been quantified.

Loons first breed at 5-10 years of age, and probably live 20 or more years. Nesting pairs are highly territorial. They arrive in Montana in April and initiate nests in early May. Nests are always within 1.5 m of the shoreline, generally on spits or small islands. Clutch size is typically 2, but varies from 1 to 4 eggs. Incubation is 26-31 days, by both sexes. Initially both adults tend the young, which fledged at approximately 10-12 weeks of age. Renesting may occur, usually within 5-14 days after egg loss. Productivity studies show that the number of fledged young per territorial pair ranges from 0.2-0.8 in the U.S. and southern Canada.

Predation of nests is usually by avian predators (gulls, American Crow, Common Raven), but also by raccoons and skunks. Predation of adults is probably very limited, but Bald Eagles are known to prey on chicks. Human and dog disturbance, flooding (by precipitation or beaver activity) can also play an important role in nest failures.

Circumstantial evidence is that young which survive to reproductive age pioneer into areas nearby their natal territory. They usually do not return to the state from wintering areas until they are 3 years old and have attained adult plumage. They rarely return to lakes more than 40 mi from their natal lake, which makes this species poor at pioneering or re-inhabiting vacant territories unless they are adjacent to existing, successful territories.

Management Issues/Recommendations. The most significant changes occurring in breeding areas are shoreline development and increased recreational use during the nesting and young-rearing season. Probability of nest success apparently decreases with increased shoreline development and recreational activity, though some loon pairs show an ability to habituate to human activities (Heimberger et al. 1983). Montana loons generally do not nest on lakes under 20 ha in size unless at least half the shoreline is undisturbed. Acidification of nesting lakes could lower nest success rates or render them unsuitable through reduction of available foods for young (Alvo et al. 1988). A Montana Common Loon Management Plan was completed in 1990 in response to the perceived need to consider this species in management of northwest Montana lakes. The Montana Loon Working Group was established in 1999 to implement items in the plan.

If nesting pairs are lost, or are unsuccessful year after year, there will not be returning 3-yr olds to augment the population. Over time, this can cause local populations to disappear. But because adult mortality is low (perhaps 5%), annual occupancy of territories may mask this problem. It is essential, therefore, to document nesting success and take steps to protect occupied territories.

Though there is no compelling evidence of population declines in this species in the state, it is likely that a considerable amount of nesting habitat for loons has been lost to lakeshore development in northwestern Montana. Water quality degradation from point sources such as faulty septic systems, or more generally from road-building, timber harvest, or other activities near nesting lakes also has the potential to change prey populations and vegetation patterns at nesting lakes. Resultant changes in nest site suitability or nest success may occur. Manipulation of water levels can also reduce the suitability of lakes and reservoirs as feeding or nesting sites.

C Maintaining the suitability of currently-used nesting territories is the top priority for the species.

Preparation of site-specific territory management plans is a primary strategy, and occupied lakes have been prioritized based on perceived or documented threats or conflicts and reproductive history (Skaar 1990). Specific management tools include controlling access to or near nests, easements, acquisition of traditional sites, signing, physical barriers, the use of artificial nest structures, and recreational use restrictions. Interim guidelines for minimizing disturbance have been developed (Skaar 1990). Use of floating signs, for example, to delineate and limit access into nesting and nursery areas has been shown to increase nest success, number of chicks produced, and frequency of 2-chick broods (Kelly 1992).

Lakeshore real estate and water-based recreation are both commodities in high demand in northwestern Montana. As nesting lakes become more developed, shoreline nesting sites can be lost. Loons are highly intolerant of human activity in the nesting territory; Kelly (1992) found that 60% of nest departures of incubating loons were due to human disturbance, usually boats. Heimberger et al. (1983) found that cottages within 150 m of a nest drastically lowered hatching success.

C Minimization of development and recreational activities on known nesting lakes, at least during critical portions of the breeding cycle, is perhaps the best means of managing loon habitat in northwestern Montana.

C Posting of nesting or nursery areas on those lakes most susceptible to disturbance has been shown to be effective.

Floating signs have been built by MFWP and conservation groups for use on high conflict lakes. They are deployed in a 70-150 m arc around the nest and form a voluntary closure. Floating signs and posters at boating access sites have been most effective when used in combination. Signs and instructions are available from the Montana Loon Working Group (Gael Bissell, (406)751-4580), who also coordinate their deployment.
Floating nesting platforms have been used with some success in lakes which lack nesting islands or where water level fluctuations threaten nesting success at natural sites. They should not be viewed as an easy

alternative to the protection of natural nest sites.

C Public education is an important element in the protection of nesting security.

Personal contact with the recreating public improves compliance with signs and builds local support for loon conservation. It should occur before, during and after the deployment of floating signs or posters. The best option is personal contact at boat ramps, by non-agency volunteers.

Land ownership around nesting lakes varies widely, and is a primary factor in the management opportunities available for this species. The U.S. Forest Service (Flathead National Forest) has already developed a loon management plan which addresses protection of habitat quality at nesting lakes (Skaar 1990). The National Park Service (Glacier National Park), and Department of State Lands (Swan River and Clearwater State Forests) also administer lands around nesting lakes. Fifty-four of 72 currently -used nesting lakes (75%) are bordered by public land, although private landowners taken as a whole own land on the greatest number of lakes (39). There are only five lakes where public access is currently denied by landowners.

Since the level of disturbance by humans plays an important role in loon nesting, it will take widespread awareness by adjacent landowners to implement measures to ensure continued use of nesting lakes by loons. The USFS Management Plan for the species (Skaar 1990) outlines both appropriate management activities and a public information strategy, including use of the media and slide-show presentations to the public at large as well as landowners at nesting lakes.

Both lead and mercury poisoning have been identified as mortality factors to this long-lived species. Montana sites have been sampled as part of a nationwide assessment of heavy metal levels in loons. Our nesting loons were among those with the lowest levels recorded. An egg from one nest (Island Lake) tested in the high risk level (1.34 ppm) for mercury (L.Kelly, pers. comm.), indicating a point source might exist at that site. These results imply that some level of continued testing might be needed, particularly at nest sites which fail on a regular basis.

Population Objectives. The management goal for loons in Montana (Skaar 1990) is to provide for a stable loon population within the suitable habitat which presently exists in the northwestern part of the state. The commitment by management agencies is to ensure Montana's contribution to the continued viability of the species in the western United States.

If juvenile and adult survivorship in Montana approach the rates of 90% estimated in New Hampshire, the 1.4 young produced per nest in recent years (Skaar 1990) should be adequate to maintain the nesting population at its current level. All indices to population trend (clutch size, chick/adult ratio, % successful pairs) show that the Montana population is stable.

C The population goal is to maintain suitable habitat for 57-185 territories in Montana.

The Montana Common Loon Management Plan identified low and high population levels which serve to identify the range within which loon populations will be managed for stability. The low level was calculated as the number of pairs in 1987 (57) times the frequency of nesting (40%), or 23 nesting pairs. The high level was defined as an estimate of the carrying capacity of northwest Montana, or 74 pairs (40% of 185 current or potential nesting territories). All management strategies identified for this species involve protection or enhancement of nesting habitat.

- Each nesting pair plays a role in the continued viability of Common Loons in Montana.

Maintaining genetic viability at the current (low end) population level should not be a problem, but there are some concerns. It was assumed in the past that there was gene flow between the Montana population and the contiguous population in Canada. But with data indicating that 40 mi from natal lakes is a maximum dispersal distance for returning recruited young, this may not be the case. Maintaining breeding pairs throughout the range of the species in the state is therefore very important.

Survey and Inventory. Annual population surveys are currently conducted primarily by volunteers, whose efforts are coordinated by the Montana Loon Society. Individual nesting pairs are monitored at known occupied lakes, and at potential sites identified in the Loon Management Plan. One mid-summer "loon day" is conducted to provide a close estimate of the total population, number of pairs with chicks, total production, and number of unsuccessful pairs. Beginning in 1999, the Montana Loon Working Group coordinated an additional occupancy check at known and potential territories in May. Annual migration counts in spring and fall have also been conducted at important migration sites (e.g. Canyon Ferry reservoir).

Coordination of surveys, nest site management and public outreach efforts will be greatly facilitated by the Montana Loon Working Group. They should continue to meet at least semiannually to:

- Coordinate the construction and use of floating signs and nest structures;
- Coordinate annual surveys of occupancy (May) and production (July) at known, historic and potential territories (nesting lakes):
- Serve as a clearinghouse for the compilation and use of population data;
- Develop and disseminate public outreach materials;
- Facilitate public contacts throughout the nesting season on high conflict lakes;
- Provide information to managers, planners, developers and landowners regarding potential conflicts on lakes used for nesting.

Trumpeter Swan

Priority Level: I MT Score: 28 AI: 5

Reason for Concern. Trumpeter Swan populations have mostly recovered form the critically low numbers of the early 1900's. This species historically bred throughout much of western Montana, but now is found locally only on the Rocky Mountain Front and in the Greater Yellowstone Ecosystem. It is considered a threatened species and of special concern by all Montana PIF agencies. Montana is one of the few states still supporting a natural population of this species.

Distribution. Current breeding populations are restricted to several locations. The Red Rock Lakes and the Greater Yellowstone area comprise the main group with a smaller population in the Bean Lake area (East Front of the Rocky Mountains). Historic breeding records were few and scattered within the western one-third of the state. An attempt at reestablishing a population has been initiated on the Flathead Reservation south of Kalispell. Gap modeling (Redmond, et al. 1998) predicts approximately 35,000 ha of habitat in Montana.

Habitat Requirements. Trumpeter Swan breeding areas consist of freshwater marshes, ponds, lakes and slow moving rivers with little fluctuation in the water level. The two breeding areas in Montana are characterized by shallow interconnected lakes, marshes, ponds and extensive wetlands. Highly irregular shorelines appear to be a feature of Swan breeding habitat. Ponds, marshes and wetlands are generally less than 1.2 meters in depth with dense stands of emergent vegetation providing adequate cover. Productive habitat provides submergent aquatic vegetation and aquatic insects and other invertebrates for feeding adults and cygnets. Nest sites also must be present in the environment and consist of structures such as muskrat and abandoned beaver lodges, floating bog or sedge hummocks or islands (Page 1976, Shea 1979, Gale et al. 1987) .

Habitat and Population Objectives. The 1998 update of the North American Waterfowl Management Plan (NAWMP Committee 1998) identified an objective of 6,800 swans in the Rocky Mountain population, with a 1995 estimate of 2,600. Our goal is to protect known nesting habitat in the state, and to manage nesting habitat in a manner compatible with increasing swan production.

Common Tern

Priority Level: II MT Score: 14 AI: 3

Reason for Concern. National populations initially were decimated by the millinery trade. Populations of this colonial nester are not adequately surveyed in the region or in the state, which is considered a species of special concern by Montana FWP and the Natural Heritage Program.

Distribution. The Common Tern is a widespread breeder from northern Alberta across Canada and the northern U.S. and south along the coasts of the Atlantic Ocean and Gulf of Mexico, as well to the West Indies and Eurasia (Ehrlich et al. 1992). Nonbreeders occur in summer at James Bay, throughout Great Lakes region, along Atlantic-Gulf coast, south in Middle America to Costa Rica, and throughout West Indies. North American populations winter in Baja California and South Carolina to Peru and northern Argentina; rare in Hawaii. Also breeds and winters widely in Old World. The Common Tern breeds mainly in northern and east-central Montana although it migrates widely throughout the state (Montana Bird Distribution Committee 1996).

Habitat Requirements. Globally, Common Terns seek seacoasts, estuaries, bays, lakes, rivers, and marshes. In Montana, nearly all colonies are found on islands. In the Northern Rockies and Great Plains, islands in large lakes or reservoirs are favored breeding grounds (Johnsgard 1979, 1986). Nesting habitat includes sandy, pebbly, or stony beaches, matted vegetation, marsh islands, and grassy areas; typically on isolated, sparsely vegetated islands in large lakes or along coast. In the Great Plains, Johnsgard (1979) reports that most nesting occurs on sparsely vegetated areas, often near vegetation or other objects. However, in Canada, they also occasionally nest in marshes, in similar situations as do Forster's Terns (Godfrey 1986). They may also use sandy beaches (Godfrey 1986). See Spendelow and Patton (1988) for further details on nesting habitat in different regions.

Ecology. Nests of simple scrapes in the soil or sand are sometimes lined with grass, pebbles or twigs (Johnsgard 1979, Godfrey 1986). They are found singly or in small loose groups, sometimes in large flocks in migration (Stiles and Skutch 1989). Eats mainly small fishes (sometimes also crustaceans and insects) obtained at surface of water by diving from air. Susceptible (especially females just prior to laying) to poisoning from dinoflagellate toxin accumulated in fishes (Nisbet 1983). Pair may defend feeding territory away from nest, especially prior to incubation (Ehrlich et al. 1992).

Management Issues. Major current threats in different areas include nest-site competition from expanding Ring-billed Gull populations (Great Lakes region); predation by owls, Black-crowned night heron, rats, or Herring gull; loss of beach habitat; flooding and rising water levels (Great Lakes region); human disturbance; and possibly biocide contamination (Buckley and Buckley 1984). In Massachusetts, loss of eggs and chicks was attributed to nocturnal desertion of nests by adults in response to predation by Great Horned Owl (Nisbet and Welton 1984). Presence of mink can reduce reproductive success (Condor 95:708-711). Local populations sometimes may increase, in spite of low productivity and interactions with gulls, due to immigration from other (disturbed) colonies (Howes and Montevecchi 1993). Gull control has benefited this species in Maine (Buckley and Buckley 1984).

Management Recommendations:

- Survey known nesting colonies on an annual basis to determine status.
- Provide adequate water levels to protect nesting islands from mammalian predators.
- Manage water levels on lake and river nesting areas so as not to flood nest sites.
- Minimize human disturbance at nesting colonies during the breeding season.

American Bittern

Priority Level: III MT Score: 18 AI: 3

Reason for Concern. This secretive marsh-dwelling heron species is poorly monitored everywhere it occurs.

Distribution. American Bitterns breed across Canada and the northern U.S., and in the larger wetland complexes of most western states. Most confirmed nesting in Montana is in the northern tier of latilong blocks (Montana Bird Distribution Committee 1996).

Habitat Requirements. Bitterns prefer large wetlands (>10ha) dominated by emergent vegetation, where they mostly select the shallow periphery for nesting and feeding. Some upland vegetation (grassland) is used for foraging (Stewart 1975).

Ecology. Bitterns are nearly omnivorous, eating insects, amphibians, fish, crayfish and small mammals.

Management Issues/Recommendations. The species' preference for tall (>60cm) nesting cover means that bitterns will not tolerate haying, mowing, or grazing during or immediately prior to the nesting season. Management of wetland complexes for waterfowl should include dense emergent vegetation for this and other priority species.

Yellow-headed Blackbird

Priority Level: III MT Score: 17 AI: 3

Reason for Concern. Yellow -headed Blackbirds are considered a local interest species because of their reliance on deeper wetlands with tall emergent vegetation. They are one of the few passerines using such habitat, which is often managed for waterfowl or colonial species.

Distribution. The Yellow-headed Blackbird is found from the mid-west westward to the Pacific Ocean south to central New Mexico and Arizona and northward to upper Alberta and British Canada. The Yellow-headed Blackbird has been documented throughout the state (Montana Bird Distribution Committee 1996).

Habitat Requirements. The Yellow-headed Blackbird is a conspicuous bird common to marshes, potholes, lakes, ponds and the shallow backwater river of rivers. They are dependent on emergent vegetation in these areas. Preferred vegetation consists of dense areas of cattails and bulrushes. Usually they tend to nest in areas of deep (2 to 4 ft) water(Ehrlich et al. 1988). Gap analysis (Redmond et al. 1998) identified 1 million ha of suitable habitat in the state.

Ecology. In areas where Yellow-headed Blackbird and Red-winged Blackbirds are both present, the Yellow-headed is dominant over the Red-winged Blackbird. Yellow-headed Blackbirds tend to place nests further out over deeper water than Red-winged Blackbird.

Management Issues/Recommendations. No specific management recommendations were developed for this species.

Habitat and Population Objectives: Intermountain Valley Wetlands

The Intermountain West Joint Venture has an established track history of implementing wetland/waterfowl conservation efforts in western Montana and elsewhere in the Rocky Mountain west. Montana PIF will work closely with them to identify ways to achieve all-bird conservation at the local level.

- Work with the Intermountain Joint Venture to accommodate the needs of priority species (all birds) in conservation planning and project design.

- Establish coordinated monitoring of the status of colonial priority species at key nesting sites statewide, and find the funding to conduct this monitoring on an annual basis.

- Provide adequate water levels where possible to protect nesting islands from mammalian predators, and so as not to flood nest sites.

- Minimize human disturbance at nesting lakes/colonies during the breeding season, through public education, signing, or seasonal restrictions.

Irrigation Reservoirs >640 ac

Description. Many large reservoirs have been built along Montana's major rivers. On the negative side, they have often destroyed or degraded riparian habitat. On the positive side, they have created some important nesting, foraging, or staging habitat for some waterbird species. Most of these reservoirs have little development of shoreline vegetation due to unnatural water level fluctuations. Some reservoirs will have marshes, wet meadows, or shrub swamps at their upper ends. Some also have flooded stands of dead trees that are used for nesting by herons and cormorants. For many bird species, large islands are the most important feature of these reservoirs.

Distribution. Throughout Montana along major rivers and streams. Most of the larger reservoirs with bird nesting potential are found in the eastern two-thirds of the state, although there are notable exceptions, particularly Pablo and Ninepipe Reservoirs on the Flathead Indian Reservation.

Importance. Islands in these large reservoirs provide important nesting areas for American White Pelicans, Caspian and Common Terns, and in some cases, cormorants and herons. Piping Plovers use the gravel shorelines for nesting. Many reservoirs have become important staging areas for migrating waterfowl, loons, grebes, gulls, and shorebirds. Many are used as foraging areas by Bald Eagles and Peregrine Falcons. Many have nearby associated colonies of Great Blue Herons or Double-crested Cormorants.

Status. Most reservoirs are managed for hydroelectric power generation or irrigation, and unnatural water fluctuations usually limit development of wetland vegetation along the shorelines. Management conflicts between the downstream river management and the reservoir make management decisions difficult. Management actions that favor stable water levels in the reservoir usually cause degradation of riparian habitat downstream. Reservoirs in the western mountain valleys often have steep sides, which limit their value to shorebirds. Some reservoirs support unnaturally high ring-billed and California gull colonies. Most reservoirs support extensive motorized recreational boating, which can limit their use by nesting birds. Contaminants may be an issue in some reservoirs, generally from contaminated sediments trapped behind the dams. In a few cases, reservoirs are leased by the U.S.Fish and Wildlife Service as National Wildlife Refuges (e.g. Ninepipe NWR), and are managed at least in part for waterfowl and colonial nesting birds. Canyon Ferry WMA near Townsend is perhaps the best example of realizing the potential of reservoir habitats for wildlife production; subimpoundments there make it a highly productive waterfowl area, and it supports one of the largest pelican colonies in the state.

Caspian Tern

Priority Level: II MT Score: 15 AI: 3

Reason for Concern. We know little about the nesting status, distribution and habitat requirements of this species of special concern in the state. It represents a good example of a colonial nester whose habitat needs should be taken into account in wetland management decisions.

Distribution. The Caspian Tern breeds locally, mainly in northern east-central Montana; it is an uncommon migrant found widely throughout the state (Montana Bird Distribution Committee 1996). In western North America, juveniles disperse northward before migrating south to wintering areas, remain in wintering area through second winter, thereafter make annual migrations between breeding and wintering areas (Gill and Mewaldt 1983).

Habitat Requirements. Caspian Terns nest in a wide array of habitats: seacoasts, bays, estuaries, lakes, marshes, and rivers. Nests are generally located on sandy or gravelly beaches and shell banks along coasts or large inland lakes, sometimes with other water birds. In Montana, the Caspian Tern is found breeding on large lakes, reservoirs, and perhaps rivers. Nest sites are typically on rocky or sandy islands; in other areas, beaches are occasionally used (Johnsgard 1979, Godfrey 1986).

Ecology. This tern eats mainly fishes obtained at surface of water by diving from air; sometimes feeds from surface like a gull and eats eggs and young of other terns and gulls (Terres 1980). Nests singly or usually in colonies of up to several thousand pairs (5000+ at Sand Island, Washington). Nests are simple scrapes in the soil or sand, sometimes lined with grass (Johnsgard 1979, Godfrey 1986). Young are tended by both parents, leave nest in a few days, first fly at 4-5 weeks. Parental care (feeding) may extend up to 5-7 months after fledging.

Associated Species. In Montana, Caspian Terns occasionally nest on same the islands as Double-crested Cormorants. Caspian Terns often rest with flocks of other tern and gull species during the non-breeding season.

Management Issues. The species shows some adaptability to changing habitat conditions. Pacific coast populations formerly nested mainly in inland marshes, now mainly on human-created habitats (e.g., salt pond dikes and levees) along coast; nests on dredge-spoil islands in North Carolina and Florida (Spendelow and Patton 1988). We know little of site fidelity patterns in Montana. In northeastern Lake Michigan, tended to use same colony site in successive years unless previous reproductive effort was unsuccessful (Cuthbert 1988).
The species is very sensitive to human disturbance in or near nesting colonies.

Management Recommendations:

- Survey known nesting colonies on an annual basis to determine status.
- Provide adequate water levels to protect nesting islands from mammalian predators.
- Manage water levels on lake and river nesting areas so as not to flood nest sites.
- Minimize human disturbance at nesting colonies during the breeding season.

American White Pelican

Priority Level: III MT Score: 20 AI: 3

Reason for Concern. American White Pelicans have a relatively high overall priority score (22) for the northern Rockies. Montana supports five widely distributed very large colonies, most of which are on public agency-managed reservoirs.

Distribution. The American White Pelican is found from the Midwest across the west. While breeding colonies are locale, the bird travels extensively and can be seen in most areas. Within the State, transient pelicans have been documented from most latilongs (Montana Bird Distribution Committee 1996). The five known colonies are at Canyon Ferry Reservoir, Arod Lake, Medicine Lake NWR, Bowdoin NWR and Fort Peck Reservoir.

Habitat Requirements. American White Pelican will use a variety of aquatic types for foraging. They can be found on rivers, streams, lakes, ponds and marshes. Breeding habitat is much more restrictive; preferred breeding habitat consists of flat, barren, earthen islands. Vegetative cover may be present but is not used. Occasionally they may nest on peninsulas but infrequently because of vulnerability problems. Gap analysis (Redmond et al. 1998) identified 32,000 ha of habitat in the state.

Ecology. American White Pelican are ground nesters. They tend to create a scrape in loose sandy soil. Vegetation is not used. Nesting colonies are usually in areas unobstructed by vertical structures to allow for takeoff from the colony. Adults will forage (almost entirely on fish) away from the colony. A round trip may be as far as 600 km (Clark et al. 1998).

Associated Species. Breeding colonies are often associated with other species including Double-crested Cormorants, Ring-billed Gulls and California Gulls.

Management Issues. American White Pelican colonies can be very large. There is some concern about local effects on sports fisheries in the vicinities of colonies, and some pressure to somehow control the size of colonies. Studies are needed to assess the effects of nesting colonies on fish populations. For now, known colonies should continue to be monitored annually to assess the statewide population, and water levels managed to minimize mammalian predation.

Habitat and Population Objectives: Irrigation Reservoirs >640 ac

- Establish coordinated monitoring of the status of colonial priority species at key nesting sites statewide, and find the funding to conduct this monitoring on an annual basis.

- Work with project managers or landowners to ensure that proper conditions for successful breeding are maintained at known nesting sites, and to resolve any conflicting resource issues.

- Identify and "nominate" active Montana participants in Colonial Waterbird planning efforts at the regional and national scale.

Irrigation Reservoirs <640 ac

Description. These are small, mostly man-made stockponds and reservoirs in the dry, unglaciated portions of Montana. They are usually fed by springs, but some are filled only by spring runoff or rain storms. Surrounding habitats are varied, but mostly include dry grasslands, sagebrush grasslands, or dry ponderosa pine, or juniper woodlands. Wetland vegetation varies widely, but can include open water, aquatic beds, mud flats, emergent marsh, and (rarely) wooded swamp. Many have an emergent wetland at the upper end of the reservoir, but little or no emergent vegetation along the deeper portions. Some will have deciduous shrubs or trees along the shorelines. Many have little vegetation along the shore, due to heavy grazing.

Importance. These stockponds in eastern Montana, although not natural, have provided wetland habitat in an otherwise dry landscape. They have been shown to play an important role as pair and brood habitat for nesting waterfowl, and provide important habitat for transient shorebirds. Depending on vegetation, they may be used by nesting American Bittern, Killdeer, small colonies of Black-crowned Night Herons, Yellow-headed Blackbirds, American Avocets, and other shorebird species. These small stockponds have provided some waterfowl and waterbird production that has compensated in part for some of the losses in the prairie pothole region.

Status. These reservoirs are very numerous in the southeastern part of the state, where they were created to provide water for livestock. Many old stockdams are in disrepair, and either washed out or in danger of being washed out. In some cases, old stock ponds are being replaced by stock tanks, which do not provide waterbird habitat. Most of these ponds show impacts of cattle grazing, irrigation water withdrawals, or both. Many have overgrazed shorelines and surrounding uplands. Some are affected by pesticide or nutrient runoff from agriculture.

Transient Shorebirds

Priority Level: II MT Score: NA AI: NA

Reason for Concern. Montana wetlands serve as important migration and staging habitats for a wide variety of transient shorebird species (Table 22). Important sites need to be identified and managed in a way which allows for their continued use during critical migration periods.

Distribution. Among the 47 species of shore birds occurring in North America, 32 (68%) breed only in the arctic and subarctic, 11 (23%) are temperate breeders, and 4 (9%) span both boreal and temperate zones (Page and Gill, Jr., 1994). Forty species of shorebird occur in Montana (Table 22). Twelve of these species nest in Montana and 28 are transient nonbreeders. Eight of these species are considered rare in Montana. Montana’s transient shorebirds migrate primarily through the wetlands of the central and eastern region of the state, though many are seen in the wetlands of the higher elevation in the western part of the state. Many of these birds make migration journeys of thousands of miles from wintering grounds in the southern United States and the tip of South America to breeding grounds in the Canadian arctic and Alaska.

Table 22. Shorebird species which occur in Montana, and their status as transients, breeders, and rarities.

Black - Bellied Plover **T***	Semipalmated Plover **T***	Greater Yellowlegs **T**
American Golden Plover **T**	Snowy Plover **R***#	Piping Plover **B*#**
Mountain Plover **B**	Killdeer **B***	Black Necked Stilt **B**
American Avocet **B**	Willet **B**	Wilson's Phalarope **B***
Lesser Yellowlegs **T**	Solitary Sandpiper **T**	Whimbrel **T***
Upland Sandpiper **B**	Long-Billed Curlew **B***	Marbled Godwit **B**
Hudsonian Godwit **T**	Ruddy Turnstone **T**	Red Knot **T***
Black Turnstone **R**	White-Rumped Sandpiper **R**	Buff-Breasted Sandpiper **R**
Sanderling **T***	Semipalmated Sandpiper **T**	Western Sandpiper **T**
Least Sandpiper **T***	Baird's Sandpiper **T**	Pectoral Sandpiper **T**
Dunlin **T**	Curlew Sandpiper **R**	Stilt Sandpiper **T**
Long - Billed Dowitcher **T**	Short - Billed Dowitcher **T***	Red Phalarope **R**
Common Snipe **B***	American Woodcock **R***	Spotted Sandpiper **B**
Red - Necked Phalarope **T**		

T = Transient **B =** Breeder **R** = Rare (fewer than 20 sightings <1996)
***** designates a "declining in world population" species (Harrington and Perry 1995).
# designates a Federally listed Threatened or Endangered Species

Habitat Relationships. Most transient shorebirds in Montana use wetland and exposed shorelines with very shallow water levels. Mudflats are particularly important feeding sites for migrating shorebirds. Water depth for foraging shorebirds ranges from 0cm (dry mud) to 18cm, and vegetation density ranges from no cover to more than 75% cover, with a majority of foraging occurring at sites with less than 25% cover (Helmers 1992).

Management Issues. Shorebirds have higher metabolic rates than do other birds of similar size (Wilson, Jr., 1991) Since small birds tend to have high mass - specific metabolic rates and high passage rates, they are less likely to tolerate poor quality foods. Shorebirds are non-randomly distributed in association with their prey at all spacial scales; their distribution is affected by abiotic factors (including tide, rain, substrate permeability, temperature, and salinity) which influence prey distributions (Cullen 1994). Substrate texture also seems to play an important role. The destruction or deterioration of important feeding habitats may affect shorebird populations more profoundly than similar losses in habitats where food is not a limiting factor. (Iribarne 1994). The amount of available habitat depends on water level, topography of wetland basins, wind action, and the responses of vegetation and invertebrates (Skagen and Knopf, 1994).

Since the transient shorebirds listed above have varying water level requirements (Table 23) due to their foraging behavior and strategies (as well as their food resource types) it is important to manage water levels so that a diverse conglomeration of birds may use Montana's wetlands. Other habitat management tools such as controlled burning play a role in invertebrate populations and foraging habitats.

Table 23. Water depth used for foraging by Montana transient shorebirds (Helmers 1992, Skagen and Knopf 1994).

	Dry	Wet	1cm	2cm	3cm	4cm	5cm	6cm	7cm	8cm	9cm	10cm	11cm	12cm
Black-bellied Plover				■	■	■	■	■	■	■	■	■		
Semipalmated Plover		■	■	■										
Greater Yellowlegs	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Lesser Yellowlegs	■	■	■	■	■	■	■	■	■	■	■	■		
Solitary Sandpiper		■	■	■	■	■	■							
Whimbrel	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Hudsonian Godwit		■	■	■	■	■	■	■	■	■	■	■	■	
Ruddy Turnstone	■	■	■	■	■	■	■							
Red Knot		■	■	■	■	■	■	■						
Sanderling	■	■	■	■	■									
Semipalmated Sandpiper		■	■	■	■	■								
Western Sandpiper		■	■	■	■	■	■							
Least Sandpiper		■	■	■	■	■								
Baird's Sandpiper		■	■	■	■	■	■							
Pectoral Sandpiper		■	■	■	■	■	■	■						
Dunlin		■	■	■	■	■	■	■						
Curlew Sandpiper		■	■	■	■	■	■	■	■	■				
Stilt Sandpiper		■	■	■	■	■	■	■	■	■				
Long-billed Dowitcher		■	■	■	■	■	■	■	■	■	■	■		
Short-billed Dowitcher		■	■	■	■	■	■	■	■	■	■	■		
Red Phalarope	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Red-necked Phalarope	■	■	■	■	■	■	■	■	■	■	■	■	■	■

It is important to keep in mind that shorebirds change locations regularly between years, seasons, or even days (Gratto-Trevor and Dickson, 1992). Shorebirds migrating through the plains are able to locate available habitat opportunistically, to occupy wet mud/shallow water habitats that become available regardless of wetland history, and to use these habitat almost immediately upon formation. Larger habitats tend to contain higher numbers of birds. Birds may exhibit greater site fidelity to habitats that are fairly predicable by nature (breeding habitat) or to habitats that are dynamic in a regular periodicity (intertidal areas) (Skagen and Knopf, 1994). "To provide quality habitat for migratory shorebirds, managers must identify what food exist at the sites they manage, what foods are needed by likely shorebirds species, and when migratory flocks will appear" (Helmers 1992). The best thing wetland managers and conservation personnel can do for population management of transient shorebirds is to provide the best habitat at the best time (Table 24). The WHSRN currently conducts and compiles information for an annual International Shorebird Survey, documenting shorebird use of more than 400 sites; these include Bowdoin and Benton Lake NWR's in Montana.

Habitat and Population Objectives: Irrigation Reservoirs <640 ac

- Work with the Prairie Potholes and Intermountain Joint Ventures to accommodate the needs of transient shorebirds in conservation planning and project design.

- Establish coordinated monitoring of the status of colonial priority species at key nesting sites statewide, and find the funding to conduct this monitoring on an annual basis.

- Work with project managers or landowners to ensure that proper conditions for successful breeding are maintained at known nesting sites, and to resolve any conflicting resource issues.

- Identify and "nominate" active Montana participants in Colonial Waterbird planning efforts at the regional and national scale.

Table 24. Montana distribution of transient shorebird species, by month.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Black-bellied Plover				■	■	■	■	■	■	■	■	
Semipalmated Plover				■	■		■	■	■			
Greater Yellowlegs				■	■	■	■	■	■	■		
Lesser Yellowlegs			■	■	■	■	■	■	■	■	■	
Solitary Sandpiper				■		■		■				
Whimbrel					■	■		■	■			
Hudsonian Godwit					■			■				
Ruddy Turnstone					■			■	■			
Red Knot					■		■	■				
Sanderling					■			■	■	■		
Semipalmated Sandpiper					■		■	■	■			
Western Sandpiper				■	■		■	■	■	■		
Least Sandpiper				■	■			■	■			
Baird's Sandpiper			■	■	■		■	■	■			
Pectoral Sandpiper							■	■	■	■		
Dunlin				■	■							
Curlew Sandpiper					■							
Stilt Sandpiper					■		■	■	■	■		
Long-billed Dowitcher				■	■		■	■	■	■		
Short-billed Dowitcher					■		■	■		■		
Red Phalarope									■			
Red-necked Phalarope					■	■	■	■	■	■		

High Elevation Wetlands

Description. These are mostly small wetlands at higher elevations in the mountains. Use by waterfowl and other water birds can be limited by a short season of open water, but associated riparian habitat is valuable to many nesting songbird species. Surrounding upland vegetation is usually alpine or sub-alpine meadows and forests. Wetland types include lakes in cirques, beaver pond complexes, high-elevation fens and bogs.

Distribution. High-elevation wetlands are found in the higher, wetter mountains. They are most common on the Beartooth Plateau and in northwestern Montana.

Importance. These wetlands provide transient habitat for Common Loons, Harlequin Ducks, and Trumpeter Swans. Some may be used for nesting by Trumpeter Swans and Barrow's Goldeneye. High elevation beaver ponds, fens and bogs with well-established willow or alder cover are important nesting areas for Rufous Hummingbird, American Redstart, MacGillivray's Warbler, Willow Flycatcher, and numerous sparrow species. LeConte's Sparrows nest in sedge fens in Glacier National Park and the northern Flathead Valley.

Habitat and Population Objectives: High Elevation Wetlands

Continue to encourage (and find funding for) surveys of important sites for priority species, and submittal of records to the Montana Natural Heritage Program.

PRIORITY SPECIES WITH UNIQUE HABITAT NEEDS

Peregrine Falcon

Priority Level: II MT Score: 17 AI: 3

Reason For Concern. The Peregrine Falcon is uniquely dependent on cliff/rock habitat for breeding. Dramatic population declines occurred from the 1950's through the 1970's, due to pesticide accumulation and eggshell thinning. The species has increased in recent decades as pesticide levels have decreased, and as reintroduction programs have placed birds back into suitable habitats. The species was delisted from the list of threatened / endangered species in 1999.

Distribution. Peregrines are one of the most widely distributed birds in the world. They breed throughout the arctic, south to the Pacific coast, and throughout the Rocky Mountains, with scattered breeding in the eastern U.S. Some birds winter in their breeding range, but most migrate to Mexico, Central America or South America. They are generally found along the major river drainages in Montana, particularly in the western mountains. There were 27 known territories in the state in 1997 (T. McEneaney, pers. comm.), while the current population is estimated at 30-35 nesting pairs (D. Flath, pers. comm.).

Habitat Requirements. Prefer large cliffs for nesting, in association with a wide variety of coniferous forest types. Prefer riparian habitats or other habitats with concentrated numbers of medium-sized avian prey for feeding. The nest site itself may be selected based on prey abundance in nearby habitats, and is often situated near or overlooking water. The Montana Gap Project predicted there are 4.4 million ha of suitable habitat in the state (Redmond et al. 1998).

Ecology. Peregrines feed on small (e.g. swifts, blackbirds) to medium-sized (Rock Dove, ducks) avian prey, which they capture on the wing. The nest is usually located on a ledge below an overhang.

Associated Species. White-throated Swift, Violet-green Swallow, Rock and Canyon Wrens, Golden Eagle, Prairie Falcon, Great Horned Owl and Rock Doves are the species most often found in the same rock/cliff habitats used by Peregrine Falcons.

Management Issues. Isolation from human activities is needed to avoid nest disturbance (Peregrine Falcon Recovery Plan 1977). Too much disturbance during the nesting season can cause nest abandonment. Pesticides are still a potential threat to the species, both in North America and wintering areas in South America.

Management Recommendations. There is still a recovery plan in place for the species, which calls for continued monitoring of known territories. There is still a need to implement a coordinated survey of known and potential territories statewide. Our goal is to maintain a stable or increasing nesting population in the state.

Black Swift

Priority Level: II MT Score: 22 AI: 3

Distribution. The Black Swift breeds from southeastern Alaska and western Canada, south to southern California, northwestern Montana, Colorado, Utah, northern New Mexico, and southeastern Arizona. This species has a very narrow wintering range. It winters in Mexico and Costa Rica. In Montana, the only breeding records are in the northwest latilongs (Montana Bird Distribution Committee 1996).

Ecology. Black Swifts build cup-shaped nests of mud, mosses, and algae on a cliff ledge, near or behind waterfalls, or in a shallow cave (Ehrlich et al. 1988). Nest heights are 0.5 to 8 m (1.6 to 26 ft). They will add to nests annually (Marín 1997). Black Swifts will nest in colonies, generally of a few pairs (Ehrlich et al. 1988). They only lay one egg a year (Baicich and Harrison 1997; Marín 1997). In late August 1997, four nests were found along a stream in northern Idaho. There was one young in each nest. One waterfall, about 6 m high, had three nests behind it, approximately 1 to 1.5 m (3 to 5 ft) apart from each other and approximately 3 to 3 m (6 to 10 ft) off the ground. The other waterfall was on the same stream and had one nest (S. Sturts, pers. comm.)

Black Swifts catch insects in the air, often at great heights. They feed on caddisflies, mayflies, beetles, flesh flies, hymenopterans, and other insects (Groves et al. 1997).

Habitat Requirements. Black Swifts breed in montane habitats in the Rockies, although along the coast they will breed in sea cliffs. In Idaho, they prefer higher-elevation mountains (Groves et al. 1997). Black Swifts require a moist cliff environment for nesting.

Other requirements for nesting include high relief, inaccessibility, darkness, and absence of obstructions in the vicinity of the nest (Knorr 1961; Harrison 1979). However, four of five active nests found by Hunter and Baldwin (1962) in Montana received direct sunlight late in the afternoon. Marín and Stiles (1992) concluded that Black Swifts breed in close proximity to water to have a more constant environment to ameliorate daily temperature changes and to have high humidity for nest attachment. They also concluded the requirements of high relief, inaccessibility, and unobstructed flyways were the secondary consequences of nesting behind or next to waterfalls.

Management Issues. Decrease in water flows, and recreational use of nest sites by rock climbers, swimmers, and hikers, are two of the biggest threats to this species. Fortunately, the darkness of the caves and the camouflage of the nesting material makes it difficult to detect this bird’s nests, although visitors who climb behind waterfalls would disturb nesting pairs. Use of pesticides near their nesting areas is probably unlikely, but any such proposals should be discouraged.

Black Rosy Finch

Priority Level: II MT Score: 22 AI: 3

Reason for Concern. The entire population of this species nests in the physiographic region that includes western Montana. The species is essentially unmonitored by BBS or other means.

Distribution. The Black Rosy-finch is found breeding only in the extreme southwest and south-central regions of the State. A few transient sightings have been documented from other parts of Montana.

Habitat Requirements. During the breeding season, the Black Rosy-finch is closely associated with tundra or open habitats above timberline. Breeding season habitats are usually found between 9,000 and 11,000 feet in elevation. Preferred areas are alpine types characterized by open rocky habitats with low vegetation; Gap analysis (Redmond, et al., 1998) predicted 200 thousand ha (<1% of the state) represented potential Black Rosy-finch habitat. Nearby talus slopes and cliffs are a necessity for roosting and nesting habitats. Cliffs should have cracks and crevasses for shelter and nest placement.

Winter habitat consists of lower valleys from approximately 4,000 to 7,000 feet in elevation (French 1959b). Preferred winter habitats are open grasslands or mixed grassland/shrubs with sparse shrub cover. Cultivated fields will also be used. Hendricks and Swenson (1983) described the winter distribution in Montana as the grassland foothills and valleys of the western mountain ranges. However they also noted that the species will use eastern plains whenever food sources are limited.

Ecology. Black Rosy-finch forage on seeds and insects. Juvenile diets contain large amounts of insects. Winter flocks depend on seed sources and are nomadic depending on the distribution of food source. On the breeding habitats they will glean seeds and insects from snowbanks and the ground near receding snowdrifts. Snow melt is often used as a source of free water. Nests are built of mosses, hair and feathers (French 1959a).

Management Recommendations. No habitat measures are proposed. Because we have a high level of responsibility for this species, a monitoring program should be implemented to track the distribution and population level of the species.

White-tailed Ptarmigan

Priority Level: III MT Score: 21 AI: 4

Reason for Concern. Montana is one of the few states which support a nesting population of this species, which is highly reliant on a undisturbed tundra habitat. While their habitat might be considered relatively secure in Montana, the species is essentially unmonitored.

Distribution. White-tailed Ptarmigan occur from Alaska and northern Canada south through British Columbia to southeastern Alberta, to northern Washington, Idaho and Montana. There are isolated populations south through the Rocky Mountains to New Mexico. Occurrence in Montana is limited primarily to Glacier National Park and the nearby Swan and Mission mountains, although there have been other confirmed sightings in the Bob Marshall/Scapegoat wilderness complex (Wright 1996).

Habitat Requirements. The White-tailed Ptarmigan is strictly a bird of alpine tundra, where they use krummholz, moist zones near snow banks, and willow-dominated streamsides (Braun et al. 1993). During winter they will sometimes move downslope into shrub habitats at or just below treeline.

Ecology. Willow buds, twigs and leaves are primary foods for ptarmigan, which also rely on a variety of forbs and insects in the summer. Ptarmigan on the ground in rocky terrain, or often near or below spruce krummholz, which are also used as shelter by broods. Broods often feed adjacent to snowbanks, where succulent vegetation and insects are available.

Management Issues/Recommendations. Grazing and intense recreational use can have negative effects on habitat suitability, but most of the known habitat is in wilderness or Glacier National Park. Maintain populations in the state. Implement monitoring where possible to further delineate populations and their nesting habitat.

Chimney Swift

Priority Level: III MT Score: 18 AI: 3

Reason for Concern. This species is on the National Audubon Watch List because of declines elsewhere in its range. It is nearly peripheral and poorly known in Montana.

Distribution. Chimney Swifts breed throughout eastern North America. In Montana they are found only in the eastern one-fourth of the state, with few confirmed breeding records.

Habitat Requirements. These aerial feeders use a wide variety of habitats for feeding, but are limited by nesting habitat. They naturally nest in large hollow trees and caves, and will use chimneys/buildings in urban settings. Most known nesting in Montana has been in the latter, although they certainly depend on cottonwood snags along the lower reaches of the Yellowstone River in the state.

Ecology. Swifts feed on flying insects exclusively, which they capture on the wing. They nest in colonies, building semi-circular cups of twigs which are held together by saliva and attached to vertical surfaces.

Management Issues/Recommendations. The species is poorly monitored, but should be surveyed through any stratified riparian monitoring program. Inclusion of suburban/urban habitats in monitoring programs is also necessary to identify nesting colony sites. Owners of buildings holding colonies should be contacted to encourage protection of the sites.

Red-winged Blackbird

Priority Level: III MT Score: 14 AI: 3

Reason for Concern. In spite of their abundance, Red-winged Blackbirds have shown significant population declines in Montana. This species was initially suggested for inclusion on our priority list because of its potential pest status in agricultural areas, susceptibility to herbicides/pesticides, and reliance on wetland habitats. Montana PIF has no recommendations for the species at this time other than to continue to collect monitoring data in the course of habitat-oriented count-based efforts. Outreach efforts regarding declining species should mention this universally recognized bird.

Brewer's Blackbird

Priority Level: III MT Score: 14 AI: 3

Reason for Concern. In spite of their abundance, Brewer's Blackbirds have shown significant population declines in Montana. This species was initially suggested for inclusion on our priority list because of its potential pest status in agricultural areas, susceptibility to herbicides/pesticides, and reliance on grassland habitats. Montana PIF has no recommendations for the species at this time other than to continue to collect monitoring data in the course of habitat-oriented count-based efforts.

NON-HABITAT (ACROSS HABITAT) ISSUES AND THREATS

This Montana Bird Conservation Plan was built upon a habitat-based approach, with the needs of priority species helping to shape management recommendations. Some conservation issues and threats to habitats and bird populations are across habitat lines, and several have been mentioned in the text. These include cowbird parasitism, the effects of urbanization, recreation, pollution, invasion of exotics, and predation. In addition to those specific recommendations already presented, Montana Partners in Flight will work to:

- Increase awareness of those threats which occur across habitats;
- Decrease the occurrence and severity of those factors that can be modified; and
- Support those programs (e.g. Cats Indoors, Songbird Blues Box) designed to alleviate the effects of cross-habitat factors through funding, education, and providing expertise to working groups and review processes.

RECOMMENDED ACTIONS

Overview. Though much work remains to be done, we have tried to identify not only those habitats and bird species most in need of conservation efforts in Montana, but specific habitat and population recommendations for each. These take the form of three primary strategies:

- Restoration or simulation of natural disturbance regimes, to re-establish habitat conditions within their historical range of variability;
- The identification and protection (through acquisition of easements or fee title, or through management agreements) of the largest and best remaining blocks of habitat, putting a priority on those supporting priority level I and II species; and
- The development and dissemination of “best management practices” or management options that will provide for the specific needs of priority species during critical times of the year.

The common threads of all approaches to our conservation efforts need to be partnerships, education and adequate monitoring. We will succeed most quickly where existing conservation efforts can be strengthened by the addition of priority bird considerations, the expertise of Montana PIF partners, and new money generated by bird conservation initiatives. **Users of this plan should review the individual habitat objectives sections to look for innovative solutions and opportunities, and to provide feedback for plan revisions to make it a more powerful tool.** Our highest priority conservation efforts and tasks in each major habitat are as follows:

Grassland. Use existing databases (e.g. TNC 1999) to identify the largest remaining blacks of grassland habitat in the state, and work to protect them, particularly those that are known to support the suite of priority species dependent on prairie dog towns (e.g Mountain Plover, Burrowing Owl). Continue and greatly expand outreach efforts with private landowners, by forming active partnerships with the state and local NRCS personnel. Incorporate the needs of grassland species into NRCS programs, notably the CRP program. Initiate a dialogue with tribal wildlife and land managers from the 7 Reservations in the state, particularly the Fort Belknap and Northern Cheyenne, where a real opportunity exists to manage grasslands in a way that fits the traditional culture.

Shrubland. Initiate a coordinated Sage Grouse monitoring effort to assess the population and distribution of Sage Grouse in the state. Implement best management practices on occupied and potentially occupied public land, and accompany those efforts with count-based monitoring for all shrub-steppe breeding birds, to validate our assumption that the Sage Grouse will work as an umbrella species in this habitat. Work with Idaho PIF to develop and distribute a landowner-oriented version of "Birds in a Sagebrush Sea".

Forest. Work with the USFS Regional Office, National Forests and individual Ranger Districts to incorporate the needs of priority birds in forest plan rewrites, individual timber sale prescriptions, and ecosystem restoration projects. Identify suitable habitat blocks and opportunities to implement forest stewardship projects on private and corporate timberlands to restore the role of fire and increase acreage of mature, dry ponderosa pine forest. Implement count-based monitoring and applied research studies to continue to evaluate and refine management prescriptions for various forest types.

Riparian. Identify opportunities to provide the high flows needed for channel diversity, gravel bar development, and cottonwood regeneration along each of the major river drainages in the state. Manage grazing and recreational uses where they are at a level incompatible with the needs of priority species. Protect snags and mature trees in riparian systems wherever possible, on both public and private lands. Develop and implement specialized monitoring for riparian birds, and survey nesting sites of colonial and other site-specific priority birds (e.g. Least Tern) on an annual basis. Identify Important Bird Areas near population centers where the structure and function of riparian systems can be taught and seen firsthand.

Wetlands. Work with the joint ventures to identify those wetland (and particularly wetland/grassland) complexes most important to landbirds, shorebirds or colonial nesters, and work toward their protection and enhancement. Work with landowners or reservoir operators to provide water levels compatible with priority species' needs.

Unique Species. Design monitoring strategies which allow the trends and distribution of unique species to be tracked through time.

IMPLEMENTATION SCHEDULE

Development of an Implementation Framework based on this Bird Conservation Plan is the primary work year 2000 task of the Montana Partners in Flight, as identified in the NFWF grant which is funding the half-time Montana PIF Coordinator. It will focus on:

- Long-range expectations: direction and adoption by partners.
- Realistic expectations for the next five years: actions.
- Specific tasks related to habitat and population objectives: 2000-2001.
- designation and objective setting for individual Important Bird Areas (IBA's)

Development of the Implementation Framework is not meant to forestall implementation of conservation tasks, and Montana PIF will work with adjoining state and provincial PIF working groups, the Prairie Pothole and Intermountain West Joint Ventures, and the Northern Rockies BCR Coordinator to identify and begin joint conservation projects at the earliest possible time. Some examples of processes already underway include:

- Prairie Partners (with Colorado Bird Observatory and Wyoming): a shortgrass conservation effort currently focused on outreach to landowners with Burrowing Owls on their land;

- Important Bird Areas: 22 sites were nominated and were under review as of the end of 1999. These ranged from large areas of grassland (e.g. south Phillips County), to riparian sites on several major rivers, to refuge wetlands and potential education sites near urban centers;

- Montana (and Northern Rockies) All-bird Monitoring: Proposals have been prepared in conjunction with and modeled after the CBO effort in Colorado, to initiate count-based monitoring of all bird species in the state;

- Coordination with Joint Ventures: The (Montana-based) Northern Rockies BCR Coordinator has established a working relationship with the existing joint ventures covering Montana, and will actively work with the newly formed Northern Great Plains JV, to assist all partners in moving toward all-bird conservation;

- Missouri River projects: Montana PIF will work with the Fish and Wildlife Service and other partners to develop integrated conservation efforts along the Missouri River drainage, as a result of the mitigation money generated by the relicensing of several dams on the system.

PROGRESS EVALUATION

Our Implementation Framework will identify a time line and process for plan updates and revision, as well as specific target dates for task completion. Progress toward the completion of tasks will be assessed through semiannual Montana PIF steering committee and/or full partnership meetings. Future revisions of the Montana Bird Conservation Plan will be based in part on the results of these semiannual meetings.

Implementation of statewide monitoring efforts for priority species is essential if we hope to assess the results of actions implemented using recommendations in this BCP. **Initiation of statewide monitoring is therefore our highest priority task for 2001.**

LITERATURE CITED

Adams, E. and M.L. Morrison. 1993. Effects of forest stand structure and composition on red-breasted nuthatches and brown creepers. J. Wildl. Manage. 57(3):616-629.

Agee, J. K. 1993. Fire Ecology of Pacific Northwest forests. Island Press, Covelo, California.

Aldrich, J. W. 1963. Geographic distribution of American Tetraonidae. J. Wildl. Manage. 27:529-545.

Altman, B. 1997. Olive-sided Flycatcher in western North America: Status review. U.S. Fish and Wildlife Service, Portland, Oregon. 59p.

Alvo, R., D.J.T. Hussell, and M. Berril. 1988. The breeding success of common loons in relation to alkalinity and other lake characteristics in Ontario. Canadian Journal of Zoology 66:746-752.

American Ornithologists' Union. 1983. Checklist of North American birds, sixth ed. Allen Press, Lawrence, Kansas. 877p.

Amundson, J. 1998. Region Four U.S. Forest Service silviculturalist. Telephone interview. July 24, 1998.

Andrews, R., and R. Righter. 1992. Colorado birds. Denver Mus. Natur. Hist., Denver. 442 p.

Aney, W.C. 1984. The effects of patch size on bird communities of remnant old-growth pine stands in Western Montana. M.S. Thesis, Univ. Montana, Missoula. 98 p.

Anstey, D.A., S.K. Davis, D.C. Duncan, and M.Skeel. 1995. Distribution and habitat requirements of eight grassland songbird species in southern Saskatchewan. Saskatchewan Wetland Conservation Corp., Regina, Saskatchewan. 11p.

Arno, S.F. 1979. Forest regions of Montana. Intermountain Forest and Range Experiment Station. Research Paper INT-RP-218. 39p.

Arno, S. F. 1980. Forest fire history in the northern Rockies. Journal of Forestry 78: 460-465.

Arno, S.F. 1986. Whitebark pine cone crops – A diminishing source of wildlife food. Western Journal of Applied Forestry 1(3):92-94.

Arno, S. F. 1991. Ecological relationships of interior Douglas-fir. p. 47-52 in D. M. Baumgartner and J. E. Lotan, eds. Interior Douglas-fir: the species and its management: symposium proceedings. Pullman, Washignton State University.

Arno, S.F. 1996. The concept: restoring ecological structure and process in ponderosa pine forests. As part of the Annual Meeting of the Society for Ecological Restoration - The use of fire in forest restoration. Intermountain Research Station. General Technical Report INT-GTR-341.

Arno, S.F. 1999. Region One Forest Service Research Forester. Telephone interview. January 28, 1999.

Arno, S. F. in prep. Fire regimes in western forest ecosystems. In: Brown, James, K. (ed.) Effects of wildland fire on ecosystems: flora and fuel. Rocky Mountain Research Station. Gen. Tech. Rep.

Arno, S. F., and D. H. Davis. 1980. Fire history of western red cedar/hemlock forests in northern Idaho. Pages 21-26 in: Proc. Fire History Workshop. Oct. 20-24, 1980, Tucson, AZ. General Technical Report RM-GTR-81. U.S.D.A. Forest Service, Rocky Mountain Forest and Range Exp. Station.

Arno, S. F., and W. C. Fischer.1995. *Larix occidentalis*—fire ecology and fire management. P. 130-135 in Ecology and management of larix forests: a look ahead. USDA For. Serv. General Technical Report INT-GTR-319. Intermountain Research Station. Ogden, UT.

Arno, S.F. and G.E. Gruell. 1983. Fire history at the forest-grassland ecotone in southwestern Montana. Journal of Rangement

Arno, S.F., and R.J. Hoff. 1989. Silvics of whitebark pine (Pinus albicaulis). General Technical Report INT-253. USDA Forest Service, Intermountain Research Station. 11 p.

Arno, S. F., D. J. Parsons, and R. E. Keane. in prep. Mixed-severity fire regimes in the northern Rocky Mountains: consequences of fire exclusion and options for the future. FIRST DRAFT (1-11-99) of ms. for Wilderness Science Symposium.

Arno, S. F., H. Y. Smith, and M. A. Krebs. 1997. Old-growth ponderosa pine and western larch stand structure: influences of pre-1900 fires and fire exclusion. USDA For. Serv. Res Pap. INT-495.

Arno, S.F., and T. Weaver. 1989. Whitebark pine community types and their patterns on the landscape. Whitebark Pine Symposium. USDA Forest Service General Technical Report INT-270, p. 97-105.

Arnold, T. W., and K. F. Higgins. 1986. Effects of shrub coverages on birds of North Dakota mixed-grass prairies. Canadian Field-Naturalist 100:10-14.

Atkinson, E. C. 1992. Ferruginous hawk (Buteo regalis) inventories on the Dillon Resource Area of southwest Montana: 1992. Montana Natural Heritage Program, Helena, Montana. 34 pages.

Atkinson, E.C. and M.L. Atkinson. 1990. Distribution and status of Flammulated Owls (Otus flammeolus) on the Salmon National Forest. Idaho Nat. Heritage Prog., Idaho Dept. Fish Game, Salmon Natl. Forest Unpublished report. 25 p. Plus appendices.

Baicich, P.J., and C.J.O. Harrison. 1997. A guide to the nests, eggs, and nestlings of North American birds. Academic Press, San Diego, CA. 347p.

Bailey, 1976. Descriptions of ecoregions of the United States. USDA Forest Service Intermountain Region. Ogden, Utah. 77 p.

Bakus, G.J. 1959. Observations of the life history of the dipper in Montana. Auk 76:190-207.

Balda, R.P. 1975. The relationship of secondary cavity nesters to snag densities in western coniferous forests. USDA Forest Service, Southwest Reg., Wildl. Habitat Tech. Bull. No. 1, Albuquerque, N.M. 37p.

Baldwin, P. H. and N.K. Zackowski. 1963. Breeding biology of the Vaux's Swift. Condor 65: 400-406.

Barrett, J.W. 1979. Silviculture of ponderosa pine in the Pacific Northwest: the state of our knowledge. USDA Forest Service Pacific Northwest Forest and Range Experiment Station. General Technical Report PNW-GTR-97.

Barrett, S. W., S. F. Arno, and C. H. Key. 1991. Fire regimes of western larch - lodgepole pine forests in Glacier National Park, Montana. Can. J. For. Res. 21: 1711-1720.

Barrett, S.W., S.F.Arno, and J.P.Menakis. 1997. Fire episodes in the inland northwest (1540-1940) based on fire history data. General Technical Report INT-GTR-370. U.S.D.A. Forest Service, Intermountain Research Station. Ogden, Utah.

Basore, N. S., L. B. Best, and J. B. Wooley. 1986. Bird nesting in Iowa no-tillage and tilled cropland. Journal of Wildlife Management 50:19-28.

Bate, Lisa. 1999. Draft Literature Review for Upper Columbia River Basin Ecosystem Management Project. Draft Report. Kalispell, MT. 8p.

Beal, F.E.L. 1911. Foods of the woodpeckers of the United States. U.S. Dept. Agric. Bull. 37. 64 p.

Bechard, M. J., R. L. Knight, D. G. Smith, and R. E. Fitzner. 1990. Nest sites and habitats of sympatric hawks (Buteo spp.) in Washington. Journal of Field Ornithology 61:159-170.

Bechard, M. J., and J. K. Schmutz. 1995. Ferruginous Hawk (Buteo regalis). In A. Poole and F. Gill, editors. The Birds of North America, No. 172. The Academy of Natural Sciences, Philadelphia, Pennsylvania; The American Ornithologists' Union, Washington, D.C. 20p.

Beier, P., and J.E. Drennan. 1997. Forest structure and prey abundance in foraging areas of northern goshawks. Ecological Applications 7(2):564-571.

Bellrose, F.C. 1978. Ducks, geese and swans of North America. Wildlife Management Institute, and Stackpole Press. Harrisburg, PA.

Bendell, J.F. and P.W. Elliott.1967. Behaviour and the regulation of numbers in blue grouse. Canadian Wildlife Service. Report Series-Number 4. Ottawa, Canada. 76 p.

Bent, A.C.1939. Life histories of North American woodpeckers. U.S. Natl. Mus. Bull.174. Washington, D.C.334 p.

Bent, A.C. 1940. Life Histories of North American cuckoos, goatsuckers, hummingbirds, and their allies. U.S. National Museum Bull. No. 17, Washington, DC.

Bent, A. C. 1948. Life histories of North American nuthatches, wrens, thrashers, and their allies. U. S. Natl. Mus. Bull. 195.

Bent, A. C. 1953. Life histories of North American wood warblers. US National Museum Bulletin No. 203, Washington, D.C.

Bent, A. C. 1968. Life histories of north American cardinals, grosbeaks, buntings, towhees, finches, sparrows and allies. Dover Publications, Inc., New York.

Bergeron, D., C. Jones, D.L. Genter, and D. Sullivan. 1992. P.D. Skaar's Montana bird distribution, Fourth Edition. Montana Natural Heritage Prog. Spec. Publ. No. 2. 116p.

Berkey, G., R. Crawford, S. Galipeau, D. Johnson, D. Lambeth, and R. Kreil. 1993. A review of wildlife management practices in North Dakota: effects on nongame bird populations and habitats. Report submitted to Region 6. U.S. Fish and Wildlife Service, Denver. 51p.

Best, L.B.1970. Effects of ecological changes induced by various sagebrush control techniques on non-game birds. M.S. thesis. Montana State University, Bozeman. 74 p.

Best, L. B., H. Campa, III, K. E. Kemp, R. J. Robel, M. R. Ryan, J. A. Savidge, H. P. Weeks, Jr., and S. R. Winterstein. 1997. Bird abundance and nesting in CRP fields and cropland in the Midwest: a regional approach. Wildlife Society Bulletin 25:864-877.

Bevis, K.R. 1994. Summary report: primary cavity-excavators in grand fir forests of central Washington's East Cascades. Central State University, Ellensburg, WA. 34 p.

Bicak, T.K., R.L. Reymond, D.A. Jenni. 1982. Effects of grazing on Long-billed Curlew (Numenius americanus) breeding behavior and ecology in southwestern Idaho. In J.M. Peck and R. D. Dalke (eds), Wildlife-Livestock m: Proceedings 10. University of Idaho, Forest Wildlife and Range Experiment Station, Moscow, ID p.74-85.

Birkenholz, D. E. 1973. Habitat relationships of grassland birds at Goose Lake Prairie Nature Preserve. Pages 63-66 in L. C. Hulbert, ed. Proceedings of the Third Midwest Prairie Conference. Kansas State University, Manhattan.

Black, A. 1992. Ferruginous Hawk reproduction and habitat survey. Northern Rockies Conservation Cooperative, Jackson, Wyoming. 30 pages.

Blackford, John L. 1955. Woodpecker concentration in burned forest. Condor 57: 28-30.

Blair, C. L. 1978. Breeding biology and prey selection of Ferruginous Hawks in northwestern South Dakota. M.S. thesis. South Dakota State University, Brookings, South Dakota. 60 pages.

Blair, C. L., and F. Schitoskey Jr. 1982. Breeding biology and diet of the Ferruginous Hawk in South Dakota. Wilson Bulletin 94:46-54.

Blankespoor, G. W. 1980. Prairie restoration: effects on nongame birds. Journal of Wildlife Management 44:667-672.

Block, W.M., and L.A. Brennan. 1987. Characteristics of Lewis's Woodpecker habitat on the Modoc Plateau, California. Western Birds 18: 209-212.

Bock, C.E. 1970. The ecology and behavior of the Lewis's Woodpecker (Asyndesmus lewis). University of California Zoological Publications 92: 1-100.

Bock, C. E., and J. H. Bock. 1987. Avian habitat occupancy following fire in a Montana shrubsteppe. Prairie Naturalist 19:153-158.

Bock, C. E., J. H. Bock, W. R. Kenney, and V. M. Hawthorne. 1984. Responses of birds, rodents, and vegetation to livestock exclosure in a semidesert grassland site. Journal of Range Management 37:239-242.

Bock, C. E.; and D.L. Larson. 1986. Winter habitats of sapsuckers in southeastern Arizona. Condor 88: 246-247.

Bock, C.E., and L.W. Lepthien. 1975. A Christmas count analysis of woodpecker abundance in the United States. Wilson Bulletin 87: 355-366

Bock, C. E., V. A. Saab, T. D. Rich, and D. S. Dobkin. 1993. Effects of livestock grazing on Neotropical migratory landbirds in western North America. Pages 296-309 *in* D. M. Finch and P. W. Stangel, editors. Status and management of Neotropical migratory birds. USDA Forest Service, General Technical Report RM-229.

Bock, C. E., and B. Webb. 1984. Birds as grazing indicator species in southeastern Arizona. Journal of Wildlife Management 48:1045-1049.

Boettcher, W. 1997. Region One timber volume report for 1987-1996. Region One Forest Service.

Bollenbacher, B. 1998. Region One U.S. Forest Service silviculturalist. Telephone interview. June 23, 1998.

Bollenbacher, Barry. 1999. Personal Communication. Regional Silviculturist. USDA Forest Service. Missoula, MT.

Bollinger, E. K. 1988. Breeding dispersion and reproductive success of Bobolinks in an agricultural landscape. Ph.D. dissertation. Cornell University, Ithaca, New York. 189p.

Bollinger, E.K. 1995. Successional changes and habitat selection in hayfield bird communities. Auk 112:720-730.

Bollinger, E.K.and T.A. Gavin.1992. Eastern Bobolink populations: ecology and conservation in an agricultural landscape. P. 497-506 in J.M. Hagan, III and D.W. Johnston, editors. Ecology and conservation of Neotropical Migrant landbirds. Smithsonian Institute Press, Washington, DC

Bosworth, Dale. 1998. Region One U.S. forest Service, Regional Forester. Pers. conversation. July 3, 1998.

Braun, C.E., K. Martin, and L.A. Robb. 1993. White-tailed Ptarmigan. In The Birds of North America, No. 68 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists Union.

Brenner, F.J.1989. The essentials of habitat. P. 311-326 in S. Atwater and J. Schnell (eds). Ruffed Grouse. Stackpole Books, Harrisburg, PA. 370 p.

Briskie, J.V. 1994. Least flycatcher (*Empidonax minimus*). *In* A. Poole and F. Gill (Eds.), The Birds of North American, No. 99. Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Brown, J.K. 1995. Fire regimes and their relevance to ecosystem management. P. 171-178 in: Proceedings of Society of American Foresters National Convention; 1994 Sept. 18-22; Anchorage, AK. SAF, Bethesda, MD.

Brown, J. K, S.F.Arno, S.W. Barrett, and J.P.Menakis. 1994. Comparing the prescribed natural fire program with presettlement fires in the Selway-Bitterroot Wilderness. Intl. J. Wildland Fire 4: 157-168.

Brown, T.C. and T.C. Daniel. 1984. Modeling forest scenic beauty: concepts and applications to ponderosa pine. Rocky Mountain Forest and Range Experiment Station. Research Paper RM-RP-256.

Buckley, P. A., and F. G. Buckley. 1984. Seabirds of the north and middle Atlantic coast of the United States: their status and conservation. Pages 101-133 in Croxall et al., eds. Status and conservation of the world's seabirds. ICBP Tech. Pub. No. 2.

Bull, E.L. and R.G. Anderson. 1978. Notes on Flammulated Owls in northeastern Oregon. Murrelet 59:26-28.

Bull, E.L., and R.C. Beckwith. 1993. Diet and foraging behavior of Vaux's swifts in northeastern Oregon. Condor 95(4):1016-1023.

Bull, E. L. and A. K. Blumton. 1997. Roosting behavior of post-fledging Vaux's Swifts in northeastern Oregon. J. Field Orhithol. 68: 302-305.

Bull, E. L. and C. T. Collins. 1993. Vaux's Swift (*Chaetura vauxi*). In The Birds of North America, No. 77 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Bull, E. L. and H. D. Cooper. 1991. Vaux's Swift nests in hollow trees. Western Birds 22: 85-91.

Bull, E.L., and J.R. Duncan. 1993. Great Gray Owl. In: Birds of North America, No. 41. (A. Poole and F.

Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.:The American Ornithologists' Union.

Bull, E. L., and R. S. Holthausen. 1993. Habitat use and management of Pileated woodpeckers in norhteastern Oregon. J. Wildl. Manage. 57: 335-345.

Bull, E. L., and J. E. Jackson. 1995. Pileated Woodpecker (*Dryocopus pileatus*). *In* The Birds of North America, No. 148 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D. C.

Bull, E.L., S.R. Peterson, and J.W. Thomas. 1986. Resource partitioning among woodpeckers in northeastern Oregon. Res. Note. PNW-444. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 19 p.

Bull, E.L., A. L. Wright, and M.G. Henjum. 1990. Nesting habitat of Flammulated Owls in Oregon. Journal of Raptor Research 24:52-55.

Burger, J., and M. Gochfeld. 1994. Franklin’s Gull (*Larus pipixcan*). *In* The Birds of North America No. 116 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists’ Union.

Burleigh, T. D. 1972. Birds of Idaho. Caxton Printers, Ltd., Caldwell, ID.

Byrd, M. A., and D. W. Johnston. 1991. Birds. Pages 477-537 in K. Terwilliger, coordinator. Virginia's endangered species: proceedings of a symposium. McDonald and Woodward Publ. Co., Blacksburg, Virginia.

Byre, V. J. 1997. Birds. Pages 327-337 in S. Packard and C. F. Mutel, editors. The tallgrass restoration handbook for prairies, savannas, and woodlands. Island Press, Washington, D.C.

Cada, B.S. and P.J. Sousa. 1985. Habitat suitability index models: Ruffed Grouse. USDI, Fish and Wildl. Service, Biological Rpt. 82(10.86). Washington, D.C.

Calder, W.A. 1993. Rufous Hummingbird. In: Birds of North America, No. 53. (A. Poole and F. Gill, Eds.). Philadelphia: the Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Call, M.W. and C. Maser. 1985. Wildlife habitats in managed rangelands - the great basin of southeastern Oregon - sage grouse. USDA/USDI General Technical Report PNW-187. 30p.

Camp, A. E., P. H. Hessburg, and R . L. Everett. 1996. Dynamically incorporating late-successional forest in sustainable landscapes. In: Hardy, C. C., and S. F. Arno, eds. The use of fire in forest restoration. General Technical Report INT-GTR-341.

Canadian Bird Trends Database. 1996a. McCown’s Longspur. Canadian Wildlife Service, Environment Canada. The Green Lane.

Canadian Bird Trends Database. 1996b. Lark Bunting. Canadian Wildlife Service, Environment Canada. The Green Lane.

Canton-Thompson, J. 1994. Social assessment of the Bitterroot Valley, Montana with special emphasis on national forest management. USDA Forest Service, Northern Region, Missoula, Montana.

Carey et al. 1991. In Ruggiero. L. F.; Aubry, K. B.; Carey, A. B.;Huff, M. H., eds. Wildlife and vegetation of unmanaged Douglas-fir forests. Gen. Tech. Rep. PNW-GTR-285. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Carter, M.F., W.C. Hunter, D.N.Pashley, J.S. Bradley, C.S. Aid, J. Price and G.S. Butcher. 1998. The Partners-In-Flight method for setting bird conservation priorities for states and physiographic areas of North America. Cornell Laboratory of Ornithology, Ithaca, New York. 13p.

Cartwright, Charles W. Jr; Burns, Denver P. 1994. Sustaining our aspen heritage into the twenty-first century. Note. USDA Forest Service. Southwestern Region. Albuquerque, New Mexico. 7 p.

Cassel, J. F. 1952. Breeding bird populations at various altitudes in north central Colorado. Ph.D. dissertation. University of Colorado, Boulder, Colorado. 147 pages.

Cassirer, E.F., J.D. Reichel, R.L. Wallen, and E.C. Atkinson. 1996. Harlequin Duck (*Histrionicus histrionicus*)--United States Forest Service/Bureau of Land Management habitat conservation assessment and conservation strategy for the U.S. Rocky Mountains. 54p.

Caton, E. 1996 Effects of fire and salvage-logging on a cavity-nesting bird community in northwestern Montana. Ph.D. Dissertation. Univ. of Montana. Missoula. 115 p.

Champlin, M.R. 1979. Structural characteristics of territorial male ruffed grouse (Bonasa umbellus) habitat in western Montana. MS thesis, Univ. of Montana, Missoula. 159 p.

Chojnacky, D. C., and S. W. Woudenberg. 1994. Toward an ecological approach to inventorying cedar-hemlock-white pine in the inland Northwest: barriers and opportunities. Pages 9-16 In:Baumgartner, D.M., J.E. Lotan, and J. R. Tonn. (eds.). Interior cedar-hemlock-white pine forests: ecology and management. Washington State Univ. Cooperative Extension, Pullman, WA.

Christensen, N. L., J. K. Agee, P. F. Brussard, J. Hughes, D. H. Knight, G. W. Minshall, J. M. Peek, S. J. Pyne, F. J. Swanson, J. W. Thomas, S. Wells, S. E. Williams, and H. A. Wright. 1989. Interpreting the Yellowstone fires of 1988. BioScience 39:678-685.

Clark, R. J. 1975. A field study of the Short-eared Owl, Asio flammeus (Pontoppidan), in North America. Wildlife Monographs 47:1-67.

Clark, T.W., A.H. Harvey, R.D. Dorn, D.L. Genter, and C. Groves, eds. 1989. Rare, sensitive, and threatened species of the Greater Yellowstone Ecosystem. Northern Rockies Conservation Cooperative, Montana Natural Heritage Program, The Nature Conservancy, and Mountain West Environmental Services. 153 p.

Colorado Sage Grouse Working Group. 1997. Gunnison sage grouse conservation plan - Gunnison Basin, Colorado. USDI - Bur. Land Mgmt. 108 p.

Colwell, M. A. and J. R. Jehl, Jr. 1994. Wilson's Phalarope (*Phalaropus tricolor*). *In* The Birds of North America, No. 83 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D. C.: The American Ornithologists' Union.

Connelly, J.W., H.W. Browers, R.J. Gates. 1988. Seasonal movements of sage grouse in southeastern Idaho. J. Wildl. Mgmt. 52(1): 116-122.

Conway, Courtney J.; Martin, Thomas E. 1993. Habitat suitability for Williamson's sapsuckers in mixed-conifer forests. Journal of Wildlife Management 57 (2): 322-328.

Cooper, J.M., C. Siddle, and G. Davidson. 1998. Status of the Lewis's Woodpecker (Melanerpes lewis) in British Columbia. Report commissioned by the Wildlife Branch, Ministry of Environment, Lands and Parks. Victoria, British Columbia. Wildl. Working Rept. No. WR-91.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Dept. Int., U.S. Fish Wildl. Serv. FWS/OBS-79-31. 131p.

Creighton, P. D. 1974. Habitat exploitation by an avian ground-foraging guild. Ph.D. dissertation. Colorado State Univ., Fort Collins. 154p.

Creighton, P. D., and P. H. Baldwin. 1974. Habitat exploitation by an avian ground-foraging guild. U.S. International Biological Program, Technical Report No. 263. Colorado State Univ., Fort Collins. 139 pages.

Crockett, A.B., Jr. 1975. Ecology and behavior of the Wlliamson's Sapsucker in Colorado. Ph. D. dissertation, Univ. Colorado, Boulder. 137p.

Crockett, A. B., and H.H. Hadow. 1975. Nest site selection by Williamson and red-naped sapsuckers. Condor 77 (3): 365-368.

Crowley, C.M. and J.W. Connelly. 1996. Sage grouse population and habitat trends in southeastern Idaho and southwestern Montana. Idaho Department of Fish and Game. 205 p.

Cullen, S. A. 1994. Black-necked Stilt foraging site selection and behavior in Puerto Rico. Wilson Bulletin, 106(3):508-513.

Cuthbert, F. J. 1988. Reproductive success and colony-site tenacity in Caspian terns. Auk 105:339-344.

Daily, G.C., Ehlich, Paul R., and Haddad, Nick M. 1993. Double keystone bird in a keystone species complex. Proc. Natl. Acad. Sci. 90:592-594.

Dale, B. C. 1983. Habitat relationships of seven species of passerine birds at Last Mountain Lake, Saskatchewan. M.S. thesis. Univ.of Regina, Regina, Saskatchewan.119p.

Dale, B. C. 1984. Birds of grazed and ungrazed grasslands in Saskatchewan. Blue Jay 42:102-105.

Dale, B. C., P. A. Martin, and P. S. Taylor. 1997. Effects of hay management regimes on grassland songbirds in Saskatchewan. Wildlife Society Bulletin 25:616-626.

Dale, B. C., and G. McKeating. 1996. Finding common ground-the nongame evaluation of the North American Waterfowl Management Plan in Canada. Pages 258-265 in J. T. Ratti, editor. Proceedings of the seventh International Waterfowl Symposium.

Daniels, O. 1991. Special grove management, legacy trees and old growth ponderosa pine communities. Memo to district rangers and program officers, Lolo National Forest. 2 p.

Daubenmire, R., and J.B. Daubenmire. 1968. Forest vegetation of eastern Washington and north Idaho. Washington Agricultural Experiment Station, Tech. Bull. 60. Washington State Univ., Pullman. 104p.

Davis, P. R. 1976. Response of vertebrate fauna to forestfire and clearcutting in south central Wyoming. Ph.D. Thesis, University of Wyoming, Laramie, WY.

Davis, S. K., and D. C. Duncan. *in press*. Grassland songbird abundance in native and crested wheatgrass pastures of southern Saskatchewan. *In* J. Herkert and P. Vickery, editors. Ecology and conservation of grassland birds in the western hemisphere. Studies in Avian Biology.

Davis, S. K., and S. G. Sealy. in press. Nesting biology of Baird's Sparrows in southwestern Manitoba. Wilson Bulletin.

Davis, W.E., Jr. 1993. Black-crowned Knight Heron (Nycticorax nycticorax). In: The Birds of North America, No. 74 (A. Poole, and F. Gill, Eds.). Philadelphia: the Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Davy, G. L. 1930. Nesting of the Ferruginous Roughleg Hawk in northern North Dakota. Oologist 47:14-18.

Daw, S.K., S. DeStefano, and R.J. Steidl. 1998. Does survey method bias the description of northern goshawk nest-site structure? J. Wildl. Manage. 62(4):1379-1384.

De Byle, Norbert V. 1981. Songbird populations and clearcut havesting of aspen in northern Utah. Research note INT-302. Ogden, Utah. USDA Forest Service. Intermountain Forest and Range Experiment Station. 7 p.

DeByle, N. V., C. D. Bevins, and W. C. Fischer. 1987. Wildfire occurrence in aspen in the interior western United States. Western Journal of Applied Forestry 2:73-76.

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, M. P. Nenneman, and B. R. Euliss. 1998 (revised 1999). Effects of management practices on grassland birds: Chestnut-collared

Longspur. Northern Prairie Wildlife Research Center, Jamestown, ND. 12 pages.

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, P. A. Rabie, and B. R. Euliss. 1999. Effects of management practices on grassland birds: McCown's Longspur. Northern Prairie Wildlife Research Center, Jamestown, ND. 11 pages.

DeGraaf, R.M. et al. 1991. Forest and rangeland birds of the United States. U.S.D.A. Forest Service Agriculture Handbook 688. 625p.

Denton, K. 1998. Region Six U.S. Forest Service silviculturalist. Telephone interview. July 24, 1998.

DeSante, D.F. and T.L. George. 1994. Population trends in the landbirds of western North America. P. 173-190 *in* A century of avifaunal change in western North America (J. R. Jehl, Jr. and N.K. Johnson, eds.). Studies in Avian Biology, No. 15.

DeSante, D. and P. Pyle. 1986. Distributional checklist of North American birds. Volume 1: United States and Canada. Artemisia Press, Lee Vining, CA.

De Smet, K. D., and M. P. Conrad. 1991. Status, habitat requirements, and adaptations of Ferruginous Hawks in Manitoba. Pages 219-221 in G. L. Holroyd, G. Burns, and H. C. Smith, editors. Proceedings of the second endangered species and prairie conservation workshop. Natural History Occasional Paper 15. Provincial Museum of Alberta, Edmonton, Alberta.

Diamond, A.W. 1991. Assessment of the risks from tropical deforestation to Canadian songbirds. Trans. 56th N. Amer. Wildl. and Nat. Res. Conf. 177-194.

Dibenedetto, J. 1999. Custer National Forest Ecologist. Telephone interview. January 28, 1999.

Dick, J. 1998. Region Three U.S. Forest Service staff forester. Telephone interview. July 24, 1998.

Dobkin, D.S. 1992. Neotropical migrant landbirds in the northern Rockies and Great Plains. USDA Forest Service, Northern Region. Publication No. R1-93-34. Missoula, MT.

Dobkin, D.S. 1994. Conservation and management of Neotropical migrant landbirds in the Northern Rockies and Great Plains. Univ. of Idaho Press, Moscow, ID. 220p.

Dobkin, D.S., and B.A. Wilcox. 1986. Analysis of natural forest fragments: riparian birds in the Toiyabe Mountains, Nevada. In: J.Verner, M.L. Morrison, and C.J. Ralph (eds.), Wildlife 2000: Modeling habitat Relationships of Terrestrial Vertebrates. Univ.Wisconsin Press, Madison, p. 293-299.

Douthett, S. 1999. Helena National Forest Range Program Manager. Telephone interview. February 9, 1999.

DuBois, A. D. 1935. Nests of Horned Larks and longspurs on a Montana prairie. Condor 37:56-72.

Dubois, A. D. 1937. The McCown Longspurs of a Montana prairie. Condor 39:233-238.

DuBois, K.L. 1996. Black Tern nest monitoring at Freezout Lake WMA. Unpubl. Prog. Rep., Montana Fish, Wildlife and Parks, Great Falls, MT.

Ducey, J., and L. Miller. 1980. Birds of an agricultural community. Nebraska Bird Review 48:58-68.

Duebbert, H. F., and J. T. Lokemoen. 1977. Upland nesting of American Bitterns, Marsh Hawks, and Short-eared Owls. Prairie Naturalist 9:33-40.

Dugger, B.D., K.M. Dugger, and L.H. Fredrickson.1994. Hooded Merganser (Lophodytes cucullatus). In: The Birds of North America, No. 98. (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences: Washington, D.C.: The American Ornithologists' Union.

Duncan, D. C., and S. K. Davis. in press. Songbirds in altered grasslands. Saskatchewan Biodiversity Conference Proceedings.

Dunn, E.H., and D.J. Agro. 1995. Black Tern (*Chlidonias niger*). *In* The Birds of North America, No. 147 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and the American Ornithologist's Union, Washington, D.C.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. The Birder's Handbook: A Field Guide to the Natural History of North American Birds. Simon and Schuster Inc., New York. 785p.

Ellingson, G. 1998. University of Montana Department of Forestry staff. Telephone interview, July 1, 1998.

England, A.S., M.J. Bechard, and C.S. Houston. 1997. Swainson's Hawk, in Birds of North America, No. 265. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia and the American Ornithologist's Union, Washington, D.C.

Erskine, A. J. 1977. Birds in boreal Canada. Report Series No. 41, Canadian Wildlife Service, Ottawa, Canada. 71p.

Erskine, A. J., Collins, B. T., Hayakawa, E., Downes, C. 1992. The Cooperative Breeding Bird Survey in Canada, 1989-1991. Progress Note 199. Canadian Wildlife Service, Environment Canada. 14pp.

Evans, D.M., and D.M. Finch. 1994. Relationships between forest songbird populations and managed forests of Idaho. P. 308-314 *in* W.W. Covington and L.F. DeBano (tech. coords.) Sustainable ecological systems: implementating an ecological approach to land management. USDA Forest Service General Technical Report RM-247. 363 p.

Evans, W. G. 1971. The attraction of insects to forest fires. Tall Timbers Conf. On Ecol. Animal Control by Habitat Manage. Proc. 3: 115-127.

Eyre, F. H., ed. 1980. Forest cover types of the United States and Canada. Society of American

Foresters, Washington D.C.

Faanes, C.A. 1983. Breeding birds of wooded draws in western North Dakota. Prairie Naturalist 15:173-187.

Faanes, C. A., and G. R. Lingle. 1995. Breeding birds of the Platte River Valley of Nebraska. Jamestown, ND: Northern Prairie Wildlife Research Center home page. http://www.npwrc.org/resource/distr/birds/platte/platte.htm (Version 16JUL97).

Fairfield, G. M. 1968. Chestnut-collared Longspur. Pages 1635-1652 *in* O. L. Austin, Jr. editor. Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies. Dover Publications, Inc., New York, New York.

Feist, F. G. 1968. Breeding bird populations on sagebrush-grassland habitat in central Montana. Audubon Field Notes. 72:691-695.

Felske, B. E. 1971. The population dynamics and productivity of McCown's Longspur at Matador, Saskatchewan. M.S. thesis. Univ. of Saskatchewan, Saskatoon. 133 p.

Finch, D.M. 1989. Habitat use and habitat overlap of riparian birds in three elevational zones. Ecology 70(4):866-880.

Finch, D.M. 1992. Threatened, Endangered, and Vulnerable Species of Terrestrial Vertebrates in the Rocky Mountain Region. USDA Forest Service General Technical Report RM-215.

Finch, D. M., S.H. Anderson, and W.A. Hubert. 1987. Habitat suitability index models: Lark Bunting. U.S. Fish and Wildlife Service Biological Report 82(10.137). 16 pages.

Finzel, J. E. 1964. Avian populations of four herbaceous communities in southeastern Wyoming. Condor 66:496-510.

Fischer, W. C., and A. F. Bradley. 1987. Fire ecology of western Montana forest habitat types. USDA Forest Service, Intermountian Forest and Range Experiment Station. General Technical Report INT-223. 95p.

Fischer, W.C. and B.D. Clayton. 1983. Fire ecology of Montana forest habitat types east of the continental divide. USDA Forest Service Intermountain Forest and Range Experiment Station. General Technical Report INT-GTR-141.

Fitzner, R. E., D. Berry, L. L. Boyd, and C. A. Reick. 1977. Nesting of Ferruginous Hawks (Buteo regalis) in Washington, 1974-75. Condor 79:245-249.

Flack, J.A.D. 1976. Bird populations of aspen forests in western North America. American Ornithological Union, Ornithological Monographs No 19. 97 p.

Forde, J. E., N. F. Sloan, and D. A. Shown. 1984. Grassland habitat management using prescribed burning in Wind Cave National Park, South Dakota. Prairie Naturalist 16:97-110.

Fowells, H.A. 1965. Silvics of forest trees of the United States. Agriculture Handbook No. 271. USDA Forest Service, Washington, D.C. 762 p.

Franzreb, K.E. 1985. Foraging ecology of brown creepers in a mixed-coniferous forest. J. Field Ornithol. 56(1):9-16.

Frawley, B. J. 1989. The dynamics of nongame bird breeding ecology in Iowa alfalfa fields. M.S. thesis. Iowa State University, Ames. 94p.

French, N.R.1959a. Life history of the Black Rosy Finch. Auk 76:159-180.

French, N.R.1959b. Distribution and migration of the Black Rosy Finch. Condor 61(1):18-29.

Friedmann, H. 1963. Host relations of the parasitic cowbirds. U.S. National Museum Bulletin 233:1-276.

Gaines, E.P., and M.R. Ryan. 1988. Piping Plover habitat use and reproductive success in North Dakota. Journal Wildlife Management 52:266-273.

Gale, R.S., E.O. Garten, and I.J. Ball. 1987. The history, ecology, and management of the Rocky Mountain population of Trumpeter Swans. Unpubl. Manuscript. Montana Wildlife Cooperative Unit, University of Montana. Missoula 314p.

Gavin, T.A. 1984. Broodedness in Bobolinks. Auk 101:179-181.

Geissler, P. H. and J. R. Sauer. 1990. Topics in route-regression analysis. Pages 54-57 in J. R. Sauer and S. Droege, eds. Survey Designs and Statistical Methods for the estimation of Avian Population Trends. U.S. Fish and Wildlife Service, Biol. Rep. 90(1).

George, J. L. 1952. The birds on a southern Michigan farm. Ph.D. thesis. Univ. of Michigan, Ann Arbor. 413p.

Giezentanner, J. B. 1970a. Avian distribution and population fluctuations on the shortgrass prairie of north central Colorado. M.S. thesis. Colorado State Univ., Fort Collins. 113p.

Giezentanner, J. B. 1970b. Avian distribution and population fluctuations on the shortgrass prairie of north central Colorado. U.S. International Biological Program, Grassland Biome Technical Report 62. 112 pages.

Giezentanner, J. B., and R. A. Ryder. 1969. Avian distribution and population fluctuations at the Pawnee site. U.S. International Biological Program, Grassland Biome Technical Report 28. 29 pages.

Gilbert, F. F. and R. Allwine. 1991. Spring bird communities in the Oregon Coast Range. Pp. 145-60 in Ruggiero. L. F.; Aubry, K. B.; Carey, A. B.;Huff, M. H., eds. Wildlife and vegetation of unmanaged Douglas-fir forests. Gen. Tech. Rep. PNW-GTR-285. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Gill, R. E., Jr. and L. R. Mewaldt. 1983. Pacific coast Caspian terns: dynamics of an expanding population. Auk 100:369-381.

Gilligan, J.M., Smith, D. R., and A. Contreras. 1994. Birds of Oregon: Status and distribution. Cinclus Publish., McMinnville, OR.

Gillis, A. M. 1990, The new forestry. BioScience 40: 558-562.

Gilmer, D. S., and R. E. Stewart. 1983. Ferruginous Hawk populations and habitat use in North Dakota. Journal of Wildlife Management 47:146-157.

Godfrey, W. E. 1986. The birds of Canada, revised edition. Distributed for National Museum of Natural Sciences, Ottawa. Univ. Chicago Press. 596 pp.

Goggans, R. 1986. Habitat use by Flammulated Owls in northeastern Oregon. M.S. thesis, Oregon State Univ., Corvallis. 54 p.

Goggans, Rebecca; Dixon, Rita D.; Seminara, Claire. 1988. Habitat use by three-toed and black-backed woodpeckers, Deschutes National Forest, Oregon. Nongame Rep. 87-3-02. Oregon Department of Fish and Wildlife; Deschutes National Forest. 49 p. + 34 figures/tables.

Graham, R. T., C. A. Wellner, and R. Ward. 1983. Pp. 67-69 in R. M. Burns (tech. comp.), Silvicultural systems for the major forest types of the United States. USDA Forest Service, Agriculture Handbook 445, Washington, D.C.

Gratto-Trevor, C. L., and H. L. Dickson. 1992. Timing of Migration and Abundance of Shorebirds at a Major Staging Area in the Canadian Prairies. Unpublished Draft report, 42pp.

Graul, W.D.1973. Adaptive aspects of the Mountain Plover social system. Living Bird 12:69-94.

Green, A. W., R. A. O'Brien, and J. C. Schaefer. 1985. Montana's Forests. Resource Bulletin INT-38. USDA Forest Dervice, Intermountain Research Station, Ogden, UT.

Green, G. A., and M. L. Morrison. 1983. Nest-site selection of sympatric Ferruginous and Swainson's hawks. Murrelet 64:20-22.

Green, P., J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann. 1992. Old-growth forest types of the Northern Region. USDA Forest Service, Region One, SES, 4/92. Missoula, MT.

Greene, E., V.R. Muehter, and W. Davison. 1996. Lazuli Bunting (*Passerina amoena*). No. 232. *In* A. Poole and F. Gill (Eds.), The birds of North America. The Academy of Natural Sciences, Philadelphia, PA and The American Ornithologists' Union, Washington, D.C.

Greer, R. D., and S. H. Anderson. 1989. Relationships between population demography of McCown's Longspur and habitat resources. Condor 91:609-619.

Griggs, J.L. 1997. All the birds of North America. HarperCollins, New York. 172p.

Grinnell, J., and A.H. Miller. 1944. The distribution of the birds of California. Pac. Coast Avifauna No. 27. 608p.

Groves, C. R., B. Butterfield, G. Lippincott, B. Csuti, and J. M. Scott. 1997. Atlas of Idaho's wildlife. Idaho Department of Fish and Game, Boise. 372 p.

Gruell, G.E. 1980. Fire's influence on wildlife habitat on the Bridger-Teton national Forest, Wyoming. Research Paper INT-RP-252. USDA Forest Service, Ogden, UT.

Gruell, G. E. 1983. Fire and vegetative trends in the Northern Rockies: interpretations from 1871-1982 photographs. USDA For. Serv. General Technical Report INT-158, 117 p.

Habeck, J. R., and R. W. Mutch. 1973. Fire dependent forests in the northern Rocky Mountains. Quaternary Research 3:408-424.

Hadow, H.H. 1973. Winter ecology of migrant and resident Lewis's Woodpeckers in southeastern Colorado. Condor 75: 210-224.

Haig, S. M. And J.H. Plissner. 1993. Distribution and abundance of Piping Plovers: results and implications of the 1991 international census. Condor 95:145-156.

Hann, et al. 1996, CRB Assessment Volume 2, Chapter 3. Landscape dynamics of the Basin. PNW-GTR-405.

Hansen, R.W. 1995. Ecological relationships between nesting Swainson's and Red-tailed Hawks in southeastern Idaho. J. Raptor Res. 29:166-171.

Hansen, P.L. and G.R. Hoffman 1988. The vegetation of the Grand River/Cedar River, Sioux, and Ashland Districts of the Custer National Forest: a habitat type classification. Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-GTR-157.

Hanson, P.L; S.W. Chade; and R.D. Pfister. 1988. Riparian dominance types of Montana. Montana Riparian Association, School of Forestry, University of Montana, Missoula, MT.

Hanson, P.L., R.D. Pfister, K. Boggs, B.J. Cook, J.Joy, and D.K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana, Missoula. Misc. Publ. No. 54. 646p.

Harrington, B. and E. Perry. 1995 Important Shorebird Staging Sites. *In* Meeting Western Hemisphere Shorebird Reserve Network Criteria in the United States.

Harris, B. 1980. Unprecedented numbers of Short-eared Owls in northeastern South Dakota during the 1978 breeding season. South Dakota Bird Notes 32:24-27.

Harris, J.H., S.D. Sanders, and M.A. Flett. 1988. The status and distribution of the willow flycatcher in the Sierra Nevada: results of the 1986 survey. Calif. Dept. Fish and Game, Wildlife Management Div., Adm. Rep. 88-1. 32P.

Harris, M. A. 1982. Habitat use among woodpeckers in forest burns. Missoula, MT: University of Montana. 63p. M.S. Thesis.

Harris, R. D. 1944. The Chestnut-collared Longspur in Manitoba. Wilson Bulletin 56:105-115.

Harrison, H. 1979. A field guide to western birds' nests. Houghton Mifflin Co., Boston, MA. 279P.

Hart, M.M., W.A. Williams, P.C. Thornton, K.P. McLaughlin, C.M. Tobaske, B.A. Maxell, D.P. Hendricks, C.R. Peterson, and R.L. Redmond. 1998. Montana atlas of terrestrial vertebrates. Unpublished report. Montana Cooperative Wildlife Research Unit, The University of Montana, Missoula. 1302 p.

Hayward, G.D. 1983. Goshawk nest habitat selection in Region One. USDA Forest Service, Unpublished Report. 21 p.

Hayward, G.D., and R.E. Escano. 1989. Goshawk nest-site characteristics in western Montana and northern Idaho. Condor 91:476-479.

Hayward, G.D. and P.H. Hayward. 1993. Boreal Owl (Aegolius funereus). In: The Birds of North America, No. 63 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences: Washington, DC: The American Ornithologist's Union. 20p.

Hayward, G.D., P.H. Hayward and E.O. Garton. 1987. Revised breeding distribution of the Boreal Owl in the northern Rocky Mountains. Condor 89:431-432.

Hayward, G.D., P.H. Hayward and E.O. Garton. 1993. Ecology of Boreal Owls in the northern Rocky Mountains, USA. Wildl. Monogr. 124. 59p.

Hayward, G.D., T. Holland,and R.E. Escano. 1990. Goshawk habitat relationships. *in* Old-growth habitats and associated wildlife species in the northern Rocky Mountains. N.M. Warren (ed.). Report R1-90-42. USDA Forest Service, Wildlife Habitat Relationships Program, Northern Region, Missoula, Montana. 47 p.

Heimberger, M., D. Euler, and J. Barr. 1983. The impact of cottage development on common loon reproductive success in central Ontario. Wilson Bulletin 95(3):431-439.

Heinselman, M. L. 1981. Fire intensity and frequency as factors in the distribution and structure of northern ecosystems. Pp. 7-57 in H. A. Mooney, T. M. Bonnicksen, N. L. Christensen, J. E. Lotan, and W. A. Reiners (eds.) Fire regimes and ecosystem properties. USDA For. Serv. Gen. Tech. Rep. WO-26, Washington, D. C.

Hejl, S.J. 1994. Human-induced changes in bird populations in coniferous forests in western North America during the past 100 years. In: J.R. Jehl and N.K. Johnson, eds. A century of avifaunal change in western North America. Studies in Avian Biol. 15:232-246.

Hejl, S.J. and L.C. Paige. 1994. A preliminary assessment of birds in continuous and fragmented forests of western re cedar/western hemlock in northern Idaho. Pages 189-197 in proc. of interior cedar-hemlock-white pine forests: ecology and management. Dept. Natural Resource Sciences, Wash. State Univ., Pullman, WA.

Hejl, S. J., and R. E. Woods. 1991. Bird assemblages in old-growth and rotation-aged Douglas-fir/ponderosa pine stands in the Northern Rocky Mountains: A preliminary assessment. Pages 93-100 *in* D. M. Baumgartner and J. E. Lotan, editors. Symposium proceedings: Interior Douglas-fir: The species and its management. Washington State University, Pullman, WA.

Hejl, S.J., R.L. Hutto, C.R. Preston, and D.M. Finch. 1995. Effects of silvicultural treatments in the Rocky Mountains. P. 220-244 *in* T.E. Martin and D.M. Finch (eds.) Ecology and management of neotropical migratory birds; a synthesis and review of critical issues. Oxford Univ. Press. 409 p.

Helmers, D. L. 1992. Shorebird Management Manual. Western Hemisphere Shorebird Reserve Network, Manomet Bird Obsrvatory, MA.

Helzer, C. J. 1996. The effects of wet meadow fragmentation on grassland birds. M.S. thesis. Univ. of Nebraska, Lincoln. 65p.

Hendricks, P., and K.H. Dueholm. 1995. Cliff-nesting raptor survey of the Sioux District, Custer National Forest:1994. Unpubl. report to U.S.D.A. Forest Service, Custer National Forest. Billings. 20p.

Hendricks, P. and J. Swenson.1983. Dynamics of the winter distribution of Rosy Finches, Leucosticte arctoa, in Montana. Can. Field-Nat. 97(3):307-310.

Herkert, J. R. 1991. An ecological study of the breeding birds of grassland habitats within Illinois. Ph.D. thesis. Univ. of Illinois, Urbana. 112p.

Herkert, J. R. 1994a. Breeding bird communities of midwestern prairie fragments: the effects of prescribed burning and habitat-area. Natural Areas Journal 14:128-135.

Herkert, J. R. 1994b. The effects of habitat fragmentation on midwestern grassland bird communities. Ecological Applications 4:461-471.

Herkert, J.R., R.E. Szafoni, V.M. Kleen, and J.E. Schwegman. 1993. Habitat establishment, enhancement and management for forest and grassland birds in Illinois. Illinois Department of Conservation, Division of Natural Heritage, Natural Heritage Technical Publication 1, Springfield, Illinois, 20 p.

Herman, S. G., and J. B. Bulger. 1979. Effects of a forest application of DDT on nontarget organisms.

Wildlife Monographs 69:1-62.

Hill, D. P., and L. K. Gould. 1997. Chestnut-collared Longspur (*Calcarius ornatus*). *In* A. Poole and F. Gill, editors. The birds of North America, No. 288. The Academy of Natural Sciences, Philadelphia, PA.; The American Ornithologists' Union, Washington, D.C.

Hillis, J.M. 1998. Lolo National Forest Wildlife Biologist. Telephone interview. 1998.

Hitchcox, Susan, M. 1996. Abundance and nesting success of cavity-nesting birds in unlogged and salvaged-logged burned forest in northwestern Montana. M.S. Thesis. Univ. of Montana. Missoula, MT. 89 p.

Hoff, R.J. and S. Hagle. 1989. Diseases of whitebark pine with special emphasis on white pine blister rust. Whitebark Pine Symposium. USDA Forest Service General Technical Report INT-270, p. 179-190.

Hoffman, N.J. 1997. Distribution of *Picoides* woodpeckers in relation to habitat disturbance within the Yellowstone area. M.S. Thesis. Montana State Univ. Bozeman, Mt. 74 p.

Hogstad, Olav. 1970. On the ecology of the three-toed woodpecker outside the breeding season. Nytt Magasin For. Zoologi 18 (2): 221-227.

Holt, D.W. and J.M. Hillis. 1987. Current status and habitat associations of forest owls in western Montana. P. 281-288 in R.W. Nero, R.J. Clark, R.J. Knapton, and R.H. Hamre (eds.), Biology and conservation of northern forest owls: symposium proceedings, Feb. 3-7, Winnnepeg, Manitoba. General Technical Report RM-142. USDA, Forest Service; Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 309 p.

Holt, D. W., and S. M. Leasure. 1993. Short-eared Owl (Asio flammeus). In A. Poole and F. Gill, editors. The birds of North America, No. 62. The Academy of Natural Sciences, Philadelphia, Pennsylvania; The American Ornithologists' Union, Washington, D.C.

Holt, D.W., J.A. Hoy, and P.L. Wright. 1987. Occurrence and first nest record of Flammulated Owls in Montana. J. Raptor Res. 21 (3):121-124.

Houston, C. S. 1982. Artificial nesting platforms for Ferruginous Hawks. Blue Jay 40:208-213.

Houston, C. S. 1985. Ferruginous Hawk nest platforms--progress report. Blue Jay 43:243-246.

Houston, C. S. 1995. Thirty-two consecutive years of reproductive success at a Ferruginous Hawk nest. Journal of Raptor Research 29:282-283.

Howard, R. P. 1975. Breeding ecology of the Ferruginous Hawk in northern Utah and southern Idaho. M.S. thesis. Utah State University, Logan, Utah. 43 pages.

Howard, R. P., and M. L. Wolfe. 1976. Range improvement practices and Ferruginous Hawks. Journal of Range Management 29:33-37.

Howes, L.A., and W. A. Montevecchi. 1993. Population trends and interactions among terns and gulls in Gros Morne National Park, Newfoundland. Can. J. Zool. 71:1516-1520.

Howie, R.R. and R. Ritcey. 1987. Distribution, habitat selection, and densities of flammulated owls in British Columbia. P. 249-254 *in* Biology and conservation of northern forest owls. USDA For. Serv. GTR-RM-142. Fort Collins, CO.

Huber, G. E., and A. A. Steuter. 1984. Vegetation profile and grassland bird response to spring burning. Prairie Naturalist 16:55-61.

Hutchins, H.E. 1989. Whitebark pine seed dispersal and establishment: Who's responsible? Whitebark Pine Symposium. USDA Forest Service General Technical Report INT-270, p. 245-255.

Hutchins, H.E., and R.M. Lanner. 1982. The central role of Clark's nutcracker in the dispersal and establishment of whitebark pine. Oecologia 55:192-201.

Hutto, R.L. 1985. Habitat selection by nonbreeding, migratory landbirds. Pages 455-476 *in* Cody, M.L. Habitat selection by birds. Academic Press, Inc. Orlando, FL.

Hutto, R.L. 1995a. USFS Northern Region songbird monitoring program: Distribution and habitat relationships. USFS Contract #R1-95-05, Second report. 120 p.

Hutto, Richard L. 1995b. Composition of bird communities following stand-replacement fires in Northern Rocky Mountain (U.S.A.) conifer forests. Conserv. Biol.. 9(5): 1041-1058.

Hutto, R.L. 1999. Habitat relationships of landbirds in the USDA Forest Service Northern Region, Northern Rockies Research Station. Draft.

Hutto, R. L., and J. S. Young. 1999. Habitat relationships of landbirds in the Northern Region, USDA Forest Service. General Technical Report RMRS-GTR-32. USDA Forest Service, Rocky Mountain Research Station, Ogden, UT.

Iribarne, O. 1994. The Effect of Migratory Shorebirds on the Benthic Community of South Western Atlantic Intertidal Flats. Research Proposal, 5pp.

Jackman, Siri M. 1974. Woodpeckers of the Pacific Northwest: their characteristics and the forests. Corvallis, OR: Oregon State University. 147 p. M.S. Thesis.

Janes, S. W. 1985. Habitat selection in raptorial birds. Pages 159-188 in M. L. Cody, editor. Habitat selection in birds. Academic Press, New York, New York.

Johnsgard, P.A. 1973. Grouse and quail of North America. U. of Nebraska, Lincoln. 553 p.

Johnsgard, P.A. 1979. Birds of the Great Plains: breeding species and their distribution. Univ. Nebraska Press, Lincoln. 539 p.

Johnsgard, P. A. 1980. A preliminary list of the birds of Nebraska and adjacent plains states. Univ. of

Nebraska Press, Lincoln. 156p.

Johnsgard, P.A. 1986. Birds of the Rocky Mountains with particular reference to national parks in the Northern Rocky Mountain region. Colorado Assoc. Univ. Press, Boulder. 504 p.

Johnsgard, P.A. 1990. Hawks, eagles, and falcons of North America. Smithsonian Institution Press, Washington, D.C. 403 p.

Johnsgard, P. A. , and S.J. Maxson.1989. P. 133-140. In S. Atwater and J. Schnell (eds). Ruffed Grouse. Stackpole Book, Harrisburg, PA. 370 p.

Johnson, D. H. 1997. Effects of fire on bird populations in mixed-grass prairie. p.181-206 in F.L. Knopf and F.B. Samson, eds. Ecology and conservation of Great Plains vertebrates. Springer-Verlag, New York.

Johnson, D. H., and L. D. Igl. 1995. Contributions of the Conservation Reserve Program to populations of breeding birds in North Dakota. Wilson Bulletin 107:709-718.

Johnson, D.H., and L. D. Igl. 1998. Effects of Management Practices on Grassland Birds. Northern Prairie Wildlife Research Center, Jamestown, ND.

Johnson, D. H., and M. D. Schwartz. 1993a. The Conservation Reserve Program: habitat for grassland birds. Great Plains Research 3:273-295.

Johnson, D.H., and M.D. Schwartz. 1993b. The Conservation Reserve Program and grassland birds. Conserv. Biol. 7:934-937.

Johnson, E. A., and C. P. S. Larsen. 1991. Climatically induced change in fire frequency in the southern Canadian Rockies. Ecology 72:194-201.

Johnson, R. G., and S. A. Temple. 1986. Assessing habitat quality for birds nesting in fragmented tallgrass prairies. Pages 245-249 in J. Verner, M. L. Morrison, and C. J. Ralph, editors. Wildlife 2000: modeling habitat relationships of terrestrial vertebrates. Univ. of Wisconsin Press, Madison.

Johnson, R. G., and S. A. Temple. 1990. Nest predation and brood parasitism of tallgrass prairie birds. Journal of Wildlife Management 54:106-111.

Kahl, R. B., T. S. Baskett, J. A. Ellis, and J. N. Burroughs. 1985. Characteristics of summer habitats of selected nongame birds in Missouri. Research Bulletin 1056. University of Missouri, Columbia.

Kantrud, H. A. 1981. Grazing intensity effects on the breeding avifauna of North Dakota native grasslands. Canadian Field-Nat. 95:404-417.

Kantrud, H. A. 1982. Maps of distribution and abundance of selected species of birds on uncultivated native upland grasslands and shrubsteppe in the Northern Great Plains. U.S. Department of the Interior, Fish and Wildlife Service, FWS/OBS-82/31. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/distr/birds/plainmap/plai (Version 16JUL97).

Kantrud, H.A. and K.F. Higgins. 1992. Nest and nest-ties characteristics of some ground-nesting, non-passerine birds of northern grasslands. Prairie Naturalist 24(2):67-84.

Kantrud, H. A., and R. L. Kologiski. 1982. Effects of soils and grazing on breeding birds of uncultivated upland grasslands of the northern Great Plains. U.S. Fish and Wildlife Service, Wildl. Res. Rept. 15. 33p.

Kantrud, H. A., and R. L. Kologiski. 1983. Avian associations of the northern Great Plains grasslands. Journal of Biogeography 10:331-350.

Kaufman, K. 1996. The lives of North American birds. Houghton Mifflin Co., Boston and New York. 765p.

Keane, R.E. 1995. A coarse scale assessment of whitebark pine in the interior Columbia River Basin. Nutcracker Notes 5:5-6. USDA Forest Service, Intermountain Research Station, IFSL, Missoula, MT.

Keister, G.P.,Jr., G.G. Anthony, and E.J. O'Neill. 1987. Use of communal roosts and foraging areas by Bald Eagles wintering in the Klamath Basin. Journal of Wildlife Management 51(2):415-420.

Kelly, L.M. 1992. The effects of human disturbance on common loon productivity in northwestern Montana. M.S. Thesis, Univ. Montana, Missoula. 65p.

Kendall, C.K., and D. Schirokauer. 1997. Alien threats and restoration dilemmas in whitebark pine and limber pine communities. Proceedings of the 9th Conference on research and resource management in parks and on public lands, D.Harmon ed., March 17-21, 1997, Albuquerque, New Mexico, p. 218-225.

Kendeigh, S. C. 1941. Birds of a prairie community. Condor 43:165-174.

Kingery, H.E. 1996. American Dipper (Cinclus mexicanus). In: The Birds of North America, No. 229. (A. Poole, and F. Gill, Ed.s). Philadelphia: The Academy of Natural Sciences; Washington, D. C.: The American Ornithologists' Union.

Kings River Conservation District. 1985. Studies on the willow flycatcher in the central Sierra Nevada conducted during 1983 and 1984. Res. Rep. 85-017. 66P.

Knapton, R.W. 1978. Breeding ecology of the clay-colored sparrow. Living Bird 17:137-158.

Knapton, R. W. 1979. Birds of the Gainsborough-Lyleton region. Saskatchewan Natural History Society Special Publication 10. 72 p.

Knapton, R.W. 1994. Clay-colored sparrow (Spizella pallida). In A. Poole and F. Gill (eds.), The Birds of North America, No 120. Philadelphia: the Academy of Natural Sciences; Washington D.C.: The American Ornithologists Union.

Knick, S.T., and J.T. Rotenberry. 1995. Landscape characteristics of fragmented shrubsteppe habitats and breeding passerine birds. Conservation Biology 9:1059-1071.

Knight, D. H., and L. L. Wallace. 1989. The Yellowstone fires: issues in landscape ecology. BioScience 39:700-706.

Knopf, F. L. 1996a. Mountain Plover (Charadrius montanus). A. Poole and F. Gill, editors. The birds of North America, No. 211. The Academy of natural Sciences, Philadelphia, Pennsylvania; The American Ornithologist's Union, Washington, D.C. 16 pages.

Knopf, F. 1996b. Review of latest data on Mountain Plover and shortgrass species in general. Pages 17-19 in D.P. Coffin, editor. Summary report - shortgrass prairie/Mountain Plover workshop. Denver Audubon Society, Aurora, Colorado.

Knopf, F. L., and J. R. Rupert. 1996. Reproduction and movements of Mountain Plovers breeding in Colorado. Wilson Bulletin 108:28-35.

Knorr, O.A. 1961. The geographical and ecological distribution of the Black Swift in Colorado. Wilson Bulletin 73:155-170.

Knowles, C.J., C.J. Stoner, and S.P. Gieb.1982. Selective use of blacktailed prairie dog towns by Mountain Plovers. Condor 84:71-74.

Konrad, P. M., and D. S. Gilmer. 1986. Post fledging behavior of Ferruginous Hawks in North Dakota. Raptor Research 20:35-39.

Koplin, James R. 1969. The numerical response of woodpeckers to insect prey in a subalpine forest in Colorado. Condor 71 (4): 436-438.

Krause, H. 1968. McCown's Longspur. Pages 1564-1597 in O. L. Austin, Jr., editor. Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies, part 3. Dover Publications, Inc., New York, New York.

Kreil, R.L. and M.P. Dryer. 1987. Nesting of the Interior Least Tern on the Yellowstone River in North Dakota. Prairie Nat. 19(2):135-136.

Kreisel, K.J. 1998. Winter and summer bird use of burned and unburned coniferous forests. M.S. Thesis. Eastern Washington University. Cheney, WA.

Kubisiak, J. 1989. P. 320-322.In S. Atwater and J. Schnell, eds. Ruffed Grouse. Stackpole Book, Harrisburg, PA. 370 p.

Kurth, L. L. 1996. Examples of fire restoration in Glacier National Park. In: Hardy, C. C., and S. F. Arno, eds. The use of fire in forest restoration. Gen. Tech. Rep. INT-GTR-341.

Lane, J. 1968. Baird's Sparrow. Pages 745-765 in A. C. Bent, editor. Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows and allies, part 2. Dover Publications Inc., New York.

Lardy, M. E. 1980. Raptor inventory and Ferruginous Hawk biology in southeastern Oregon. M.S. thesis. University of Idaho, Moscow, Idaho. 52 pages.

Larrison, E. J., and K. G. Sonnenberg. 1968. Washington birds: Their location and identification. Seattle Audubon Society, Seattle, WA.

Laubach, R. 1984. Breeding birds of Sheeder Prairie Preserve, West-central Iowa. Proceedings of the Iowa Academy of Science 91:153-163.

Leary, A. W., R. Mazaika, and M. J. Bechard. 1998. Factors affecting the size of Ferruginous Hawk home ranges. Wilson Bulletin 110:198-205.

Leiberg, J.B. 1899. The Bitterroot Forest Reserve (Montana portion), 19^{th} Annual Report (1897-1898), U.S. Geological Survey, Part V:253-282.

Lesica, P. 1996. Using fire history models to estimate proportions of old-growth forest in northwest Montana, USA. Biological Conservation 77: 33-39.

Lesica, P. and S.V. Cooper. 1997. Presettlement vegetation of southern Beaverhead County, Montana. Montana Natural Heritage Program, Helena, MT. 35 p.

Linder, K.A. 1994. Habitat utilization and behavior of nesting Lewis's Woodpeckers (Melanerpes lewis) in the Laramie range, southeast Wyoming. M.S. thesis, University of Wyoming, Laramie.

Link, W. A., and J. R. Sauer. 1994. Estimating equations estimates of trend. Bird Populations 2:23-32.

Linkhart, B.D. 1984. Range, activity, and habitat use by nesting flammulated owls in a Colorado ponderosa pine forest. M.S. Thesis. Colorado State University. Fort Collins, CO.

Linner, S. C. 1980. Resource partitioning in breeding populations of Marsh Hawks and Short-eared Owls. M.S. thesis. Utah State University, Logan, Utah. 66 pages.

Logan, R.S. 1998. Montana's Innovative Stewardship Program. Extension Forestry, School of Forestry, University of Montana, Missoula, MT.

Lokemoen, J. T., and H. F. Duebbert. 1976. Ferruginous Hawk nesting ecology and raptor populations in northern South Dakota. Condor 78:464-470.

Losensky, B.T. 1993. Historical vegetation in Region One by climatic section. USDA Forest Service Northern Region. Draft.

Losensky, B. J. 1995. Spatial and temporal relationships of Larix Forests. P. 136-143 in Ecology and management of larix forests: a look ahead. USDA For. Serv. General Technical Report INT-GTR-319. Intermountain Research Station. Ogden, UT.

Losensky, B. T.; Clark, R.; Dibenedetto, J. 1995. A description of historic vegetation patterns and trends on the northern plains using repeat photography. USDA Forest Service Northern Region and Custer National Forest. Draft.

Lowther, P.E. 1996. LeConte's Sparrow (Ammodramus leconteii) In: The Birds of North America, No. 224. (A. Poole and F. Gill, eds.).Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Lundquist and Mariani 1991. In Ruggiero. L. F.; Aubry, K. B.; Carey, A. B.;Huff, M. H., eds. Wildlife and vegetation of unmanaged Douglas-fir forests. Gen. Tech. Rep. PNW-GTR-285. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

MacLaren, P. A., S. H. Anderson, and D. E. Runde. 1988. Food habits and nest characteristics of breeding raptors in southwestern Wyoming. Great Basin Naturalist 48:548-553.

Madden, E. M. 1996. Passerine communities and bird-habitat relationships on prescribe-burned, mixed-grass prairie in North Dakota. M.S. thesis. Montana State University, Bozeman. 153p.

Madge, S., and H. Burn. 1994. Crows and jays: A guide to crows, jays, and magpies of the world. Houghton Mifflin Co., Boston and New York. 191 p.

Madsen, Sarah J. 1985. Habitat use by cavity-nesting birds in the Okanogan National Forest, Washington. Seattle, WA: University of Washington. 113 p. M.S. Thesis.

Maher, W. J. 1973. Matador Project: Birds I. Population dynamics. Canadian committee for the International Biological Programme, Matador Project, Technical Report 34. University of Saskatchewan, Saskatoon. 56p.

Maher, W. J. 1974. Matador Project: Birds II. Avifauna of the Matador area. Canadian Committee for the International Biological Programme, Matador Project, Technical Report 58. University of Saskatchewan, Saskatoon. 31p.

Mahon, C. L. 1995. Habitat selection and detectability of Baird's Sparrow in southwestern Alberta. M.S. thesis. University of Alberta, Edmonton . 70 p.

Maj, M. 1996. Northern Goshawk (*Accipiter gentilis atricapillus*): Assessment of monitoring and management in the Northern Region. USDA Forest Service, Northern Region, Missoula, Montana. 32 p.

Manfredo, M.J., M. Fishbein, G.E. Haas, and A.E. Watson. 1990. Attitudes toward prescribed fire policies. Journal of Forestry 88 (7): 19-23.

Mannan, R. W. 1984. Habitat use by Hammond’s Flycatcher in old-growth forests, northeastern Oregon.

Murrelet 65:84-86.

Mannan, R. W., and E. C. Meslow. 1984. Bird populations and vegetation characteristics in managed and old-growth forests, northeastern Oregon. J. Wildl. Manage. 48: 1219-38.

Manuwal, D.A. 1970. Notes of the territoriality of Hammond's flycatcher (*Empindonax hammondi*) in western Montana. Condor 72:364-365.

Manuwal, D. A. 1991. Spring bird communities in the southern Washington Cascade Range. In: In Ruggiero. L. F.; Aubry, K. B.; Carey, A. B.; Huff, M. H., eds. Wildlife and vegetation of unmanaged Douglas-fir forests. Gen. Tech. Rep. PNW-GTR-285. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 159-174.

Manuwal, D.A., and M.H. Huff. 1987. Spring and winter bird populations in a Douglas-fir forest sere. Journal of Wildlife Management 51(3):586-595.

Mariani, J.M. and D.A. Manuwal. 1990. Factors influencing brown creeper (Certhia americana) abundance patterns in the southern Washington Cascade Range. Stud. Avian Biol. 13:53-57.

Marín, M. 1997. Some aspects of the breeding biology of the Black Swift. Wilson Bulletin 109(2):290-306.

Marín, M., and F.G. Stiles. 1992. On the biology of five species of swifts (Apodidae, Cypseloidinae) in Costa Rica. Proc. West. Found. Vertebr. Zool. 4:287-351.

Marshall, D. B. 1992. Status of the black-backed woodpecker in Oregon and Washington. Portland, OR: Portland Audubon Society. May 26-29, 1992; Blue Mountains Biodiversity Conference. 13 p.

Marshall, J.T. 1988. Birds lost from a giant sequoia forest during fifty years. The Condor 90:359-372.

Martin, N.S. 1965. Effects of chemical control of sagebrush on the occurrence of sage grouse in southwestern Montana. J. Wildl. Management 34(2): 313-320.

Martin, P. A. in prep. Benefits of minimum-tillage crop management regimes to grassland songbirds in southern Alberta. Report submitted to the Canadian Wildlife Service, Saskatoon, Saskatchewan. 38p.

Martin, S.G. 1967. Breeding biology of the Bobolink. M.S. thesis. University of Wisconsin, Madison. 122 p.

Martin, S.G. 1971. Polygyny in the Bobolink: habitat quality and the adaptive complex. Ph.D. dissertation. Oregon State University. 181p.

Maser, C., J. W. Thomas, and R. G. Anderson. 1984. Wildlife habitats in managed rangelands-The Great Basin of southeastern Oregon. The relationship of terrestrial vertebrates to plant communities. USDA Forest Service Pacific Northwest Research Station, USDI Bureau of Land Management General Technical Report PNW-172. LaGrande, OR.

Mattson, D.J., and C. Jonkel. 1989. Stone pines and bears. Whitebark Pine Symposium. USDA Forest Service General Technical Report INT-270, p. 223-236.

Mattson, D.J., B.M. Blanchard, and R.R. Knight. 1992. Yellowstone grizzly bear mortality, human habituation, and whitebark pine seed crops. J. Wildl. Manage. 56(3):432-442.

McCallum, D.A. 1994. Flammulated Owl (Otus flammeolus). *In* The Birds of North America, No. 93, (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union. 24 p.

McCallum, D.A. and F.G. Gehlbach. 1988. Nest-site preferences of Flammulated Owls in western New Mexico. Condor 90:653-661.

McCarthy, Clint. 1998. Custer National Forest Biologist. Personal Conversation. August 21, 1998.

McCarthy, C. 1999. Custer National Forest Biologist. Telephone interview. February 4, 1999.

McClelland, B. R. 1977. Relationships between hole-nesting birds, forest snags, and decay in western larch-Douglas-fir forests of the northern Rocky Mountains. PhD dissertation. University of Montana, Missoula, MT. 489 p.

McGarigal, K., and W.C. McComb. 1992. Streamside versus upslope breeding bird communities in the Central Oregon coast Range. Journal of Wildlife Management 56(1):10-21.

Medin, D.E. 1985. Breeding bird responses to diameter-cut logging in west-central Idaho. USDA Forest Service, Int. Res. Sta., Research Paper INT-355. 12 p.

Medin, D.E. 1992. Birds of a Great Basin sagebrush habitat in east-central Nevada. Res. Pap. INT-452. Ogden, UT: U. S. Department of Agriculture, Forest Service, Intermountain Research Station. 4 p.

Medin, D.E., and G.D. Booth. 1989. Responses of birds and small mammals to single-tree selection logging in Idaho. USDA Forest Service, Int. Res.Sta., Research Paper INT-408. 11p.

Mellen, T. K., E.C. Meslow. and R.W. Mannan. 1992. Summertime home range and habitat use of pileated woodpeckers in western Oregon. J. Wildl. Manage. 56: 96-103.

Merriam, C.H. 1890. Results of a biological survey of the San Francisco Mountain’s region and desert of the Little Colorado in Arizona. USDA North American Fauna 3, Washington, DC.

Messmer, T. A. 1990. Influence of grazing treatments on nongame birds and vegetation structure in south central North Dakota. Ph.D. dissertation. North Dakota State Univ., Fargo. 164p..

Meuchel, R. 1998. Region one U.S. Forest Service Fire-Use Specialist. Telephone interview. June 24, 1998.

Mickey, F. W. 1943. Breeding habits of McCown’s Longspur. Auk 60:181-209.

Minore, D. 1979. Comparative autecological characteristics of northwestern tree species. USDA For. Serv. General Technical Report PNW-87. 72 p. Northwest For. and Range Exp. Sta., Portland, OR.

Minore, D. 1990. *Thuja plicata* Donn ex D. Don. Western Redcedar. Pp. 590-600 in R. M. Burns and B. H. Honkala (tech. coords.), Silvics of North America, volume 1, conifers. USDA Forest Service, Agriculture Handbook 654, Washington, DC.

Montana Bald Eagle Management Plan. 1994. USDI-Bur. of Reclamation, Billings, MT. 104p.

Montana Bald Eagle Working Group. 1991. habitat management guide for Bald Eagles in northwestern Montana. 29 p.

Montana Bird Distribution Committee. 1996. P.D. Skaar's Montana Bird Distribution, Fifth Edition. Special Publication No. 3. Montana Natural Heritage Program, Helena. 130p.

Montana Natural Heritage Program. 1997. Vertebrate Characterization Abstract, *Black Necked Stilt.*

Morgan, P., and S.C. Bunting. 1989. Fire effects in whitebark pine forests. Whitebark Pine Symposium. USDA Forest Service General Technical Report INT-270, p. 166-170.

Morris, R. D., and G. P. Burness. 1992. A new procedure for transmitter attachment: effects on brood attendance and chick feeding rates by male common terns. Condor 94:239-243.

Morrison, R.I.G. 1994. Shorebird Population Status and Trends in Canada. Pp 3-5. In: Hyslop, C. (ed.). Bird trends. A Report on Results of National and Regional Ornithological Surveys in Canada. Environment Canada. 3:1-20.

Mosconi, S.L., and R.L. Hutto. 1982. The effects of grazing on land birds of a western Montana riparian habitat. P. 221-233 *In* J.M. Peek and P.D. Dalke (Eds.) Wildlife-livestock relationships symposium. Univ. of Idaho, Forest Wildl. Range Exp. Sta., Moscow, ID.

Munts, M. A. 1994. A comparison of bird communities between untreated control and two timber harvest types in western Montana. M.S. thesis. University of Montana, Missoula, MT.

Murphy, R. K. 1991. Ecology and management of prairie raptors. Proceedings of the Nongame Wildlife Workshop. U.S. Fish and Wildlife Service, Region 6.

Murphy, R. K., and J. T. Ensign. 1996. Raptor nesting chronology in northwestern North Dakota. Prairie Naturalist 28:51-57.

Mussehl,T., P. Schladweiler, and R. Weckwerth. 1971. Forest grouse. Pages 143-151 in T. W. Mussehl and F.W. Howell, eds. Game management in Montana. Montana Fish and Game Dept., Game Manage. Div., Helena, MT.

Niemuth, N. 1992. Use of man-made structures by nesting Ferruginous Hawks in Wyoming. Prairie Naturalist 24:43.

Nisbet, I. C. T. 1983. Paralytic shellfish poisoning: effects on breeding terns. Condor 85:338-345.

Nisbet, I. C. T. and M. J. Welton. 1984. Seasonal variations in breeding success of common terns: consequences of predation. Condor 86:53-60.

North American Waterfowl Plan (NAWMP) Committee. 1998. Expanding the vision: 1998 update, North American Waterfowl Management Plan. U.S. Fish and Wildlife Service, Arlington, VA; Canadian Wildlife Service, Hull, Quebec; and Instituto Nacional de Ecologia, San Angel, MX. 32p.

Oberholser, H. C. 1974. The bird life of Texas, volume 2. Univ. of Texas Press, Austin. 538p.

O'Grady, D. R., D. P. Hill, and R. M. R. Barclay. 1996. Nest visitation by humans does not increase predation on Chestnut-collared Longspur eggs and young. Journal of Field Ornithology 67:275-280.

Olendorff, R. R. 1993. Status, biology, and management of Ferruginous Hawks: a review. Raptor Research and Technical Assistance Center, Special Report. U.S. Department of the Interior, Bureau of Land Management, Boise, Idaho. 84 p.

Olson, S.L. 1984. Density and distribution, nest site selection, and activity of the Mountain Plover on the Charles M. Russell National Wildlife Refuge. M.S. thesis. University of Montana, Missoula Montana. 62 pages.

Olson-Edge, S.L., and W.D. Edge. 1987. Density and distribution of the Mountain Plover on the Charles M. Russell National Wildlife Refuge. Prairie Naturalist 19:233-238.

Ottmar, R.D., M.D. Schaaf, E. Alvarado. 1996. Smoke considerations for using fire in maintaining healthy forest ecosystems. As part of the Annual Meeting of the Society for Ecological Restoration: The use of fire in forest restoration. Intermountain Research Station. General Technical Report INT-GTR-341.

Owens, R. A., and M. T. Myres. 1973. Effects of agriculture upon populations of native passerine birds of an Alberta fescue grassland. Canadian Journal of Zoology 51:697-713.

Packee, E. C. 1990. *Tsuga heterophylla* (Raf.) Sarg. Western hemlock. Pp. 613-622 in R. M. Burns and B. H. Honkala (tech. coords.), Silvics of North America, volume 1, conifers. USDA Forest Service, Agriculture Handbook 654, Washington, DC.

Page, G. W., and R. E. Gill, Jr. 1994. Shorebirds in Western North America: Late 1800s to Late 1900s. Studies in Avian Biology.

Page, G.W., J.S. Warriner, J.C. Warriner, and P.W.C. Paton. 1995. The Snowy Plover. *In* The Birds of North America, No. 154. A. Poole and F. Gill, Eds. Academy of Natural Sciences, Philadelphia and the American Ornithologists Union, Washington, D.C.

Page, R.D. 1976. the ecology of Trumpeter Swans on Red Rock Lakes National Wildlife Refuge, Montana. Dissertation, University of Montana, Missoula.

Paige, C., and S.A. Ritter. 1999. Birds in a sagebrush sea: managing sagebrush habitats for bird communities. Partners in Flight Western Working Group, Boise, ID. 47p.

Palmer, R.S., ed. 1962. Handbook of North American birds. Yale Univ. Press.

Palmer, R. S. 1988. Ferruginous Hawk. Pages 135-151 in Handbook of North American birds, volume 5. Yale University Press, New Haven, Connecticut.

Pampush, G.L. and R.G. Anthony. 1993. Nest success, habitat utilization and nest site selection of Long-billed Curlews in the Columbia Basin, Oregon. Condor 95:954-967.

Patterson, R.L. 1952. The sage grouse in Wyoming. Wyoming Fish and Game Commission/ Sage Books, Inc. 341p.

Patterson, M.P., and L.B. Best. 1996. Bird abundance and nesting success in Iowa CRP fields: the importance off vegetation structure and composition. American Midland Naturalist 135:153-167.

Paulson, D. R. 1993. Shorebirds of the Pacific Northwest. (c) 1993 University of Washington Press. p. 208-211.

Peet, R. K. 1988. Forests of the Rocky Mountains. P. 63-101 in: M. G. Barbour and W. D. Billings (eds.). North American Terrestrial Vegetation. Cambridge University Press, New York.

Peterson, J.G. 1993. Ecological implications of sagebrush manipulation to wildlife, soils and vegetation: a literature review. Montana Department Fish Wildlife Parks.

Peterson, K.L, and L.B. Best 1985. Brewer's Sparrow nest-site characteristics in a sagebrush community. Journal of Field Ornithology 56:23-27.

Petersen, K. L. and L. B. Best. 1991. Nest-site selection by sage thrashers in southeastern Idaho. Great Basin Naturalist. 51:261-266.

Peterson, J.M., and C. Fichtel. 1992. Olive-sided Flycatcher, *Contopus borealis*. P. 353-367 *in* K.J. Schneider and D.M. Pence (eds.) Migratory birds of management concern in the northeast. U.S. Fish and Wildlife Service, Newton Corner, MA. 400 p.

Peterson, R.T. 1961. A field guide to western birds. Houghton Mifflin Co., Boston, MA 309p.

Petit, D.R., J.F. Lynch, R.L. Hutto, J.G. Blake, and R.B. Waide. 1993. Management and conservation of migratory landbirds overwintering in the neotropics. P. 70-92 *in* D.M. Finch and P.W. Stangel (eds.) Status and management of neotropical migratory birds. USDA Forest Service General Technical Report RM-229. 422 p.

Petit, D.R., J.F. Lynch, R.L. Hutto, J.G. Blake, and R.B. Waide. 1995. Habitat use and conservation in the neotropics. P. 145-197 in T.E. Martin and D.M. Finch (eds.) Ecology and management of neotropical migratory birds: a synthesis and review of critical issues. Oxford Univ. Press. 409 p.

Pfister, R. D., B.L. Kovalchik, S.F. Arno, and R. C. Presby. 1977. Forest habitat types of Montana. USDA Forest Service, Intermountian Forest and Range Experiment Station. General Technical Report INT-34. 174 p.

Phillips, A., J. Marshall, and G. Monson. 1964. Birds of Arizona. Univ. of Arizona Press, Tucson. 212 p.

Pitocchelli, J. 1993. MacGillivray's Warbler (*Oporonis tolmei*). No. 159. *In* A. Poole and F. Gill (Eds.), The birds of North America. The Academy of Natural Sciences, Philadelphia, PA and The American Ornithologists' Union, Washington, D.C.

Porter, D. K., and R. A. Ryder. 1974. Avian density and productivity studies and analyses on the Pawnee Site in 1972. U.S. International Biological Program, Grassland Biome Technical Report 252. Colorado State University, Fort Collins, Colorado. 77 pages.

Powers, L. R., and T. H. Craig. 1976. Status of nesting Ferruginous Hawks in the Little Lost River Valley and vicinity, southeastern Idaho. Murrelet 57:46-47.

Prescott, D.R.C., and D.M. Collister. 1993. Characteristics of occupied and unoccupied loggerhead shrike territories in southeastern Alberta. J. Wildlife Management 57:346-352.

Prescott, D. R. C., and G. M. Wagner. 1996. Avian responses to implementation of a complementary/rotational grazing system by the North American Waterfowl Management Plan in southern Alberta: the Medicine Wheel Project, NAWMP-018. Alberta NAWMP Centre, Edmonton. 24p.

Prescott, D. R. C., R. Arbuckle, B. Goddard, and A. Murphy. 1993. Methods for the monitoring and assessment of avian communities on NAWMP landscapes in Alberta, and 1993 results. Alberta NAWMP Centre. NAWMP-007. Edmonton, Alberta. 48 pages.

Price, J., S. Droege, and A. Price. 1995. The summer atlas of North American breeding birds. Academic Press, San Diego, CA. 364p.

Pylypec, B. 1991. Impacts of fire on bird populations in a fescue prairie. Canadian Field Naturalist 105:346-349.

Raish, C., W. Yong, and J. Marzluff. Contemporary human use of southwestern ponderosa pine forests. In: Block, W.M. and D.M. Finch, tech. eds. 1997. Songbird ecology in southwestern ponderosa pine forests: a literature review. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-GTR-292. 152 p.

Raphael, M.G. and M. White. 1984. Use of snags by cavity-nesting birds in the Sierra Nevada. Wildlife Monographs 86: 1-66.

Ratcliffe, B. D., and J. L. Murray. 1984. Recent successful nesting of Ferruginous Hawk in Manitoba. Blue Jay 42:215-218.

Rauscher, R.L. 1997. Black Terns in Montana. Unpubl. Prog. Rep., Montana Fish, Wildlife and Parks, Bozeman, MT.

Redmond, R.L., M.M. Hart, J.C. Winne, W.A. Williams, P.C. Thornton, Z. Ma, C.M. Tobalske, M.M. Thornton, K.P. McLaughlin, T.P. Tady, F.B. fisher, and S.W. Running. 1998. The Montana Gap Analysis Project: final report. Unpub. Report. Montana cooperative Wildlife Research Unit, Univ. of Montana, Missoula. 136p.

Redmond, R.L. and M.L. Prather. 1996. Mapping existing vegetation and land cover across western Montana and northern Idaho. Wildlife Spatial Analysis Lab. University of Montana, Missoula, MT.

Reel, S., L. Schassberger and W. Ruediger. 1989. Caring for our natural community: Region 1- threatened, endangered and sensitive species program. USDA, Forest Service Northern Region Wildlife and Fisheries.

Reichel, J., and D.L. Genter.1995. Harlequin Duck surveys in western Montana, 1994. Montana Natural Heritage Program. Helena, MT. 58p.

Renken, R. B. 1983. Breeding bird communities and bird-habitat associations on North Dakota waterfowl production areas of three habitat types. M.S. thesis. Iowa State Univ., Ames. 90p.

Renken, R. B., and J. J. Dinsmore. 1987. Nongame bird communities on managed grasslands in North Dakota. Canadian Field-Nat. 101:551-557.

Restani, M. 1991. Resource partitioning among three Buteo species in the Centennial Valley, Montana. Condor 93:1007-1010.

Reynolds, R.E., T.L. Shaffer, J.R. Sauer, and B.G. Peterjohn. 1994. Conservation Reserve Program: benefit for grassland birds in the Northern Plains. Trans. No. Am. Wildl. & Natur. Resour. Conf. 59: 328-336.

Reynolds, R.T. and B.D. Linkhart. 1987. Fidelity to territory and mate in Flammulated Owls. P. 234-238 in R.W. Nero, R.J. Knapton, and R.H. Hamre (eds.), Biology and conservation of northern forest owls: symposium proceedings.. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. GTR RM-142. 309 p.

Reynolds, R.T. and B.D. Linkhart. 1992. Flammulated owls in ponderosa pine: evidence of preference for old growth. P. 166-169 in the Southwest and Rocky Mountain regions: Proceedings of a workshop (M.R. Kaufmann, W.H. Moir, and R.L. Bassett, tech. coords.). USDA For. Serv. General Technical Report RM-213.

Reynolds, T. D. and T. D. Rich. 1978. Reproductive ecology of the sage thrasher (Oreoscoptes montanus) on the snake River Plain in south-central Idaho. Auk. 95:580-582.

Reynolds, T. D. and C. H. Trost. 1980. The response of native vertebrate populations to crested wheatgrass planting and grazing by sheep. Journal of Range Management. 33:122-125.

Rich, T. D. and S. I. Rothstein. 1985. Sage thrashers eject cowbird eggs. Condor. 87:561-562.

Richmond, M.L., L.R. DeWeese, and R.E. Pillmore. 1980. Brief observations on the breeding biology of the flammulated owl in Colorado. Western Birds 11:35-46.

Rising, J.D. 1996. A guide to the identification and natural history of the sparrows of the United States and Canada. Academic Press, Inc., San Diego, CA. 365 p.

Rocky Mountain/Southwestern Peregrine Falcon Recovery Team. 1977. Peregrine Falcon Recovery Plan, Rocky Mountain and Southwest Population. U.S. Fish and Wildlife Service. 183p.

Rodenhouse, N. L., L. B. Best, R. J. O'Connor, and E. K. Bollinger. 1995. Effects of agricultural practices and farmland structures on Neotropical migratory birds. Pages 269-293 in T. E. Martin, and D. M. Finch, editors. Ecology and management of Neotropical migratory birds: a synthesis and review of critical issues. Oxford University Press, New York.

Rotenberry, J. T., and J. A. Wiens. 1978. Nongame bird communities in northwestern rangelands. Pages 32-46 in Proceedings of the workshop on nongame bird habitat management in coniferous forests of western United States. U.S.D.A. Forest Service, General Technical Report PNW-64.

Rotenberry, J.T., and J.A. Wiens. 1980. Habitat structure, patchiness, and avian communities in North American shrubsteppe vegetation: a multivariate analysis. Ecology 61:1228-1250.

Roth, S. D., Jr., and J. M. Marzluff. 1989. Nest placement and productivity of Ferruginous Hawks in western Kansas. Transactions of the Kansas Academy of Science 92:132-148.

Rude K. 1998. The prairie pothole region: land of extremes...landscape of change. Prairie Pothole Joint Venture, Ducks Unlimited, Inc., and North Dakota Wetlands Trust. U.S. Fish and Wildlife Service, Denver. Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/1998/ppregion/ppregion.htm (Version 17AUG98).

Rummel, L., and C. Goetzinger. 1975. The communication of intraspecific aggression in the common loon. Auk 92(2):333-346.

Ryan, K. C., and E. D. Reinhardt 1988. Predicting post-fire mortality of seven western conifers. Can. J. For. Res. 18: 1291-1297.

Ryder, R. A. 1980. Effects of grazing on bird habitats. Pages 51-66 in R. M. DeGraff and N. G. Tilghman, editors. Management of western forests and grasslands for nongame birds, USDA Forest Service, General Technical Report INT-86.

Ryder, R.R. and D.E. Manry.1994.White-faced Ibis (Plegadis chihi). In: The Birds of North America No. 130. A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia and The American Ornithologists Union, Washington, D.C.

Ryser, F.A., Jr. 1985. Birds of the Great Basin. Univ. Nevada Press, Reno.

Saab, V. A. 1996. Influence of spatial scale and land management on habitat use by breeding birds in cottonwood forests of southeastern Idaho. PhD Dissertation. Univ. Colorado, Boulder. 140 p.

Saab, V.A. and J. Dudley. 1996. Why do burned forests provide conditions for nest site convergence among cavity-nesting birds? Abstract no. 119. 114th Stated meeting of the American Ornithologists' Union, 13-17 August 1996, Boise, ID.

Saab, V. and Dudley, J. 1997. Bird responses to stand-replacement fire and salvage logging in ponderosa pine/ Douglas-Fir forests of southwestern Idaho. Study No. 4202-1-7-7. U.S. Forest Service. Intermountain Research Station. Boise, ID. 34 p.

Saab, V. A., and J. G. Dudley. 1998. Responses of cavity-nesting birds to stand-replacement fire and salvage-logging in ponderosa pine/Douglas-fir forests of southwestern Idaho. USDA For. Serv. Research Paper RMRS-RP-11. Rocky Mountain Research Station, Ogden, UT.

Saab, V. A., and J. S. Marks. 1992. Summer habitat use by Columbian Sharp-tailed Grouse in western Idaho. Great Basin Nat. 52:166-173.

Saab, V.A. and T.D. Rich. 1997. Large-scale conservation assessment for neotropical migratory land birds in the interior Columbia River Basin. USDA For. Serv. General Technical Report PNW-GTR-339. 56p.

Saab, V.A., C.E. Bock, T.D. Rich, and D.S. Dobkin. 1995. Livestock grazing effects in western North America. P. 311-353 *In* T.E. Martin and D.M. Finch (Eds.). Ecology and management of Neotropical migratory birds. Oxford Univ. Press, New York, NY. 489p.

Salt, W. R., and J. R. Salt. 1976. The birds of Alberta. Hurtig Publishers, Edmonton, Alberta. 498 pages.

Sample, D. W. 1989. Grassland birds in southern Wisconsin: habitat preference, population trends, and response to land use changes. M.S. thesis, Univ. of Wisconsin, Madison. 588p.

Sandbak, D.J. 1999. Custer National Forest silviculturalist. Telephone interview. February 8, 1999.

Sanders, S.D., and M.A. Flett. 1988. Ecology of a Sierra Nevada population of willow flycatchers (*Empidonax traillii*), 1986-1987. Calif. Dept. Fish and Game, Wildlife Management Div., Adm. Rep. 88-3. 34P.

Saskatchewan Wetland Conservation Corporation. 1997. Grassland bird conservation through Saskatchewan's native prairie stewardship program. Saskatchewan Wetland Conservation Corporation, Regina. 25 p.

Sauer, J. R., B. G. Peterjohn, and Link, W. A. 1994. Observer differences in the North American Breeding Bird Survey. Auk 111:50-62.

Sauer, J. R., B. G. Peterjohn, S. Schwartz, and J. E. Hines. 1995. The Grassland Bird Home Page. Version

95.0. Patuxent Wildlife Research Center, Laurel, MD.

Sauer, J.R., J.E. Hines, G.Gough, I. Thomas, and B.G. Peterjohn. 1997. The North American Breeding Bird Survey: results and analysis. Version 96.3. Patuxent Wildlife Research Center, Laurel, MD.

Saunders, A. A. 1914. The birds of Teton and northern Lewis and Clark counties, Montana. Condor 16:124-144.

Saunders, A.A. 1921. A distributional list of the birds of Montana. Pac. Coast Avifauna 14:1-194.

Scharf, W.C. and J. Kren. 1996. Orchard Oriole (Icterus spurius). In: The Birds of North America, No. 255 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Science; Washington, D.C.: The American Ornithologists' Union.

Schmidt, R. 1981. Ferruginous Hawk breeding documented in Sargent County, North Dakota. Prairie Naturalist 13:32.

Schmidt, W. C., R. C. Shearer, and A. L. Roe. 1976. Ecology and silviculture of western larch forests. USDA Forest Service Tech. Bull. 1520. 96 p.

Schmutz, J. K. 1984. Ferruginous and Swainson's hawk abundance and distribution in relation to land use in southeastern Alberta. Journal of Wildlife Management 48:1180-1187.

Schmutz, J. K. 1987. The effect of agriculture on Ferruginous and Swainson's hawks. Journal of Range Management 40:438-440.

Schmutz, J. K. 1991a. Population dynamics of Ferruginous Hawks in Alberta. Pages 212-214 in G. L. Holroyd, G. Burns, and H. C. Smith, editors. Proceedings of the second endangered species and prairie conservation workshop. Natural History Occasional Paper 15. Provincial Museum of Alberta, Edmonton, Alberta.

Schmutz, J. K. 1991b. Age-related differences in reproductive success among Ferruginous and Swainson's hawks in Alberta. Journal of Raptor Research 25:160.

Schneider, N.A. 1998. Passerine use of grasslands managed with two grazing regimes on the Missouri Coteau in North Dakota. M.S. thesis. South Dakota State University, Brookings. 94 p.

Schubert, G.H. 1974. Silviculture of southwestern ponderosa pine: the status of our knowledge. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Research Paper RM-RP-123.

Scott, V. E., and G.L. Crouch. 1988. Summer birds and mammals of aspen-conifer forests in west-central Colorado. Research Paper RM-280. Fort Collins, Colorado: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 6p.

Scott, V. E., and G.L. Crouch. 1988. Breeding birds in uncut aspen and 6 to 10 year-old clearcuts in Southwestern colorado. Research Note RM-400. Fort Collins, Colorado: USDA Forest Service. Rocky Mountain Forest and Range Experiment Station. 5p.

Scott, V.E., K.E. Evans, D.R. Patton, and C.P. Stone. 1977. Cavity-nesting birds of North American forests. U.S. For. Serv. Agric. Handbook 511. 112 p.

Scurlock, D. and D.M. Finch. A Historical Review. In: Block, W.M. and Finch, D.M., tech. eds. 1997. Songbird ecology in southwestern pine forests: a literature review. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-GTR-292. 152 p.

Sedgwick, J.A. and F.L. Knopf. 1990. Habitat relationships and nest site characteristics of cavity-nesting birds in cottonwood floodplains. J. of Wildlife Management 54: 112-124.

Serena, M. 1982. The status and distribution of the willow flycatcher (*Empidonax traillii*) in selected portions of the Sierra Nevada, 1982. Calif. Dept. Fish and Game, Wildlife Management Div., Adm. Rep. 82-5. 28P.

Shafer, J. 1998. Region Four U.S. Forest Service silviculturalist. Telephone interview, August 4, 1998.

Shea, R.E. 1979. The ecology of Trumpeter Swans in Yellowstone National Park and vicinity. MS. Thesis University of Montana, Missoula.

Shepperd, W.D., R.R. Alexander, and F. Ronco, Jr. 1983. Silviculture of ponderosa pine in the central and southern Rocky Mountains. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Research Paper RM-TT-4.

Shindler, B. and M. Reed. 1996. Forest management in the Blue Mountains: public perspectives on prescribed fire and mechanical thinning. USDA Forest Service Pacific Northwest Research Station, and the Blue Mountains Natural Resources Institute. PNW Agreement No. 95-0702.

Short, L.L. 1982a. Black-backed woodpecker *Picoides arcticus.* In: Monograph Series, No. 4. Woodpeckers of the world. Greenville: Delaware Museum of Natural History: 338-343.

Short, L.L. 1982b. Three-toed woodpecker *Picoides tridactylus.* In: Monograph Series, No. 4. Woodpeckers of the world. Greenville: Delaware Museum of Natural History: 331-338.

Shuford, W.D. 1999. Status assessment and conservation plan for the Black Tern in North America. U.S. Department of Interior, Fish and Wildlife Service, Denver, CO.

Sjolander, S., and G. Agren. 1972. Reproductive behavior of the common loon. Wilson Bulletin 84(3):296-308.

Skaar, D. 1990. Montana common loon management plan. Prep. by Montana Loon Society for USDA Forest Service. 27p.

Skagen, S. K., and F. L. Knopf. 1994. Migrating Shorebirds and Habitat Dynamics at a Prairie Wetland Complex. Wilson Bulletin. 106(1):91-105.

Skagen, S. K., Sharpe, P. B., Waltermire, R. G., Dillon, M. B. 1998. Biogeographical Profiles of Shorebird Migration in Midcontinental North America. U. S. Geological Survey, Biological Resources Division, Midcontinent Ecological Science Center, Fort Collins, Colorado.

Skeel, M. A., D. C. Duncan, and S. K. Davis. 1995. Abundance and distribution of Baird's sparrow in Saskatchewan in 1994. Saskatchewan Wetland Conservation Corporation, Regina. 13p.

Skinner, R. M. 1974. Grassland use patterns and prairie bird populations in Missouri. M.A. thesis. Univ. of Missouri, Columbia. 53 p.

Small, A. 1994. California birds; their status and distribution. Ibis Publ. Co., Vista, CA.

Smith, D. G., and J. R. Murphy. 1978. Biology of the Ferruginous Hawk in central Utah. Sociobiology 3:79-98.

Smith, K.G. 1982. On habitat selection of Williamson's and "red-naped" yellow-bellied sapsuckers. Southwestern Naturalist 27: 464-466.

Smith, R. L. 1963. Some ecological notes on the Grasshopper Sparrow. Wilson Bulletin 75:159-165.

Smith, R. L. 1968. Grasshopper Sparrow. Pages 725-745 in O. L. Austin, Jr., editor. Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies, Part 2. Dover Publications, Inc., New York.

Snyder, W.D. and G.C. Miller. 1991. Changes in plains cottonwoods along the Arkansas and South Platte rivers-eastern Colorado. Prairie Naturalist 23: 165-176.

Sousa, P.J. 1983. Habitat suitability index models; Lewis's Woodpecker. USDI, Fish and Wildlife Service. FWS/OBS-82/10.32.

Sousa, P.J., and W.N. McDonal. 1983. Habitat suitability index models: Baird's Sparrow. U.S. Depart. Int., Fish and Wildlife Service FWS/OBS-82/10.44. 12 pgs.

South Dakota Ornithologists Union. 1978. The birds of South Dakota: an annotated check list. South Dakota Ornithologists Union, Vermillion. 311p.

Spencer, O.R. 1943. Nesting habits of the black-billed cuckoo. Wilson Bulletin 55(1):11-22.

Spendelow, J. A. and S. R. Patton. 1988. National atlas of coastal waterbird colonies in the contiguous United States: 1976-1982. U.S. Fish Wildl. Serv., Biol. Rep. 88(5). x + 326 pp.

Squires, J. (in Prep). Ecology of the northern goshawk. i*n* Northern Goshawk: technical assessment of status, ecology, and management. R.T. Reynolds and R.H. Hamre (tech. eds.), USDA Forest Service, Rocky Mountain Research Station, Gen.Tech. Rept., Missoula, Montana.

Squires, J.R., and R.T. Reynolds. 1997. Northern goshawk *Accipiter gentilis*, p. 1-32 *in* Poole, A. and F.

Gill (eds.), Vol 298. The birds of North America. The Academy of Natural Sciences, the American Ornithologists' Union, Washington, D.C.

Squires, J.R., and L.F. Ruggiero. 1995. Winter movements of adult northern goshawks that nested in southcentral Wyoming. Journal of Raptor Research 29:5-9.

Stallcup, P.L. 1968. Spatio-temporal relationships of nuthatches and woodpeckers in ponderosa pine forests of Colorado. Ecology 49 (5): 831-843.

Steeger, C., and M.M. Machmer. 1995. Wildlife trees and their use by cavity-nesters in selected stands of the Nelson Forest Range. Technical Report TR-010. Forest Science Section. Ministry of Forests. Nelson, B.C. 28 p.

Steeger, C., M.M. Machmer, and E. Walters. 1997. Ecology and management of woodpeckers and wildlife trees in British Columbia. Fraser River action plan. Pandion Ecological Research, Ymir, BC. 23 p.

Stephens, D.A., and S.H. Sturts. 1998. Idaho bird distribution. Spec. Pub. No. 13, Idaho Museum of Natural History, Pocatello. 77P.

Stewart, R. E. 1975. Breeding birds of North Dakota. Tri-College Center for Environmental Studies, Fargo. 295p.

Stickney, P. F. 1988. Early development of vegetation following holocaustic fire in northern Rocky Mountain forests. Northwest Science 64: 243-246.

Stiles, F. G., and A. F. Skutch. 1989. A guide to the birds of Costa Rica. Comstock Publ. Associates, Cornell Univ. Press, Ithaca. 511 pp.

Strong, M. A. 1971. Avian productivity on the shortgrass prairie of northcentral Colorado. M.S. thesis. Colorado State Univ., Fort Collins. 70p.

Strong, P.I.V., J.A. Bissonette, and J.S. Fair. 1987. Reuse of nesting and nursery areas by common loons. J. Wildl. Manage. 51:123-127.

Sturman, W.A. 1968. Description and analysis of breeding habitats of the chickadees, Parus atricapillus and Parus rufescens. Ecology 49: 418-31.

Sturts, S.H. Personal communication. E-mail messages December 23 and 24, 1997.

Sullivan, D.D. 1976. Life history of the Townsend's solitaire (Myadestes townsendi) in western Montana. M.S. Thesis, Univ. Montana, Missoula. 119p.

Sutter, G. C., and R. M. Brigham. 1998. Avifaunal and habitat changes resulting from conversion of native prairie to crested wheat grass: patterns at songbird community and species levels. Canadian Journal of Zoology 76:869-875.

Swanson, F. J., and Franklin, J. F. 1992. New forestry principles from ecosystem analysis of Pacific Northwest forests. Ecol. Appl. 2: 262-274.

Swengel, S. R. 1996. Management responses of three species of declining sparrows in tallgrass prairie. Bird Conservation International 6:241-253.

Tashiro-Vierling, K.Y. 1994. Population trends and ecology of the Lewis's Woodpecker (Melanerpes lewis) in southeastern Colorado. M.A. thesis, University of Colorado, Boulder.

Taylor, D. L., and W. J. Barmore, Jr. 1980. Post-fire succession of avifauna in coniferous forests of Yellowstone and Grand Teton National Parks, Wyoming. Pages 130-145 in R. M. DeGraff, technical coordinator. Workshop proceedings: management of western forests and grasslands for nongame birds. General Technical Report INT-86. U.S. Forest Service, Ogden, Utah.

Taylor, J. 1994. Black-backed woodpecker habitat summary. Unpublished literature review. On file at the Bonners Ferry Ranger District, Idaho Panhandle National Forest. No page numbers.

Telfer, E.S. 193. Habitat change as a factor in the decline of the western Canadian loggerhead shrike, *Lanius ludovicianus*, population. Canadian Field-Naturalist 106:321-326.

Terres, J.K. 1980. The Audubon Society encyclopedia of North American birds. Alfred A. Knopf, New York. 1109p.

Tewksbury, J.J., S.J. Hejl, and T.E. Martin. 1998. Breeding productivity does not decline with increasing fragmentation in a western landscape. Ecology 79(8):2890-2903.

The Nature Conservancy (TNC). 1999. Ecoregional conservation in the Northern Great Plains Steppe. TNC. 76p.

Thomas, J.W., R.G. Anderson, C. Maser, and E.L. Bull. 1979. Snags. P. 60-77 *in* Wildlife habitats in managed forests: the Blue Mountains of Oregon and Washington (J.W. Thomas ed.). USDA Forest Service Agricultural Handbook 553.

Thompson, F. R. III, J.R. Probst, and M. G. Raphael. 1992. Impacts of silviculture: overview and management recommendations. Pages 201-219 in (T. Martin and D. M. Finch, eds.). Ecology and Management of Neotropical Migratory Birds. Oxford University Press, New York.

Timchak, Larry. 1999. Region One U.S. Forest Service Developed Recreation Site Specialist. Telephone interview. February 10, 1999.

Timossi, I. 1990. California's statewide wildlife habitat relationships system. Calif. Dep. Fish and Game. Computer database for the IBM personal computer. June 1992 Version.

Titus, J.R., and L.W. VanDruff. 1981. Response of the common loon to recreational pressure in the Boundary Waters Canoe Area, northeastern Minnesota. Wildl. Monogr. No. 79:1-59.

Tobalske, Bret W. 1992. Evaluating habitat suitability using relative abundance and fledging success of red-naped sapsuckers. Condor 94(2):550-553.

Tobalske, B.W. 1997. Lewis's Woodpecker (Melanerpes lewis). *In* The Birds of North America, No. 284 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Tobalske, B.W., R.C. Shearer, and R.L. Hutto. 1991. Bird populations in logged and unlogged western larch/Douglas-fir forest in northwestern Montana. USDA Forest Service, Int. Res. Sta., Research Paper INT-442. 12 p.

Tomback, D.F. 1978. Foraging strategies of Clark's nutcracker. Living Bird 16:123-161.

Tomback, D.F. 1982. Dispersal of whitebark pine seeds by Clark's nutcracker: a mutualism hypothesis. J. Animal Ecology 51:451-467.

Townsend, C. W. 1961. Short-eared Owl (Asio flammeus flammeus). Pages 169-182 in A. C. Bent, editor. Life histories of North American birds of prey, Vol. 2. Dover Publications, Inc., New York, New York.

Turner, M.G. and W.H. Romme. 1994. Landscape dynamics in crown fire ecosystems. Landscape Ecology 9:59-77.

Ulliman, M. J., A. Sands, and T. Hemker. 1998. Draft conservation plan for Columbian Sharp-tailed Grouse and its habitats in Idaho. Idaho Department of Fish and Game, Boise. 36 pp

USDA Forest Service. 1994. Neotropical migratory bird reference book--Vol. 1. Pacific Southwest Region. 832p.

USDA Forest Service. 1997. Region One Timber Harvest Report. Missoula, MT.

USDA Forest Service. 1998. Planning notes and charts: timbered, dry sites available for burning. Fire, Aviation, and Air unit; USDA Forest Service Northern Region.

USDA Forest Service and USDI Bureau of Land Management. 1997. Upper Columbia River Basin Draft Environment Impact Statement, Volume 1.

USFWS. 1998. Twelve month Administrative finding on petition to list the Northern Goshawk in the contiguous western United States under the Endangered Species Act. USDI, Fish and Wildlife Service, Portland, Oregon. 129 p.

Vander Wall, S.B., and H.E. Hutchins. 1983. Dependence of Clark's nutcracker, *Nucifraga columbiana*, on conifer seeds during the postfledging period. Canadian Field-Naturalis 97(2):208-214.

Van Rossem, A.J. 1936. Birds of the Charleston Mountains, Nevada. Pac. Coast Avifauna. 24. 65p.

Vermeer, K. 1973. Some aspects of the nesting requirements of common loons. Wilson Bulletin 85:429-

435.

Verner, J. 1994. Current management situation of flammulated owls. *In* Flammulated, boreal, and great gray owls in the United States (G.D. Hayward, ed.): A technical conservation assessment. U.S. For. Serv. General Technical Report 253.

Verner, J., and A. S. Boss, editors. 1980. California wildlife and their habitats: western Sierra Nevada. USDA Forest Service General Technical Report PSW-37. Pacific Southwest Forest and Range Experiment Station. 439 p.

Vickery, P. D., M. L. Hunter, Jr., and S. M. Melvin. 1994. Effects of habitat area on the distribution of grassland birds in Maine. Conservation Biology 8:1087-1097.

Vickery, P. D. 1996. Grasshopper Sparrow (Ammodramus savannarum). In: A. Poole and F. Gill, editors. The birds of North America, 239. The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C. 24 p.

Vierling, K.T. 1997. Habitat selection of Lewis's Woodpeckers in southeastern Colorado. Wilson Bulletin 109: 121-130.

Volkert, W. K. 1992. Response of grassland birds to a large-scale prairie planting project. Passenger Pigeon 54:190-196.

Wakeley, J. S. 1978. Factors affecting the use of hunting sites by Ferruginous Hawks. Condor 80:316-326.

Walkinshaw, L. 1966. Summer biology of Traill's flycatcher. Wilson Bulletin 78:31-46.

Weinhagen, A.C. 1998. Nest-site selection by the black-backed woodpecker in Northeastern Vermont. M.S. Thesis, Univ. of Vermont, 52 p.

Wershler, C. 1991. A management strategy for Mountain Plovers in Alberta. Pages 169-172 in G. L. Holroyd, G. Burns, and H. C. Smith, editors. Proceedings of the second endangered species and prairie conservation workshop. Natural History Occasional Paper No. 15. Provincial Museum of Alberta, Edmonton, Alberta.

Wershler, C.R., and C.A. Wallis. 1987. Status report on the Mountain Plover, Charadrius montanus, in Canada. Committee on the Status of Endangered Wildlife in Canada. 34 pages.

Wershler, C., W. W. Smith, and C. Wallis. 1991. Status of the Baird's Sparrow in Alberta: 1987/1988 update with notes on other grassland sparrows and Sprague's Pipit. Pages 87-89 in: G. L. Holroyd, G. Burns, and H. C. Smith, eds. Proceedings of the second endangered species and prairie conservation workshop. Natural History Occasional Paper No. 15. Provincial Museum of Alberta, Edmonton.

West, J. D., and J. M. Speirs. 1959. The 1956-1957 invasion of Three-toed Woodpeckers. Wilson Bulletin 71:348-363.

Western Wood Products Association. 1998. Business Report and General Information. Website.

Weston, J. B. 1968. Nesting ecology of the Ferruginous Hawk, Buteo regalis. Brigham Young University Science Bulletin 10:25-36.

Weydemeyer, W. 1975. Half-century record of the breeding birds of the Fortine area, Montana: nesting data and population status. Condor 77: 281-287.

White, C. M., and T. L. Thurow. 1985. Reproduction of Ferruginous Hawks exposed to controlled disturbance. Condor 87:14-22.

Whitmore, R. C. 1979. Temporal variation in the selected habitats of a guild of grassland sparrows. Wilson Bulletin 91:592-598.

Whitmore, R. C. 1981. Structural characteristics of Grasshopper Sparrow habitat. Journal of Wildlife Management 45:811-814.

Wiens, J. A. 1969. An approach to the study of ecological relationships among grassland birds. Ornithological Monographs 8:1-93.

Wiens, J. A. 1970. Avian populations and patterns of habitat occupancy at the Pawnee site, 1968-1969. U.S. International Biological Program, Grassland Biome Technical Report 63. Colorado State University, Fort Collins, Colorado. 57 pages.

Wiens, J. A. 1970. Avian populations and patterns of habitat occupancy at the Pawnee site, 1968-1969. U.S. International Biological Program, Grassland Biome Technical Report 63. Colorado State Univ., Fort Collins. 57 p.

Wiens, J. A. 1971. Avian ecology and distribution in the comprehensive network, 1970. U.S. International Biological Program, Grassland Biome Technical Report 77. Colorado State Univ., Fort Collins. 49p.

Wiens, J. A., and M. I. Dyer. 1975. Rangeland avifaunas: their composition, energetics, and role in the ecosystem. Pages 146-182 *in* D. R. Smith, editor. Symposium on the management of forest and range habitats for nongame birds. USDA Forest Service, General Technical Report WO-1.

Wiens, J. A. and J. T. Rotenberry. 1981. Habitat associations and community structure of birds in shrubsteppe environments. Ecological Monographs 51:21-41.

Wiens, J.A., and J.T. Rotenberry. 1985. Response of breeding passerine birds to rangeland alteration in a North American shrubsteppe locality. Journal of Applied Ecology 22:655-668.

Wilcox, L. 1959. A twenty year banding study of the Piping Plover. Auk 75:129-152.

Willard, E.E. 1989. Use and impact of domestic livestock in whitebark pine forests. Whitebark Pine Symposium. USDA Forest Service General Technical Report INT-270, p. 179-190.

Williamson, P. 1971. Feeding ecology of the Red-eyed Vireo (*Vireo olivaceus*) and associated foliage-gleaning birds. Ecological Monographs 41(2):129-152.

Wilson, S. D., and J. W. Belcher. 1989. Plant and bird communities of native prairie and introduced Eurasian vegetation in Manitoba, Canada. Conservation Biology 3:39-44.

Wilson, Jr., W. H. 1991. The Foraging Ecology of Migratory Shorebirds in Marine Soft - Sediment Communities; the Effects of Episodic Predation on Prey Populations. American Zoology. 31:840 - 848.

Winter, J. 1974. The distribution of flammulated owl in California. Western Birds 5:25-44.

Winter, M. 1994. Habitat selection of Baird's Sparrows in the northern mixed-grass prairie. Diplomarbeit, Universitat Tubingen, Germany. 108 pages.

With, K. A. 1994a. McCown's Longspur (Calcarius mccownii). In A. Poole and F. Gill, editors. The birds of North America, No. 96. The Academy of Natural Sciences, Philadelphia, Pennsylvania; The American Ornithologists' Union, Washington, D.C.

With, K. A. 1994b. The hazards of nesting near shrubs for a grassland bird, the McCown's Longspur. Condor 96:1009-1019.

With, K. A., and D. R. Webb. 1993. Microclimate of ground nests: the relative importance of radiative cover and wind breaks for three grassland species. Condor 95:401-413.

Woffinden, N. D. 1975. Ecology of the Ferruginous Hawk (Buteo regalis) in central Utah: population dynamics and nest site selection. M.S. thesis. Brigham Young University, Provo, Utah. 102 pages.

Woffinden, N. D., and J. R. Murphy. 1983. Ferruginous Hawk nest site selection. Journal of Wildlife Management 47:216-219.

Woods, C.P. 1993. Variation in loggerhead shrike nest composition between two shrub species in southwest Idaho. J. Field Ornithology 64:352-357.

Woods, C.P., and T.J. Cade. 1996. Nesting habits of the loggerhead shrike in sagebrush. Condor 98:75-81.

Woodmansee, R. G., and L. S. Wallach. 1981. Effects of fire regimes on biogeochemical cycles. Pages 379-400 in H. A. Mooney, et al. Fire Regimes and ecosystem properties. GTR-WO-26.

Wright, P.L. 1996. Status of rare birds in Montana, with comments on known hybrids. Northwestern Naturalist 77:57-85.

Wright, V. 1996. Multi-scale analysis of flammulated owl habitat use: owl distribution, habitat management, and conservation. M.S. thesis, Univ. of Montana, Missoula. 91 p.

Wright, V., S.J. Hejl, and R.L. Hutto. 1997. Conservation implications of a multi-scale study of flammulated owl (*Otus flammelous*) habitat use in the northern Rocky Mountains, USA. P. 506-516 in

Duncan, J.R., D.H. Johnson, T.H. Nicholls, eds. Biology and conservation of owls of the Northern Hemisphere: 2nd International symposium; 1997 February 5-9; Winnipeg, MB. General Technical Report NC-190. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 635 p.

Yanishevsky, R.M. 1993. Adopt-a-Forest activity report and maps. National Audubon Society. Boulder, CO.

Young, J. S.., and R. L. Hutto. 1999. Habitat and landscape factors affecting cowbird distribution in the northern Rockies. Studies in Avian Biology 18:41-51.

Yosef, R. 1996. Logerhead shrike (*Lanius ludovicianus)*. In: A. Poole and F. Gill, eds. The Birds of North America, No. 231. Academy of Natural Sciences, Philadelphia; and The American Ornithologists Union, Washington, DC.

Yunick, Robert P. 1985. A review of recent irruptions of the black-backed woodpecker and three-toed woodpecker in eastern North America. Journal of Field Ornithology 56 (2): 138-152.

Zeiner, D.C., W. Laudenslayer Jr., K. Mayer, and M. White., eds. 1990. California's wildlife, Vol. 2, Birds. Calif. Dep. Fish and Game, Sacramento. 732p.

Zelenak, J. R., and J. J. Rotella. 1997. Nest success and productivity of Ferruginous Hawks in northern Montana. Canadian Journal of Zoology 75:1035-1041.

Zwickel, F.C. 1992. Blue Grouse In: The Birds of North America, No. 15.(A. Poole, P. Stettenheim and F. Gill, Eds).

APPENDIX A

List of common and scientific names of plants listed in the text.

Grasses and grass-like plants:
barley *Hordeum vulgare*
blue gramma *Bouteloua gracilis*
bluebunch wheatgrass *Agropyron spicatum*
buffalo grass *Buchloe dactyloides*
bulrush *Scirpus* spp.
cordgrass *Spartina pectinata*
crested wheatgrass *Agropyron cristatum*
elk sedge *Carex geyeri*
Idaho fescue *Festuca idahoensis*
intermediate wheatgrass *Agropyron intermedius*
June grass *Koelaria cristata*
Kentucky blue grass *Poa pratensis*
little bluestem *Andropogon scoparius*
needle-and-thread *Stipa comata*
Parry rush *Juncus parryi*
Pennsylvania sedge *Carex pennsylvanicus*
pinegrass *Calamagrostis rubescens*
prairie sandreed *Calamavilfa longifolia*
rough fescue *Festuca scabrella*
rushes *Juncus* spp.
saltgrass *Distichlis stricta*
sedges *Carex* spp.
smooth brome *Bromus inermis*
spikerushes *Eleocharis* spp.
western wheatgrass *Agropyron smithii*

Forbs:
alfalfa *Medicago sativa*
beargrass *Xerophyllum tenax*
broom snakeweed *Gutierrezia sarothrae*
Canada thistle *Cirsium arvense*
Clintonia *Clintonia uniflora*
dandelion *Taraxicum officianalis*
dwarf mistletoe *Arceuthobium* spp.
heart-leaf arnica *Arnica latifolia*
plains prickly pear *Opuntia polyacantha*
sweet clover *Melilotus* spp.
yarrow *Achillea* spp.

Shrubs:
alder *Alnus* spp.
bearberry *Arctostaphylos uva-ursi*
big sagebrush *Artemisia tridentata*
    Basin big sage (*A.t. tridentata*)
    Mountain big sage (*A.t.vaseyana*)
    Wyoming big sage (*A.t. wyomingensis*)
bitterbrush *Purshia tridentata*
black sage *Artemisia nova*
budsage *Artemisia spinescens*
buffaloberry *Sheperdia canadensis*
ceanothus *Ceanothus* spp.
chokecherry *Prunus virginiana*
creeping juniper *Juniperus horizontalis*
currants and gooseberry *Ribes* spp.
dogwood *Cornus* spp.
dwarf huckleberry *Vaccinium* spp.
elderberry *Sambucus* spp.
greasewood *Sarcobatus vermiculatus*
hawthorn *Crataegus* spp.
huckleberry *Vaccinium globulare*
low sage *Artemisia arbuscula*
menziesia *Menziesia ferruginea*
mountain mahogany *Cercocarpus montanus*
ninebark *Physocarpus malvaceus*
red-osier dogwood *Cornus stolonifera*
rose *Rosa spp.*
rubber rabbitbrush *Chrysothamnus nauseosus*
saltbush *Atriplex* spp.
serviceberry *Amelanchier alnifolia*
shiny-leaf spiraea *Spiraea betulifolia*
silverberry *Eleagnus commutata*
snowberry *Symphoricarpos* spp.
spiny hopsage *Grayia spinosa*
spiraea *Spiraea* spp.
three-tip sage *Artemisia tripartita*
twinflower *Linnea boreali*
willow *Salix* spp.
Wood's rose *Rosa woodsii*
wolfberry *Symphoricarpos occidentalis*
yew *Taxus brevifolia*

Trees:
American elm *Ulmus americana*
aspen *Populus tremuloides*
black cottonwood *Populus trichocarpa*
box elder *Acer negundo*
bur oak *Quercus macrocarpa*
Douglas-fir *Pseudotsuga menziesi*
Engelman spruce *Picea engelmannii*
grand fir *Abies grandis*
green ash *Fraxinus pennsylvanicus*
limber pine *Pinus flexilis*
Lodgepole pine *Pinus contorta*
narrowleaf cottonwood *Populus angustifolium*
paper birch *Betula papyrifera*
plains cottonwood *Populus deltoides*
Rocky Mountain juniper *Juniperus scopulorum*
subalpine fir *Abies lasiocarpa*
Western hemlock *Tsuga heterophylla*
western larch *Larix occidentalis*
Western redcedar *Thuja plicata*
western white pine *Pinus monticola*
whitebark pine *Pinus albicaulis*

APPENDIX B:

Common and scientific names of Montana's breeding bird species, with PIF priority scores (Carter et al. 1998)

SPECIES	SCIENTIFIC NAME	MONTANA SCORES:									P.A.	
		AI	PT	PTU	TB	RA	BD	ND	TN	MT	64	39
Common Loon	Gavia immer	3	3	7	4	3	1	2	3	19	16	
Pied-billed Grebe	Podilymbus podiceps	3	3	6	2	2	1	1	2	14	13	14
Horned Grebe	Podiceps auritus	3	3	8	2	3	1	2	2	16	15	20
Red-necked Grebe	Podiceps grisegena	3	3	7	3	3	1	2	2	17	18	
Eared Grebe	Podiceps nigricollis	3	3	6	2	2	1	1	2	14	15	15
Western Grebe	Aechmophorus occidentalis	3	3	7	3	3	3	3	2	20	20	19
Clark's Grebe	Aechmophorus clarkii	3	3	8	3	3	3	3	2	20	19	20
American White Pelican	Pelecanus erythrorhynchos	3	3	6	2	3	3	3	3	20	22	21
Double-crested Cormorant	Phalacrocorax auritus	3	3	6	2	2	2	1	1	14	13	14
American Bittern	Botaurus lentiginosus	3	3	7	3	3	1	2	3	18	17	18
Great Blue Heron	Ardea herodias	3	3	5	2	2	1	1	2	14	13	14
Black-crowned Night-Heron	Nycticorax nycticorax	3	3	8	3	2	1	1	2	15	13	14
White-faced Ibis	Plegadis chihi	2	3	8	3	3	1	1	3	16	15	16
Trumpeter Swan	Cygnus buccinator	5	3	7	4	4	4	4	4	28	26	26
Mute Swan	Cygnus olor	1	3	8	1	1	1	1	1	9		
Canada Goose	Branta canadensis	3	1	2	1	2	1	1	2	11	13	11
Wood Duck	Aix sponsa	3	2	3	3	3	1	2	3	17	19	18
Green-winged Teal	Anas crecca	3	2	3	2	2	1	1	2	13	11	12
Mallard	Anas platyrhynchos	3	1	1	2	1	1	1	2	11	12	12
Northern Pintail	Anas acuta	3	2	4	3	1	1	1	2	13	13	14
Blue-winged Teal	Anas discors	3	3	5	3	2	1	1	2	15	14	17
Cinnamon Teal	Anas cyanoptera	3	3	6	3	3	2	1	3	18	17	15
Northern Shoveler	Anas clypeata	3	2	2	3	2	1	1	2	14	13	15
Gadwall	Anas strepera	3	1	2	3	2	1	1	2	13	13	13
American Wigeon	Anas americana	3	2	4	3	2	1	2	2	15	16	16
Canvasback	Aythya valisineria	3	3	7	3	3	1	2	3	18	18	20
Redhead	Aythya americana	3	3	6	3	3	2	2	3	19	19	20
Ring-necked Duck	Aythya collaris	4	3	7	3	3	2	2	3	20	20	19
Lesser Scaup	Aythya affinis	3	3	5	3	2	2	1	3	17	14	15
Harlequin Duck	Histrionicus histrionicus	4	3	8	3	3	2	3	3	21	20	
Common Goldeneye	Bucephala clangula	3	3	8	3	2	1	1	2	15	16	14
Barrow's Goldeneye	Bucephala islandica	3	3	8	3	4	3	4	2	22	24	
Bufflehead	Bucephala albeola	3	3	7	3	3	2	1	3	18	18	17
Hooded Merganser	Lophodytes cucullatus	3	3	8	3	4	2	4	2	21	22	20
Common Merganser	Mergus merganser	3	2	4	2	3	1	1	2	14	17	15
Ruddy Duck	Oxyura jamaicensis	3	3	6	3	2	2	2	3	18	17	18
Turkey Vulture	Cathartes aura	3	3	7	2	2	1	1	1	13	11	13
Osprey	Pandion haliaetus	3	2	3	1	3	1	1	3	14	16	17
Bald Eagle	Haliaeetus leucocephalus	3	3	7	3	3	2	1	3	18	16	19
Northern Harrier	Circus cyaneus	3	2	1	3	3	1	1	3	16	17	17
Sharp-shinned Hawk	Accipiter striatus	3	3	7	3	3	1	1	2	16	18	16
Cooper's Hawk	Accipiter cooperii	3	3	8	3	3	1	1	2	16	15	17
Northern Goshawk	Accipiter gentilis	3	3	7	3	4	1	1	3	18	21	19
Swainson's Hawk	Buteo swainsoni	3	1	2	3	3	2	3	4	19	19	20
Red-tailed Hawk	Buteo jamaicensis	3	1	1	1	3	1	1	1	11	12	11
Ferruginous Hawk	Buteo regalis	4	1	2	4	4	2	3	3	21	22	20
Golden Eagle	Aquila chrysaetos	3	3	5	3	4	1	1	2	17	17	17
American Kestrel	Falco sparverius	3	2	1	2	2	1	1	1	12	13	12
Merlin	Falco columbarius	3	3	8	2	3	1	1	2	15	15	15
Peregrine Falcon	Falco peregrinus	3	3	8	2	4	1	1	3	17	18	19
Prairie Falcon	Falco mexicanus	3	3	6	2	4	2	2	3	19	21	21
Gray Partridge	Perdix perdix	4	3	5	1	1	1	1	1	12	11	11

APPENDIX B:

Common and scientific names of Montana's breeding bird species, with PIF priority scores (Carter et al. 1998)

SPECIES	SCIENTIFIC NAME	MONTANA SCORES:									P.A.	
		AI	PT	PTU	TB	RA	BD	ND	TN	MT	64	39
Chukar	Alectoris chukar	2	3	8	1	1	1	1	1	10	12	9
Ring-necked Pheasant	Phasianus colchicus	3	2	1	1	1	1	1	1	10	10	11
Spruce Grouse	Falcipennis canadensis	4	3	8	3	3	1	1	3	18	18	
Blue Grouse	Dendragapus obscurus	3	3	8	3	3	3	3	3	21	24	21
White-tailed Ptarmigan	Lagopus leucurus	4	3	8	2	4	3	3	2	21	22	
Ruffed Grouse	Bonasa umbellus	3	3	6	3	3	2	2	2	18	21	17
Sage Grouse	Centrocercus urophasianus	4	3	6	4	4	3	3	4	25	23	25
Sharp-tailed Grouse	Tympanuchus phasianellus	4	3	5	2	3	2	2	2	18	18	21
Wild Turkey	Meleagris gallopavo	3	3	7	2	3	2	2	3	18	17	17
Yellow Rail	Coturnicops noveboracensis	2	3	8	3	4	3	5	4	24		24
Virginia Rail	Rallus limicola	3	3	8	3	2	1	2	2	16	16	15
Sora	Porzana carolina	3	3	5	2	2	1	1	2	14	14	14
American Coot	Fulica americana	3	2	2	2	1	1	1	1	11	12	11
Sandhill Crane	Grus canadensis	4	2	3	3	3	2	4	3	21	21	20
Piping Plover	Charadrius melodus	2	3	8	4	4	4	4	4	25		26
Killdeer	Charadrius vociferus	3	5	1	2	2	1	2	3	18	18	18
Mountain Plover	Charadrius montanus	3	3	8	4	4	5	4	4	27	25	27
Black-necked Stilt	Himantopus mexicanus	3	3	8	3	3	1	1	2	16		15
American Avocet	Recurvirostra americana	3	2	3	3	3	2	4	3	20	20	20
Willet	Catoptrophorus semipalmatus	3	2	2	3	3	3	2	2	18	19	18
Spotted Sandpiper	Actitis macularia	3	3	5	2	2	1	1	1	13	14	12
Upland Sandpiper	Bartramia longicauda	3	2	2	3	2	2	3	4	19	19	20
Long-billed Curlew	Numenius americanus	4	3	5	3	3	3	4	3	23	20	23
Marbled Godwit	Limosa fedoa	3	3	6	3	3	3	3	3	21	22	23
Common Snipe	Gallinago gallinago	3	4	4	2	2	1	1	2	15	14	13
Wilson's Phalarope	Phalaropus tricolor	4	3	5	3	2	2	4	3	21	19	19
Franklin's Gull	Larus pipixcan	3	4	3	3	3	3	4	2	22	22	24
Ring-billed Gull	Larus delawarensis	3	2	4	1	2	3	1	1	13	11	12
California Gull	Larus californicus	3	3	5	2	2	3	4	1	18	18	16
Caspian Tern	Sterna caspia	3	3	8	3	2	1	1	2	15	15	14
Common Tern	Sterna hirundo	3	3	8	2	2	1	1	2	14	14	14
Forster's Tern	Sterna forsteri	3	3	7	3	3	3	3	2	20	20	19
Least Tern	Sterna antillarum	3	3	8	4	3	1	1	2	17		17
Black Tern	Chlidonias niger	3	3	7	3	2	1	2	3	17	17	19
Rock Dove	Columba livia	3	3	5	1	1	1	1	1	11	8	10
Mourning Dove	Zenaida macroura	3	2	1	1	1	1	1	1	10	12	10
Black-billed Cuckoo	Coccyzus erythropthalmus	2	4	3	3	3	2	2	3	19	17	19
Yellow-billed Cuckoo	Coccyzus americanus	2	3	7	4	3	1	2	3	18	18	19
Barn Owl	Tyto alba	2	3	8	3	3	1	1	3	16	17	18
Flammulated Owl	Otus flammeolus	4	3	8	4	3	3	4	3	24	22	
Eastern Screech-Owl	Otus asio	3	3	8	4	3	2	2	2	19	17	17
Western Screech-Owl	Otus kennicottii	3	3	8	3	3	2	2	2	18	19	
Great Horned Owl	Bubo virginianus	3	3	5	1	3	1	1	1	13	13	12
Northern Hawk-Owl	Surnia ulula	2	3	8	2	4	2	2	2	17	17	
Northern Pygmy-Owl	Glaucidium gnoma	3	3	8	2	3	2	2	2	17	16	
Burrowing Owl	Athene cunicularia	4	4	3	4	3	1	2	3	21	17	21
Barred Owl	Strix varia	3	3	8	2	3	1	1	2	15	14	
Great Gray Owl	Strix nebulosa	4	3	8	2	4	2	2	2	19	18	17
Long-eared Owl	Asio otus	3	3	8	2	3	1	1	3	16	16	16
Short-eared Owl	Asio flammeus	4	3	5	3	4	1	1	4	20	19	20
Boreal Owl	Aegolius funereus	3	3	8	2	4	2	2	2	18	17	
Northern Saw-whet Owl	Aegolius acadicus	4	3	7	2	3	1	1	2	16	17	15

APPENDIX B:

Common and scientific names of Montana's breeding bird species, with PIF priority scores (Carter et al. 1998)

SPECIES	SCIENTIFIC NAME	MONTANA SCORES:									P.A.	
		AI	PT	PTU	TB	RA	BD	ND	TN	MT	64	39
Common Nighthawk	Chordeiles minor	3	3	5	2	2	1	1	2	14	14	16
Common Poorwill	Phalaenoptilus nuttallii	3	3	8	2	3	2	3	3	19	19	19
Black Swift	Cypseloides niger	3	3	8	2	4	3	4	3	22	23	
Chimney Swift	Chaetura pelagica	3	3	8	3	2	1	3	3	18		16
Vaux's Swift	Chaetura vauxi	3	3	7	3	3	3	3	3	21	22	
White-throated Swift	Aeronautes saxatalis	3	3	8	2	2	2	3	2	17	15	17
Ruby-throated Hummingbird	Archilochus colubris	2	3	8	2	3	1	3	2	16		15
Black-chinned Hummingbird	Archilochus alexandri	3	3	8	2	3	3	5	2	21	20	
Calliope Hummingbird	Stellula calliope	4	3	6	2	3	3	5	2	22	22	20
Rufous Hummingbird	Selasphorus rufus	3	3	7	2	3	3	5	2	21	19	20
Belted Kingfisher	Ceryle alcyon	3	5	2	2	3	1	1	2	17	15	15
Lewis's Woodpecker	Melanerpes lewisi	3	3	8	3	4	2	2	2	22	22	22
Red-headed Woodpecker	Melanerpes erythrocephalus	3	3	7	3	3	2	2	3	19	18	19
Red-naped Sapsucker	Sphyrapicus nuchalis	4	1	2	3	3	3	3	3	20	21	21
Williamson's Sapsucker	Sphyrapicus thyroideus	3	3	7	3	3	3	3	3	21	22	
Downy Woodpecker	Picoides pubescens	3	2	4	2	3	1	1	1	13	14	16
Hairy Woodpecker	Picoides villosus	3	2	2	2	3	1	1	2	14	14	14
Three-toed Woodpecker	Picoides tridactylus	3	3	8	3	4	1	1	3	18	19	18
Black-backed Woodpecker	Picoides arcticus	4	3	8	4	4	2	2	3	22	22	20
Northern Flicker	Colaptes auratus	3	4	4	2	2	1	1	1	14	14	13
Pileated Woodpecker	Dryocopus pileatus	3	3	6	3	3	1	1	2	16	14	
Olive-sided Flycatcher	Contopus borealis	3	4	4	3	3	1	2	3	19	20	17
Western Wood-Pewee	Contopus sordidulus	3	1	1	2	2	1	2	3	14	16	15
Alder Flycatcher	Empidonax alnorum	2	3	8	3	2	1	3	2	16	16	
Willow Flycatcher	Empidonax traillii	4	2	2	3	3	1	4	2	19	21	19
Least Flycatcher	Empidonax minimus	3	3	5	3	2	1	3	2	17	17	15
Hammond's Flycatcher	Empidonax hammondii	4	4	4	3	3	3	4	2	23	22	20
Dusky Flycatcher	Empidonax oberholseri	3	2	2	2	3	3	4	2	19	22	21
Cordilleran Flycatcher	Empidonax occidentalis	3	4	3	2	3	3	4	2	21	20	21
Say's Phoebe	Sayornis saya	4	2	4	2	3	1	3	2	17	14	16
Cassin's Kingbird	Tyrannus vociferans	3	3	8	3	3	3	4	3	22		22
Western Kingbird	Tyrannus verticalis	3	2	4	2	2	1	4	2	16	15	16
Eastern Kingbird	Tyrannus tyrannus	3	3	5	2	2	1	2	2	15	14	14
Horned Lark	Eremophila alpestris	4	2	1	2	1	1	1	1	12	12	10
Tree Swallow	Tachycineta bicolor	3	2	1	2	2	1	2	2	14	15	12
Violet-green Swallow	Tachycineta thalassina	3	3	5	2	2	1	3	3	17	17	15
N. Rough-winged Swallow	Stelgidopteryx serripennis	3	2	2	2	2	1	3	2	15	16	16
Bank Swallow	Riparia riparia	3	3	5	2	2	1	1	2	14	14	14
Cliff Swallow	Hirundo pyrrhonota	3	2	4	1	1	1	1	2	11	10	13
Barn Swallow	Hirundo rustica	3	1	1	1	1	1	1	2	10	12	11
Gray Jay	Perisoreus canadensis	3	3	6	2	3	1	1	2	15	15	15
Steller's Jay	Cyanocitta stelleri	3	3	6	2	2	2	2	2	16	14	16
Blue Jay	Cyanocitta cristata	3	3	8	1	2	1	2	1	13	11	12
Pinyon Jay	Gymnorhinus cyanocephalus	3	3	6	2	2	3	3	2	18	18	16
Clark's Nutcracker	Nucifraga columbiana	3	3	5	2	3	2	2	2	17	16	16
Black-billed Magpie	Pica pica 3	5	1	1	2	2	2	2	17	19	18	
American Crow	Corvus brachyrhynchos	3	2	4	1	1	1	1	1	10	10	10
Common Raven	Corvus corax	3	1	2	1	2	1	1	1	10	11	11
Black-capped Chickadee	Poecile atricapillus	3	1	2	2	2	1	1	2	12	13	14
Mountain Chickadee	Poecile gambeli	3	3	5	2	2	2	2	2	16	16	16
Boreal Chickadee	Poecile hudsonicus	3	3	8	2	3	1	1	2	15	16	
Chestnut-backed Chickadee	Poecile rufescens	3	3	7	3	2	4	4	2	21	18	

APPENDIX B:

Common and scientific names of Montana’s breeding bird species, with PIF priority scores (Carter et al. 1998)

SPECIES	SCIENTIFIC NAME	MONTANA SCORES:									P.A.	
		AI	PT	PTU	TB	RA	BD	ND	TN	MT	64	39
Red-breasted Nuthatch	Sitta canadensis	3	1	2	2	2	1	1	2	12	14	11
White-breasted Nuthatch	Sitta carolinensis	3	3	6	2	3	1	1	2	15	13	12
Pygmy Nuthatch	Sitta pygmaea	3	3	7	3	2	3	3	3	20	19	
Brown Creeper	Certhia americana	3	3	8	4	3	1	1	2	17	18	15
Rock Wren	Salpinctes obsoletus	3	2	2	2	3	1	2	2	15	15	18
Canyon Wren	Catherpes mexicanus	3	3	8	2	3	2	2	2	17	17	16
House Wren	Troglodytes aedon	3	1	1	3	2	1	1	1	12	11	10
Winter Wren	Troglodytes troglodytes	3	2	3	4	2	1	1	2	15	14	
Sedge Wren	Cistothorus platensis	2	3	8	3	3	3	3	3	20		21
Marsh Wren	Cistothorus palustris	3	3	6	3	2	2	2	3	18	17	18
American Dipper	Cinclus mexicanus	4	3	6	3	4	2	2	3	21	21	19
Golden-crowned Kinglet	Regulus satrapa	4	3	5	3	3	2	1	2	18	17	16
Ruby-crowned Kinglet	Regulus calendula	3	2	2	2	2	1	2	2	14	16	15
Blue-gray Gnatcatcher	Polioptila caerulea	3	3	8	2	2	1	2	2	15		
Eastern Bluebird	Sialia sialis	3	3	8	2	2	1	2	2	15		15
Western Bluebird	Sialia mexicana	3	3	7	2	3	3	3	2	19	17	
Mountain Bluebird	Sialia currucoides	4	1	1	2	2	2	3	2	16	17	18
Townsend's Solitaire	Myadestes townsendi	4	5	2	3	3	2	2	2	21	19	18
Veery	Catharus fuscescens	3	3	5	3	2	2	2	3	18	17	17
Swainson's Thrush	Catharus ustulatus	3	2	2	3	1	1	2	3	15	15	16
Hermit Thrush	Catharus guttatus	3	2	4	3	2	1	2	2	15	16	15
American Robin	Turdus migratorius	3	2	1	1	1	1	1	1	10	12	9
Varied Thrush	Ixoreus naevius	4	3	6	3	2	2	4	2	20	18	
Gray Catbird	Dumetella carolinensis	3	2	2	2	2	1	3	2	15	15	16
Northern Mockingbird	Mimus polyglottos	1	3	8	1	1	1	1	1	9	11	11
Sage Thrasher	Oreoscoptes montanus	3	2	4	4	2	3	3	2	19	16	17
Brown Thrasher	Toxostoma rufum	3	1	2	3	3	1	3	2	16	17	16
American Pipit	Anthus rubescens	3	3	8	2	2	1	1	2	14	14	16
Sprague's Pipit	Anthus spragueii	5	2	4	4	3	4	3	3	24	22	24
Cedar Waxwing	Bombycilla cedrorum	3	2	4	2	2	1	1	2	13	12	12
Loggerhead Shrike	Lanius ludovicianus	3	2	2	4	3	1	1	3	17	18	17
European Starling	Sturnus vulgaris	3	2	4	1	1	1	1	1	10	12	9
Cassin's Vireo	Vireo cassinii	3	3	8	2	3	3	3	3	20	21	
Plumbeous Vireo	Vireo plumbeus	3	3	5	2	3	2	4	2	19	22	20
Warbling Vireo	Vireo gilvus	3	2	1	3	2	1	4	2	17	17	17
Red-eyed Vireo	Vireo olivaceus	3	2	2	4	1	2	2	2	16	16	16
Tennessee Warbler	Vermivora peregrina	2	3	8	2	2	2	4	2	17	18	
Orange-crowned Warbler	Vermivora celata	3	3	5	2	2	1	2	1	14	13	14
Nashville Warbler	Vermivora ruficapilla	3	3	6	2	2	2	4	2	18	16	
Yellow Warbler	Dendroica petechia	3	1	1	2	2	1	1	1	11	18	11
Yellow-rumped Warbler	Dendroica coronata	3	2	2	2	2	1	1	1	12	16	14
Townsend's Warbler	Dendroica townsendi	4	2	4	3	2	3	3	3	20	19	
Black-and-white Warbler	Mniotilta varia	3	3	8	2	3	2	2	2	17		16
American Redstart	Setophaga ruticilla	3	3	5	2	2	1	2	2	15	16	16
Ovenbird	Seiurus aurocapillus	3	3	8	3	2	2	3	3	19	19	18
Northern Waterthrush	Seiurus noveboracensis	4	2	4	3	2	1	2	2	16	13	14
MacGillivray's Warbler	Oporornis tolmiei	4	3	5	2	2	3	3	3	20	20	19
Common Yellowthroat	Geothlypis trichas	3	2	1	2	1	1	2	2	13	12	14
Wilson's Warbler	Wilsonia pusilla	3	3	5	2	2	1	3	2	16	16	
Yellow-breasted Chat	Icteria virens	3	3	5	3	2	1	3	2	17	15	17
Western Tanager	Piranga ludoviciana	3	2	4	3	2	2	3	2	17	19	19
Black-headed Grosbeak	Pheucticus melanocephalus	3	1	2	3	2	2	4	3	18	18	18

APPENDIX B:

Common and scientific names of Montana's breeding bird species, with PIF priority scores (Carter et al. 1998)

SPECIES	SCIENTIFIC NAME	MONTANA SCORES:									P.A.	
		AI	PT	PTU	TB	RA	BD	ND	TN	MT	64	39
Lazuli Bunting	Passerina amoena	3	2	2	3	2	2	5	2	19	19	19
Indigo Bunting	Passerina cyanea	3	3	8	2	1	1	3	2	15	15	15
Dickcissel	Spiza americana	2	3	8	3	1	2	4	4	19		21
Green-tailed Towhee	Pipilo chlorurus	3	3	6	3	2	3	3	2	19	18	19
Spotted Towhee	Pipilo maculatus	3	3	5	3	2	2	2	2	17	15	15
Chipping Sparrow	Spizella passerina	3	5	1	2	2	1	2	1	16	15	16
Clay-colored Sparrow	Spizella pallida	3	3	5	3	2	2	3	3	19	18	18
Brewer's Sparrow	Spizella breweri	3	4	4	4	1	3	3	2	20	21	21
Field Sparrow	Spizella pusilla	3	3	6	3	2	2	2	3	18		19
Vesper Sparrow	Pooecetes gramineus	4	2	1	2	1	1	2	2	14	14	13
Lark Sparrow	Chondestes grammacus	3	2	4	3	2	1	3	2	16	15	16
Sage Sparrow	Amphispiza belli	2	3	8	4	2	3	4	3	21	22	21
Lark Bunting	Calamospiza melanocorys	4	2	4	4	1	3	3	3	20	20	18
Savannah Sparrow	Passerculus sandwichensis	3	1	1	2	1	1	2	1	11	12	12
Baird's Sparrow	Ammodramus bairdii	5	2	2	4	3	4	5	4	27	25	26
Grasshopper Sparrow	Ammodramus savannarum	3	2	2	3	2	1	2	3	16	20	16
Le Conte's Sparrow	Ammodramus leconteii	3	3	8	3	3	2	4	4	22	23	23
Nelson's Sharp-t. Sparrow	Ammodramus nelsoni	2	3	8	3	4	4	5	4	25		26
Fox Sparrow	Passerella iliaca	3	3	6	2	2	1	2	2	15	12	
Song Sparrow	Melospiza melodia	3	3	5	2	1	1	1	1	12	14	14
Lincoln's Sparrow	Melospiza lincolnii	3	3	6	2	2	1	2	2	15	14	15
White-crowned Sparrow	Zonotrichia leucophrys	3	2	2	2	1	1	2	1	12	12	13
Dark-eyed Junco	Junco hyemalis	3	2	2	1	2	1	1	1	11	11	14
McCown's Longspur	Calcarius mccownii	4	3	5	4	3	5	5	4	28	27	27
Chestnut-collared Longspur	Calcarius ornatus	4	2	4	4	1	4	3	4	22	22	21
Bobolink	Dolichonyx oryzivorus	3	5	2	3	2	2	2	4	21	19	19
Red-winged Blackbird	Agelaius phoeniceus	3	5	1	2	1	1	1	1	14	10	14
Western Meadowlark	Sturnella neglecta	3	2	1	3	1	1	2	3	15	17	17
Yellow-headed Blackbird	Xanthocephalus xanthocephalus	3	2	4	3	1	2	3	3	17	16	18
Brewer's Blackbird	Euphagus cyanocephalus	3	5	1	1	1	2	1	1	14	15	12
Common Grackle	Quiscalus quiscula	3	1	2	1	1	1	2	1	10	11	12
Brown-headed Cowbird	Molothrus ater	3	2	4	1	1	1	1	1	10	10	9
Orchard Oriole	Icterus spurius	3	3	7	3	2	2	3	2	18		17
Baltimore Oriole	Icterus galbula	3	3	8	3	2	2	3	2	18		16
Bullock's Oriole	Icterus bullockii	3	3	5	3	2	1	4	2	18	16	17
Pine Grosbeak	Pinicola enucleator	3	3	7	2	3	1	2	2	16	15	15
Gray-crowned Rosy-Finch	Leucosticte tephrocotis	3	3	8	2	2	3	2	2	17	17	16
Black Rosy-Finch	Leucosticteatrata	3	3	8	2	4	4	4	2	22	22	
Cassin's Finch	Carpodacus cassinii	3	4	4	3	2	3	2	2	19	19	17
House Finch	Carpodacus mexicanus	3	2	3	1	1	1	1	1	10	8	10
Red Crossbill	Loxia curvirostra	3	3	5	3	2	1	1	3	16	16	16
White-winged Crossbill	Loxia leucoptera	3	3	8	2	3	1	1	3	16	15	
Pine Siskin	Carduelis pinus	3	3	5	1	2	1	1	1	12	13	12
American Goldfinch	Carduelis tristis	3	3	5	2	2	1	1	1	13	14	11
Evening Grosbeak	Coccothraustes vespertinus	3	3	5	2	1	2	1	2	14	14	13
House Sparrow	Passer domesticus	3	2	1	1	1	1	1	1	10	12	10

APPENDIX C

A partial list of land trusts and other organizations that accept conservation easements in Montana.

Name, Address, Phone:	Mission:
Bitterroot Land Trust 120 S. 5 ST., Suit 203 Hamilton, MT 59840 (406) 375-0956	Protect open space through voluntary easements; develop, promote, and publicize innovative land preservation and low-impact development techniques; provide long-term stewardship of lands protected by easements.
Five Valleys Land Trust PO Box 8953 Missoula, MT 59807 (406) 549-0755	Protection of wildlife habitat, riparian areas, agricultural lands, and scenic/historic places throughout Missoula, Ravalli, Mineral, Sanders, Lake and Granite counties.
Flathead Land Trust PO Box 1913 Kalispell, MT 59903 (406) 752-8293	Help protect the wildlife, scenery, and traditional way of life in the Flathead Valley through the purchase of property, the acquisition of conservation easements, and the wise use of land.
Gallatin Land Trust PO Box 7021 Bozeman, MT 59771 (406) 587-8404	Conservation of open space, agricultural land, wildlife habitat, and the creation of public trails in and around Gallatin County.
Montana Land Reliance PO Box 355 Helena, MT 59620 (406) 443-7027	Provide protection for private lands that are ecologically significant for agricultural production, fish and wildlife habitat, and open space.
Prickly Pear Land Trust PO Box 892 Helena, MT 59624 (406) 442-0490	Work voluntarily and cooperatively with area landowners to perpetuate the historic, scenic, recreational, wildlife and agricultural values of Lewis and Clark and Jefferson counties.
Rock Creek Trust 102 E. Main Missoula, MT 59802 (406) 728-2841	Long-term protection of open lands, family lands, clean water, and wildlife habitat in the Rock Creek drainage (Granite and Missoula counties).
Save Open Space, Inc. 1916 Brooks, PAB 353 Missoula, MT (406)549-6083	Facilitate the preservation of open space located in and around Missoula; promote awareness of open space and its value to the community through education and advocacy.
The Conservation Fund NW Regional Office P.O. Box 1524 Sun Valley, ID 83353 (208) 726-4419	Seek sustainable solutions for the 21st century, emphasizing the integration of economic and environmental goals, through real estate transactions, demonstration projects, education and community-baed activities.
The Nature Conservancy 32 S. Ewing Helena, MT 59601 (406) 443-0303	Preserve plants, animals and natural communities that represent the diversity of life, by protecting the lands and waters they need to survive.

APPENDIX C

A partial list of land trusts and other organizations that accept conservation easements in Montana (continued).

Name, Address, Phone:	Mission:
The Rocky Mountain Elk Foundation 2291 West Broadway Missoula, MT 59808 (406) 523-4500	Permanently protect critical wildlife habitat (for elk and other wildlife), by using acquisitions, leases, exchanges or conservation easements.
Trust For Public Lands PO Box 200 Helena, MT 59624 (406) 443-4017	Conserve land for recreation and spiritual nourishment, and to improve the quality of life of American communities.