Chapter 3: Affected Environment

This chapter of the Environmental Assessment (EA) describes the existing environment that would potentially be affected by the proposed Red Fleet Reservoir Resource Management Plan (RMP) alternatives. The resource information presented in this chapter is of sufficient detail to support and clarify the impact analyses provided in Chapter 4 of this document. The resources discussed in this chapter were identified by the public and various groups and agencies that have an interest in the Red Fleet Reservoir RMP Study Area (Study Area). Chapter 1 of this document provides a detailed description of the scoping process and outcomes. The resource conditions described in this chapter existed in 2011 and 2012; these conditions established the baseline for analysis of effects in Chapter 4. Resource conditions were determined by onsite inspections, literature searches, and through coordination with local, state, and federal agency personnel.

Local Setting

The Study Area is located in northeastern Utah approximately 12 miles north of Vernal City in Uintah County. Additional characteristics of the local setting and project history are described in Chapter 1; this section provides an overview of the existing economic, population, housing, and tourism characteristics of Uintah County.

Economy

Uintah County's economy is characterized by development of oil and gas resources and mining; consequently, international market prices for these natural resources have a strong influence on fluctuations in the local economy. Table 3-1 summarizes employment by industry for Uintah County in the first quarter of 2011. The mining, oil, and gas sector had the largest number of establishments in the county (197), accounted for the largest average employment (2,933 jobs), and had the largest payroll (more than $56 million). Total private-sector employment was 10,760 and the total private sector payroll was $126.8 million. The public sector accounted for an additional 2,872 jobs and $24.3 million in payroll.

Growth in oil and gas production in recent years has helped to support growth in the construction, manufacturing, trade, and service sectors, particularly in the Vernal area. As shown in Figure 3-1, employment in Uintah County grew steadily from 2001 to 2008 with average annual employment increasing from 9,866 jobs to 15,273 jobs. Employment has declined somewhat since, with a relatively quick decline to 13,321 jobs in 2009 and a slower rate of decline for the subsequent 2 years. Average employment during the first quarter of 2011 was 12,933 jobs.

Population

Changes in rates of population growth and decline in Uintah County are also closely tied to oil, gas, and mining development trends. Figure 3-2 illustrates population by year from 1940 to 2009. The County's population grew somewhat gradually from 1940 to 1970, with an average annual growth rate of about 1 percent during this period. There was significant out-migration in most years during this period, with growth largely due to natural increase. In 1970 the population of Uintah County was 12,800. Beginning in that year, the rate of growth increased significantly,

Table 3-1. Uintah County Employment and Income by Sector, First Quarter 2011.

INDUSTRY SECTOR	ESTABLISHMENTS	AVERAGE EMPLOYMENT	PAYROLL	AVERAGE MONTHLY WAGE
Private Sector				
Agriculture, Forestry, Fishing and Hunting	12	50	$311,871	$2,079
Mining (including oil and gas)	197	2,993	$56,243,820	$6,264
Utilities	6	143	$3,034,701	$7,074
Construction	137	769	$8,522,702	$3,694
Manufacturing	32	180	$1,366,712	$2,531
Wholesale Trade	69	618	$9,639,194	$5,199
Retail Trade	123	1,452	$9,386,118	$2,155
Transportation and Warehousing	116	850	$11,095,144	$4,351
Information	13	133	$1,055,381	$2,645
Finance and Insurance	41	185	$1,693,210	$3,051
Real Estate and Rental and Leasing	77	402	$5,809,084	$4,817
Professional Scientific and Technical Services	92	393	$3,651,186	$3,097
Admin., Support, Waste Management Remediation	41	296	$2,600,631	$2,929
Education Services	8	21	$65,145	$1,034
Health Care and Social Assistance	63	965	$6,638,583	$2,293
Arts, Entertainment, and Recreation	11	23	$37,344	$541
Accommodation and Food Services	65	952	$2,802,980	$981
Other Services (except Public Administration)	79	378	$3,112,934	$2,745
Total Private Sector	**1,172**	**10,760**	**$126,837,234**	**$3,929**
Public Sector				
Federal Government	27	370	$5,272,640	$4,750
State Government	16	157	$1,526,337	$3,241
Local Government	60	2,345	$17,500,320	$2,488
Total Public Sector	**103**	**2,872**	**$24,299,297**	**$2,820**

Source: UDWS (2012).

averaging about 5 percent annually until 1982 when the population peaked at 26,000. However, collapse of the oil shale industry that year resulted in a decline in regional population throughout the 1980s. Uintah County's population declined by an annual average of about 2.6 percent during this period, to 22,200 in 1989. The county's population has been on an upswing since 1990, increasing gradually during the 1990s and the first half of the next decade. The rate of population growth increased beginning in 2005 to an average annual increase of about 3.6 percent. This rate of increase was associated with increased activity in natural gas exploration and development. The 2010 U.S. Census showed Uintah County's population had reached an all-time high of 32,588.

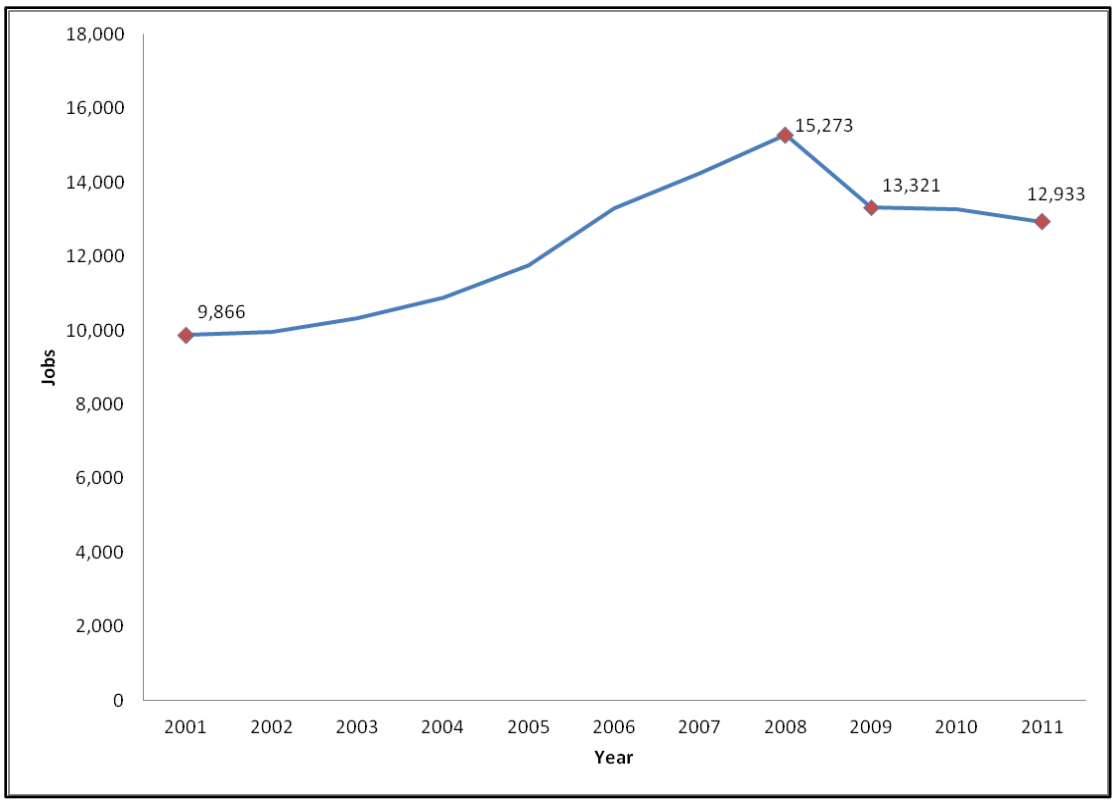

Figure 3-1. Uintah County Average Employment, 2001–2011 (UDWS 2012).

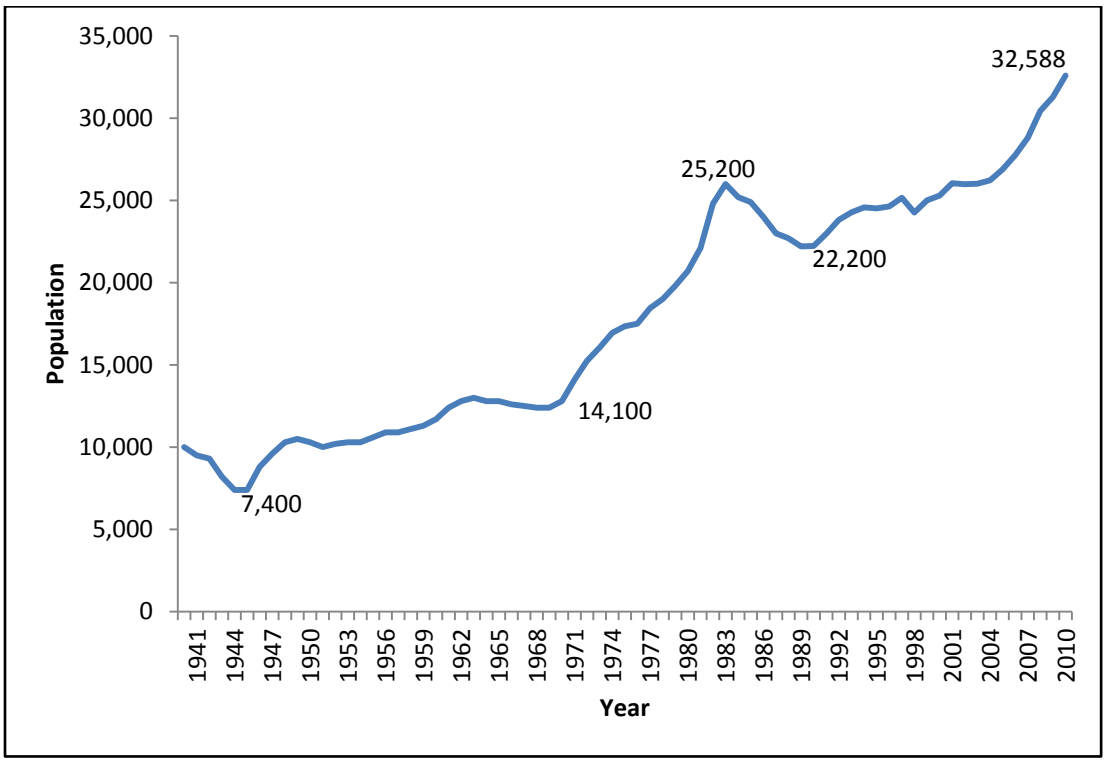

Figure 3-2. Uintah County Population 1940–2010 (GOPB 2012, U.S. Census Bureau 2012).

Housing

Population growth in the late 1970s and early 1980s also created a residential construction boom in Uintah County, as illustrated in Figure 3-3. From 1975 to 1978, Uintah County averaged about 273 new residential buildings per year. This increased to an annual average of 418 new buildings per year from 1979 to 1982. A significant number of multiple-unit dwellings must have been constructed in 1983, as the number of units constructed in that year spiked while the number of new buildings plummeted from 515 in 1982 to 74 in 1984. This was followed by a bust, where residential construction nearly ceased for the remainder of the decade. A new construction boom commenced in 2002 and continued through 2009. During this period, new building construction averaged about 283 structures per year, with a peak of 537 new structures in 2006. The 2006 building year was also a peak in terms of the value of residential construction, which suggests that higher-valued residences were constructed during this period. Higher-value nonresidential construction was also built in the 2006–2008 timeframe.

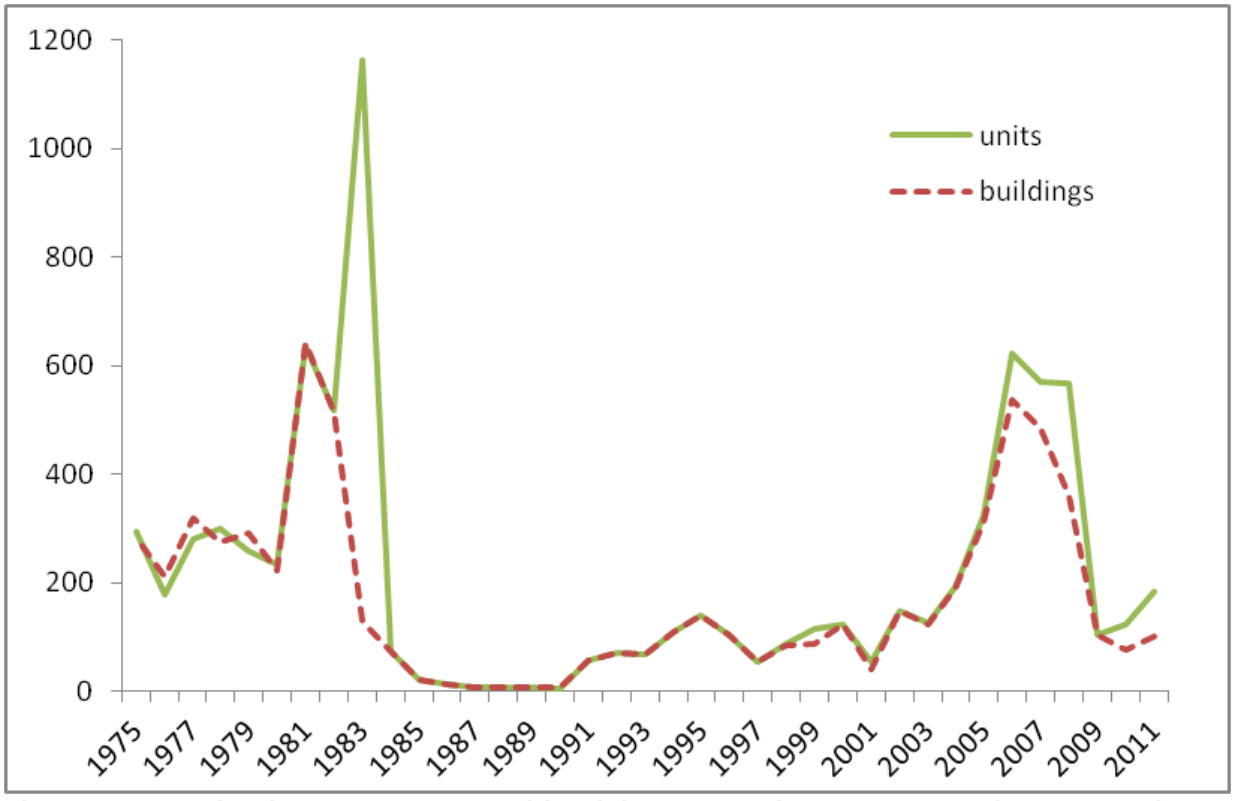

Figure 3-3. Uintah County New Residential Construction, 1975–2011 (BEBR 2012).

Tourism

Natural and historical resources in Uintah County have drawn tourists for many years, bringing economic benefits. Destinations include Dinosaur National Park, Flaming Gorge Reservoir, Steinaker State Park, Red Fleet State Park, museums, and Uintah County's Western Park multi-activity conference complex. The county strives to balance increased recreation and tourism with the area's rural lifestyle and traditional resource uses (Uintah County 2005). Travel and tourism

accounted for 1,236 Uintah County jobs in 2010 and traveler spending totaled $65.7 million, which ranked Uintah County 14th among Utah's 29 counties (Utah Office of Tourism 2012).

Research by the Utah Division of State Parks and Recreation (State Parks) found that the majority of Red Fleet State Park (State Park) visitors live outside the area. State Parks has also estimated that visitors generated approximately $561,413 in local wages, earnings, rents, and tax revenues within Uintah County in 2009. Not captured in these figures, Red Fleet Reservoir also supports economic impacts to the county through the provision of boating opportunities. There are five boat dealerships in Uintah County. Through its operations at Red Fleet Reservoir, State Parks itself paid $2,679 in sales and use taxes and, along with Steinaker State Park, paid $2,593 in transient room taxes to Uintah County (State Parks 2011).

Environmental Justice

Environmental Justice refers to the protection of human rights, particularly those of minority and lower-income populations. It further means that, to the greatest extent practicable and permitted by law, minority and low-income groups are provided the opportunity to participate prior to decision making and are not affected in a disproportionately high and adverse manner by government programs and activities affecting human health or the environment. In addition, Environmental Justice means that such populations are allowed to share in the benefits of and are not excluded from the due processes associated with government activities that involve human health and the environment. Environmental Justice is included in this document in compliance with Executive Order 12898, signed in 1994.

According to data from the U.S. Census Bureau (2012), Uintah County had a population of 32,588 in 2010; this was a 29 percent increase from the population count of 25,224 in 2000. The majority of the population in both of these census years was predominantly white alone/not Hispanic or Latino, with nearly 86 percent of the population in 2000 and about 83 percent in 2010. Approximately 3.5 percent of the population was Hispanic or Latino in 2000, which increased to just over 7 percent in 2010. The largest minority race category in both 2000 and 2010 was Native American, with 2,599 persons in 2000 and 2,905 persons in 2010.

Uintah County median household income in 2010 was $59,730. This median income level was $3,400 above the state median. In 2010, 11.7 percent of Uintah County's population lived at or below the poverty level. This was 3.2 percent higher than the state average but 2.1 percent below the average poverty level of the United States.

Partnerships

The U.S. Department of the Interior (DOI), Bureau of Reclamation (Reclamation) administers approximately 2,561 acres at Red Fleet Reservoir. This figure includes a full pool surface area of approximately 533 acres. Water operations, recreation facilities, fish and wildlife resources, minerals, and other resources are managed through the following interagency partnerships.

Water Operations and Water Rights

Red Fleet Dam water operations were turned over to the Uintah Water Conservancy District (UWCD) on May 1, 1985. Reclamation retains title to Red Fleet Dam, water rights, reservoir,

surrounding land, canals, and appurtenant works, while UWCD has a permanent right to the use of water within the provisions of the contract.

Recreation Management

Red Fleet State Park was opened to the public in 1988 and is managed through a Memorandum of Agreement between Reclamation and State Parks and subsequent agreements. The agreements obligate State Parks to administer recreation and to operate, maintain, and replace recreational facilities. Water-based activities, such as swimming, waterskiing, pleasure boating, and fishing are the prominent attractions at Red Fleet Reservoir. Other activities include sunbathing, picnicking, camping, sightseeing, hiking, and biking.

Fish and Wildlife Management

The Utah Division of Wildlife Resources (UDWR) has full authority to enforce state fishing and hunting regulations within the Study Area. By regulation, shotgun and archery hunting are not permitted in state parks within 0.25 miles of developed recreational areas where camping, picnicking, boating, and other activities take place. The UDWR conducts a fisheries stocking program at Red Fleet Reservoir and works with Reclamation, State Parks, and other entities in providing fishing and wildlife enjoyment opportunities for all persons.

The U.S. Fish and Wildlife Service (USFWS) is responsible for working with Reclamation in protecting fish and wildlife and their habitats under the auspices of the Fish and Wildlife Coordination Act (1958 as amended). Reclamation is responsible for management and recovery of Threatened and Endangered Species within the Study Area under the Endangered Species Act of 1973 (ESA), as amended, with recommendations and consultation provided by the USFWS.

Minerals Development and Withdrawn Lands Management

Through an Interagency Agreement dated December 1982, Reclamation and the U.S. Bureau of Land Management (BLM) agreed to coordinate on land-use planning, land resource management, land conveyance and exchange, and cooperative services. The agreement brings coordinated agency efforts into compliance with existing laws and policies. The agreement provides that Reclamation will, when requested, provide expertise in water resources conservation, development, and management, to be utilized by the BLM in preparing its RMPs. The agreement further provides that the BLM will, when requested, provide expertise in land resource, forest, range, oil, gas, and mineral management, to be utilized by Reclamation when preparing its RMPs and in managing public lands administered, acquired, or withdrawn by Reclamation.

Law Enforcement and Fire Suppression

Law enforcement and fire suppression activities are primarily provided by State Parks, UDWR, Uintah County, and the Uintah Basin Interagency Fire Center.

Road Maintenance

Access to the State Park begins at U.S. Route 191 (US-191) and proceeds easterly on a county road a distance of 2.0 miles to the pay gate at the park and is under the jurisdiction of Uintah County (Utah Code 72-3-205).

Water Quality

The Utah Department of Environmental Quality (UDEQ), Division of Water Quality (UDWQ) is responsible for ensuring that state water quality standards and beneficial uses are met for surface waters within the Study Area.

Water Resources

This section provides a detailed description of the Red Fleet Reservoir watershed, water operations, and water quality conditions. Sources of information consulted to develop this description of existing conditions included U.S. Geological Survey (USGS) gage station records, UDWQ reports, Reclamation reports, U.S. Environmental Protection Agency (EPA) Storage and Retrieval (STORET) water quality data, consultations with agency personnel, and onsite observations during a field visit in October 2011.

Watershed

The watershed area draining to Red Fleet Reservoir, illustrated in Figure 3-4, is approximately 60,600 acres in size. The headwaters of Big Brush Creek originate in the Uinta Mountains at a peak elevation of approximately 10,600 feet above sea level. Big Brush Creek flows southeast until it is impounded by Red Fleet Dam at a streambed elevation of approximately 5,500 feet. The majority of the watershed area is located within the Ashley National Forest, while the southern portion of the watershed consists of lands managed by the BLM.

A USGS gage (09261700) records flows on Big Brush Creek at a site about 1 mile upstream of Red Fleet Reservoir. Daily flow data were analyzed for water years 1980 through 2010 to assess the hydrologic regime of the creek. Mean annual discharge for this time period is approximately 42 cubic feet per second (cfs). The largest instantaneous peak flow recorded at this site was 423 cfs on May 25, 2005. Average peak flow for the 1980–2010 time period is 248 cfs. The Big Brush Creek hydrograph is largely driven by snowmelt runoff. Peak flow generally occurs in May. A secondary flow peak is sometimes observed in early fall, a result of "monsoon" rainstorms. Figure 3-5 shows a typical annual hydrograph for Big Brush Creek.

Reservoir

Red Fleet Reservoir is managed by UWCD primarily for storage of water for irrigation, municipal, and industrial purposes. The reservoir is operated with a normal (i.e., full/maximum) water surface elevation of 5,608.2 feet, and the crest elevation of the dam is at an elevation of 5,627.0 feet. Total reservoir capacity is 26,000 acre-feet with a 521-acre surface area at normal water surface elevation (Reclamation 2011a).

Red Fleet Dam outlets into Big Brush Creek. Near the outlet of the dam, Tyzack Pumping Plant removes water and conveys it west to the Ashley Valley Water Treatment Plant via the Tyzack Aqueduct (Reclamation 2011b). This water is subsequently used for municipal and industrial purposes by the Jensen Water District and Vernal City (Reclamation 2011b). The Tyzack Pumping Plant has a design capacity of 45 cfs and was completed in 1983 (Reclamation 2011b).

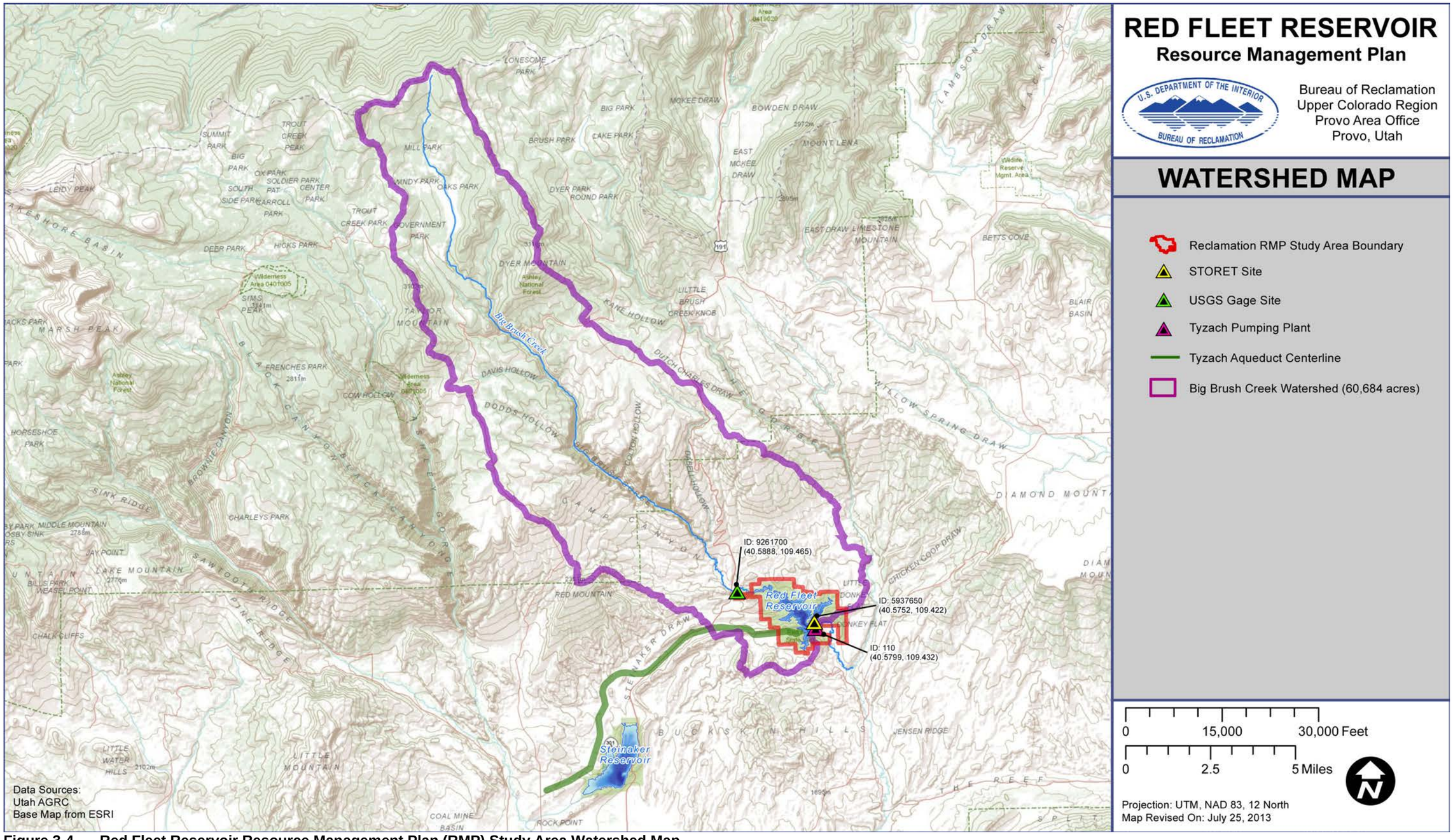

Figure 3-4. Red Fleet Reservoir Resource Management Plan (RMP) Study Area Watershed Map.

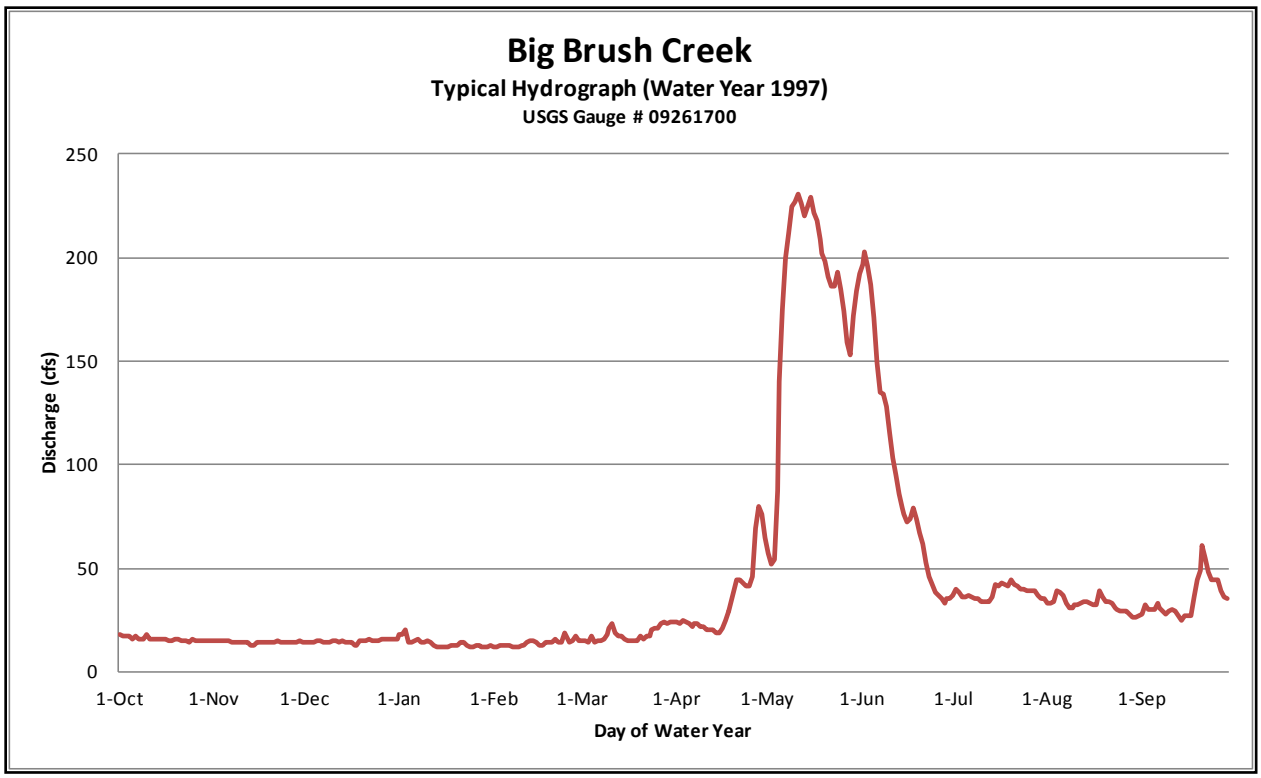

Figure 3-5. Typical Hydrograph for Big Brush Creek above Red Fleet Reservoir.

Red Fleet Reservoir water elevation data for October 1988 through September 2010 are graphed in Figure 3-6. As shown in the plot, water levels fluctuate significantly throughout the year. Typical seasonal fluctuations are on the order of 15 to 20 feet. The seasonal patterns are typical for a reservoir managed for irrigation storage. Reservoir levels during the first few months of the water year are primarily a function of conditions at the end of the previous year. Levels then increase during winter and spring, when there is no demand for irrigation water and heavy snowmelt runoff inflows in Big Brush Creek enter the reservoir. Water levels in the reservoir drop during summer and fall, when water is released for irrigation and inflows from Big Brush Creek are low. This seasonal pattern holds during dry, average, and wet water years (Figure 3-7) but the rates, timing, and magnitude of the fluctuations vary. In dry water years (e.g., 1990) water levels never completely fill the reservoir; in wet years (e.g., 2005 when snowmelt runoff inflows are high and irrigation demands low) reservoir levels rise very rapidly and drop more slowly.

Sedimentation

Some evidence of sedimentation can be seen in aerial imagery near the inflow of Red Fleet Reservoir, but the apparent delta feature is relatively small. Big Brush Creek is a natural stream channel and likely carries significant sediment loads during high-flow periods, but specific amounts are not known because quantitative studies of sediment transport and reservoir sedimentation rates have not been completed. Possible sources of sediment to Big Brush Creek include livestock grazing, logging, and roads (UDWQ 2011a). Field observations noted significant rill erosion at the US-191 crossing associated with poor roadway drainage controls.

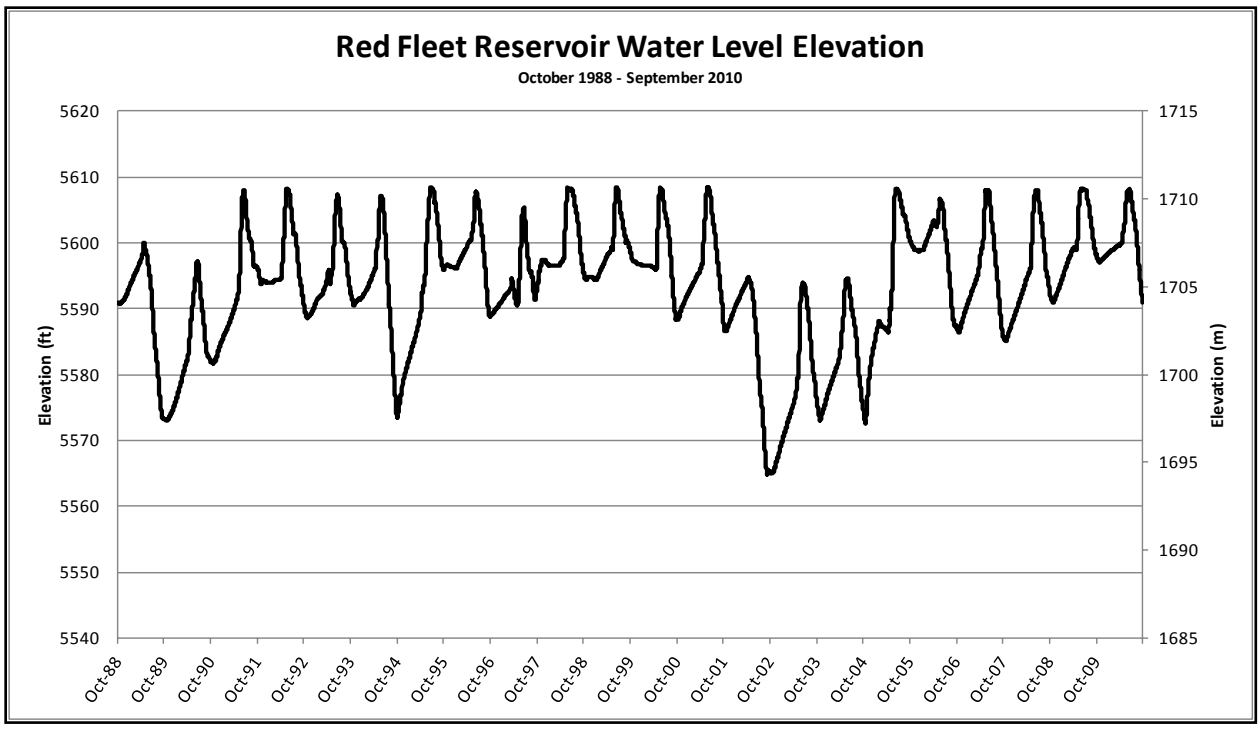

Figure 3-6. Daily Red Fleet Reservoir Water Levels for Water Years 1989–2010.

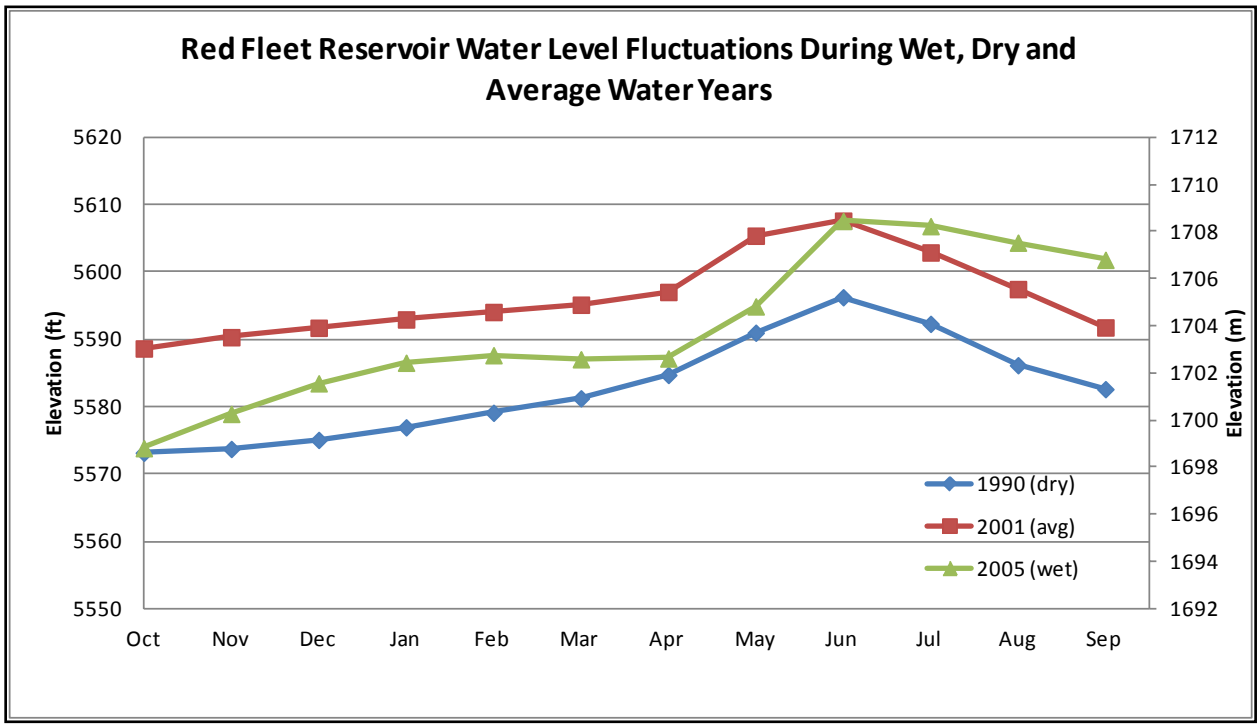

Figure 3-7. Monthly Red Fleet Reservoir Water Level Fluctuations for Typical Wet, Average, and Dry Years Based on Gage Data for Big Brush Creek.

Development associated with the potash mine just west of US-191 may also contribute sediment to Big Brush Creek.

Field observations indicate that shoreline erosion contributes some sediment to Red Fleet Reservoir, although the eroded areas appear to be fairly isolated and small. In many areas the shoreline consists of resistant sandstone bedrock. In a few localized areas, illegal, off-highway-vehicle (OHV) activities on hill slopes near the shoreline have reduced vegetation cover and likely increased stormwater-associated sediment inputs to the reservoir. The developed portions of the State Park are another potential sediment source; however, drainage from the existing paved roads, boat launch, and campground facilities appears to generally be well managed and not a major contributor of sediment. Walking trails, such as the trail to the Dinosaur Trackway Area, could be improved to reduce the amount of bare soil exposed to erosion.

Floodplains

Floodplains are present in the Study Area where Big Brush Creek enters the Red Fleet Reservoir and on Big Brush Creek below the outlet of Red Fleet Dam. Cottonwood Wash, a smaller, intermittent tributary that enters at the northeast end of the reservoir, also appears to support riparian floodplain vegetation within the Study Area. Upstream of the US-191 crossing, Big Brush Creek exhibits a meandering plan form with a hydrologically connected floodplain that supports stands of riparian willows. The extent of this riparian vegetation appears to be limited by developed pastureland on the north side of the Big Brush Creek. Between the US-191 crossing and the reservoir, Big Brush Creek continues to support riparian floodplain vegetation, but its lateral extent is limited by the narrow valley and steep slopes adjacent to the creek.

The operations of Red Fleet Reservoir and Tyzack Pumping Plant have substantially altered the hydrologic regime of Big Brush Creek below Red Fleet Dam. High peak flows have been cut off, and base flows have been artificially increased during the growing season when irrigation water is delivered downstream via the creek (Figure 3-8). The effects of these hydrologic changes have not been studied in detail on Big Brush Creek, but the altered and simplified flow regime has the potential to reduce active floodplain areas and riparian functions. Upper streambank/floodplain areas that previously would have overtopped during peak flows have become hydrologically disconnected from the creek, while low bank areas that previously would have supported grasses and herbaceous riparian vegetation are now continuously inundated during the growing season. Floodplain functions below the Red Fleet Dam also appear to have been impacted by agricultural development. Based on field observations of the area visible from the dam, pastures are mowed to the edge of the creek in many areas, and buffers of natural riparian vegetation are of minimal width. Vertical, bare banks are also visible and the channel appears somewhat incised.

Water Quality

The State of Utah has assigned four beneficial use classifications for the upper portion of Big Brush Creek (from the creek headwaters to Red Fleet Reservoir). Indicated in Table 3-2, these use classifications are 1C (drinking water), 2B (infrequent primary contact recreation), 3A (coldwater fisheries), and 4 (irrigation). Big Brush Creek currently meets all water quality standards and is attaining its designated beneficial uses (UDWQ 2010). Red Fleet Reservoir also has these same four classifications as well as use 2A (frequent primary contact recreation). In 2010 the state identified temperature as a cause of impairment to coldwater aquatic life use in the reservoir (UDWQ 2010). This is likely a greater problem at the surface during late summer,

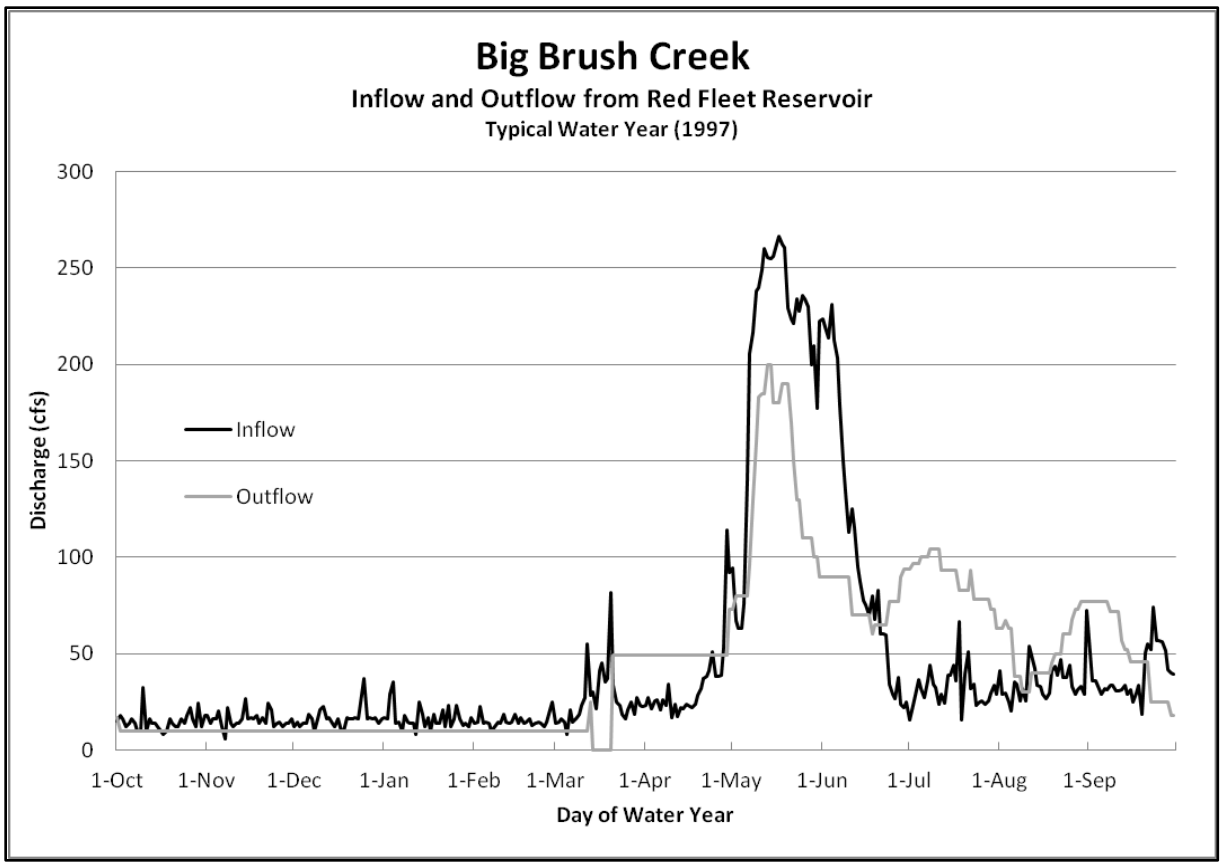

Figure 3-8. Comparison of Flow Patterns of Big Brush Creek at Inflow versus Outflow from Red Fleet Reservoir during a Typical Water Year.

Table 3-2. Designated Beneficial Use Classes and Attainment Status.

BENEFICIAL USE CLASSES	DESCRIPTION	ATTAINMENT STATUS	
		Big Brush Creek	Red Fleet Reservoir
1C	Domestic Water Source (with prior treatment)	Attained	Attained
2A	Frequent Primary Contact Recreation (swimming, kayaking)	Not a designated use	Attained
2B	Infrequent Primary Contact Recreation (fishing, hunting)	Attained	Attained
3A	Coldwater Aquatic Life	Attained	Impaired (2010), low-priority TMDL
4	Irrigation	Attained	Attained

Source: UDWQ (2011b).

when the air temperatures are highest and the water levels are lowest, creating conditions where water temperatures rise easily.

Water quality data taken near the Red Fleet Dam (Figure 3-9) illustrate water temperatures at the surface exceeding the numeric standard of 20 degrees Celsius. July data show how high air temperatures create a lens of warmer water at the surface, while water temperatures remain consistent below 10 meters. October data in Figure 3-10 show a much less pronounced difference between water temperatures at the surface and at depth. While this stratification is known to occur in the reservoir (UDWQ 2011a), some mixing through the water column may occur in shallower areas due to wind and other surface disturbances such as boats. Mixing may also occur on a seasonal basis with turnover of lake water.

With respect to dissolved oxygen, Red Fleet Reservoir has been observed to have low dissolved oxygen levels at certain times. However, based on the EPA approved Total Maximum Daily Load (TMDL) for dissolved oxygen (UDWQ 2010), none of the reservoir's beneficial uses are listed as impaired as a result of low dissolved oxygen levels. Dissolved oxygen is used when organisms are active and respiring and also when organic matter decomposes. During the day, photosynthesis will naturally increase dissolved oxygen levels. Measurements show the reservoir as oligotrophic (low productivity) with measurements for some dates falling into the eutrophic range (UDWQ 2010). Under these eutrophic conditions, dissolved oxygen concentrations tend to drop. Sometimes concentrations may drop to very low levels and may go anoxic at night or after a large algal die-off. With temperature stratification, lower depths of the reservoir can have lower dissolved oxygen concentrations, particularly during summer months (UDWQ 2011a). In addition to temperature, algae can affect the dissolved oxygen levels. The state has noted cyanobacteria present at the reservoir and State Parks staff has confirmed observation of algal blooms at Red Fleet Reservoir, often in September (M. Murray 2011, pers. comm.).

Nutrient levels are not presently considered a water quality problem for Red Fleet Reservoir, though measurements at depth have exceeded the state numerical criteria for phosphorus (0.025 milligrams per liter). Formations containing phosphorus are part of the regional geology and there is a phosphorous mine located upstream of Red Fleet Reservoir. There are no wastewater treatment plants discharging to either Big Brush Creek or Red Fleet Reservoir that could potentially create elevated levels of nutrients. Grazing on adjacent lands can also be a source of pollutants and State Parks makes efforts to maintain boundary fencing to keep cattle away from the reservoir (M. Murray 2011, pers. comm.).

Nonpoint sources that most directly affect the reservoir are associated with stormwater runoff from paved surfaces at the State Park facilities. Stormwater from parking areas will transport debris and pollutants that have deposited on the paved surface including oils and grease, nutrients, trash, and pet waste. In addition, stormwater can cause erosion and rilling off of the paved areas, which would transport sediment to the reservoir. Notably, this reservoir is bowl-shaped with high bedrock cliffs in many locations. There are few areas with riparian buffers and the lack of vegetated buffer allows stormwater to enter the reservoir directly. However, sediment does not present a water quality concern at the present time.

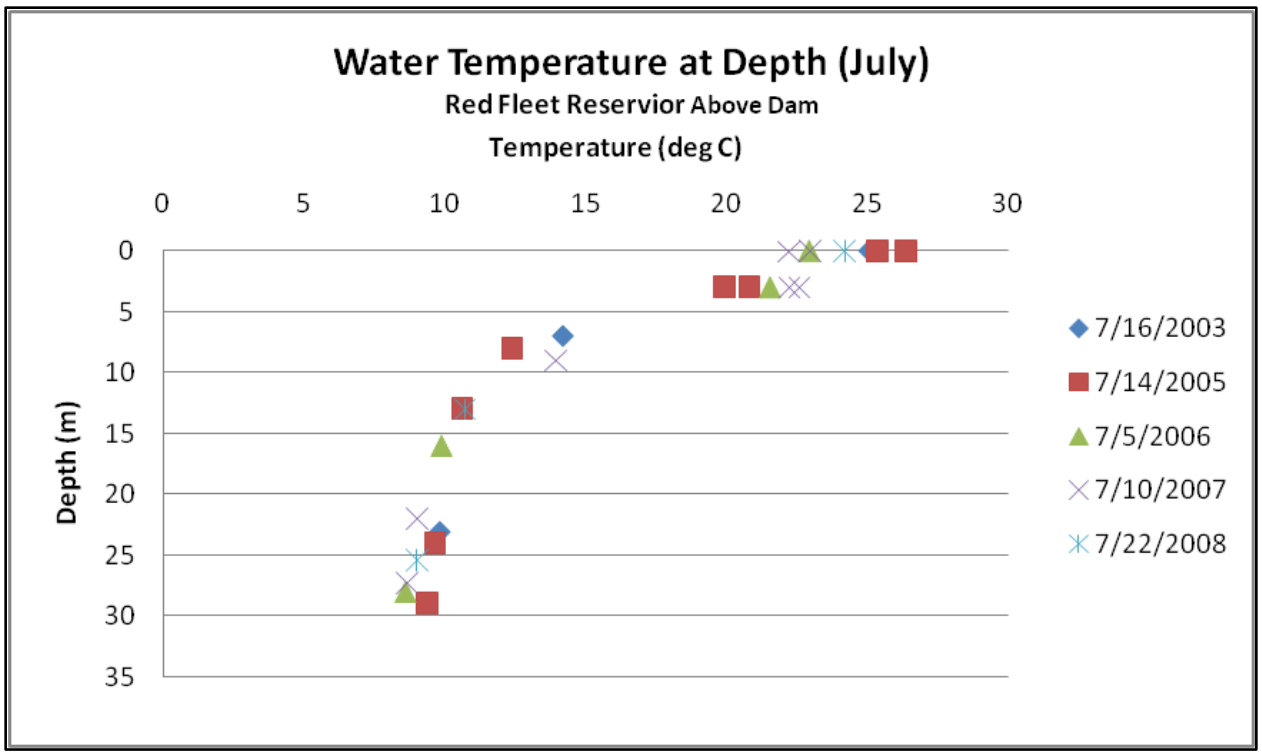

Figure 3-9. July Water Temperatures at Indicated Depths at STORET Station 5937650 (USEPA 2011).

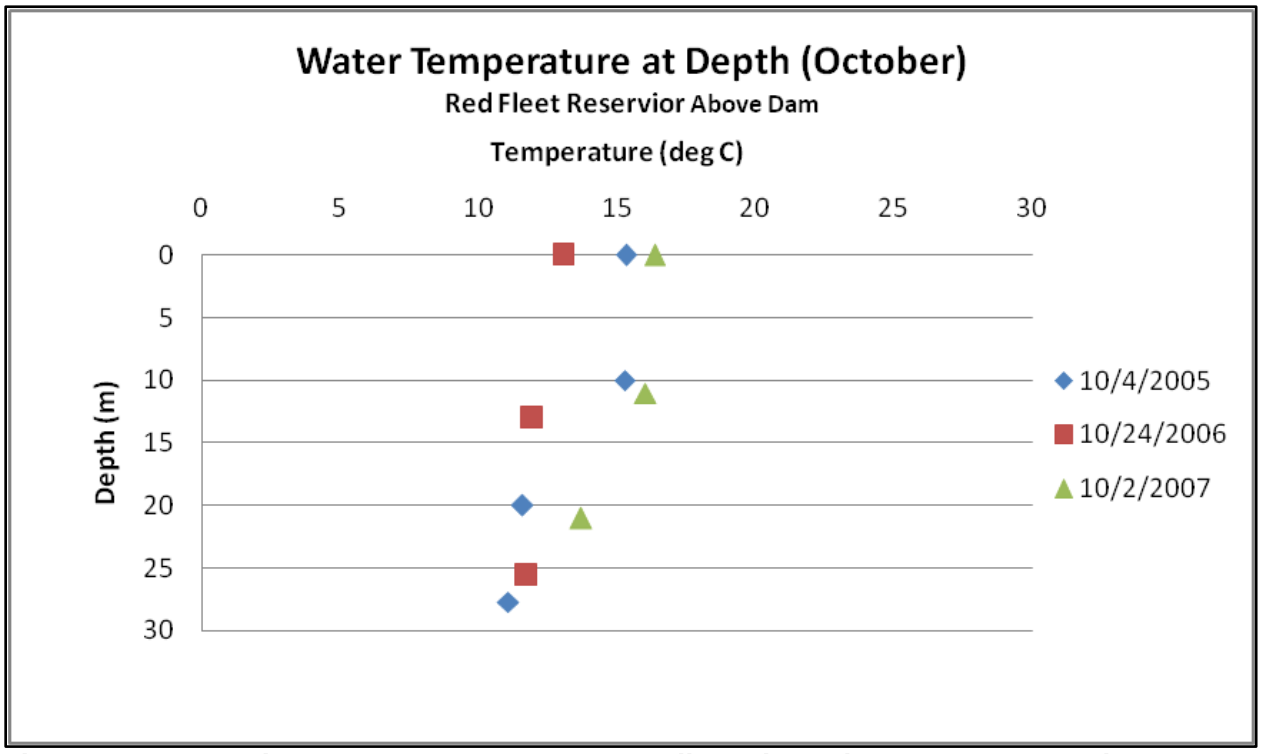

Figure 3-10. October Water Temperatures at Indicated Depths at STORET Station 5937650 (USEPA 2011).

Other water quality health concerns at reservoirs can include bacteria, viruses, and heavy metals. Bacteria (e.g., *E. Coli* and cryptosporidium) and viruses have not been found at Red Fleet Reservoir. Recreational use and pet waste are likely the largest potential sources for introduction of bacteria and viruses. With respect to metals, the State of Utah has issued consumption advisories for large and small walleye and largemouth bass caught from Red Fleet Reservoir (UDWQ 2010). These advisories are indicative of mercury occurring in the water column; however, the current levels do not impair water quality.

Recreation and Visual Resources

Recreation activities within the Study Area are managed by State Parks for outdoor public recreation purposes. Access to the Study Area is provided by Red Fleet Access Road, a road maintained by Uintah County, off of US-191 and approximately 12.2 miles north of downtown Vernal. Sources of information used to develop this assessment of existing recreation and visual resources included State Parks reports, tourism websites, Reclamation reports and technical guidance documents, BLM's visual resource management system, consultation with agency personnel, and field observations made in fall 2011 and summer 2012.

Recreation Opportunities and Facilities

The dominant recreational opportunities and attractions at Red Fleet Reservoir are water-based activities including fishing, swimming, waterskiing, pleasure boating, and personal watercraft use. Camping, picnicking, hiking, sightseeing, and sunbathing are also enjoyed in conjunction with water-based activities. Undeveloped beaches at Red Fleet Reservoir are only accessible via hiking or boating. Motorized and nonmotorized trails are located nearby. The reservoir provides year-round recreation opportunities; ice fishing continues through winter. The proximity of Red Fleet Reservoir to a National Scenic Byway (US-191), another state park (Steinaker State Park), and another reservoir (Steinaker Reservoir) creates a confluence of recreational opportunities near the Study Area.

By regulation 43 CFR § 420.2, Reclamation lands are closed to off-highway vehicle (OHV) use, except where specifically designated as open and in accordance with a public process specified in §420.21. By state regulation (R651-411-2), OHV use is allowed only within designated areas at State Parks. At present, Reclamation has not designated any areas, roads, or trails as open to OHV use at Red Fleet Reservoir.

The Study Area has been divided into nine management areas which are shown in Figure 1-3. Recreation facilities within each management area are described below.

State Park Area

Access to the State Park Area is provided by Red Fleet Access Road, a paved county road, approximately 1.9 miles from the US-191 intersection. The developed campground sits on a bluff overlooking Red Fleet Reservoir and offers 38 campsites including 5 full hookups for recreational vehicles (RVs), 9 tent-only sites, and 24 standard campsites. Because of the limited number of full hookup sites, some visitors use generators. The use of generators is restricted between the hours of 10:00 p.m. and 6:00 a.m. All sites are back-in and accommodate tents and RVs up to 30 feet long. The Study Area does not offer a group camping area. There are 37 day-

use picnic sites and flush toilets at the day-use area and 1 vault toilet at the boat ramp. The reservoir can accommodate a maximum of 40 boats based on available parking. Entrance fees are as follows: $7 for day use including watercraft launches, $4 for day use for Utah seniors 62 years and older, $75 for an annual pass, and $35 for a Senior Adventure (annual) Pass. The Study Area is open year-round with no holiday closures. Summer hours are from 6:00 a.m. to 10:00 p.m. Winter hours are from 8:00 a.m. to 5:00 p.m. (State Parks 2012a, Utah.com 2012).

Inflow Area

This is an undeveloped area surrounding the reservoir inflow. Public access is available from unimproved roads off of US-191 and by boat. These unimproved roads that are outside the Reclamation boundary are used by anglers to access Big Brush Creek for fishing.

Dinosaur Trackway Area

This is an undeveloped area that includes a dinosaur tracks exhibit across the water from the boat ramp at the State Park Area. Public access is provided by a hiking trail that begins on BLM lands north of Red Fleet Reservoir. The trailhead is maintained by BLM. Public access is also possible by boat or by swimming. No fees are required.

North Beach Area

This area includes a beach area along the southeast portion of a small bay. The beach area is accessible by walking a short distance from a closed gate at the Reclamation property boundary. There are also two user-created, unimproved roads into the northwestern side of the small bay. There are no developed facilities and no fees are required.

South Beach Area

This area includes a small cove that is accessible by boat. There is also a County road providing access to the area from the west; however, this road is not currently open to public access. There are no developed facilities and fees are not required.

South Side Area

There are no developed facilities in the South Side Area. Public access is available from unpaved county roads, administrative access roads, and several user-created, unimproved roads. No fees are required.

East Side Area

There is an undeveloped reservoir overlook on the East Side Area above Red Fleet Dam. Walk-in access to the reservoir shoreline is also possible. There are no developed facilities and no fees are required.

Primary Jurisdiction Area

This area includes Red Fleet Dam and lands surrounding the Tyzack Pumping Plant and Tyzack Aqueduct. For the protection of public health, safety, and welfare, public access to this area and recreational uses (including trail use) are not permitted unless approved by Reclamation and the UWCD. These areas are used primarily by anglers who fish from the dam or shoreline. Public access to the dam area is limited to foot traffic or from boats along the shoreline. Public access to the Tyzack Aqueduct shoreline is possible from an administrative access road (gated) or from other user-created, unimproved roads. No fees apply to this area.

Reservoir Inundation Area

This area includes the reservoir water surface at full pool. Developed public facilities include the movable floating boat dock and a movable floating swimming dock near the existing boat ramp. No fees apply to this area.

Flaming Gorge-Uintas National Scenic Byway

The proximity of Red Fleet Reservoir to a National Scenic Byway, another state park (Steinaker State Park), and another reservoir (Steinaker Reservoir) creates a confluence of recreational opportunities near the Study Area. Red Fleet Reservoir is just off the southern portion of the Flaming Gorge-Uintas National Scenic Byway. The scenic byway consists of portions of US-191 and State Route 44 (SR-44), and is approximately 80 miles long. The south end of the scenic byway starts in Vernal, Utah, at the intersection of U.S. Route 40 (US-40) and US-191. It runs north on US-191, enters Ashley National Forest, passes Steinaker Reservoir and Red Fleet Reservoir, climbs into the Uinta Mountains, and leaves Utah to enter Wyoming after crossing Flaming Gorge Reservoir. This scenic byway was designated as Utah's first Forest Service Scenic Byway in 1988. It was added to the National Scenic Byways system on June 9, 1998.

There are informational signs along the byway explaining the geology of the area. Visitors can use turn-outs, view areas, and nature trails to view and explore the high desert and forested landscape. There is a visitor center near the junction of US-191 and SR-44 at Red Canyon Overlook, which provides vistas of Flaming Gorge. Flaming Gorge-Uintas National Scenic Byway is listed on the "Fall Colors Tour" at Utah.com (FGCOC 2012, Utah.com 2012).

Visitation and Visitor Characteristics

According to visitation information collected from State Parks, the majority of visitations to Red Fleet Reservoir occur from May to September. These figures also indicate that the months of June and July are typically peak months for visitation during the year. Further evaluation of these figures also indicates that visitation levels have been sporadic over a 9-year period. At this time, accurate visitation rates are available for 2003 through 2011. A summary of visitation rates for these years is contained in Table 3-3.

Table 3-3. Summary of Annual Visitation at Red Fleet Reservoir from 2003 to 2010.

YEAR	NUMBER OF VISITORS	PERCENT (%) CHANGE PER YEAR
2003	33,162	Not applicable.
2004	27,550	-16.92
2005	23,959	-13.05
2006	30,818	28.63
2007	38,274	24.19
2008	39,210	2.45
2009	37,222	-5.07
2010	28,617	-23.12
2011	31,822	11.20

Source: State Parks (2012b).

Recreation Conflicts and Concerns

Observations by State Parks personnel suggest that recreation improvements and added capacity at Red Fleet Reservoir could increase visitation and revenue throughout the year (M. Murray 2011, pers. comm.). The existing Developed Day Use Area at Red Fleet Reservoir is underutilized, which may be due to lack of parking on peak days. Underutilization may also result from the layout of the area—the campground and day use areas are closely spaced, creating conflicts among visitors, particularly related to noise and crowding. Visitors have expressed desires for ATV trail access from the State Park, a new beach area, and better access to the reservoir shoreline for fishing.

Water and Land Recreation Opportunity Spectrum Analysis (WALROS)

An analysis and classification of the recreation opportunities that currently exist within the Study Area is included in this section. The analysis was conducted using the Water and Land Recreation Opportunity Spectrum (WALROS) system developed by Reclamation (Reclamation 2011c). The WALROS is modeled after the Recreation Opportunity Spectrum (ROS) and Water Recreation Opportunity Spectrum (WROS) systems, but is updated and tailored for use on land and water resources such as reservoirs, lakes, rivers, and bays.

The WALROS system is a means by which the water and land related recreation opportunities of an area can be inventoried and mapped by classes. This is accomplished by analyzing the physical, social, and managerial setting components for each use area (Reclamation 2011c). The WALROS system characterizes the type of experience a visitor could expect when visiting a particular area. The scale of degree of major development for the six major classifications, shown in Table 3-4, range from fully developed (Urban) to completely undeveloped (Primitive). The WALROS classifications serve as the basis from which to compare future WALROS levels associated with various land and water resource use strategies.

Table 3-4. Scale of Degree of Major Development Used in WALROS Classifications.

URBAN (U)	SUBURBAN (SU)	RURAL DEVELOPED (RD)	RURAL NATURAL (RN)	SEMI PRIMITIVE (SP)	PRIMITIVE (P)
80–100%	50–80%	20–50%	10–20%	3–10%	0–3%
Dominant	Very prevalent	Prevalent	Occasional	Minor	Very minor
Extensive	Widespread	Common	Infrequent	Little	Very little
A great deal	Very obvious	Apparent	Periodic	Seldom	Rare
Extremely	Very	Moderately	Somewhat	Slightly	Not at all

Source: Reclamation (2011c).

The six major recreation opportunity classes were mapped and inventoried using protocols from Reclamation's handbook (Reclamation 2011c) and expert opinion. The recreation attributes that differentiate the WALROS classes are described in Table 3-5. Three attributes of the recreation setting are assessed—physical setting, managerial setting, and social setting. Using these attributes, a rating from 1 (Urban) to 11 (Primitive) is given to inventoried sites.

Table 3-5. Setting Descriptors by Attribute Categories Used in WALROS.

PHYSICAL ATTRIBUTES	SOCIAL ATTRIBUTES	MANAGERIAL ATTRIBUTES
• Degree of development • Sense of closeness to a community • Degree of natural resource modification • Distance to development on or adjacent to a water resource • Degree that natural ambiance dominates the area	• Degree of visitor presence • Degree of visitor concentration • Degree of recreation diversity • Distance to visitor services, security, safety, comforts, and conveniences • Degree of solitude and remoteness • Degree of non-recreational activity	• Degree of management structures • Distance to on-site developed recreation facilities and services • Distance from developed public access facilities • Frequency of seeing management personnel

Source: Reclamation (2011c).

A WALROS analysis showing the current recreation opportunities was developed for the nine management areas defined for Red Fleet Reservoir, which are illustrated in Figure 1-3. The results are presented in Table 3-6 and are illustrated on Figure 3-11. The inventory was conducted during fall 2011 by the Project Team. Each management area was treated as an inventory site. The physical, social, and managerial attributes were noted on a WALROS inventory protocol sheet. Project Team members circled the degree extent or magnitude that each attribute was rated and the results were compiled for each management area. Then a map was created showing the WALROS class in each management area.

Table 3-6. Setting Attribute Ratings and Overall WALROS Classification for Each Red Fleet Reservoir Management Area.[a]

MANAGEMENT AREA (INVENTORY SITE)	PHYSICAL SETTING ATTRIBUTE RATING	SOCIAL SETTING ATTRIBUTE RATING	MANAGEMENT SETTING ATTRIBUTE RATING	OVERALL WALROS CLASSIFICATION
Inflow Area	SP8	RN8	RN7	RN8
State Park Area	RD5	RD4	S4	RD4
South Beach Area	RN8	RN8	RN8	RN8
South Side Area	RN8	RN8	RN8	RN8
Primary Jurisdiction Area	RD5	RD5	RD5	RD5
East Side Area	SP8	SP8	SP8	SP8
North Beach Area	RN9	RN8	RN8	RN8
Dinosaur Trackway Area	RN8	RN7	RN7	RN7
Reservoir Inundation Area	RN6	RN6	RN6	RN6

[a] See Table 3-4 for abbreviation descriptions.

Visual Resources

Visual resources include the visible physical features on a landscape, such as land, water, vegetation, animals, structures, and other features. A viewshed is the landscape that can be directly seen under favorable atmospheric conditions from a specific viewpoint or along a transportation corridor (BLM 1984). For the purposes of this RMP project, the Study Area falls under one viewshed.

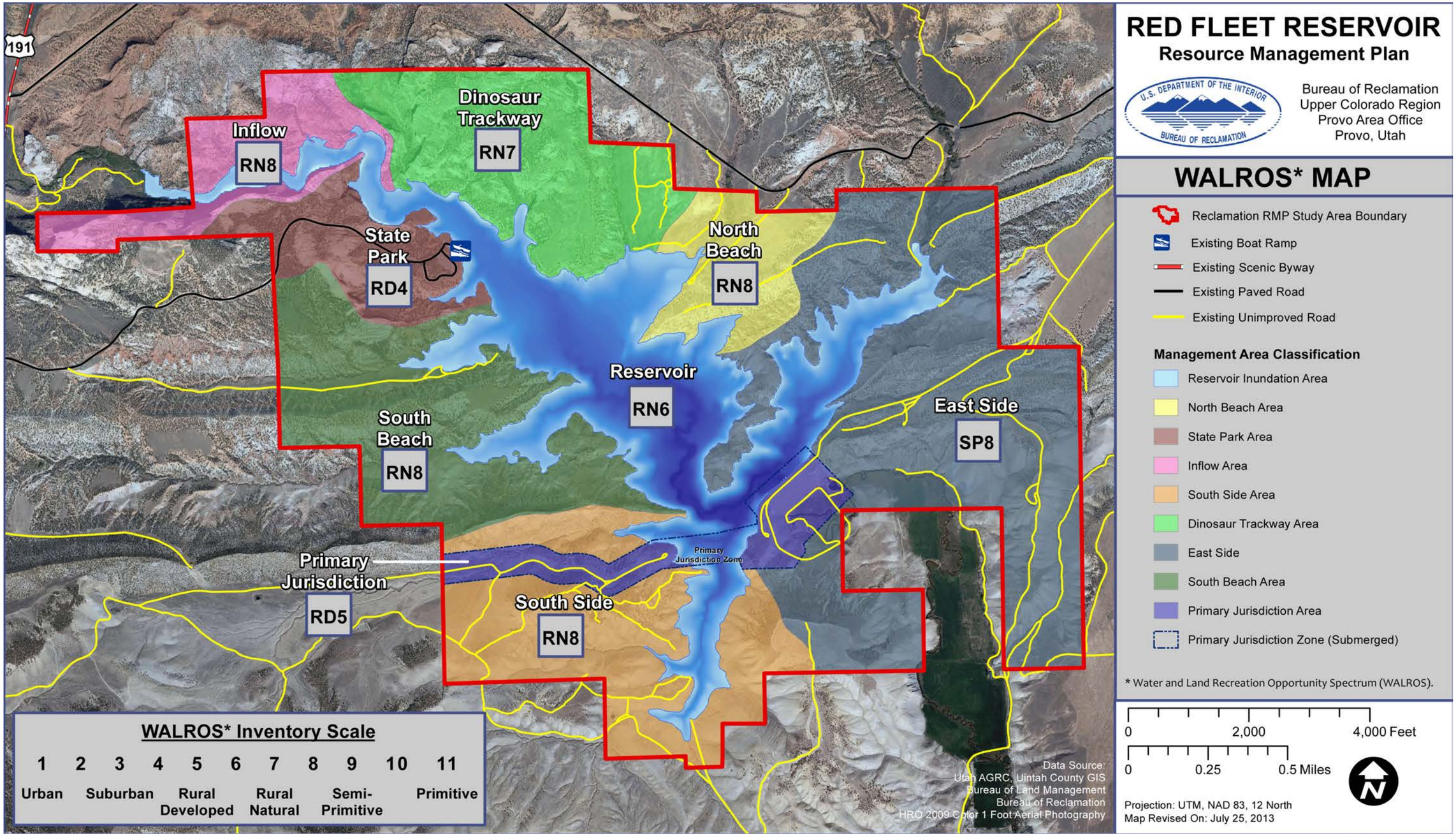

Figure 3-11. Red Fleet Reservoir Resource Management Plan (RMP) Study Area WALROS Map.

The BLM Visual Resource Management (VRM) system (BLM 1986) was used as the technical approach to assess and classify the existing visual setting that may be experienced by visitors to Red Fleet Reservoir. The VRM system is designed to inventory existing scenic values and provide baseline visual conditions for assigning visual resource management objectives to lands under BLM agency management. The primary objective of the VRM is to maintain the existing visual quality of BLM-administered public lands and to protect unique and fragile visual resources. In short, the VRM system identifies visual values, establishes objectives for managing those values, and provides a means to evaluate proposed projects to ensure that visual resource management objectives are met. The BLM VRM system was used because of the existence of BLM lands surrounding the Study Area and because it is best suited for this type of characteristic landscape within the Study Area.

There are two phases of work involved in the VRM assessment process: (1) Visual Resource Inventory (VRI) and (2) analysis of the Visual Resource Contrast Rating.

For the VRI, three factors are considered: scenic quality rating, sensitivity level, and distance zones. From the inventory process, landscape units are assigned one of four visual resource inventory classes as described in the BLM Handbook H-8431-1 (BLM 1986).

For the Visual Resource Contrast Rating analysis, potential visual impacts from the project RMP alternatives are analyzed to determine whether proposed activities would meet the management objectives established for the Study Area from the VRI. A visual contrast rating process is used in the analysis, which involves comparing the proposed project features with the major features in the existing landscape using the basic design elements of form, line, color, and texture. The analysis is then used as a guide for resolving visual impacts. Potential visual impacts, including the Visual Resource Contrast Rating analysis, are discussed in Chapter 4: Environmental Consequences.

The first step in the VRM inventory for the Study Area involved identifying the existing BLM visual classes on surrounding BLM lands. The BLM has classified lands under their jurisdiction immediately adjacent to and in the vicinity of Red Fleet Reservoir in their RMP. The BLM's Vernal Field Office RMP was completed in October 2008. The BLM lands to the west and north of the Study Area have been designated as Class II while BLM lands immediately to the east and south have been designated as Class III and Class IV, respectively (BLM 2008).

The VRI phase for the Study Area followed the VRM process, which has four steps. These steps are (1) establishing scenic quality rating, (2) performing sensitivity level analysis, (3) delineating distance zones, and (4) determining visual resource classes by overlay methods. Data collected included USGS quadrangle maps, GoogleEarth maps, aerial photographs, surface photographs, Study Area maps, and maps of existing BLM lands and visual resource classes. These data were used to analyze vegetation types, land uses, and landscape character. Fieldwork consisted of driving and walking designated travel routes and visiting recreation destinations within the Study Area.

The following Red Fleet Reservoir VRI analysis provides a description and classification of the Study Area's visual landscape character associated with the natural and cultural lines, forms, colors, and textures that are reflected in land, rock, vegetation, and water forms.

Regional Setting and Landscape Character

The Study Area is located in the Uinta Basin physiographic section of the larger Colorado Plateaus province. Uinta Basin is rimmed by the Wasatch Mountains on the west, the Uinta Mountains on the north, Roan Plateau on the south, and runs east into western Colorado. The region is characterized by high mountain terrain, fertile valleys and rugged and stark uninhabited canyon lands.

The landscape character surrounding the Study Area exhibits a range of natural and developed landscapes. U.S. Highway 191 crosses Big Brush Creek just west of the Study Area as it climbs out of Steinaker Draw. The Buckskin Hills to the south are dry and dusty and top out close to 7,000 feet elevation. Ashley Valley farther to the south includes the city of Vernal, the surrounding small towns, and agricultural land.

Vegetation types outside of developed areas are typically upland vegetation communities where the exposed rock dominates the landscape with scattered trees, shrubs, and sparse grasses. There are riparian-wetland vegetation communities with larger trees that are found on the reservoir's fringe and along tributary streams.

Scenic Quality Rating

Scenic quality is the overall impression retained by the observer after driving through, walking through, or flying over an area of land (BLM 1986). It is a measure of the visual appeal of a tract of land where those with the most variety and the most harmonious composition have the greatest scenic value. Rating scenic quality requires an understanding of the landscape characteristics and a description of the existing scenic values. A landscape is first divided into subunits called scenic quality rating units (SQRU) that appear homogeneous in terms of landscape characteristics, similar visual patterns, and similar man-made modifications. The size of the SQRUs may vary from several thousand acres to 100 acres or less, depending on the homogeneity of the landscape features and the detail desired in the inventory. For this inventory, the Study Area was assumed to be a single SQRU, as it appears to be a similar homogeneous landscape type from key observation points and along the dominant paths of travel.

The SQRUs are rated by seven key factors: landform, vegetation, water, color, influence of adjacent scenery, scarcity, and cultural modification. Using a standardized point system, values for each category are calculated and, according to total points, three Scenic Quality Classes are determined. Class A areas combine the most outstanding characteristics, Class B areas combine both outstanding features and fairly common features, and Class C areas have features fairly common to the physiographic region (BLM 1986).

The Study Area SQRU landscape character features are dominated by panoramic views of water framed by surrounding hills. The landscape forms include the wide, flat, horizontal plane of the water surface with rounded and amorphous hills and ridges rising above. The characteristic lines include the horizontal lines of the water's edge meeting the angular land forms and continuing to the rounded outlines of silhouetted hills. The shoreline is geomorphic with convex slopes

contrasting with the vertical cliffs along part of the shoreline. Landscape colors include blues and grays of the water as well as grays, reds, and browns of the exposed rock and earth, and the vegetation colors of light and dark greens. The landscape texture is dominated by the contrast of the smooth water surface and the medium-course texture of the patchy vegetation growing on the surrounding hillsides. Exposed rock dominates the ridgelines and slopes along the northwest portion of the Study Area with scattered trees, shrubs, and a sparse herbaceous layer. The exposed red and white bedrock colors and textures provide a contrast with the surrounding shrublands and semi-desert grassland. Based on these characteristics, the Study Area was judged to be rated with a scenic quality score of 22, which makes it a Class A classification.

Sensitivity Level

Sensitivity levels are a measure of public concern for scenic quality, where lands are assigned high, medium, or low sensitivity levels by analyzing various indicators of public concern (BLM 1986). These include interest in and public concern for a particular area's visual resources, an area's degree of public visibility, the level of use of an area by the public, and the type of visitor use that an area receives (BLM 1984). The sensitivity of viewers in the Study Area's viewshed is determined based on viewing duration, use volumes, and aesthetic concerns. Sensitive viewing areas typically include residences, common travel routes, recreational areas, and special areas.

The sensitivity level for users visiting Red Fleet State Park was determined to be medium based on the following findings: (1) the reservoir is a regional recreational destination, (2) there are expectations that the Study Area will retain the characteristics of the surrounding viewshed, (3) the geology and biology of the Study Area are of local interest (not of national significance), (4) access to the Study Area via US-191 is a primary travel route and national scenic byway, and (5) the man-made reservoir was constructed to supply downstream water to farmers for crop irrigation purposes.

Distance Zones

The visual quality of a landscape may be magnified or diminished by the visibility of the landscape from sensitive viewpoints. As such, distance plays a key part in VRM where visible details in the landscape or the scale of objects being observed depend on the proximity of the viewer. Because areas that are closer have a greater effect on the observer, they require more attention than do areas that are farther away. Distance zones allow this consideration of the proximity of the observer to the landscape (BLM 1980).

There are three distance zones described in the VRM process: foreground-middleground, background, and seldom seen. These distance zones are based on the relative visibility from key observation points and primary travel routes. The foreground-middleground zone includes areas seen from highways, water routes, or other view locations less than 3 to 5 miles away. Areas seen beyond the foreground-middleground zone but are less than 15 miles away are considered background. Areas that are not seen as either foreground-middleground or background are in the seldom-seen zone. For the Study Area, the foreground-middleground distance zone encompasses all Reclamation lands from key observation points and primary travel routes.

Visual Resource Class

By combining the results of the scenic quality rating, sensitivity level, and distance zones, the Study Area was determined to be Class II. The objective of Class II, as described in the BLM Visual Resource Inventory Handbook (BLM 1986), is as follows:

> The objective of [Class II] is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Natural and Cultural Resources

This section provides detailed descriptions of existing conditions for Study Area resources including geology, soils, vegetation, wildlife, fisheries, special-status species, cultural, paleontological, and extractive resources. The Study Area was also inventoried for possible Indian Trust Assets (ITAs), to determine consistency with DOI and Reclamation policies for fulfilling ITA obligations, and for any environmental hazard conditions.

Geology

Sources of information used to develop this assessment of geologic conditions included published literature, USGS reports, and field observations made in October 2011. The Study Area is located northeast of Vernal on the southern flank of the Uinta Mountains in northeastern Utah. The Uinta Mountains are an east-west trending, 150-mile-long mountain range consisting of Precambrian- to Quaternary-aged rocks formed during a period of Cretaceous uplift (USGS 1975). Sedimentary rock strata in and around the Study Area dip steeply to the south exposing several Mesozoic formations (Kinney 1955).

The geology of the Study Area is dominated by Mesozoic sedimentary rocks ranging in age from upper Triassic to upper Cretaceous. These formations consist of sandstones, shales, siltstones, mudstones, and limestones (Sprinkel 2006). Some Quaternary alluvial, colluvial, and eolian deposits of mud, silt, sand, and gravel are present in the Study Area (Sprinkel 2006). The Quaternary deposits are Holocene to Pleistocene in age. A small deposit of the Paleozoic-aged Weber Sandstone is also located within the Study Area. Figure 3-12 depicts the Study Area geology.

As mapped by Sprinkel (2006), Red Fleet Reservoir is primarily surrounded by Mesozoic sedimentary deposits, except on the northeast corner of the Red Fleet Reservoir, where surficial deposits of Quaternary alluvium and eolian deposits (Qae) occur. These deposits are composed of alluvial mud, silt, and sand mixed with windblown sand and silt. Quaternary alluvium deposits (Qal) occur along Brush Creek below Red Fleet Dam on the southwestern portion of the Study Area. These deposits are composed of alluvial silt, sand, and gravel. Quaternary piedmont alluvium deposits occur on the southwestern portion of the Study Area. These deposits are composed of alluvial sand, gravel, cobbles and boulders. A small deposit of Quaternary alluvium and colluvium deposits (Qac) is located along the western shoreline of Red Fleet Reservoir. This deposit consists of mud, silt, sand, and gravel. A small deposit of the lower Permian- to

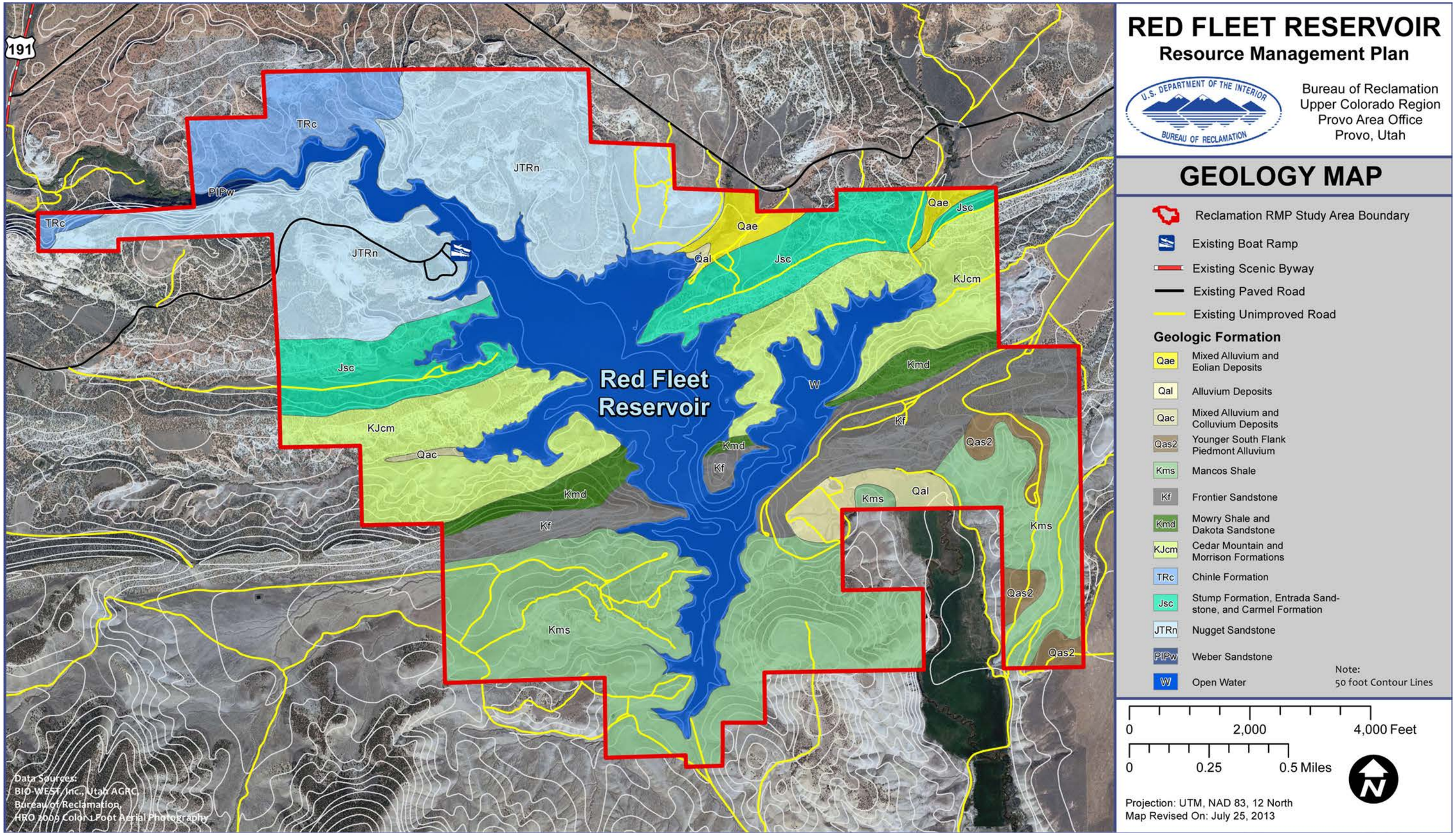

Figure 3-12. Red Fleet Reservoir Resource Management Plan (RMP) Study Area Geology Map.

middle-Pennsylvanian-aged Weber Sandstone (PIPw) is present in the northwest portion of the Study Area, where Brush Creek enters Red Fleet Reservoir.

Mesozoic rock formations present in the Study Area include the upper-Cretaceous-aged Mancos Shale (Kms); the upper-Cretaceous-aged Frontier Sandstone (Kf); the upper- to lower-Cretaceous-aged Mowry Shale and Dakota Sandstone (Kmd); the lower-Cretaceous- to upper-Jurassic-aged Cedar Mountain and Morrison Formations (Kjcm), which are composed primarily of shale, mudstone, claystone, and siltstone; the upper- to middle-Jurassic-aged Stump, Entrada, and Carmel Formations (Jsc), which are composed primarily of shale, siltstone, sandstone, and limestone; the lower-Jurassic- to upper-Triassic-aged Nugget Sandstone (JTRn); and the upper-Triassic-aged Chinle Formation, which is composed primarily of siltstone, sandstone, claystone, shale, and conglomerate (Sprinkel 2006).

Geologic mapping shows no faults or folds located in the Study Area vicinity (Sprinkel 2006). A member of the Red Fleet Reservoir RMP/EA Interdisciplinary Project Team (Project Team) observed a small, unmapped fault on the eastern shore of the reservoir. It is unlikely that this fault is active, given its limited extent. The geologic units that are important within the Study Area are listed below in Table 3-7, along with their associated age, map symbol, and a summarized description of the unit modified from Sprinkel (2006).

Seismic Activity

Most of the faults that exhibit surface displacement within the region are located approximately 12 miles west of the Study Area. All the faults in this area are normal and characterized by high-to-moderate dips. Most of these faults trend in a northwest-southeast direction (Sprinkel 2006). Seismic hazard mapping by the USGS (2011) has placed the Study Area within a zone that has a 2 percent probability of exceedance in 50 years of a 0.15 Peak Acceleration (%g) earthquake. A 0.15%g earthquake generally produces strong perceived shaking and light potential for damage (USGS 2006). Therefore, although the potential for seismic activity exists at the Study Area, there is a very low probability that seismic activity would produce significant damage.

Liquefaction

Seismic events would not trigger liquefaction in the Study Area because the geologic deposits found within the Study Area are composed of Mesozoic sedimentary rocks, which are non-liquefiable materials. Unconsolidated, surficial deposits are found in the Study Area. These deposits are relatively thin and small in scale. The unconsolidated deposits are underlain by the Mesozoic sedimentary rock units in the area. The presence of the sedimentary rocks eliminates the potential for liquefaction of these unconsolidated deposits.

Shoreline Erosion

Wave action from wind-generated and boat-generated waves, along with annual fluctuations in reservoir levels, contribute to shoreline erosion at Red Fleet Reservoir. The geomorphic areas most susceptible to erosion are points that protrude into the reservoir, convex shorelines, and steep shorelines. A significant factor in the degree of shoreline erosion is the shoreline's slope. The more gently sloping shorelines, which are generally protected from wave erosion by beaches, tend to erode much less than steeper shorelines. Erosion is more prevalent on softer geologic formations including: Quaternary deposits, Mancos Shale, Mowry Shale, Cedar Mountain Formation, Morrison Formation and the Stump Formation.

Table 3-7. Geologic Units Located within the Study Area.

MAP SYMBOL	DEPOSIT DESCRIPTION
	Quaternary Deposits
Qae	Mixed Alluvium and Eolian Deposits (Holocene): unconsolidated alluvial mud, silt, and sand mixed with well-sorted, fine-grained, windblown sand silt; less than 10 meters thick.
Qal	Flood-Plain Alluvium (Holocene): unconsolidated silt, sand, and gravel mostly along Green River; 1–30 meters thick.
Qac	Mixed Alluvium and Colluvium (Holocene to Pleistocene): unconsolidated, poorly to moderately sorted mud, silt, sand, and gravel along channels of Green River tributaries, smaller streams, and intermittent streams; on Mancos Shale, unit is mostly reworked mud; less than 10 meters thick.
Qas2	Younger South Flank Piedmont Alluvium (Upper Pleistocene): unconsolidated to moderately consolidated, poorly sorted sand, gravel, cobbles, and boulders; poorly developed soil profile and stage II-III pedogenic carbonate (caliche) coatings of clasts in upper 1 meter of deposit; mapped on south flank of Uinta Mountains from Island Park to Whiterocks Canyon and topographically higher than Qas1; less than 3 meters thick.
	Mesozoic Sedimentary Rocks
Kms	Mancos Shale (Upper Cretaceous): main body of the Mancos Shale; dark-gray, soft, slope-forming calcareous shale containing beds of siltstone and bentonitic clay; only mapped on south flank of Uinta Mountains; 1,400–1,700 meters thick.
Kf	Frontier Sandstone (Upper Cretaceous): upper part resistant, light-brown to light-gray and yellow, fine-grained and ripple- marked sandstone with local petrified wood and invertebrate fossils; lower part soft, light- to dark-gray calcareous shale; locally includes minor limestone (with bivalve coquina) and coal beds in the lower part, 36–85 meters thick.
Kmd	Mowry Shale and Dakota Sandstone (Upper and Lower Cretaceous): locally shown as one unit along south flank of Uinta Mountains because formations are too thin to show separately at map scale. Mowry Shale (Upper and Lower Cretaceous): dark-gray, siliceous shale that weathers silver gray, contains abundant fossil fish scales and disarticulated fish bones; 10–75 meters thick. Dakota Sandstone (Lower Cretaceous): upper and lower resistant, yellow and light-gray, medium- to coarse-grained sandstone beds separated by a carbonaceous shale; contains coal beds in exposures along south flank of Uinta Mountains, 15–76 meters thick.
KJcm	Cedar Mountain Formation and Morrison Formation (Lower Cretaceous and Upper Jurassic): Cedar Mountain is mapped with underlying Morrison Formation because it is generally thin and contact with underlying Morrison is difficult to map. Cedar Mountain Formation (Lower Cretaceous): purple, gray and greenish-gray mudstone, siltstone, minor sandstone and limestone; contains calcrete beds that weather out as carbonate nodules; 0–60 meters thick. Morrison Formation (Upper Jurassic): upper Brushy Basin Member consists of soft, banded, variegated (light-gray, olive-gray, red, and light-purple) shale, claystone, siltstone, and minor cross-bedded sandstone, conglomerate, and bentonite; lower, Salt Wash Member may not be present in the Flaming Gorge area; dinosaur remains are preserved in Salt Wash Member at dinosaur National Monument south of quadrangle; 90–287 meters thick.
Jsc	Stump Formation, Entrada Sandstone, and Carmel Formation (Upper and Middle Jurassic): locally shown as one unit where formations are too thin to show separately at map scale. Stump Formation (Upper Jurassic): upper Redwood Member is greenish-gray and light-green slope-forming shale with glauconitic, fossiliferous (belemnites and bivalves) sandstone and limestone; lower Curtis Member is resistant, light-gray to greenish-gray, cross-bedded, glauconitic sandstone; Curtis Member is thin or locally missing in this quadrangle because of erosion prior to deposition of Redwood Member along J-4 unconformity of Pipiringos and O'sullivan (1978); palynomorph assemblage from base of Curtis Member indicates an Oxfordian age; 40–82 meters thick. Entrada Sandstone (Middle Jurassic): upper part reddish-brown siltstone and fine-grained sandstone and lower part light-gray, pink, and light-brown sandstone; lower sandstone is resistant to erosion and forms cliffs and ridges; 30–75 meters thick. Carmel Formation (Middle Jurassic): medium- to dark-red, green, and gray sandy shale, sandstone, siltstone, limestone, and gypsum; upper part is mostly slope-forming red shale, siltstone, and sandstone underlain by a middle gypsiferous unit; lower part is mostly ledge-forming limestone, which is commonly oolitic and fossiliferous; may contain one or more biotite-rich ash layers; 30–144 meters thick.

Table 3-7. (Cont.)

MAP SYMBOL	DEPOSIT DESCRIPTION
	Mesozoic Sedimentary Rocks
JTRn	Nugget Sandstone (Lower Jurassic and Upper Triassic): pink, light-gray, and light-brown, resistant, massive-weathering, large-scale cross-bedded sandstone; locally contains carbonate lenses (playa) and fluvial lenses (wadi) near top; forms cliffs and ridges; vertebrate tracks of Jurassic age preserved in a fluvial lens near the top of the Nugget near Red Fleet Reservoir, and casts of vertebrate tracks of Late Triassic age are preserved on underside of base of Nugget south of quadrangle near Dinosaur National Monument; 200–315 meters thick.
Trc	Chinle Formation (Upper Triassic): purplish-red, purple, light-gray, greenish-gray, light-green, ripple marked siltstone, sandstone, claystone, shale, and conglomerate that locally contains abundant petrified wood; generally forms slopes; upper 26–36 meters is light-reddish-brown planar laminated sandstone, cross-bedded sandstone, siltstone, and variegated mudstone that is correlated with Bell Springs Members of Nugget Sandstone by Jensen and Kowallis (2005); base is resistant conglomerate unit named the Gartra Member; 40–140 meters thick.
	Paleozoic Sedimentary Rocks
PIPw	Weber Sandstone (Lower Permian to Middle Pennsylvanian): light-gray to yellowish-gray, very thick-bedded sandstone with interbeds of limestone in the lower part, highly cross-bedded sandstone in the upper part; forms steep cliffs and ridges; 186–472 meters thick.

The major process eroding and transporting shoreline sediments into Red Fleet Reservoir occurs primarily when the reservoir is at full pool, allowing waves to impinge against the steep portions of the shoreline. The waves undercut a notch in the steeper shorelines, resulting in shoreline collapse. When a large enough volume of material has been eroded, the collapsed debris eventually forms a beach that then protects the highest shoreline from wave energy. This process also adds small amounts of sediment to the reservoir. Shorelines are still adjusting to Red Fleet Reservoir's presence in areas with minor erosion. After the shoreline reaches a stable angle from beach formation, the hill behind the shoreline will also continue to erode to a more-stable angle. This process may take up to several decades.

Minor erosion occurs when Red Fleet Reservoir is at lower water levels, when waves contact the shoreline below the high-water level. This primarily mobilizes silt and clay into the water column near the shore. Areas with eroding shorelines shown by wave-cut cliffs are present primarily on the southern and eastern portions of the reservoir. In some locations, riprap has been placed to prevent further erosion. The riprap placed at and near the dam has been largely successful in stopping erosion.

Soils

According to the U.S. Department of Agriculture (USDA) web soil survey (USDA 2012), the Red Fleet Reservoir area consists of loam, loamy fine sand, loamy sand, clay loam, sandy loam, fine sandy loam, sandy clay loam, silty clay loam, sandy loam, very cobbly loam, very cobbly sandy loam, very cobbly sandy clay loam, clay, silty clay, fine sand, and weathered bedrock (USDA 2012). Silty clay loam, loamy fine sand, loam, and clay loam are the most prevalent soils in the Study Area. The majority of the northern portion of the Study Area is composed primarily of sandy loam, loamy fine sand, and sand. The majority of the middle portion of the Study Area is composed primarily of loam, clay loam, and clay. The majority of the southern portion of the Study Area is composed of silty clay loam and gravelly loam. The Mikim Loam,1–3 percent slope, Parodox Loam, and the Yarts Fine Sandy Loam are rated as "prime farmland if irrigated"

by the USDA (2012). These soil units comprise 6.58 percent of the Study Area. The remainder of the Study Area is rated as "not prime farmland". The names and characteristics of the various soils found within the Study Area are summarized in Table 3-8 and shown in Figure 3-13.

Table 3-8. Soil Types Located within the Study Area.

SOIL NAME	PERCENT OF STUDY AREA SOILS	SLOPE (PERCENT)	DEPTH TO BEDROCK IN CENTIMETERS	SHRINK-SWELL POTENTIAL (0.00–1.00)[a]	LIMITATIONS	
					BUILDING SITE DEVELOPMENT[b]	SEPTIC[c]
Arches-Mespun-Rock Outcrop Complex	17.46	4–40	23	0.00	Very Limited	Very Limited
Badland-Montwel Complex	10.01	50–90	>200	0.50-1.00	Very Limited	Very Limited
Badland-Rock Outcrop Complex	5.30	1–100	>200	0.00-1.00	Very Limited	Very Limited
Begay Sandy Loam	0.02	2–15	>200	0.00	Somewhat to Very Limited	Somewhat Limited
Bullpen-Mikim Complex	1.61	25–50	>200	0.00-0.50	Very Limited	Very Limited
Clapper Gravelly Loam	6.96	25–50	>200	0.00	Very Limited	Very Limited
Gerst Loam	12.46	4–40	>200	0.00	Very Limited	Very Limited
Gerst Rock Outcrop Complex	12.26	4–40	>200	0.00	Very Limited	Very Limited
Hanksville Silty Clay Loam	18.64	25–50	>200	1.00	Very Limited	Very Limited
Mikim Loam, 1-3% slope	0.37	1–3	>200	0.50	Somewhat Limited	Somewhat Limited
Mikim Loam, 3-15% Slope	1.87	3–15	>200	0.50	Somewhat Limited	Somewhat Limited
Paradox Loam	2.08	1–3	>200	0.00	Not Limited to Somewhat Limited	Somewhat Limited
Reepo Rock Outcrop Complex	3.20	4–25	76	0.00	Very Limited	Very Limited
Rock Outcrop	2.54	0–100	0	0.00	Not Rated	Not Rated
Shotnick-Walkup Complex	0.70	0–2	>200	0.00	Not Limited to Very Limited	Not Limited
Solirec Fine Sandy Loam	0.36	3–8	>200	0.00	Not Limited to Somewhat Limited	Somewhat Limited
Yarts Fine Sandy Loam	4.12	2–4	>200	0.00	Not Limited to Somewhat Limited	Not Limited

Source: NRCS Web Soil Survey (USDA 2012).
[a] 0.00–1.00 is a scale of the severity of shrink-swell limitations. 0.00 represents no limitation and 1.00 represents a severe limitation.
[b] Building Site Development = shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets.
[c] Septic = septic tank absorption fields.

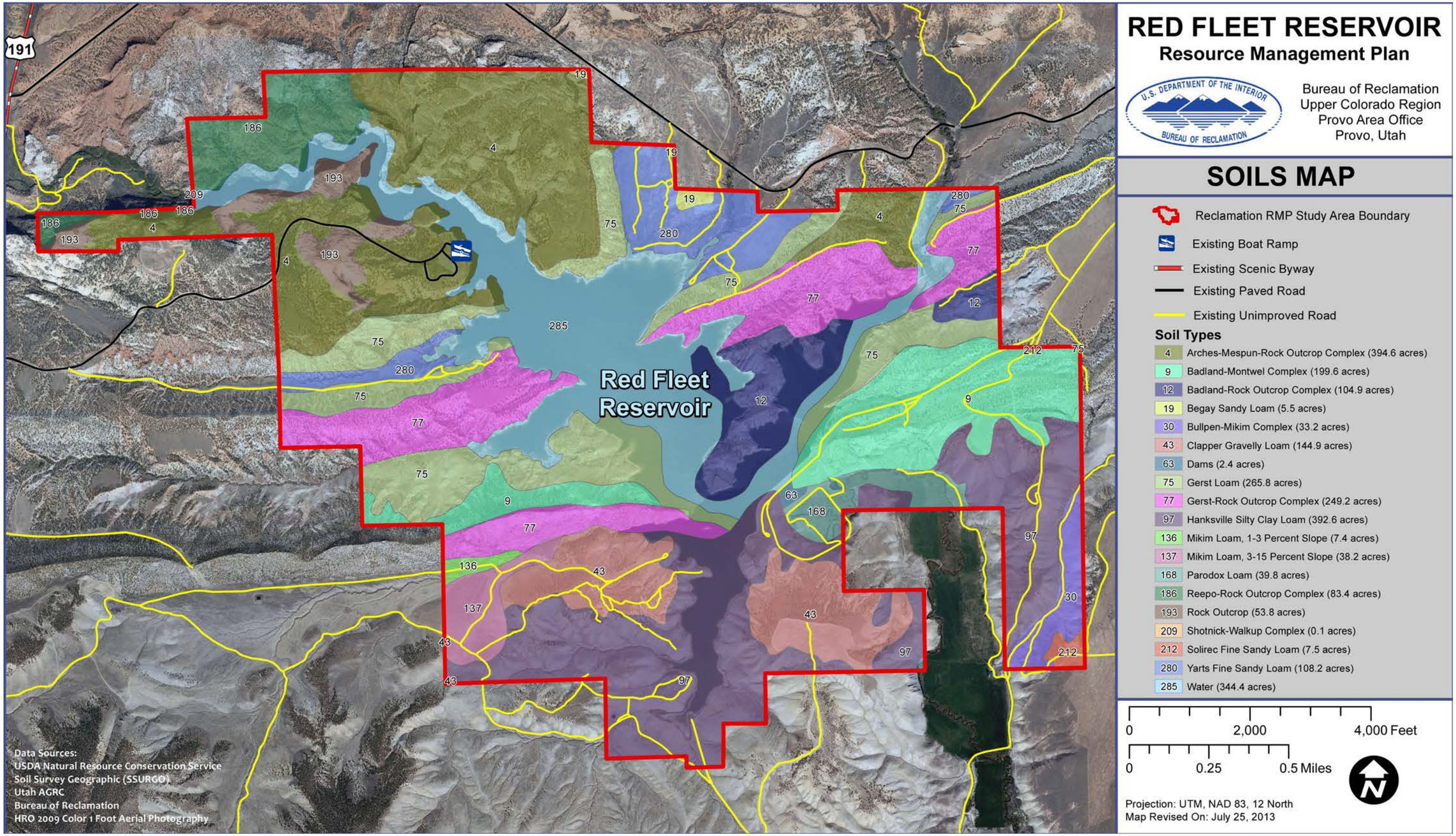

Figure 3-13. Red Fleet Reservoir Resource Management Plan (RMP) Study Area Soils Map.

Soil Erosion

Soils in the Study Area are moderately susceptible to wind erosion. The USDA classifies soils based upon their Wind Erodibility Group, which classifies soils that have similar susceptibility to wind erosion in cultivated areas (USDA 2012). The soil groups range from 1 to 8, with group 1 representing soils that are most susceptible to wind erosion and group 8 representing soils that are least susceptible to wind erosion. The Reepo-Rock Outcrop Complex is classified as group 1. The Arches-Mespun-Rock Outcrop Complex is classified as group 2. The Bullpen-Mikim Complex is classified as group 5. The Clapper Gravelly Loam is classified as group 6. The Rock Outcrop is classified as group 8. The remaining soils are classified as either group 3 or 4 (USDA 2012).

Soils in the Study Area are moderately susceptible to water erosion. The USDA rates soils based upon their susceptibility to sheet and rill erosion by water by assigning soil erosion factors. The erosion factor is based upon the percentages of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity. Erosion factor values range between 0.02 and 0.69. With all other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill water erosion (USDA 2012). Soils within the Study Area are rated 0.10–0.43. The erosion factors of the Badland-Montwell Complex, Badland-Rock Outcrop Complex, Begay Sandy Loam, Bullpen-Mikim Complex, and Clapper Gravelly Loam range between 0.10 and 0.20. The erosion factors of the remainder of the soils range between 0.24 and 0.43.

Characteristics and Limitations of Soil Resources

Characteristics of soils, such as slope, depth to bedrock, and shrink-swell potential, are shown in Table 3-8. Shrinking and swelling of some soils can damage building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned soil use will not tolerate large volume changes (USDA 2012). Similarly, if steep slopes are present or depth to parent rock is shallow, additional building limitations may exist.

The Study Area soils are also rated in Table 3-8 according to soil limitations affecting their suitability for building site development and septic development. Building site development refers to the degree of soil limitations affecting shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The degree of soil limitations that affect the construction of septic tank absorption fields is based on soil permeability, depth to seasonal high-water table, depth to bedrock, and the area's susceptibility to flooding. The degree of soil limitation is expressed as "not limited," "somewhat limited," or "very limited." "Not limited" indicates that the soil has features that are very favorable for building or septic development, and that good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for building or septic development, and that the limitations can be overcome or minimized by special planning, design, or installation. "Very limited" indicates that the soil has one or more features that are unfavorable for building or septic development, and that the limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures (USDA 2012). Generally, the soils within the Study Area are rated as either "somewhat limited" or "very limited."

Utilization of Soil Resources

The majority of the soils in the Study Area currently support vegetation favorable for wildlife habitat and recreational activities.

Vegetation

This section describes the vegetation communities found in the Study Area. Upland vegetation communities are discussed first, followed by riparian-wetland communities. Figure 3-14 illustrates the distribution and acreages of these various classes within the Study Area. Sources of information consulted to develop this assessment of existing conditions included published literature, the Southwest Regional Gap Analysis (Lowry et al. 2007), State of Utah and Uintah County-listed noxious weeds obtained from the Utah Department of Agriculture and Food (UDAF) (UDAF 2012), consultations with agency personnel, and field observations made in fall 2011.

Upland Vegetation Communities

Red Fleet Reservoir is located on the Colorado Plateau within the Semi-Arid Benchlands and Canyonlands ecoregion. It is near the boundary of both the Uinta Basin Slopes, and the Uinta Basin Floor ecoregions (Bailey et al. 1994). Ecoregion determination is based on geology, vegetation, climate, hydrology, land use, and other ecological and cultural factors (CECWG 1997). The Semi-Arid Benchlands and Canyonlands ecoregion represents benches and mesas from 1,524–2,286 meters in elevation dominated by grassland, shrubland and/or woodland vegetation communities. The benches are separated from remnant mesatops by low escarpmentsand narrow canyons. Exposed bedrock is abundant on steep slopes, canyons, and escarpments. Typical soils are entisols of fine sand. Common plant species include winterfat (*Krascheninnikovia lanata*), Mormon tea (*Ephedra* spp.), fourwing saltbush (*Atriplex canescens*), big sagebrush (*Artemisia tridentata*), pinyon pine (*Pinus edulis*), and Utah juniper (*Juniperus osteosperma*) (Woods et al. 2001).

Bedrock Canyon and Tableland Approximately 127 acres of the Study Area is classified as bedrock canyon and tableland. These features occur above the Brush Creek inflow down to the vicinity of the developed State Park Area and the Dinosaur Trackway Area. This classification corresponds to the Colorado Plateau Mixed Bedrock Canyon and Tableland class in the Southwest Regional Gap Analysis (Lowry et al. 2007). It is a temperate, xeric ecological system occurring on the Colorado Plateau, and is characterized by the sparsely vegetated to barren terrain of steep cliffs, narrow canyons and open rock. Scattered trees, shrubs and a sparse herbaceous layer account for less than 10 percent cover. Exposed rock is most often sandstone, shale or limestone. Associated plant species commonly include pinyon pine, ponderosa pine (*Pinus ponderosa*), juniper (*Juniperus* spp.), mountain mahogany (*Cercocarpus intricatus*), white fire (*Abies concolor*), fourwing saltbush, and Mormon tea. This system is similar to Intermountain Basins Cliff and Canyon but is more geographically restricted (Lowry et al. 2007).

Pinyon-Juniper Shrubland Pinyon-Juniper Shrubland is the largest and most dispersed vegetation class in the Study Area, accounting for approximately 1,061 acres. This community corresponds to Colorado Plateau Pinyon-Juniper Shrubland ecological system (Lowry et al. 2007), which occupies mesatops, foothills, and slopes at elevations ranging from about 4,000 to 6,500 feet. This system extends upslope transitioning to Colorado Plateau Pinyon-Juniper Woodland. These two systems are similar but differ in elevation range, moisture and shrub/tree

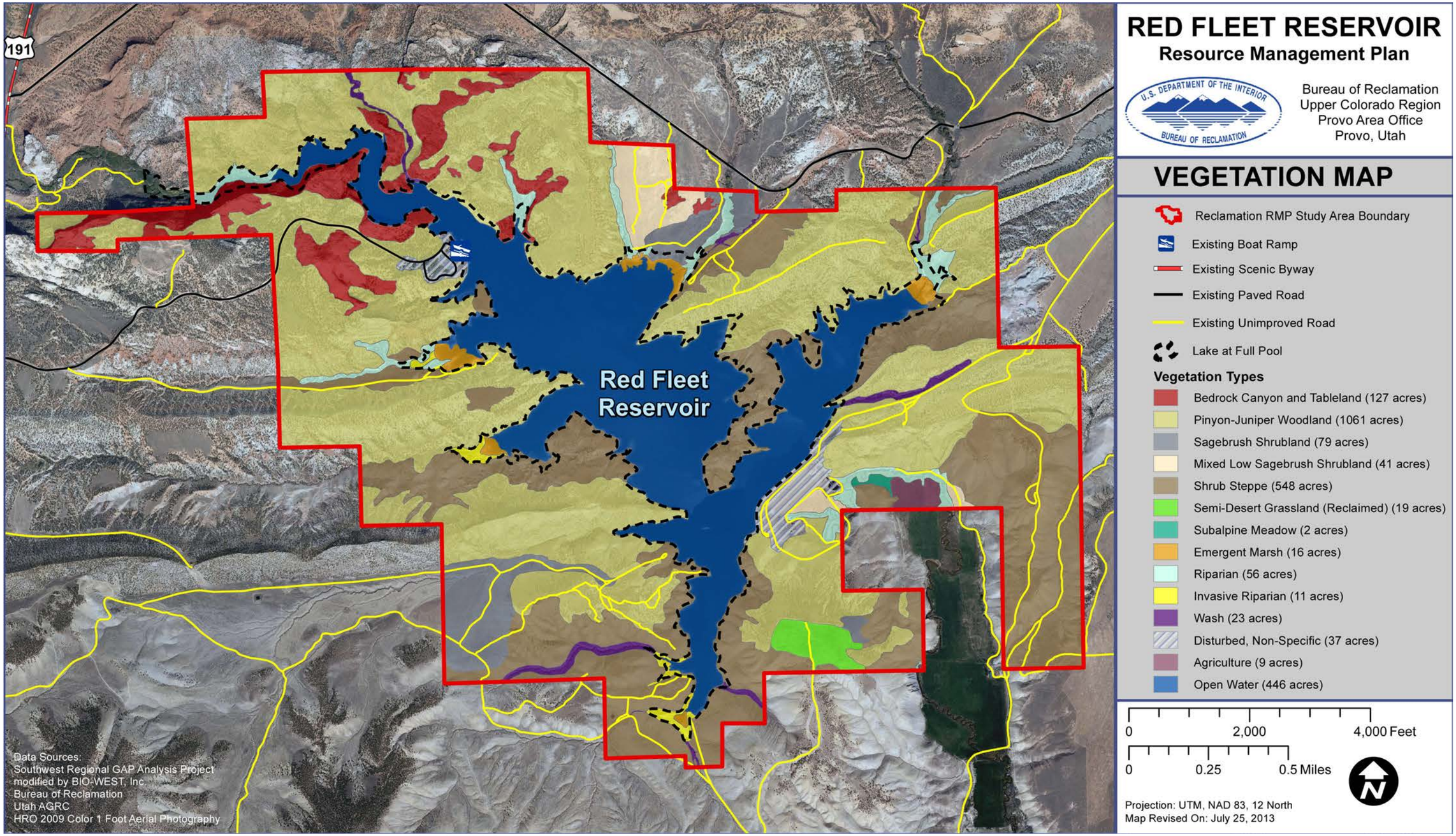

Figure 3-14. Red Fleet Reservoir Resource Management Plan (RMP) Study Area Vegetation Map.

height. Shrublands exist at slightly lower elevations than woodlands, are dryer, and have a maximum shrub height of 9.8 feet. Common species include pinyon pine, Utah juniper, black sagebrush (*Artemisia nova*), Wyoming big sagebrush (*Artemisia tridentata* spp. *wyomingensis*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), and blackbrush (*Coleogyne ramosissima*). The herbaceous layer consists of sparse to dense xeric graminoides (Lowry et al. 2007).

Sagebrush Shrubland Approximately 79 acres of sagebrush shrubland are located in the southwestern portion of the Study Area. This vegetation community continues westward onto BLM lands in an upland valley separated from the Study Area by pinyon-juniper and shrub steppe hillsides. This ecological system is consistent with the Inter-Mountain Basins Big Sagebrush Shrubland that is widespread across the western United States and occupies lowlands (4,900–7,500 feet) in broad basins, valleys, and foothills between mountain ranges (Lowry et al. 2007). The dominant species in this system is Wyoming big sagebrush or basin big sagebrush (*Artemisia tridentata* spp. *tridentata*) with scattered juniper species or pinyon pine. The most common associated shrub species are greasewood (*Sarcobatus vermiculatus*), saltbush (*Atriplex* spp.), rubber rabbitbrush (*Ericameria nauseosa*), yellow rabbitbrush, and bitterbrush (*Purshia tridentata*). In areas that have been previously burned, mountain snowberry (*Symphoricarpos oreophilus*) may be co-dominant. The herbaceous layer has less than 25 percent coverage and common species are Indian ricegrass (*Achnatherum hymenoides*), blue grama (*Bouteloua gracilis*), thickspike wheatgrass (*Elymus lanceolatus*), Idaho fescue (*Festuca idahoensis*), needle and thread (*Hesperostipa comata*), western wheatgrass (*Pascopyrum smithii*), and Sandberg bluegrass (*Poa secunda*). Invasive cheatgrass (*Bromus tectorum*) or other nonnative species can dominate the herbaceous layer (Lowry et al. 2007).

Mixed Low Sagebrush Shrubland Approximately 41 Study Area acres consist of this temperate xeric ecological system. This community is found at the North Beach Area and below Red Fleet Dam. Regionally, this system is known to occupy hilltops, toeslopes, dry flats, and gravel draws of the Colorado Plateau and Uinta Basin at elevations up to 5,900 feet (Lowry et al. 2007). The most common and dominant shrub species are black sagebrush, Bigelow sage (*Artemisia bigelovii*), and Wyoming big sagebrush. The herbaceous layer has 25 percent or more coverage and consists of temperate xeric grasses. Common species are Indian ricegrass, needle and thread, and James' galleta (*Pleuraphis jamesii*).

Shrub Steppe Hillsides in the southeastern half of the Study Area (about 536 acres) that are not pinyon-juniper communities can be characterized as shrub steppe. This community is typical of the Intermountain Basins Semi-Desert Shrub Steppe ecological system occupying alluvial fans and flats throughout the U.S. intermountain west and extending into the southern Great Plains (Lowry et al. 2007). This shrub steppe exhibits a sparse to moderately dense woody layer with a patchy grass herbaceous layer that is often more dominant than woody species coverage. Common shrub and dwarf shrub species are fourwing saltbush, big sagebrush, yellow rabbitbrush, Mormon tea, rubber rabbitbrush, winterfat, and broom snakeweed (*Gutierrezia sarothrae*). The shrub layer may be dominated by a single species. Species found in the herbaceous layer include bluebunch wheatgrass (*Pseudoroegneria spicata*), Indian ricegrass, blue grama, saltgrass (*Distichlis spicata*), Sandberg bluegrass, alkali sacaton (*Sporobolus airoides*), needle and thread, James' galleta, and saline wildrye (*Leymus salinus*). Forbs within the herbaceous layer are highly variable.

Semi-Desert Grassland An approximately 19-acre reclaimed hilltop south of Red Fleet Dam that was used as a source for dam construction has revegetated as a semi-desert grassland vegetation community. This vegetation community is consistent with the Intermountain Basins Semi-Desert Grassland community that is widespread in the U.S. intermountain west, occupying lowlands and uplands in an elevation range between 4,700 to 7,600 feet (Lowry et al. 2007). Dominant vegetation consists of drought-tolerant grasses with scattered shrub species. The most common plants that may be found in this system are Indian ricegrass, blue grama, needle and thread, three-awn (*Aristida* spp.), satin grass (*Muhlenbergia* spp.), James' galleta, sagebrush (*Artemisia* spp.), saltbush, blackbrush, Mormon tea, winterfat, and snakeweed (*Gutierrezia* spp.).

Riparian-Wetland Vegetation Communities

Riparian-wetland communities provide important ecological and resource management functions, including conveyance and storage of floodwaters, prevention of erosion, wildlife habitat, recreation, water supply and quality maintenance, archeological value, educational value, and aesthetic value (Dennison and Schmid 1997). Riparian zones can be defined as strips of vegetation adjacent to streams, rivers, lakes, reservoirs, and other inland aquatic systems that affect or are affected by the presence of water (Fischer et al. 2000). Wetlands can be defined as lands transitional between terrestrial and aquatic systems where the water table is usually at or near the soil surface or the land is covered by shallow water (Cowardin et al. 1979). Depending on the level of flooding and soil saturation, riparian-wetland communities within the Study Area may be legally protected under the Clean Water Act of 1972 and the Utah Stream Alteration Rule of 1973 (CWA 1972/UT 1973). Thus, the identification and classification of these communities is important both from the standpoint of resource management as well as legal jurisdiction; consequently, riparian-wetland communities were identified in the recreation development suitability analysis, summarized in Chapter 2.

The riparian-wetlands classification within the Study Area includes several types of ecosystems that are associated with flooding and/or soil saturation of varying durations. For the purposes of the RMP, the riparian-wetlands classification includes areas dominated by woody wetland vegetation that require frequent flooding, areas dominated by herbaceous emergent/submerged aquatic vegetation that require frequent or permanent flooding, and unvegetated dry washes flowing into Red Fleet Reservoir that exhibit a defined channel due to ephemeral flows. The dry wash areas are subject to ephemeral flows that prevent the growth of vegetation within the channel. The dry wash areas are included in the riparian-wetlands classification because management decisions here can be important to the aquatic ecosystem as a whole. Similarly, the subalpine meadow community, though it is most typically dominated by upland plant species, is included with the riparian-wetlands classification because wetland species and soils likely extend into this small area located along Big Brush Creek below Red Fleet Dam.

Riparian-wetlands within the Study Area were classified into groups according to the International Terrestrial Ecological Systems Classification, and mapping data was downloaded from the Southwest Regional Gap Analysis Project. The riparian-wetland classes identified include five types of communities and are mapped in Figure 3-14.

Riparian Riparian plant communities are found at the Big Brush Creek inflow and other drainage areas, totaling about 56 acres. These correspond to the Rocky Mountain Lower Montane Riparian Woodland and Shrubland ecological system, which is found throughout the

Colorado Plateau and Rocky Mountain regions at elevations of about 3,000–9,200 feet (Lowry et al. 2007). This system represents an assemblage of tree communities with varying dominant tree species and a highly diverse shrub component. Riparian communities are dependent on annual flooding of riverine systems. They can be found occupying floodplains, sand and cobble bars, islands, and irrigation ditches. Common tree species include box elder (*Acer negundo*), eastern cottonwood (*Populus deltoides*), narrowleaf cottonwood (*Populus angustifolia*), Fremont cottonwood (*Populus fremontii*), Douglas fir (*Pseudotsuga menziesii*), and blue spruce (*Picea pungens*). Some common shrub species are redosier dogwood (*Cornus sericea*), chokecherry (*Prunus virginiana*), skunkbush sumac (*Rhus trilobata*), willow (*Salix* spp.), silver buffaloberry (*Shepherdia argentea*), snowberry (*Symphoricarpos* spp.), and river hawthorn (*Crataegus rivularis*). Patches of Russian olive (*Elaeagnus angustifolia*) and saltcedar (*Tamarix* spp.) are also common (Lowry et al. 2007).

Invasive Riparian Approximately 11 acres of the Study Area are dominated by invasive riparian vegetation. Regionally, this ecological system includes all altered or disturbed riparian communities that are dominated by saltcedar and Russian olive (Lowry et al. 2007). At Red Fleet Reservoir, riparian areas dominated by these invasive species are found in bays along the southwestern side of the reservoir; in particular, the southernmost bay appears to be a significant seed source for saltcedar that may facilitate spreading to other areas.

Subalpine Meadow A 2-acre area below Red Fleet Dam is characterized by vegetation typical of a subalpine meadow. Vegetation is generally dominated by forbs with a lower grass component. Vegetation is a mixture of plants found within both wetland and upland communities. It is often a transitional area from wetland communities to upland communities. The community found in the Study Area is most consistent with the Rocky Mountain Subalpine Montane Mesic Meadow community. Regionally, this ecological system is located at gentle to moderately sloping sites where tree growth is restricted by snow or dry, windy conditions (Lowry et al. 2007). It is similar to Rocky Mountain Alpine-Montane Wet Meadow system but is not as wet, with only moist to saturated soils in spring and dry soils through the rest of the growing season. Common associated genera and species include bluebells (*Mertensia* spp.), beardstongue (*Penstemon* spp.), bellflower (*Campanula* spp.), lupine (*Lupinus* spp.), goldenrod (*Solidago* spp.), mule ear (*Wyethia* spp.), arrowleaf balsamroot (*Balsamorhiza sagittata*), tufted hairgrass (*Deschampsia caespitosa*), western meadow-rue (*Thalictrum occidentale*), prairie junegrass (*Koeleria macrantha*), and marsh valerian (*Valeriana sitchensis*).

Wash This ecological system is sparsely vegetated to barren with less than 10 percent cover. Wash communities occupy ephemeral streambeds and banks and comprise about 23 acres of the Study Area. This system is most often found in the U.S. intermountain west but may also be found, to a lesser extent, in the western Great Plains (Lowry et al. 2007). In general, washes are often bordered by shrublands dominated by greasewood, rubber rabbitbrush, silver sage (*Salvia argentea*), and Apache plume (*Fallugia paradoxa*). Shrubs form a dense linear boarder but do not extend into the wash itself. In areas where water pools, saltgrass is typically dominant.

Emergent Marsh Approximately 16 acres of the Study Area are characterized as emergent marsh, found in bays of Red Fleet Reservoir where washes and riparian communities funnel toward the lake. All of these occur below the full pool elevation of the reservoir, and are

therefore periodically inundated. Dominant vegetation is herbaceous and adapted to frequent or continual inundation. North American Arid West Emergent Marshes are found in association with landscape depressions, lake edges, and stream and river banks (Lowry et al. 2007). Specific species vary greatly throughout the Arid West, but common genera include bulrush (*Schoenoplectus* spp.), cattail (*Typha* spp.), rush (*Juncus* spp.), pondweed (*Potamogeton* spp.), smartweed (*Polygonum* spp.), and canary grass (*Phalaris* spp.). Rooted vegetation can exist in up to 6.5 feet of open water. Vegetation may also include floating, partially submerged, and fully submerged species.

Disturbed Non-specific Vegetation Communities

This ecological system describes areas that have been disturbed by human activity to the point that they are barren or exhibit relatively low vegetated cover (Lowry et al. 2007). For the Study Area, this vegetation class was used to represent the State Park facilities area and Red Fleet Dam, totaling about 37 acres. Additionally, a small area below the dam (9 acres) is continuous with an agricultural field that continues southward outside of the Reclamation boundary.

Noxious Weeds

Table 3-9 shows plant species listed by the State of Utah and Uintah County as noxious weeds, as reported by UDAF (UDAF 2012). Portions of the Study Area that are most vulnerable to infestation by noxious weeds include roadsides, camping areas, fishing access areas, and the reservoir shoreline. Noxious weeds frequently infest roadsides because vehicles help disperse seeds over large geographical areas. Off-highway vehicle travel, fishing and hunting access, and other recreational activities may also promote the spread of noxious species by disturbing existing vegetation and by helping to disperse seeds. Persons walking through riparian areas can spread species including (but not limited to) poison hemlock (*Conium* spp.), teasel (*Dipsacus* spp.), Canada thistle (*Cirsium arvense*), hoary cress, and perennial pepperweed. Dogs may spread species such as houndstongue, teasle, and thistle (*Cirsium* spp.) by carrying seeds in their fur. As previously described, fluctuating water levels along shorelines are vulnerable to saltcedar and Russian olive infestation.

Wildlife

Wildlife of interest to state and federal agencies and the general public in the Study Area include special-status species (federal and state threatened and endangered species and other species of concern), big game, raptors, waterfowl, and general wildlife populations. Wildlife viewing opportunities, big game-vehicle conflicts, nuisance wildlife species, and the effect of reservoir uses on wildlife habitats are also concerns in the Study Area. Sources of information used to develop this assessment of existing wildlife conditions included UDWR reports, websites, data, and maps, published literature, consultations with agency personnel, and field observations made in October 2011.

Habitat Characteristics

Figure 3-15 illustrates habitat areas that have been identified by UDWR for particular species. The Study Area overlaps winter habitats for elk (*Cervus canadensis*) and mule deer (*Odocoileus hemionus*), and the area below Red Fleet Dam is continuous with an area designated as mule deer year-long habitat. Portions of the Study Area (i.e., along the north side of the reservoir and an area below the dam) are continuous with larger areas of brood habitat, occupied habitat, and winter habitats for greater sage-grouse (*Centrocercus urophasianus*).

Table 3-9. State of Utah and Uintah County Noxious Weed List.

COMMON NAME	SCIENTIFIC NAME
black henbane	*Hyoscyamus niger*
diffuse knapweed	*Centaurea diffusa*
Johnsongrass	*Sorghum halepense*
leafy spurge	*Euphorbia esula*
Medusahead	*Taeniatherum caput-medusae*
oxeye daisy	*Leucanthemum vulgare*
purple loosestrife	*Lythrum salicaria*
St. John's wort	*Hypericum perforatum*
spotted knapweed	*Centaurea stoebe*
sulfur cinquefoil	*Potentilla recta*
yellow starthistle	*Centaurea solstitialis*
yellow toadflax	*Linaria vulgaris*
Bermudagrass	*Cynodon dactylon*
Dalmatian toadflax	*Linaria dalmatica*
dyer's woad	*Isatis tinctoria*
hoary cress	*Cardaria draba*
musk thistle	*Carduus nutans*
perennial pepperweed	*Lepidium latifolium*
poison hemlock	*Conium maculatum*
Russian knapweed	*Centaurea repens*
squarrose knapweed	*Centaurea virgata*
Scotch thistle	*Onopordum acanthium*
Canada thistle	*Cirsium arvense*
field bindweed	*Convolvulus arvensis*
houndstongue	*Cynoglossum officinale*
quackgrass	*Elymus repens*
saltcedar	*Tamarix* spp.
common teasel [b]	*Dipsacus fullonum*
puncturevine [b]	*Tribulus terrestris*
Russian olive [b]	*Elaeagnus angustifolia*

Source: UDAF (2012).
[b] Uintah County noxious weeds

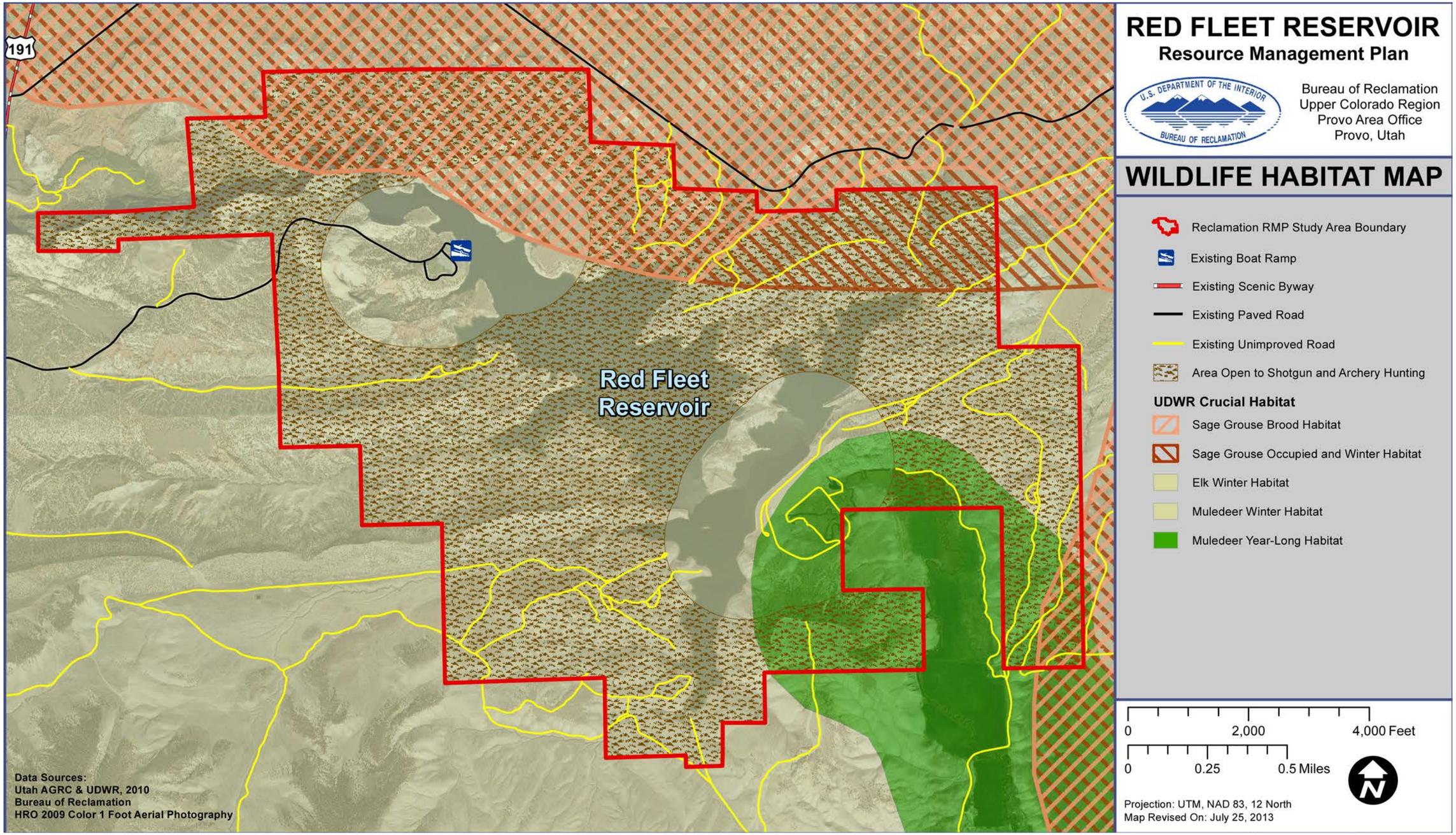

Figure 3-15. Red Fleet Reservoir Resource Management Plan (RMP) Study Area Wildlife Habitat Map.

A component of the Utah Comprehensive Wildlife Conservation Strategy (CWCS) is to prioritize habitat types within the state for species of greatest conservation need (Sutter et al. 2005). Five criteria are used to score habitats: abundance, threats, trends, sensitive species occurrence, and vertebrate biodiversity. Habitat types are evaluated and assigned values from 1 to 5 in each of the five categories, with potential total scores of 5–25, 5 being the lowest possible priority and 25 being the highest possible priority. Habitat types with high scores are considered to be high priority and most in need of conservation. The CWCS scoring system was used as a guideline for assessing habitat preservation priorities for Study Area vegetation communities. Table 3-10 summarizes Study Area vegetation communities and CWCS scoring of habitats.

Table 3-10. Status Review of Study Area Habitat Types Using the Utah Comprehensive Wildlife Conservation Strategy (CWCS) Scoring System.

STUDY AREA VEGETATION COMMUNITY	COMPARABLE CWCS[a] HABITATS	OVERALL CWCS SCORE
Bedrock Canyon and Tableland	Rock	11.7
Pinyon-Juniper Woodland	Pinyon-Juniper	12.6
Sagebrush Shrubland	High Desert Scrub	14.8
Shrub Steppe	High Desert Scrub	14.8
Emergent Marsh	Wetland	20.7
Riparian and Invasive Riparian	Lowland Riparian/Mountain Riparian	23.8/20.5
Subalpine Meadow	Grassland	17.7
Disturbed/Modified (Agriculture)	Agriculture	15

[a] Utah Comprehensive Wildlife Conservation Strategy (Sutter et al. 2005).

The majority of the wildlife habitat in the Study Area consists of upland plant communities (e.g., woodlands, shrublands, and grasslands). Statewide, these communities rank in the middle of the CWCS prioritization scale. Within the Study Area, these habitats are continuous with BLM lands that are important to a wide range of wildlife including big game, rodents, lizards, snakes, upland game birds, raptors, and songbirds. As previously illustrated, portions of the Study Area overlap designated greater sage-grouse brood, occupied, and winter habitats. In 2013 the State of Utah completed a conservation plan for greater sage-grouse (UDWR 2013). The plan includes measurable objectives to maintain habitat acreage and spatial distribution of the species and to increase the population size.

The highest priority CWCS habitats found in the Study Area are the emergent marsh and riparian habitats. Riparian-wetland vegetation types are located in the bays where washes and riparian corridors drain to Red Fleet Reservoir. Despite a limited amount of riparian-wetland vegetation types and their fragmented nature, these habitats add substantially to the biological diversity of the Study Area by attracting a diverse assemblage of wildlife species that otherwise would not occur. Riparian-wetland habitats are considered a limited resource in the surrounding arid environment and are valuable to species of waterfowl, shorebirds, passerines, and amphibians.

In general, factors that negatively influence wildlife habitat condition in the Study Area are disturbance from recreation use, introduction of invasive plants and animals, and reservoir water management. Recreational use may cause disturbance to and displacement of wildlife, and can degrade habitat conditions. Disturbance associated with campers, boats, and vehicular traffic

often increases stress to some wildlife that are intolerant of human presence, such as nesting birds. Depending on the level of disturbance, some species may be displaced from the Study Area to adjacent habitats. Recreational use of undeveloped areas can also cause trampling and subsequent fragmentation of habitat, depending on the level and frequency of disturbance. Fluctuating reservoir water levels alter wildlife use in a number of ways. For instance, when water levels are low, species that prefer mudflats and shallow water, such as shorebirds, benefit by having available habitat and prey. Conversely, low water levels can create exaggerated separations of riparian-wetland habitats from open water, negatively affecting habitat quality for other species. When water levels are raised during the breeding season, nesting and roosting sites may become flooded. Fish spawning areas, which are where many birds feed, also vary with the changing water levels. Shore scouring prevents vegetation from becoming established and can facilitate establishment of invasive plants such as saltcedar. These factors can reduce the overall amount of available habitat for some species.

Birds

Migratory birds found within the Study Area are protected under the Migratory Bird Treaty Act of 1918 (MBTA) and Executive Order 13186 (66 FR 3853, January 17, 2001), "Responsibilities of Federal agencies to Protect Migratory Birds." This order directs federal agencies to take certain actions to further implement the MBTA and the Bald and Golden Eagle Protection Act of 1940 as well as other pertinent statutes.

Red Fleet Reservoir receives a substantial amount of bird use during all seasons of the year because of the presence of a complex of open water and upland habitats. This complex provides waterfowl, grebes, and other waterbirds with resources they require, including food items (e.g., fish, macroinvertebrates, and some emergent vegetation) and habitat to loaf and rest. However, protective cover, nest material, and secluded nesting areas are rather limited in the Study Area. Such resources are directly associated with riparian-wetland vegetation types that are larger than 1 acre in size, and therefore are in short supply in the Study Area. The quality of the habitat for waterfowl and other waterbirds is influenced by the high degree of disturbance resulting from recreational use and fluctuating water levels.

Water birds potentially found in the Study Area include common loon (*Gavia immer*), pied-billed grebe (*Podilymbus podiceps*), eared grebe (*Podiceps caspicus*), western grebe (*Aechmophorus occidentalis*), Clark's grebe (*Aechmophorus clarkii*), American white pelican (*Pelecanus erythrorhynchos*), double-crested cormorant (*Phalacrocorax auritus*), great blue heron (*Ardea herodias*), Canada goose (*Branta canadensis*), gadwall (*Anas strepera*), American wigeon (*Anas americana*), mallard (*Anas platyrhynchos*), northern pintail (*Anas acuta*), cinnamon teal (*Anas cyanoptera*), green-winged teal (*Anas carolinensis*), redhead (*Aythya americana*), ring-necked duck (*Aythya collaris*), lesser scaup (*Aythya affinis*), northern shoveler (*Spatula clypeata*), common merganser (*Mergus merganser*), ruddy duck (*Oxyura jamaicensis*), American coot (*Fulica americana*), killdeer (*Charadrius vociferous*), spotted sandpiper (*Actitis macularius*), greater yellowlegs (*Tringa melanoleuca*), willet (*Tringa semipalmata*), Franklin's gull (*Larus pipixcan*), ring-billed gull (*Larus delawarensis*), California gull (*Larus californicus*), and Forster's tern (*Sterna forsteri*). Waterfowl hunting is allowed at Red Fleet according to current UDWR waterfowl hunting guidebook regulations (see Figure 3-15).

Raptors, such as red-tailed hawk (*Buteo jamaicensis*), osprey (*Pandion haliaetus*), great-horned owls (*Bubo virginianus*), barn owl (*Tyto alba*) and American kestrel (*Falco sparverius*), likely occur throughout the Study Area, particularly in the cottonwood (*Populus* sp.) around the reservoir edges. The upland areas provide an abundance of small mammal prey, such as deer mouse (*Peromyscus maniculatus*) and gopher (*Thomomys* spp.). Peregrine falcon (*Falco peregrinus*) have nested in the Study Area (Maxfield 2012). Bald eagle (*Haliaeetus leucocephalus*) commonly winter on the reservoir. Golden eagle (*Aquila chrysaetos*) has been documented nesting along the cliffs on the north end of Red Fleet Reservoir (Maxfield 2012). Both eagle species are given special protection under the Bald and Golden Eagle Protection Act, which prohibits the take of birds, their parts, nests, or eggs without a permit.

Although hunting greater sage-grouse is allowed in Utah, the species is listed as sensitive by the state and is considered a candidate species by the federal government (UDWR 2009a). Sage-grouse use of the Study Area vicinity is somewhat limited, and occurs most often in winter (Maxfield 2012).

Songbirds using habitat in the Study Area could include yellow-rumped warbler (*Dendroica coronata*), black-capped chickadee (*Poecile atricapillus*), mountain bluebird (*Sialia currucoides*), white-crowned sparrow (*Zonotrichia leucophrys*), chipping sparrow (*Spizella passerina*), and song sparrow (*Melospiza melodia*).

Other species of birds using the Study Area include mourning dove (*Zenaida macroura*), northern flicker (*Colaptes auratus*), Steller's jay (*Cyanocitta stelleri*), pinyon jay (*Gymnorhinus cyanocephalus*), western scrub-jay (*Aphelocoma californica*), black-billed magpie (*Pica hudsonia*), common raven (*Corvus corax*), American crow (*Corvus brachyrhynchos*), tree swallow (*Tachycineta bicolor*), violet-green swallow (*Tachycineta thalassina*), northern rough-winged swallow (*Stelgidopteryx serripennis*), cliff swallow (*Hirundo pyrrhonota*), wild turkey (*Meleagris gallopavo*), and common nighthawk (*Chordeiles minor*).

The Study Area includes UDWR-delineated habitat for two game bird species, California quail (*Callipepla californica*) and chukar (*Alectoris chukar*). Hunting does not generally occur for these species within the Study Area boundary, so the area may provide a useful refuge for these species, if they are present.

Mammals

The Study Area provides habitat for a number of mammal species, including big game, small mammals, bats, and others. The pinyon-juniper, sagebrush and grassland habitats serve as both summer and winter habitat for mule deer and winter habitat for elk. Moose (*Alces alces*) may use stream drainages associated with the Red Fleet Reservoir, and predators such as black bear (*Ursus americanus*), mountain lion (*Felis concolor*), and coyote (*Canis latrans*) are also found in the area. Big game hunting is not allowed within the Study Area, which may provide important refuge for these species during hunting season.

Other mammals potentially found within the Study Area include dwarf shrew (*Sorex nanus*), Merriam's shrew (*Sorex merriami*), mountain cottontail (*Sylvilagus nuttalli*), white-tailed jackrabbit (*Lepus townsendii*), beaver (*Castor canadensis*), porcupine (*Erethizon dorsatum*), northern pocket gopher (*Thomomys talpoides*), Ord's kangaroo rat (*Dipodomys ordii*), brush

mouse (*Peromyscus boylii*), canyon mouse (*Peromyscus crinitus*), deer mouse, pinyon mouse (*Peromyscus truei*), long-tailed vole (*Microtus longicaudus*), muskrat (*Ondatra zibethicus*), cliff chipmunk (*Neotamias dorsalis*), Hopi chipmunk (*Neotamias rufus*), least chipmunk (*Neotamias minimus*), Uinta chipmunk (*Neotamias umbrinus*), yellow-bellied marmot (*Marmota flaviventris*), red fox (*Vulpes vulpes*), ringtail (*Bassariscus astutus*), raccoon (*Procyon lotor*), American mink (*Mustela vison*), badger (*Taxidea taxus*), long-tailed weasel (*Mustela frenata*), and bobcat (*Lynx rufus*). Northern river otter (*Lontra canadensis*) breed at Red Fleet Reservoir and along Big Brush Creek, both above and below the reservoir (Maxfield 2012). A small number of white-tailed prairie dog (*Cynomys leucurus*) can be found in the basin on the southwest side of the reservoir (Maxfield 2012).

The Study Area supports a number of bat species because of the availability of a stable insect prey source associated with the reservoir and the riparian-wetland habitats along Big Brush Creek and the reservoir shoreline. Both spotted bat (*Euderma maculata*) and big free-tailed bat (*Nyctinomops macrotis*) have been detected during acoustic surveys just above the reservoir along Big Brush Creek (Maxfield 2012). Other potential species include big brown bat (*Eptesicus fuscus*), little brown myotis (*Myotis lucifugus*), and long-eared myotis (*Myotis evotis*).

Herpetofauna

Suitable habitat for amphibians at Red Fleet is very limited. The relatively degraded riparian-wetland habitats are small and disturbed, but it is likely that some species thrive within the Study Area, particularly those that are tolerant of arid conditions, such as the Great Basin spadefoot (*Spea intermontana*). Other potentially occurring species within the Study Area include boreal chorus frog (*Pseudacris maculata*), tiger salamander (*Ambystoma tigrinum*), and northern leopard frog (*Lithobates pipiens*). Reptile species that potentially occur throughout the Study Area in the upland and riparian-wetland habitats include common sagebrush lizard (*Sceloporus graciosus*), eastern fence lizard (*Sceloporus undulates*), greater short-horned lizard (*Phrynosoma hernandesi*), Great Basin gophersnake (*Pituophis catenifer deserticola*), eastern racer (*Coluber constrictor*), midget faded rattlesnake (*Crotalus concolor*), milksnake (*Lampropeltis triangulum*), striped whipsnake (*Masticophis taeniatus*), and prairie rattlesnake (*Crotalus viridis*). Several species of garter snake (*Thamnophis* spp.) are also likely present.

Fisheries

Red Fleet Reservoir is managed as a put-and-take fishery and stocked with rainbow trout (*Oncorhynchus mykiss*) every year; however, the reservoir also contains other species, including some warmwater species that have been illegally introduced. This section discusses existing fishery conditions, including aquatic invasive species. Sources of information consulted to develop this assessment of existing conditions included UDWR reports, published literature, consultations with agency personnel, and field observations made during a site visit in October 2011.

Red Fleet Reservoir is considered an oligotrophic-mesotrophic reservoir and has low turbidity (UDWQ 2011a). This means that the reservoir has a low nutrient content for supporting organisms. The water body also experiences thermal and chemical stratification in the summer months, with the top-most layer becoming too warm to support coldwater fish species. The deepest water layer experiences nutrient loading (sink), but nutrient levels nearer the surface do not appear to exceed state pollution thresholds (UDWQ 2008).

The shoreline habitat of Red Fleet Reservoir has intermixed vegetated and nonvegetated slopes, in addition to a few areas that have been stabilized with riprap (e.g., the dam). The majority of the topography is steep sloping shorelines and cliffs. Much of the habitat in the form of fish cover is represented by boulders or large cobble submerged along the shoreline. Inundated and emergent vegetation is present in the shallow coves and inflow areas. The largest area of submerged vegetation occurs in the northern end of the lake at the Big Brush Creek inflow. Shallow, marsh-like habitat is also present at the mouth of Cottonwood Wash east of the dam. Low-water years could produce limited cover for all life stages of fish because there is little shoreline vegetation present.

Although standard water quality parameters don't seem to indicate impairment to the aquatic biota (UDWQ 2011a), the UDEQ has issued a mercury fish consumption advisory on Red Fleet Reservoir as of August 2011. This finding advises that pregnant women do not eat walleye (*Sander vitreus*) greater than 12 inches, and adults to limit their consumption to two 8-ounce servings per month (UDEQ 2011). Although mercury is a naturally occurring element, it can transform into toxic methyl mercury. Chronic exposure in low concentrations can lead to neurological effects in developing fetuses and children. Although mercury may be found in low concentrations in Red Fleet Reservoir, it bioaccumulates and biomagnifies through the food web. Therefore, secondary consumers contain higher concentrations (and sometimes toxic concentrations) than that found in the water column (Morel et al. 1998). There are no health risks associated with other uses of Red Fleet Reservoir, including swimming (UDEQ 2011).

With the presence of selenium throughout the Big Brush Creek drainage, there is potential for elevated selenium levels to occur in Red Fleet Reservoir. Selenium accumulated in fish tissue could result in consumption advisories for harvested fish. Selenium has also shown to cause malformations in fish that may hinder their reproductive capacity (Lemly 1998).

Fish Species

Fishery biologists and managers use the Statewide Aquatic Habitat Classification System to rate stream sections and water bodies according to aesthetic, access, and productivity characteristics. Ratings within these categories are then totaled, weighed, and given a numeric rating from 1 to 6. Big Brush Creek near the confluence of Red Fleet Reservoir has been classified as a Class 3 body of water (Crosby and Bartlett 2005). A brief description of each class is as follows:

- **Class 1** waters are top-quality fisheries that should be preserved and improved for angling and recreational use. These areas are accessible by vehicle, with blue ribbon trout fishing and excellent productivity that supports large fish populations of one or more species of sportfish.

- **Class 2** waters also provide excellent fishing but are lacking in one category. Many of these waters are comparable to Class 1 waters, except are smaller in size. Water fluctuations may differentiate these waters from Class 1 streams.

- **Class 3** waters are very important because they comprise about half of the total stream fishery habitat and support the majority of recreational fishing in Utah.

- **Class 4** waters are usually poor in quality with limited fishery habitat. These waters are usually small and have poor scenic value with a short growing season. Drawdown or dewatering may occur. Stocking of catchable-sized fish are required to maintain the fishery.

- **Class 5** waters are of little value to the sport fishery due to the degradation of the natural environment from human development. A long-term sport fishery cannot be established by natural or artificial means.

- **Class 6** waters are those streams that are dewatered for a significant period each year.

Sport species in Utah water bodies are given a management classification in addition to the aquatic habitat classification. The management classifications denotes how a species or group of species is managed relative to fishing pressure, fish production of the system, and presence of wild fish, species of special concern, or trophy fishery conditions. The stream section of Big Brush Creek adjacent to Red Fleet reservoir is managed as a wild-fish water, in which fish species and habitat dictate what can naturally be produced and sustained. Fish within these waters reproduce naturally, and fishing opportunities are sustained rather than managed. Red Fleet Reservoir is managed with a Basic Yield classification for rainbow trout (*Oncorhynchus mykiss*) and largemouth bass (*Micropterus salmoides*). Basic Yield Waters are those that provide fishing opportunities in areas where angling pressure is extensive or where habitat is marginal for fishery success (Crosby and Bartlett 2005).

Red Fleet Reservoir is managed primarily as a put-and-take fishery for rainbow trout, although there are brown trout (*Salmo trutta*) present that have entered the reservoir via Big Brush Creek. Due to illegal stockings of black bass (*Micropterus* spp.) and sunfish (*Lepomis* spp.), Red Fleet Reservoir is managed as a two-story fishery, with both coldwater and warmwater fishes (Johnson and Crosby 1992). The illegal stocking of walleye in 2002 (T. Hedrick 2011, pers. comm.) has become problematic in managing for the rainbow trout fishery because of increased predation (Boren 2011).

Fish assemblages for Red Fleet Reservoir have varied historically but currently support eight species of fish representing four families (Table 3-11). Coldwater fish species consist of rainbow trout and brown trout, while warmwater species of largemouth bass, smallmouth bass (*Micropterus dolomieu*), green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), and walleye have inhabited Red Fleet Reservoir by way of introduction. Red Fleet Reservoir also harbors a population of flannelmouth sucker (*Catostomus latipinnis*) that was thought to have been trapped in the reservoir from Big Brush Creek during dam construction. Specific bag and possession limits do exist for sport fish on the reservoir; however, length limits are not imposed (Table 3-12).

Because Red Fleet Reservoir is a put-and-take trout fishery, the reservoir is stocked annually with rainbow trout. Stockings occur in spring or fall and have varied from approximately 60,000 to 15,000 fish per year since 2002 (Table 3-13) (UDWR 2011a).

Experimental gill netting in 2010 and 2011 showed highest catch rates for rainbow trout and walleye, although relatively few individuals were captured either year. Largemouth bass and

Table 3-11. Fish Species Occurring in Red Fleet Reservoir.

COMMON NAME (*SCIENTIFIC NAME*)	STATUS
Family Catostomidae—Suckers	
flannelmouth sucker (*Catostomus latipinnis*)	Native/CS[a]
Family Salmonidae—Trout	
brown trout (*Salmo trutta*)	Introduced
rainbow trout (*Oncorhynchus mykiss*)	Introduced
Family Centrarchidae—Sunfishes	
bluegill (*Lepomis macrochirus*)	Introduced
largemouth bass (*Micropterus salmoides*)	Introduced
green sunfish (*Lepomis cyanellus*)	Introduced
smallmouth bass (*Micropterus dolomieu*)	Introduced
Family Percidae—Perch	
walleye (*Sander vitreus*)	Introduced

Source: E. Johnson 2011, pers. comm.
[a] CS = species receiving special management in Utah under a conservation agreement in order to preclude the needs for federal listing.

Table 3-12. Daily Bag and Size Limits for Sportfish in Red Fleet Reservoir.

SPECIES	LIMIT
bluegill and green sunfish [a]	50 in aggregate
largemouth bass and smallmouth bass [a]	6 in aggregate
trout in aggregate [a]	4
walleye [a]	No limit. All walleye must immediately be killed.

Source: UDWR (2011b).
[a] No minimum or maximum size limit.

Table 3-13. Rainbow Trout Stocking Records (2002–2011) in Red Fleet Reservoir.

YEAR	NUMBER STOCKED	SIZE (inches)
2002	no stocking record	-
2003	62,239	6
2004	20,008	8
2005	30,150	3 and 8
2006	19,989	8
2007	20,420	9
2008	15,064	8 and 10
2009	no stocking record	-
2010	20,007	8
2011	20,007	8

Source: UDWR (2011a).

bluegill were also captured during sampling events for both years. One flannelmouth sucker (536 mm) was also captured in 2010. It appears that several year classes of walleye and largemouth bass exist in the reservoir, indicating that natural reproduction and recruitment are occurring (E. Johnson 2011, pers. comm.; Johnson 2010).

Aquatic Nuisance and Invasive Species

Aquatic nuisance and invasive species (AIS) are defined as water-associated, nonnative plant and animal species that threaten diversity or abundance of native species due to a variety of ecological factors. There are numerous AIS already occurring in Utah waters with others threatening immediate arrival. Red Fleet Reservoir is among the Utah water bodies that are susceptible to AIS introductions. (UDWR 2009b).

Quagga Mussel Invasive mussels are a threat throughout Utah and in other states because they can be transported in boats and equipment, reproduce rapidly, deplete nutrients in the water, and are costly to control (UDWR 2012a). Quagga mussel (*Dreissena bugensis*) veligers were found and later confirmed with DNA testing (PCR) in 2008 in Red Fleet Reservoir. The UDWR immediately established monitoring efforts and a boat-washing program; however, subsequent testing has been negative for DNA, adults, or larval quagga mussel. Consequently, the State of Utah downlisted Red Fleet Reservoir from "detected" to "inconclusive" in 2012 (Dalton 2012).

Pathogens Whirling disease is a condition caused by the parasite *Myxobolus cerebralis.* This pathogen has been detected in other Utah waters (UDWR 2009b), but has not been found in Red Fleet Reservoir or Big Brush Creek to date. While rainbow trout are very susceptible to this pathogen, the disease is mostly detrimental to smaller fish. It is unlikely that catchable-sized fish stocked in Red Fleet Reservoir would show deformities should the pathogen occur.

Nonnative Fish Species The fishery at Red Fleet Reservoir has been changing as a result of illegal introductions of bass, sunfish, and walleye (T. Hedrick 2011, pers. comm.). This has resulted in decreased catch rates for rainbow trout, which were originally stocked for a put-and-take fishery. Although bass, sunfish, and walleye are considered sportfish throughout the state, they are nuisance species and invasive in nature.

Threatened, Endangered, and Other Special-Status Species

This section provides an assessment of special-status species known to occur in Uintah County and the likelihood of occurrence in the Study Area. This includes consideration of state-listed, special-status species as well as any federally listed endangered, threatened, or candidate species.

Plants

The vegetation communities associated with Red Fleet Reservoir have the potential to support listed plant species of concern (state and federal) that have known distributions in Uintah County. These species are listed in Table 3-14. Potential occurrence of these species is based on the existence of appropriate, or seemingly appropriate, habitat within the Study Area. Not all potential habitats will be appropriate for species presence. Because of the specific habitat needs of each species, it is likely that only micro-habitats within the vegetation classifications will be appropriate for rare occurrence. Field surveys, prior to implementation of any new facilities, would be to determine presence or absence of these species; site-specific impacts are not addressed in this EA.

Table 3-14. Rare Plant Species with Potential to Occur at Red Fleet Reservoir.

COMMON NAME	SCIENTIFIC NAME	GLOBAL RANK [a]	STATE RANK [b]	FEDERAL STATUS
Graham's columbine	*Aquilegia grahamii*	G1	S1	
park rockcress	*Arabis vivariensis*	G2G3	S1	
horseshoe milkvetch	*Astragalus equisolensis*	G5	S1	
Hamilton's milkvetch	*Astragalus hamiltonii*	G1	S1	
canyonlands sedge	*Carex curatorum*	G2	S2	
Ownbey thistle	*Cirsium ownbeyi*	G3	S1	
Graham's cryptantha	*Cryptantha grahamii*	G3	S3	
giant helleborine	*Epipactis gigantea*	G3	S2S3	
orchard snakeweed	*Gutierrezia pomariensis*	G2G3	S2S3	
Garrett bladderpod	*Lesquerella garrettii*	G2	S2	
large yellow evening primrose	*Oenothera flava* var. *acutissima*	G2	S2	
Uinta parrya	*Parrya rydbergii*	G3Q	S3	
Flowers' penstemon	*Penstemon flowersii*	G1	S1	
Goodrich's penstemon	*Penstemon goodrichii*	G2	S2	
Graham's penstemon	*Penstemon grahamii*	G2	S2	Proposed Threatened
white river penstemon	*Penstemon scariosus* var. *albifluvis*	G4	S1	Candidate
alcove bog-orchid	*Platanthera zothecina*	G2	S2	
shrubby reed-mustard	*Schoenocrambe suffrutescens*	G1	S1	Endangered
pariette cactus	*Sclerocactus brevispinus*	G1	S1	Threatened
Uinta basin hookless cactus	*Sclerocactus wetlandicus*	G3	S3	Threatened
Ute ladies tresses	*Spiranthes diluvialis*	G2	S1	Threatened
Uinta wirelettuce	*Stephanomeria tenuifolia* var. *uintaensis*	G5	S1	
sterile yucca	*Yucca sterilis*	G4G5	?	
alcove death camas	*Zigadenus vaginatus*	G2	S2	

Source: UDWR (2012b).

[a] Global Ranking: G1-Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors. G2-Imperiled—At high risk of extinction or elimination due to very restricted range, very few populations, steep declines, or other factors. G3- Vulnerable—At moderate risk of extinction or elimination due to a restricted range, relatively few populations, recent and widespread declines, or other factors. G4-Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors. G5-Secure—Common; widespread and abundant. GQ-Questionable taxonomy that may reduce conservation priority— Distinctiveness of this entity as a taxon or ecosystem type at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon or type in another taxon or type, with the resulting taxon having a lower-priority (numerically higher) conservation status rank. The "Q" modifier is only used at a global level and not at a national or subnational level.

[b] State Ranking: S1-Critically Imperiled—Critically imperiled in the jurisdiction because of extreme rarity or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the jurisdiction. S2-Imperiled—Imperiled in the jurisdiction because of rarity due to very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from jurisdiction. S3-Vulnerable—Vulnerable in the jurisdiction due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation.

Many of the rare plant species have the potential to occur in more than one vegetation community type. The vegetation communities with the highest number of potential rare plant species are Mixed Low Sagebrush Shrubland (10 species), Pinyon-Juniper Woodland (8 species), and Shrub Steppe (8 species). Conversely, Emergent Marsh, Wash, Invasive Riparian, and the disturbed vegetation communities do not have the potential for rare plant occurrence.

Bedrock Canyon and Tableland vegetation type has the potential to support Graham's columbine (*Aquilegia grahamii*), Canyonlands sedge (*Carex curatorum*), Flowers' penstemon (*Penstemon flowersii*), Uinta Basin hookless cactus (*Sclerocactus wetlandicus*), and alcove death camas (*Zigadenus vaginatus*). Pinyon-Juniper Woodland has the potential to support park rockcress (*Arabis vivariensis*), Hamilton's milkvetch (*Astragalus hamiltonii*), Ownbey thistle (*Cirsium ownbeyi*), Graham's cryptantha (*Cryptantha grahamii*), White River penstemon (*Penstemon scariosus* var. *albifluvis*), pariette cactus (*Sclerocactus brevispinus*), Uinta wirelettuce (*Stephanomeria tenuifolia* var. *uintaensis*), and sterile yucca (*Yucca sterilis*). Sagebrush shrubland has the potential to support horseshoe milkvetch (*Astragalus equisolensis*), Ownbey thistle, Graham's cryptantha, Garrett bladderpod (*Lesquerella garrettii*), White River penstemon, shrubby reed-mustard (*Schoenocrambe suffrutescens*), and sterile yucca. Mixed Low Sagebrush Shrubland has the potential to support park rockcress, horseshoe milkvetch, Hamilton's milkvetch, Graham's cryptantha, orchard snakeweed (*Gutierrezia pomariensis*), Uinta parrya (*Parrya rydbergii*), alcove bog-orchid (*Platanthera zothecina*), shrubby reed-mustard, Uinta basin hookless cactus, and sterile yucca. Shrub steppe has the potential to support park rockcress, Hamilton's milkvetch, Uinta parrya, Goodrich's penstemon (*Penstemon goodrichii*), Graham's penstemon, shrubby reed-mustard, pariette cactus, and Uinta basin hookless cactus. Riparian areas have the potential to support giant helleborine (*Epipactis gigantea*), and Ute lady's tresses (*Spiranthes diluvialis*). Subalpine meadow has the potential to support Garrett bladderpod, and large yellow evening primrose (*Oenothera flava* var. *acutissima*).

There are two occurrences of Ute lady's tresses reported on private land near the Inflow Area. Populations are described as occurring in riparian habitat in moist soil conditions. These occurrences were last observed in 2007. Field investigations are needed to determine current health of documented populations and further investigate additional potential habitats for species presence or absence on Reclamation lands (UDWR 2012b; Defreese 2012).

Wildlife

Threatened and endangered and state-listed wildlife species listed in Table 3-15 that are known or suspected to occur within or near the Study Area are discussed below. Although Mexican spotted owl (*Strix occidentalis lucida*) and the Canada lynx (*Lynx canadensis*) were noted by the USFWS as potentially occurring in the Study Area, suitable habitat (i.e., mature coniferous forest) is not present. Similarly, the black-footed ferret (*Mustela nigripes*) is listed as an endangered species in Uintah County and is listed because portions of Uintah County were part of its historical range, and because there is a reintroduced colony in Coyote Basin on the east side of the county (UDWR 2012b). However, there is no suitable habitat or prey base for black-footed ferret within the Study Area.

Table 3-15. State and Federally Listed Threatened, Endangered, or Sensitive Wildlife and Fish Species Occurring in Uintah County.

COMMON NAME	SCIENTIFIC NAME	STATUS [a]	POTENTIAL TO OCCUR IN THE STUDY AREA
	Birds		
American white pelican	*Pelecanus erythrorhynchos*	SPC	YES
bald eagle	*Haliaeetus leucocephalus*	SPC	YES
bobolink	*Dolichonyx oryzivorus*	SPC	NO
burrowing owl	*Athene cunicularia*	SPC	YES
ferruginous hawk	*Buteo regalis*	SPC	YES
greater sage-grouse	*Centrocercus urophasianus*	S-ESA	YES
Lewis's woodpecker	*Melanerpes lewis*	SPC	NO
long-billed curlew	*Numenius americanus*	SPC	NO
mountain plover	*Charadrius montanus*	SPC	NO
northern goshawk	*Accipiter gentilis*	CS	NO
Mexican spotted owl	*Strix occidentalis lucida*	S-ESA	NO
short-eared owl	*Asio flammeus*	SPC	NO
three-toed woodpecker	*Picoides tridactylus*	SPC	NO
yellow-billed cuckoo	*Coccyzus americanus*	S-ESA	NO
	Mammals		
big free-tailed bat	*Nyctinomops macrotis*	SPC	YES
black-footed ferret	*Mustela nigripes*	S-ESA	NO
brown (grizzly) bear	*Ursus arctos*	S-ESA	NO
Canada lynx	*Lynx canadensis*	S-ESA	NO
fringed myotis	*Myotis thysanodes*	SPC	NO
kit fox	*Vulpes macrotis*	SPC	NO
spotted bat	*Euderma maculatum*	SPC	YES
Townsend's big-eared bat	*Corynorhinus townsendii*	SPC	POSSIBLE
white-tailed prairie-dog	*Cynomys leucurus*	SPC	YES
	Reptiles		
cornsnake	*Elaphe guttata*	SPC	NO
smooth greensnake	*Opheodrys vernalis*	SPC	NO
	Fish		
bluehead sucker	*Catostomus discobolus*	CS	NO
bonytail	*Gila elegans*	S-ESA	NO
Colorado pikeminnow	*Ptychocheilus lucius*	S-ESA	NO
Colorado River cutthroat trout	*Oncorhynchus clarkii pleuriticus*	CS	NO
flannelmouth sucker	*Catostomus latipinnis*	CS	YES
humpback chub	*Gila cypha*	S-ESA	NO
razorback sucker	*Xyrauchen texanus [Abbott]*	S-ESA	NO
roundtail chub	*Gila robusta*	CS	NO

Source: UDWR (2012b).
[a] S-ESA = federally-listed or candidate species under the Endangered Species Act. SPC = wildlife species of concern to the State of Utah; CS = species receiving special management under a conservation agreement in order to preclude the needs for federal listing.

Habitat for the western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) is characterized by dense lowland riparian areas with a dense sub-canopy of shrubs. These birds nest in lower to mid elevations from 2,500–6,000 feet and typically require large, 100-200-acre tracts of contiguous riparian habitat for nesting (Hughes 1999). It is unlikely that the western yellow-billed cuckoo would nest within the Study Area. Occurrences would be temporary and infrequent because of recreational use and lack of suitable habitat.

As previously illustrated in Figure 3-15, UDWR lists the northern edge and the lower southeast corner of the Study Area as being occupied habitat for greater sage-grouse. These large game birds inhabit dry upland areas such as foothills and mountain valleys. They are a sagebrush obligate species, and require sagebrush during most of their life cycle. Optimal habitat also includes an understory of grasses and forbs, and is usually associated with some wet meadow habitat (Schroeder et al. 1999; UDWR 2009a).

Fish

The federally listed fish species occurring in the area of influence of Red Fleet Reservoir are bonytail (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), and razorback sucker (*Xyrauchen texanus* [Abbott]). Although none of these endangered fish species are known to occur in Red Fleet Reservoir or Big Brush Creek above the reservoir (M. Breen 2011, pers. comm.), any water depletions from any portion of the Upper Colorado River Basin could jeopardize the continued existence of (or adversely modify the critical habitat of) the four endangered fish species of the Colorado River, and so such actions must be evaluated with regard to criteria described in the Upper Colorado River Endangered Fish Recovery Program (USFWS 1987).

State-listed sensitive fish species likely to have occurred historically in the Big Brush Creek drainage basin include flannelmouth sucker, bluehead sucker (*Catostomus discobolus*), and roundtail chub (*Gila robusta*). Currently, bluehead sucker can be found downstream of Red Fleet Reservoir near the confluence of the Green River, while flannelmouth sucker occur within Red Fleet Reservoir and likely upstream from the reservoir in Big Brush Creek. Roundtail chub, which currently occur in the Green River, were likely found in the lower portion of Big Brush Creek historically (Bosworth 2003, UDWR 2006). Roundtail chub are not currently found in Red Fleet Reservoir (Crosby and Bartlett 2005).

It was thought that the flannelmouth sucker currently inhabiting Red Fleet Reservoir were likely individuals impounded in the reservoir after dam construction. This would mean that these individuals would be 30 years old or more. Although flannelmouth sucker are a long-lived fish, recent studies indicate an average life span of 10 years (Sigler and Sigler 1996). Recent preliminary aging data from pectoral fin rays from two individuals captured in Red Fleet Reservoir determined these fish to be 7–8 years old. This data is still being verified (M. Breen 2011, pers. comm.). It is most likely that individuals were impounded in the reservoir and a small population has recruited. It is likely that spawning habitat exists within Big Brush Creek and near the inflow of Big Brush Creek to Red Fleet Reservoir. This is an important issue when considering the removal of unwanted fish species via chemical treatment, should this ever be warranted.

Cultural Resources

Cultural resources are defined as physical or other expressions of human activity or occupation. Such resources include culturally significant landscapes, prehistoric and historic archaeological sites as well as isolated artifacts or features, traditional cultural properties, Native American and other sacred places, and artifacts and documents of cultural and historic significance. Section 106 of the National Historic Preservation Act of 1966 (NHPA) mandates that Reclamation take into account the potential effects of a proposed federal undertaking on historic properties, such as a "Federal Action" in accordance with the National Environmental Policy Act (NEPA). Historic properties are defined as any prehistoric or historic district, site, building, structure, or object included in, or eligible for, inclusion in the National Register of Historic Places (NRHP). Potential effects of the described alternatives on historic properties are the primary focus of this analysis.

The affected environment for cultural resources is identified as the area of potential effects (APE), in compliance with the regulations to Section 106 of the NHPA (36 CFR 800). The APE is defined as the geographic area within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties. The APE for the undertaking (proposed action) includes the entire Study Area.

Culture History Overview

The Study Area lies on the border between the Uinta Mountains, an east-west trending, 150-mile-long mountain range in northeastern Utah and the distinctly bowl-shaped region known as the Uinta Basin. Both the Uinta Mountains and Uinta Basin are sections of what geologist William Lee Stokes refers to as the Colorado Plateau physiographic province (1986). The general culture history of the Study Area described below is based on the broader cultural chronological sequence of the Uinta Basin.

Archaeological evidence of human occupation in the Uinta Basin extends as far back as about 11,000 years ago, the beginning of what is generally referred to as the PaleoIndian Period (ca 13,000 BP–6,000 BC). The PaleoIndian Period is characterized by human adaptation to terminal Pleistocene environments and the exploitation of various extinct and modern megafauna (Lower-Eskelson 2007). A deficiency in evidence of plant procurement as well as repeated or longer-term occupation suggests that PaleoIndian populations in the Uinta Basin were highly mobile. Although distinctive artifacts typically associated with the hunting of Pleistocene megafauna have been discovered in the Uinta Basin, there remains a lack of stratified sites exhibiting evidence of human occupation prior to about 6,000 BC. PaleoIndian projectile points from the Uinta Basin (i.e., Clovis, Folsom, Goshen, Agate Basin, Hell Gap, Eden-Scottsbluff, and Alberta-Cody), however, are identical to those from the northwestern plains region of the North America, which have been recovered in chronometrically dated contexts from this period (Spangler 1995). As a result, even though a detailed account of the nature and extent of human occupation in the Uinta Basin during the PaleoIndian Period remains difficult without sufficient site data, the existence of these projectile points implies that the area was inhabited during the PaleoIndian Period.

The next period in the cultural chronological sequence of the Uinta Basin is known as the Early Archaic Period (ca 6,000 BC– 3,000 BC). According to Jennings (1978), a shift to a "mobile hunting-collecting way of life" marks the transition from the PaleoIndian to the Early Archaic

Period. In addition, new projectile point types also appear during the Early Archaic Period (i.e., Pinto Series, Humboldt, Elko Series, Northern Side-Notched, Hawken Side-Notched, Sudden Side-Notched, and Rocker Base Side-Notched). This change in projectile point production is seen by some as a reflection of the development of the atlatl for the pursuit of smaller, faster game (Holmer 1986). The discovery of projectile points characteristic of the Early Archaic Period in association with temporary camps and lithic scatters suggests human occupations in the region were sporadic. The Early Archaic inhabitants of the Uinta Basin likely practiced nomadic exploitation of local resources in small groups based on seasonal and locational availability (Spangler 1995). Although cultural remains from the PaleoIndian and Early Archaic Periods remain sparse in the Uinta Basin, dozens of archaeological sites representing the next cultural chronological sequence period, the Middle Archaic, exist in the region.

The shift from the Early Archaic to the Middle Archaic Period in the Uinta Basin is demonstrated by an increase in human populations and the appearance of the distinctive McKean Complex projectile points (Spangler 1995). The Middle Archaic Period (ca 3,000 BC–500 BC) sites illustrate cultural influences from the plains region of North America. The continued production and use of Elko Series projectile points, however, indicates cultural influences from the Great Basin and/or northern Colorado Plateau as well (Spangler 1995). Most researchers agree that Middle Archaic populations in the Uinta Basin were mobile foragers whose subsistence patterns included predominantly hunting, supplemented with gathering. This theory is supported by the fact that no permanent settlements have been discovered in the region, although a few semi-permanent base camps have been noted. Middle Archaic Period subsistence activities were likely conducted within the context of small bands. These small bands hunted game and procured locally available floral resources from one of these semi-permanent base camps (Spangler 1995). As the Middle Archaic Period transitioned into the Late Archaic Period, the subsistence strategies and settlement patterns that are generally associated with the Early and Middle Archaic Periods began to change.

As the Late Archaic Period (ca 500 BC–AD 550) began, McKean Complex projectile points vanish. Semi-subterranean residential structures began to appear regularly at base camps beginning around AD 1. At the same time, the introduction of maize horticulture, the bow and arrow, and Rose Spring arrow points suggest that, in addition to the traditional Archaic mobile hunter-gatherer subsistence strategies prevalent during the Early and Middle Archaic Periods, a new strategy incorporating horticulture and a more sedentary lifestyle emerged (Spangler 1995). The Archaic Periods were followed by a series of Formative Stage cultures, groups that were even more dependent on foods produced through horticulture (Jennings 1978).

The Formative Stage (ca AD 550–AD 1300) and the "Fremont culture," a term generally associated with the people of the Formative Stage, remains the most thoroughly investigated period of the cultural chronological sequence of the Uinta Basin. Even with the breadth of research associated with the Formative Stage, important questions regarding temporal ranges, geographic distribution, settlement patterns, and subsistence strategies, to name a few, remain unanswered. Some broad distinctions, however, can be made between the Late Archaic Period and the Formative Stage. In addition to a greater, perhaps dominant, importance placed on horticulture as a subsistence strategy, one such distinction involves an increase in the complexity of residential architecture. Architectural advancements include prepared clay floors, adobe-

rimmed firepits, and coursed-masonry architecture (Spangler 1995). An increase in the size of food-storage structures, typically associated with food surplus, also demarcates the Formative Stage. The manifestation of small villages and farmsteads, elaborate rock art and figurines, and ceramics suggest an "enhanced social complexity" during this period (Spangler 1995:453).

In the Uinta Basin, specifically, the Fremont culture is characterized by "shallow, saucer-shaped pithouses or surface structures with randomly placed potholes and off-center firepits, some of which were adobe-rimmed" (Spangler 1995). Surface storage structures were nearly absent and Uinta Gray ceramics dominated all other types. Uinta Gray ceramics were constructed using a coil-and-scrape method are almost exclusively tempered with crushed calcite (Madsen 1977). Unlike the Fremont cultures in other portions of Utah, the Uinta Basin Fremont did not use the Utah-type metate, nor did they produce unfired clay figurines. Gilsonite, a natural asphalt found only in the Uinta Basin, was used to repair broken ceramics (Marwitt 1970). The use of gilsonite marks another distinguishing feature of the Uinta Fremont. Projectile points used in the Uinta Basin during the Formative Stage include Rose Springs, Cottonwood triangular, Eastgate expanding-stem, and Elko corner-notched varieties. By AD 1300, evidence of the Fremont culture in the Uinta Basin disappears, giving way to what is commonly termed the Protohistoric Period (AD 1300–1650).

The reasons for the disappearance of Fremont culture sites in the Uinta Basin remain unclear. Some researchers postulate that climatic changes or the pressures of other cultural groups entering the region caused the Fremont culture abandonment (Jennings 1978). Others believe that the Fremont culture didn't actually abandon the Uinta Basin, but rather, that Fremont culture peoples coexisted with the new groups, such as the ancestral Ute (Uinta-ats) and Shoshone. A sheer lack of archaeological data associated with the Protohistoric Period in the Uinta Basin leaves many questions about the cultural continuity, or lack thereof, unanswered. Whatever the reasons, evidence points to a disappearance of horticulture and subsequent dominance of a more hunter-gatherer-oriented subsistence strategy, traditionally referred to as Shoshonean or Numic. Although earlier Formative Stage Fremont culture remains turn up at some archaeological sites dating to the Protohistoric Period, the Protohistoric Period material culture in the Uinta Basin, unlike earlier Fremont sites, includes Desert side-notched projectile points, Shoshonean ceramics, and occasionally, basketry and Shoshonean knives. Decidedly different rock art styles from those of the Formative Period also appear (Spangler 1995). One distinct aspect of Protohistoric Period rock art in the Uinta Basin is the representation of the horse. The introduction of the horse into the Uinta Basin cultures occurred sometime during the late stages of the Protohistoric Period. Contact between Euro-American peoples and Native American groups to the south eventually led to the animals' dissemination into the basin. The introduction, and subsequent dependency, of the horse in Protohistoric Period cultures marks the shift to the next period in the cultural chronological sequence of the Uinta Basin.

The Historic Ute Period (ca AD 1650–present) follows the Protohistoric Period. According to Spangler (1995), the Historic Ute Period actually consists of three distinct phases, the Antero Phase (ca AD 1650–1861), the Early Reservation Phase (ca AD 1861–1881), and the Late Reservation Phase (ca AD 1881–present). The Antero Phase is generally classified as the time period when those Protohistoric Period groups living in the Uinta Basin first adopted a lifestyle highly dependent on the horse but prior to their confinement to reservations. Subsistence

strategies during this time continued to include both hunting and gathering, although the introduction of the horse dramatically changed the dynamics of these strategies. Groups in the Uinta Basin became exceptionally mobile, exploiting floral and faunal resources all over Utah. In addition to buffalo, historical accounts reference seasonal hunting forays into the Uinta Basin for fish, fowl, and lacustrine plant resources (Spangler 1995). Small bands of 10 to 40 individuals, and occasionally larger groups numbering in the hundreds, travelled throughout the region hunting and gathering.

Ute peoples during this period experienced rapid social, political, and economic change (Spangler 1995). The aforementioned use of horses contributed greatly to the changes, as did the arrival of Euro-American explorers into the Uinta Basin. According to historical descriptions, the first Euro-American explorers to enter the Uinta Basin were members of the small Spanish expedition from Santa Fe, New Mexico, headed by Fray Silvestre Velez de Escalante and Fray Francisco Atanasio Dominguez. The Dominguez-Escalante expedition traveled through the Uinta Basin in 1776 searching for a land route to Monterey, California. These explorers opened the Uinta Basin to Spanish, and later Mexican, American, and British fur-trappers and traders.

With the arrival of Euro-American explorers came trade with the Ute groups in the Uinta Basin. Euro-American items such as weaponry, blankets, metal utensils, and glass ornaments were often traded for animal furs during the early nineteenth century. This eventually led the Ute peoples to become increasingly dependent upon these trade goods. Euro-American trade with these Native American groups, along with intermarriage between Euro-Americans and the Native American groups in the Uinta Basin, “irreversibly altered traditional lifeways” (Spangler 1995). The practice of slave trading and exacting tribute from traders also became prevalent by the 1830s. Increased territoriality and warfare were among the results of such practices.

Several important U.S. government expeditions (official and unofficial) also visited the Uinta Basin during the Antero Phase, including the Captain John C. Fremont expedition in the 1840s. The government declared that the intent of these expeditions involved surveying and mapping undiscovered western territories (Spangler 1995). The Uinta Basin drew little interest during this initial exploration. Many saw the climate and environment as unsuitable for settlement. In 1852 Mormon leader Brigham Young ordered small survey parties to explore the Uinta Basin to determine the suitability for locating settlements there. Upon their return the survey parties reported that the Uinta Basin was one vast contiguity of waste and measurably valueless (Fuller 1994). As a result Young decided not to send Mormon settlers to the region. Mormon leaders did, however, decide that the Uinta Basin was a suitable region for the relocation of Ute peoples. Near the end of the Antero Phase, the social and political attitudes of the Mormon leaders toward the Native American groups led to their dispossession from their traditional territories around Utah Lake.

Violence resulting from the dispossession and relocation of the Ute peoples resulted in the creation of the first reservation in the Uinta Basin in 1861. The creation of the Uintah Reservation marks the beginning of the Early Reservation Phase of the Historic Ute Period. According to Spangler (1995), this phase is defined as the period when Ute peoples throughout Utah were systematically removed from their traditional territories and forced to live in the Uintah Reservation. The reservation originally included western Uintah County, most of

modern-day Duchesne County, and the Strawberry Valley (Spangler 1995). Ute peoples participated in government-sponsored agricultural projects, and relations on the reservation were relatively peaceful. The arrival of government surveying parties in 1876 and the subsequent arrival of homesteaders to the reservation in the late 1870s, however, led the Ute peoples to suspect a government plan to open the reservation to white settlers. As the Early Reservation Phase came to an end, the Ute culture was experiencing "tremendous social upheaval precipitated by at least three decades of intensive association with Euro-Americans" (Spangler 1995). The Ute peoples of western Colorado were facing similar issues.

By 1881 violence over the dispossession of traditional territories in the region culminated in the forcible relocation of Ute peoples from western Colorado to a new temporary reservation, the Ouray Reservation, in the Uinta Basin. According to Spangler (1995), this marks the beginning of the Late Reservation Phase of the Historic Ute Period. The forced settlement of so many different Ute bands in the Uinta Basin led to serious friction. Increased Mormon settlement in the Uinta Basin continued to promote Ute fears of white settler infiltration of reservation lands. Ute lifeways now included cattle ranching, cultivation of crops, and dairy farming. The Late Reservation Phase was also marked by a decisive plan of enculturation by the U.S. government. Through the use of government-assigned reservation superintendents, Ute peoples were to be made into "carbon-copy white men" (Spangler 1995). The discovery of gilsonite and valuable hydrocarbon resources in the Uinta Basin in the late 1880s led to the withdrawal of 7,000 acres from the Uinta Reservation (Fuller 1994). The subsequent establishment of U.S. military forts and the official opening of the Uintah and Ouray Reservations to white settlement in 1887, with the Dawes Severalty Act, marked the final dispossession of the Ute peoples (Spangler 1995).

With an influx of white settlers (mostly farmers and ranchers) entering the Uinta Basin, complex irrigation systems and additional rangelands were needed. This led to the dispossession of Ute peoples from the reservation lands originally set aside for their exclusive use following their previous dispossession from traditional territories. Initially, livestock represented the main industry of white settlers in the Uinta Basin, likely due to the availability of grass and water in the region. Eventually, the sheep industry boomed, contributing to a decline in the cattle industry (Lower-Eskelson 2007). Commercial oil production began in 1948 but was not fully exploited until the 1970s with increases in the price of crude oil. Consequently, private and public ventures began work to develop an inexpensive process for separating oil from oil shale and tar sands, both prevalent in the Uinta Basin.

Around 1980, international oil prices began to fall and the economic health of the Uinta Basin, based heavily on the oil industry, fell sharply. The development of water resources for other parts of Utah, especially the Wasatch Front, led to another temporary economic stimulus. Today, little evidence of the aforementioned economic flourishes remains (Fuller 1994). What does remain is a fairly small population base of both white farmers and ranchers as wells as Ute peoples on the Uintah and Ouray Reservation, who are supported by a fragile economy based on petroleum and mining. According to Burton (1996), an estimated 30 percent of jobs in the Uinta Basin were related to mining and petroleum.

Existing Cultural Resource Information

A Class I cultural resource literature search was conducted by Reclamation at the Division of State History, Utah State Historic Preservation Office, on October 19, 2011, to identify any

previously conducted cultural resource inventories and recorded cultural resource sites within the Study Area. Files from Reclamation and General Land Office maps were also examined. As a result of the literature search, 14 previously conducted cultural resource inventories and four previously recorded cultural resource sites were identified within the Study Area. The four previously recorded sites are all prehistoric in nature. Two of the sites have been previously determined ineligible for the NRHP, one site has been previously recommended ineligible for the NRHP, and the other site's eligibility was undetermined.

Due to the scarcity of previously recorded sites in the Study Area, the previously recorded sites were revisited and re-recorded by Reclamation's archeologist during the RMP process. In addition, an initial recording of two previously identified prehistoric sites were also performed.

In accordance with 36 CFR 800.4(c), all six sites were evaluated for significance in terms of NRHP eligibility. The significance criteria applied to evaluate cultural resources are defined in 36 CFR 60.4 as follows:

> The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and:
>
> - that are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> - that are associated with the lives of persons significant in our past; or
>
> - that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> - that have yielded, or may be likely to yield, information important in prehistory or history.

Following an evaluation of each site, Reclamation's archeologist has determined that all four of the previously recorded sites are ineligible for the NRHP. Reclamation has determined, however, that the two newly recorded prehistoric sites are eligible for the NRHP under Criteria C and D.

The Red Fleet Reservoir RMP establishes only a conceptual framework for managing cultural resources at Red Fleet Reservoir and does not implement any specific projects. As such, the scope of this RMP focuses on a broad scale of cultural resource impacts associated with the array of alternatives and their broad levels of proposed development within the Study Area. Site-specific cultural resource impacts will be addressed as part of separate NEPA and Section 106 compliance processes prior to the implementation of individual projects proposed as part of the selected RMP; those site-specific impacts are not addressed in this RMP.

Paleontological Resources

Paleontological resources are defined as any fossilized remains, traces, or imprints of organisms, preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of life on earth. Any materials associated with an archaeological resource (as defined in section 3(1) of the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470bb(1)) and any cultural item (as defined in Section 2 of the Native American Graves Protection and Repatriation Act (25 U.S.C. 3001)) are not considered paleontological resources. Section 6302 of the Paleontological Resources Preservation Act (PRPA) of 2009 (Sections 6301-6312 of the Omnibus Land Management Act of 2009 [Public Law 111-11 123 Stat. 991-1456]) requires the U.S. Secretary of the Interior to manage and protect paleontological resources on federal land using scientific principles and expertise. The affected environment for paleontological resources is represented by the same proposed action Study Area APE that corresponds to cultural resources.

Paleontological History

The following is a very brief overview of the paleontological history of the Study Area. Due to the extensive nature of the geologic record in the Study Area, a more detailed description of paleontological history has been omitted. Comprehensive paleontological histories are available in various publications specific to the paleontology at Red Fleet Reservoir (Santucci and Zack 2000, Sloan et al. 1980, Hamblin and Bilbey 1999, Hamblin et al. 2000).

The rock formations exposed within the Study Area are of sedimentary origin. These sediments were originally deposited under a variety of environmental conditions, mainly marine in nature. At the end of the Cretaceous period, approximately 65 million years ago, geologic processes created an uplift, resulting in the formation of the Uinta Mountains. This process led to a transition from marine sediments to what we see in the Study Area today, mainly a sequence of sandstones and shales with minor limestones (Sloan et al. 1980). Sedimentary exposures in the Study Area include 11 formations from the Mesozoic era (dating from about 250 million to 65 million years ago). In addition, Quaternary alluvium from the Cenozoic era (dating from about 65 million years ago to present) also appear.

Various paleontological resource types are known to exist within the same formations found in the Study Area. These include, but are not limited to, petrified or carbonized wood, marine vertebrates and invertebrates, and ichnofossils (Santucci and Zack 2000).

Existing Paleontological Resource Information

A paleontological resource file search was conducted by the Utah Geological Survey, at the request of Reclamation, on January 23, 2012, to identify any previously conducted paleontological resource surveys and recorded paleontological resource localities within the Study Area. Files from Reclamation were also examined. Four previously conducted paleontological resource surveys and 57 previously recorded paleontological resource localities were identified within the Study Area during the file search.

Paleontological resources localities within the Study Area include fossil plant remains in the form of petrified wood and gymnosperm branches and needles. Invertebrate remains in the Study Area consist of brachiopods, bivalves, gastropods, ammonoids, and belemnites. Several vertebrate fossils have also been recovered from the Study Area. These include not only fish

scales and a partial fish skeleton, but also pliosaur and plesiosaur remains. Ichnofossils, such as shrimp burrows, ornithopod tracks, and a theropod tracksite, also appear in the Study Area (Santucci and Zack 2000).

The Red Fleet Reservoir RMP will establish only a conceptual framework for managing paleontological resources at Red Fleet Reservoir and does not implement any specific projects. As such, the scope of this RMP focuses on a broad scale of paleontological resource impacts associated with the array of alternatives and their broad levels of proposed development within the Study Area. Site-specific paleontological resource impacts will be addressed as part of separate NEPA and PRPA compliance processes prior to the implementation of individual projects proposed as part of the selected RMP; those site-specific impacts are not addressed in this RMP.

Indian Trust Assets (ITAs)

Indian Trust Assets are legal interests in property held in trust by the United States for Indian tribes or individuals. Trust assets may include lands, minerals, hunting and fishing rights, traditional gathering grounds, and water rights. Impacts to ITAs are evaluated by assessing how the action affects the use and quality of ITAs. Any action that adversely affects the use, value, quality or enjoyment of an ITA is considered to have an adverse impact to the resources.

The DOI's policy is to recognize and fulfill its legal obligations to identify, protect, and conserve the trust resources of federally recognized Indian tribes and tribal members, and to consult with tribes on a government-to-government basis whenever plans or actions affect tribal trust resources, trust assets, or tribal safety (please refer to Departmental manual, 512 DM 2). Under this policy, as well as Reclamation's ITA policy, Reclamation is committed to carrying out its activities in a manner that avoids adverse impacts to ITAs when possible, and to mitigate or compensate for such impacts when avoidance is not possible. All impacts to ITAs, even those considered nonsignificant, must be discussed in the trust analyses in NEPA compliance documents and appropriate compensation or mitigation must be implemented.

Reclamation contacted the Bureau of Indian Affairs (BIA) Uintah and Ouray Agency in Fort Duchesne, Utah to identify any potential impacts to ITAs within the Study Area. According to the BIA, the only known ITA involves a water right in the Green River held in trust for the Ute Indian Tribe of the Uintah and Ouray Reservation.

Energy, Minerals, and Other Extractive Resources

Mineral resources are divided into three categories: locatable, leasable, and saleable. Locatable minerals include gold, silver, lead, zinc, and other "high value" metallic ores subject to the Mining Law of 1872, as amended by 30 U.S.C. Ch. 2. Leasable minerals are oil and gas, oil shale, coal, potash, phosphate, sodium, gilsonite, and geothermal resources. These are subject to lease under the Mineral Leasing Act of 1920, as amended and supplemented (30 U.S.C. 181, et seq.), the Mineral Leasing Act for Acquired Lands as amended (30 U.S.C. 351-359), and the Geothermal Steam Act of 1970, (30 U.S.C. 1001-1025). Saleable minerals are of the common variety and include sand, stone, gravel, pumice, cinders, clay, and other minerals extracted in bulk such as petrified wood. These minerals are subject to sale and disposal at the discretion of Reclamation under the Act of July 31, 1947, as amended (30 U.S.C. 601 et seq.); the Act of July

23, 1955 (30 U.S.C. 601); the Act of September 28, 1962 (30 U.S.C. 611); and Section 10 of the Reclamation Projects Act of 1939 (43 U.S.C. 387). Except for minerals and conditions meeting the provisions of section 10 of the Reclamations Projects Act of 1939, leases for mineral and geothermal resources on all land acquired or withdrawn by Reclamation are issued by the BLM. There is a borrow area on top of the hill just south of Red Fleet Dam that was used as a source of fill for construction of Red Fleet Dam (M. Murray 2011, pers. comm.).

Leasable minerals are under discretionary authority, meaning they are open to development through application and permitting by the BLM with concurrence of Reclamation. Under the present Interagency Agreement (December 1982), the BLM will, in all issues involving mineral and geothermal leases, request that Reclamation determine whether leasing is permissible and, if so, provide any stipulations required to protect the interests of the United States. Currently, no formal Reclamation stipulations exist for the Study Area.

No evidence of mineralization was observed during the Project Team site visit in October 2011. No past locatable mineral development has occurred within the Study Area. Most of the Study Area consists of steep slopes, open water, and recreational or administrative areas. Therefore, locatable mineral resource exploration or development in the Study Area is unlikely. However, the potential for hydrocarbon resources does exist within the Study Area. There are several gas fields in the vicinity of Red Fleet Reservoir. As with locatable mineral resources, the exploration or development of leasable minerals is unlikely because of the limited available surface area. There are also saleable mineral resources (e.g., sand, gravel, and cobbles) in the Study Area. Limited quantities of cobble and gravel resources and large quantities of silt and clay were observed in the Study Area during the Project Team site visit in October 2011.

Waste Water, Solid Waste, and Hazardous Materials

Wastewater

Wastewater generated by the restrooms and residence at the State Park is treated using a septic tank and absorption field within the Study Area. The fish-cleaning station is designed to be a decomposition unit, but cold temperatures prevent operation as designed, and the debris must be cleaned out manually about three times per year (M. Murray 2012b, pers. comm.).

Solid Waste

All solid waste is transported out of the Study Area for disposal in a local landfill.

Hazardous Materials

Hazardous materials are not used in the Study Area. No evidence of spills, contamination problems, or hazardous materials were identified within the Study Area. A propane tank is present at the Stake Park warehouse.

Land Management

This section describes current land management conditions that affect Study Area resource management, including ownership and transportation characteristics as well as existing legal, institutional, and land-use constraints, such as contracts between Reclamation and other entities.

Legal constraints include legislative acts, compacts, and agreements that govern the diversion and use of water from Big Brush Creek and, specifically, water stored in Red Fleet Reservoir. Institutional constraints include water delivery contracts or water rights and Reclamation's administrative procedures that govern the management and use of Study Area facilities. Land-use constraints include existing Memorandums of Understanding, contracts, lease agreements, permits, easements, and rights-of-way that govern the management and use of Study Area resources.

Land Ownership and Management

Figures 1-1 and 1-2 show land ownership characteristics surrounding the Study Area. Within a 2-mile radius, approximately 76 percent of lands are federal, administered by the BLM. Another 5 percent are state trust lands, administered by the State of Utah School and Institutional Trust Lands Administration (SITLA). There are two SITLA parcels adjacent to the Red Fleet Reservoir Reclamation boundary, as illustrated in Figure 1-2. The remaining lands (approximately 19 percent) near Red Fleet Reservoir are privately owned. These private lands are located adjacent to the Reclamation boundary in two locations, at the Big Brush Creek inflow and below Red Fleet Dam.

Transportation and Access

Roads entering the Study Area are illustrated on the Study Area map (Figure 1-2). Primary access to the State Park begins at US-191 and proceeds east on a paved, two-lane county road labeled "Red Fleet Access Road" for a distance of 2.0 miles to the pay station at the park. By state code, this access road is under the jurisdiction of and is maintained by Uintah County (Utah Code 72-3-205).

Red Fleet Dam is accessed via Donkey Flat Road, a paved county road, located north of Red Fleet Reservoir. Donkey Flat Road joins with Brush Creek Road, an unpaved county road, to the northeast of the Reclamation property. An access road to the dam branches from Brush Creek Road near the Reclamation property boundary. For security reasons, public access into to the Primary Jurisdiction Zone is prevented by a gate and fence. Brush Creek Road can also be accessed from the south from the Diamond Mountain Highway, which is a paved county road originating in Vernal.

Little Valley Road, an unimproved (Class D) county road, crosses through Reclamation property along the southern boundary. Little Valley Road originates at US-191 within Reclamation property at Steinaker Reservoir just north of Vernal and terminates on Brush Creek Road a short distance south of the Red Fleet Dam.

Also illustrated in Figure 1-2 are a number of unimproved roads within the Reclamation boundary. A Class D county road provides access to the South Beach Area. This road is currently gated and provides administrative access only. To prevent the spread of AIS, the public is presently not allowed to drive to the South Beach Area. There is another road into the North Beach Area, which is gated at the Reclamation boundary for similar reasons. At the present time, the public is allowed walk-in access to the North Beach Area. Some of the other undesignated roads within the Reclamation boundary provide administrative access and need to be maintained; others are user-created unimproved roads that could potentially be decommissioned, particularly

wherever these roads present erosion problems, provide access to unsafe areas, or enable trespass into the Primary Jurisdiction Zone.

Legal Constraints

Legal constraints include legislative acts, compacts, and agreements that govern the use of water from Big Brush Creek and, specifically, water stored in Red Fleet Reservoir.

Reclamation Act of 1902

In the Reclamation Act of June 17, 1902, the U.S. Congress authorized construction of irrigation projects in arid and semiarid lands that now comprise the western United States (43 U.S.C. § 301). General authority over these projects was assigned to the U.S. Secretary of the Interior; project administration and oversight responsibilities were assigned to Reclamation. Proceeds from sales of public lands were placed into a Reclamation fund to assist in paying for the irrigation projects. Reclamation is the agency responsible for overall resource and facility management within the Study Area.

Colorado River Storage Project Act of 1956 as Amended (1962, 1964, 1968, and 1980)

The Colorado River Storage Project Act of 1956 as amended (1962, 1964, 1968, and 1980) provides for the following: (1) the comprehensive development of the water resources of the Upper Colorado River Basin to regulate the flow of the Colorado River; (2) water storage for beneficial consumptive use, making it possible for states of the Upper Basin to use the apportionments made to and among them in the Colorado River Compact and the Upper Colorado River Basin Compact, respectively; and (3) the reclamation of arid and semiarid land, control of floods, and generation of hydroelectric power. The act authorizes the U.S. Secretary of the Interior to construct, operate, and maintain initial units of the Colorado River Storage Project and additional reclamation projects (referred to as "participating projects") in the Upper Colorado River Basin. The units and projects consist of dams, reservoirs, power plants, transmission facilities, and appurtenant works. The Central Utah Project (CUP) is a participating project of the Colorado River Storage Project; Red Fleet Dam, Tyzack Aqueduct, and Tyzack Pumping Plant and are components of the Jensen Unit of the CUP.

Reclamation Recreation Management Act of 1992

The Reclamation Recreation Management Act (Public Law 102-575) provides uniform policies regarding recreation developments, fish and wildlife enhancements, cost sharing of federal multipurpose water resource projects, and other purposes. As part of the policies section on management of Reclamation lands, the U.S. Secretary of the Interior is authorized to develop, maintain, and revise RMPs for Reclamation lands. The RMPs shall provide for the development, use, conservation, protection, enhancement, and management of resources on Reclamation lands in a manner that is compatible with the authorized purposes of each specific Reclamation project.

Institutional Constraints

Institutional constraints for resource planning include existing water delivery contracts, water rights, and the Reclamation administrative procedures that govern the management and use of Study Area facilities.

Reclamation's Emergency Management Policies and Directives

Reclamation's Emergency Management Policies and Directives provide for safety and protection of environmental resources from incidents at Reclamation storage dams and reservoirs by: (1) taking the reasonable and prudent actions necessary to ensure timely notification to potentially affected jurisdictions of such incidents, and (2) defining program needs and requirements essential to maintain self-regulation by line managers, be responsive to public safety, and satisfy legal requirements during operations or emergency incidents at Reclamation facilities. This program also requires that an Emergency Action Plan be written for each dam to include emergency management initiating conditions, response levels, and expected actions. The Emergency Action Plan for Red Fleet Reservoir was completed and signed April 12, 2012.

Standing Operating Procedures (SOPs)

Standing Operating Procedures (SOPs) are prepared for all Reclamation dams and reservoirs to establish, in one primary document, the complete, accurate, current, structure-oriented operating instructions for each dam and reservoir and its related structures. The document's purpose is to ensure adherence to approved operating procedures over long periods of time and during changes in operating personnel. Operating procedures shall not deviate from those stated in the SOPs without appropriate authorization. The SOP for Red Fleet Reservoir and Dam was signed into effect on June 14, 2004.

Water Operations

Red Fleet Reservoir has a total capacity of 26,000 acre-feet, of which 24,000 acre-feet is active storage. The reservoir has a surface area of 521 acres at the normal water surface elevation of 5,608.2 feet. Red Fleet Dam and Reservoir were turned over to UWCD for operation and maintenance on May 1, 1985. The operation and maintenance responsibilities for the Tyzack Aqueduct and Tyzack Pumping Plant were transferred to the UWCD on October 1, 1988.

Land Use Constraints

Land use constraints are existing policies and agreements that define management and agency jurisdiction, authorities, and responsibilities for the use, enhancement, and protection of resources within the Study Area. The following is a list of contracts and agreements on file with Reclamation.

Reclamation Contracts

- Memorandum of Agreement 0-LM-40-00020 between the Bureau of Reclamation and the Utah Division of State Parks and Recreation for Management of Recreation Facilities at Red Fleet Reservoir.

- Repayment Contract 6-05-01-00143 between the United States and the Uintah Water Conservancy District, June 3, 1976.

    - Amendment to Contract 6-05-01-00143 for conformance with the Reclamation Reform Act of 1982, November 1, 1985.

    - Amendment to Contract 6-05-01-00143 to modify the municipal and industrial water repayment obligation, December 30, 1992.

Concession Agreements

- None currently.

Licenses, Leases, and Permits

- License Agreement 4-07-41-L0420 to Mountain States Telephone and Telegraph Company (Mountain Bell), September 17, 1984.

- Relocation Contract 6-07-01-00122 between Bureau of Reclamation and Uintah County, Utah for Relocation of a County Road.