CHAPTER 3— INSTREAM FLOW NEEDS ASSESSMENT

This chapter summarizes Reclamation's Instream Flow Needs Assessment for the Sheyenne River and portions of the Red River of the North (Bureau of Reclamation 1999). The Instream Flow Needs Assessment, which constituted Phase I, Part B, of the Red River Valley MR&I Water Needs Assessment, was finalized in August 1999. The purposes of the assessment were to:

1. Quantify the relationship between seasonal flows and available habitat for selected fish species.
2. Describe a reasonable seasonal instream flow regime for aquatic life and riparian corridor maintenance.
3. Identify water quality improvement opportunities and needs.
4. Identify flow-related recreational opportunities and needs.
5. Identify changes in recreational activities likely to result from the described seasonal instream flow regime (changes in use, regional economic impacts, and economic benefits).
6. Identify legal and institutional instream-flow-related opportunities and needs associated with State water law for North Dakota and Minnesota.

The study area for the Instream Flow Needs Assessment was defined as (1) the Sheyenne River from the Harvey, North Dakota, U.S. Geological Survey (USGS) gauging station to its confluence with the Red River of the North just downstream of Fargo, North Dakota, and (2) the Red River of the North from near Wahpeton, North Dakota (upstream of Fargo), to the international gauging station at Emerson, Manitoba, Canada,. The primary reach of interest on the Red River was between Fargo, North Dakota, and the mouth of the Buffalo River (Halstad, Minnesota USGS gauging station).

AQUATIC LIFE MAINTENANCE FLOW NEEDS ASSESSMENT

The relationship between available fishery habitat and flow was quantified using the Modified Habitat Preference Methodology (Modified Physical Habitat Simulation Method) of the Instream Flow Incremental Methodology (IFIM) (Stalnaker et al. 1995) and a variation of the computational methods used by the Physical Habitat Simulation System (PHABSIM) of the IFIM. Figures 3.1 through 3.8 illustrate the quantitative relationships developed between available fishery habitat and seasonal instream flows at Reclamation's six study sites. These relationships were used to evaluate the alternatives described in chapter 6 of this report. Chapter 7 includes an analysis of the available fishery habitat, expressed as percent of maximum weighted usable area for all fish species versus flow for each of the alternatives.

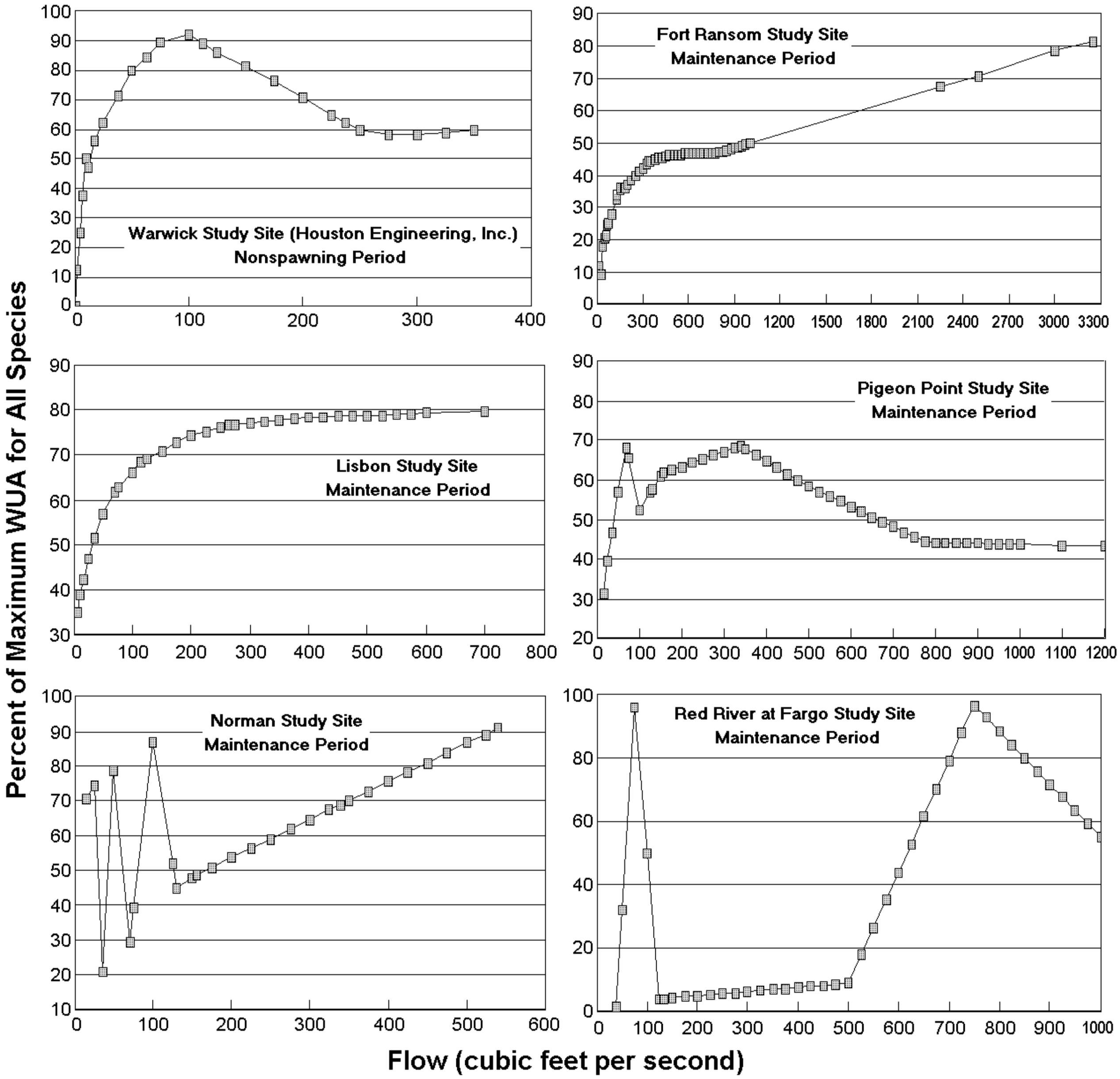

Figure 3.1.—Percent of maximum weighted usable area (WUA) available for all species of fish during the maintenance period (July-February) versus flow at Reclamation's six study sites.

Multiple methods were used to evaluate instream flow needs for aquatic life and riparian corridor maintenance and for water quality improvement. As an example for use by resource managers, a seasonal instream flow regime for maintenance of the aquatic community was developed using the following comparative methods:

1. Hydrologic Methods:
    a. Annual mean flow comparison
    b. Average (mean) flow for all water years — high (spawning)/low (maintenance) period comparison

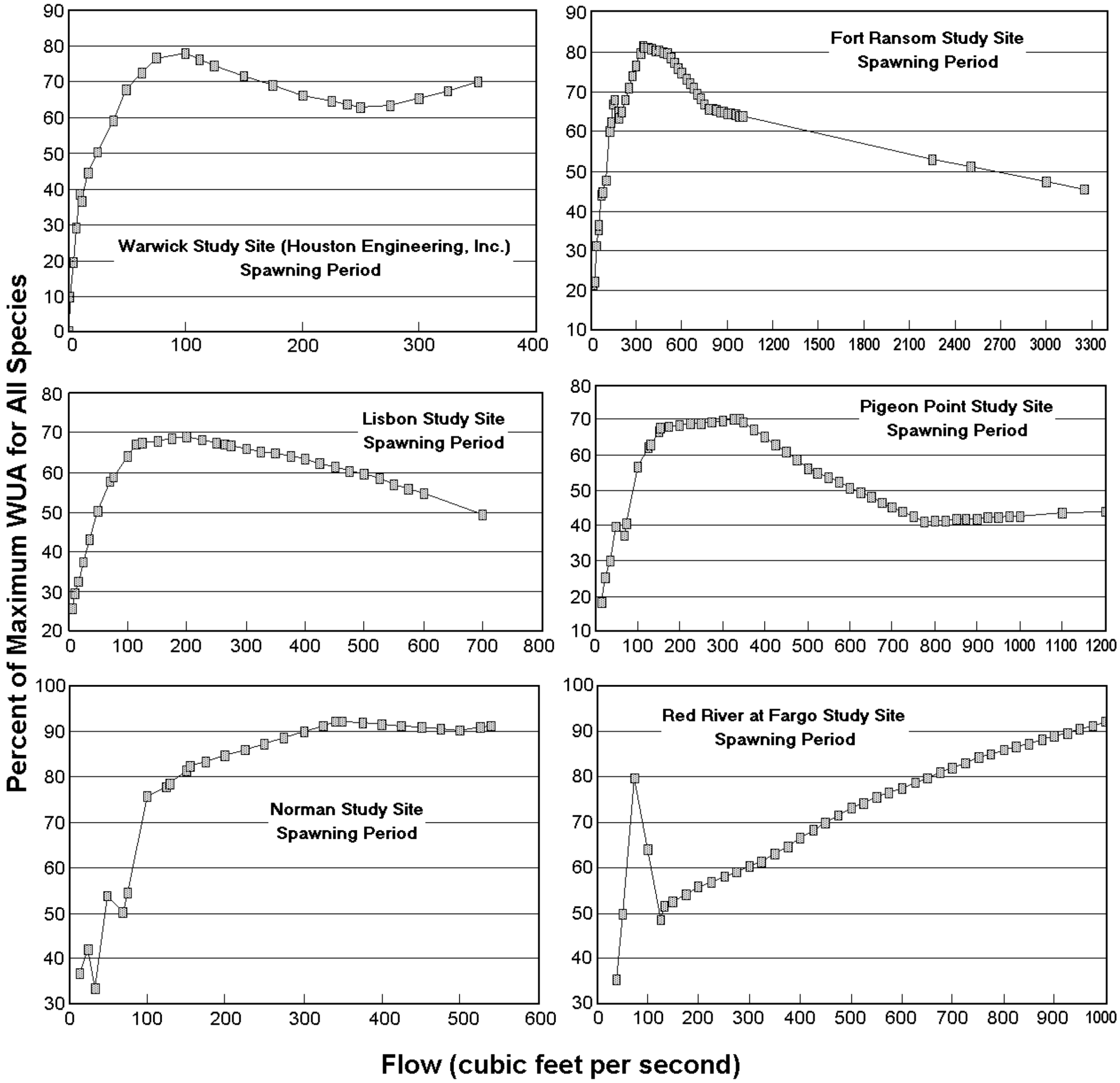

Figure 3.2.—Percent of maximum weighted usable area (WUA) available for all species of fish during the spawning period (March-June) versus flow at Reclamation's six study sites.

c. Tennant method comparison (Tennant 1976)
d. 25% of the annual mean flow comparison
e. Water-year-type flow comparison — high (spawning)/low (maintenance) period flows for dry, average, and wet years

2. Wetted perimeter vs. flow method comparison (O'Shea 1995)
3. Hydraulic rating method employing the wetted perimeter technique (Nelson 1980)
4. Modified Habitat Preference Methodology (Modified Physical Habitat Simulation Method) of the Instream Flow Incremental Methodology (IFIM; Stalnaker et al. 1995) and a variation of the computational methods used by the Physical Habitat Simulation System (PHABSIM) of the IFIM.

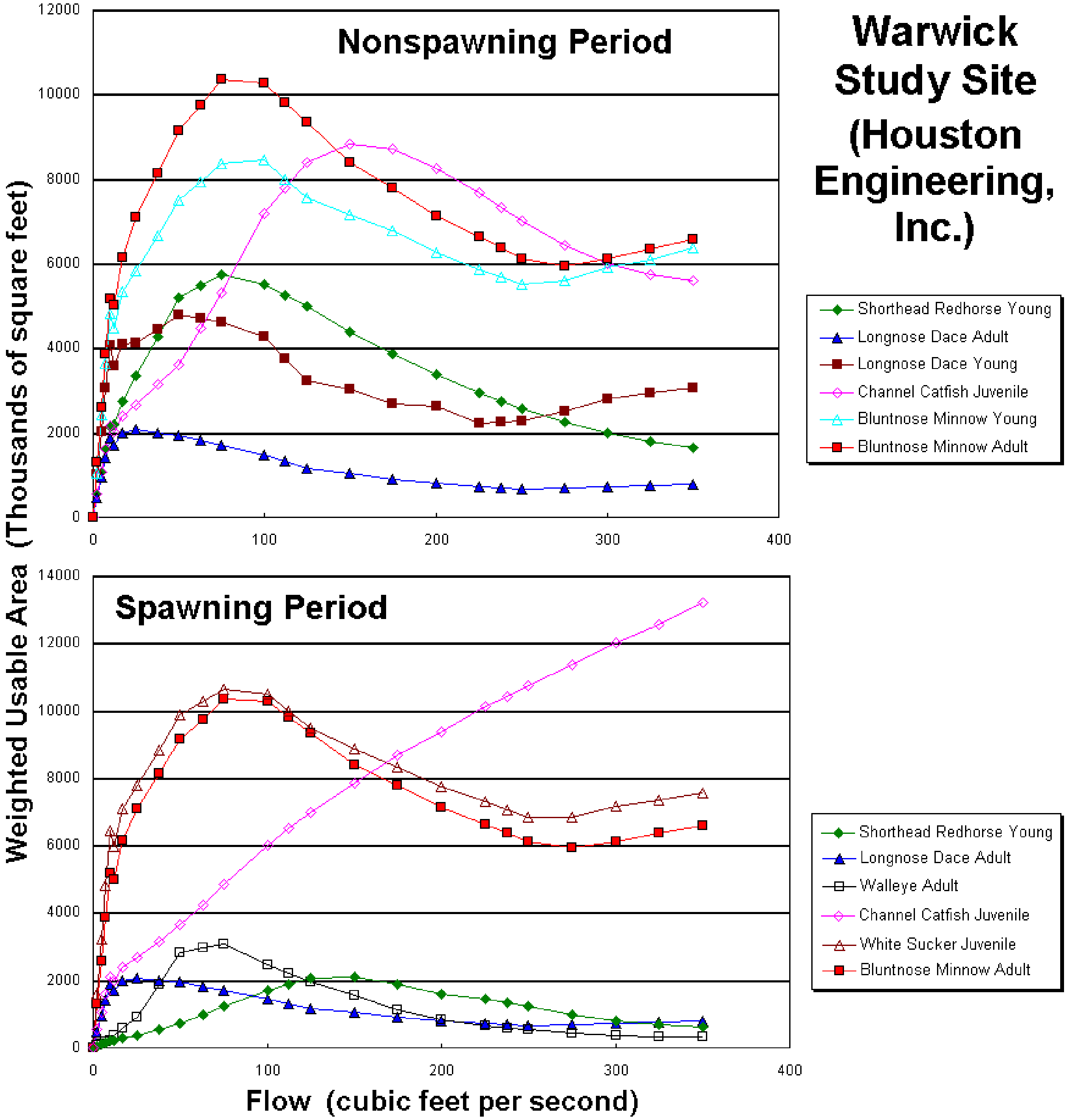

Figure 3.3.—Weighted usable area versus flow by species of fish during maintenance and spawning periods at the Warwick study site.

A goal-oriented methodology was used in developing the seasonal instream-flow regime as an example for resource managers to consider for management and planning purposes. Table 3.1 lists the resulting seasonal instream-flow regime for aquatic life and riparian corridor maintenance. It should be noted that the flows listed here were not considered additional demands to be met by alternatives in the Phase II analysis. The seasonal instream-flow regime is provided only for consideration as a means to protect the basic needs of aquatic life in the river

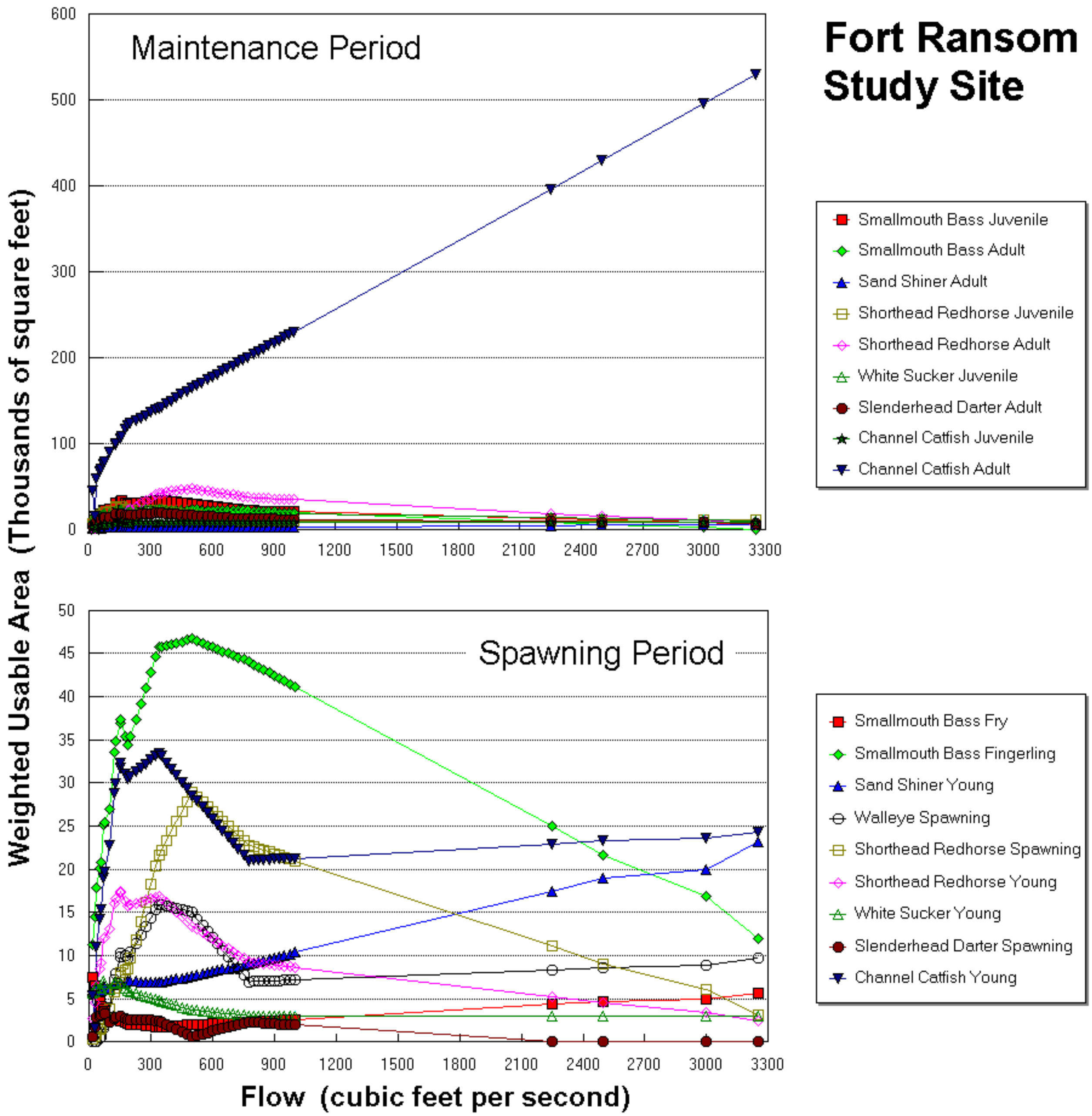

Figure 3.4.—Weighted usable area versus flow by species of fish during maintenance and spawning periods at the Fort Ransom study site.

systems and was not intended to represent minimizing or optimizing flows. Decisionmakers and resource managers may choose to consider this flow regime for future management and planning purposes. Seasonal instream flow needs can be defined many ways. For this assessment, however, they are defined as those flows that would maintain the ecological integrity of the riverine ecosystem (maintaining the existing community structure at a defined level based on the application of hydrologic, hydraulic, and habitat-based methodologies).

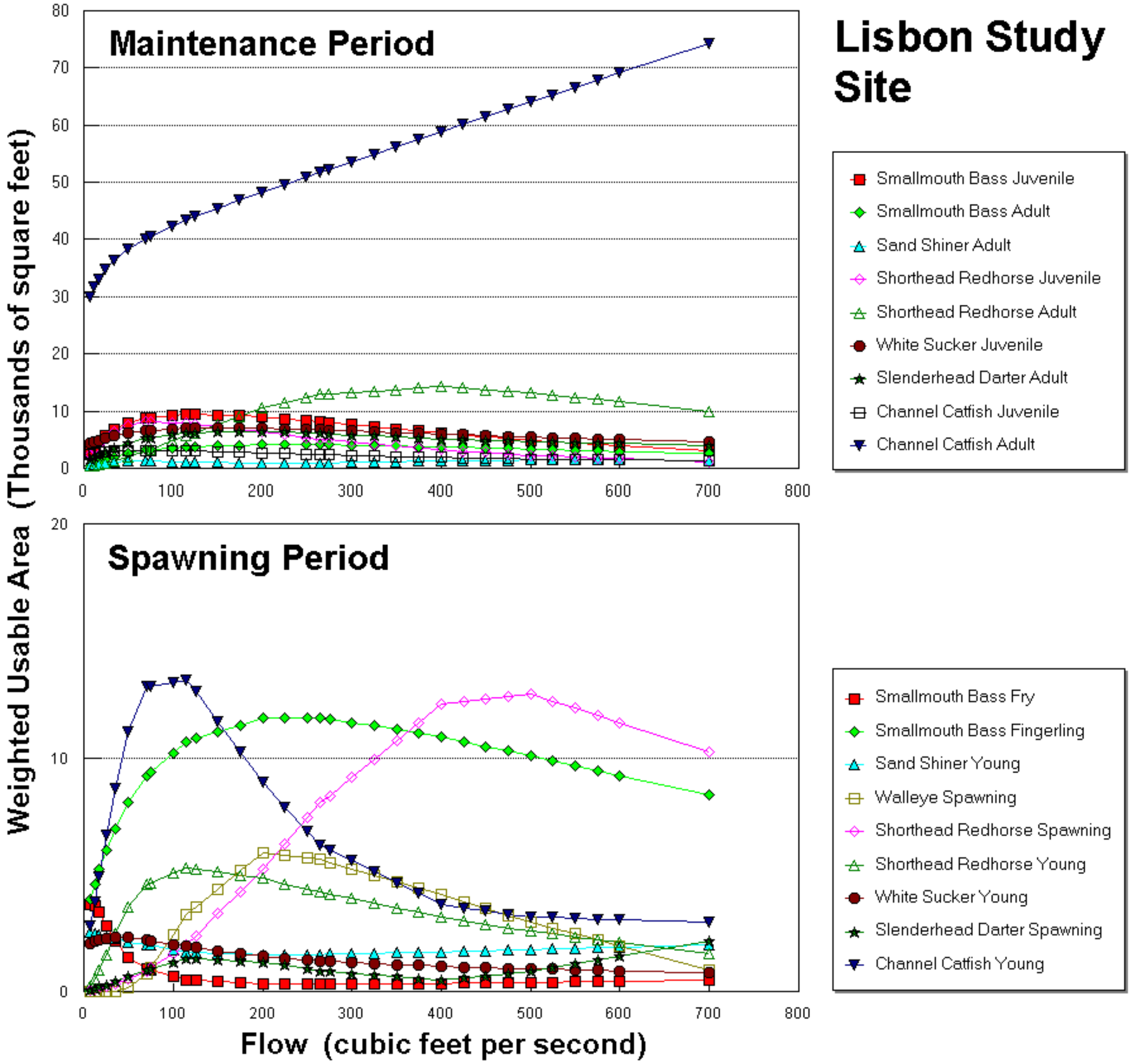

Figure 3.5.—Weighted usable area versus flow by species of fish during maintenance and spawning periods at the Lisbon study site.

It is important that the seasonal instream-flow regime be viewed in its proper context, as a part of the assessment of water needs in the Red River basin which might be met through the various alternatives being investigated in Phase II. This information may be especially useful in determining the level of benefit that might result from the delivery of water through the Sheyenne and Red River systems. This level of benefit is expressed here as the percent of maximum fishery habitat available or, in other words, the percent of maximum weighted usable area (WUA) for both the maintenance and spawning periods of each year for all species of fish that were analyzed.

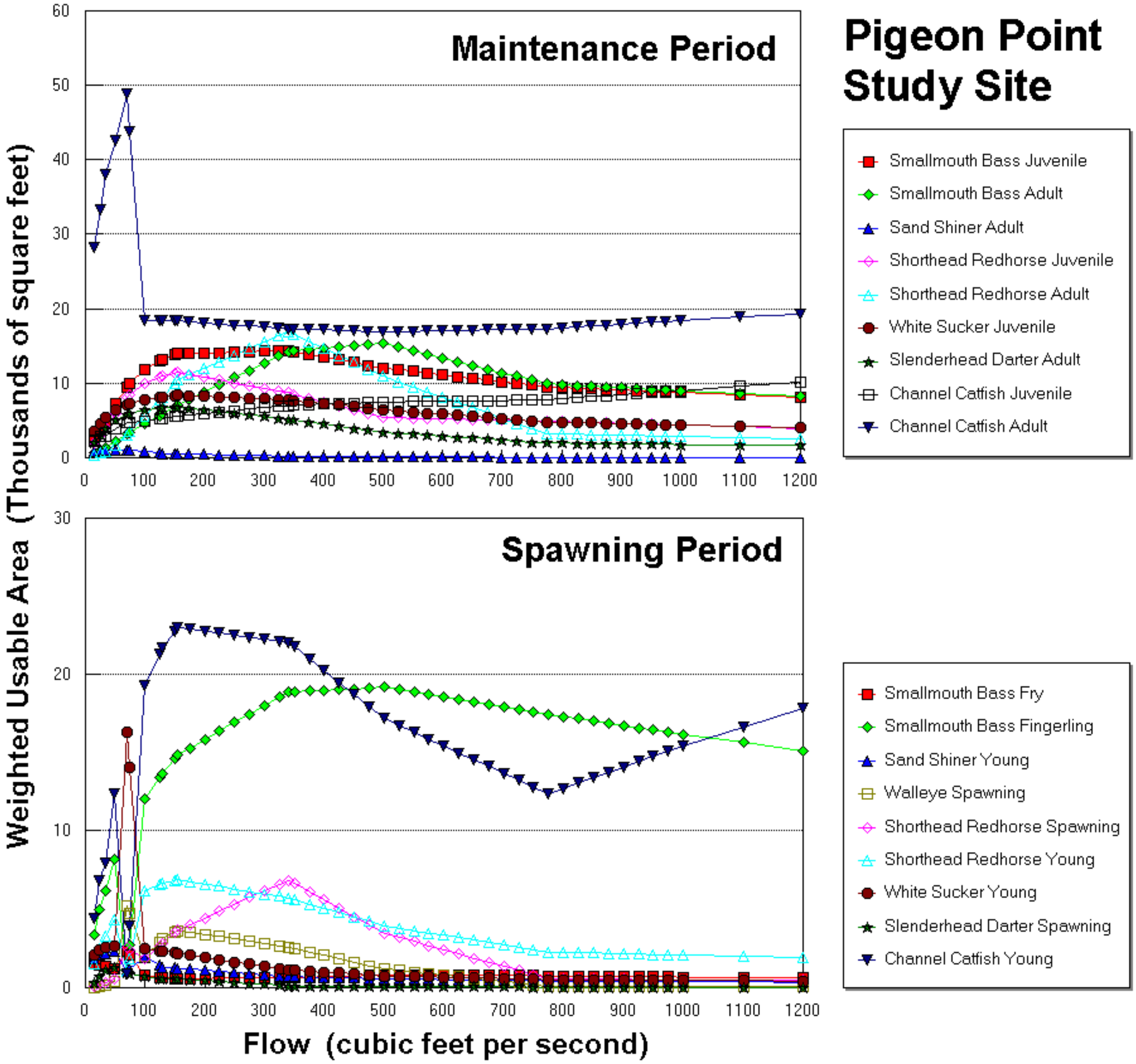

Figure 3.6.—Weighted usable area versus flow by species of fish during maintenance and spawning periods at the Pigeon Point study site.

The analysis demonstrated that the application of different methodologies do result in differing recommendations for any given location on the Sheyenne River or the Red River of the North. Use of the Modified Habitat Preference Method—both the multiplicative technique and the goal-oriented methodology (plus consideration of historic flows and hydrologic and hydraulic method results)—resulted in the most defensible approach to establishing a seasonal instream-flow regime for the study area for this appraisal level of analysis.

For both the Red and Sheyenne Rivers, the seasonal instream-flow regime described here, compared to mean historic flows, would generally result in similar amounts of habitat being maintained for all sites considered but require less water to produce the results.

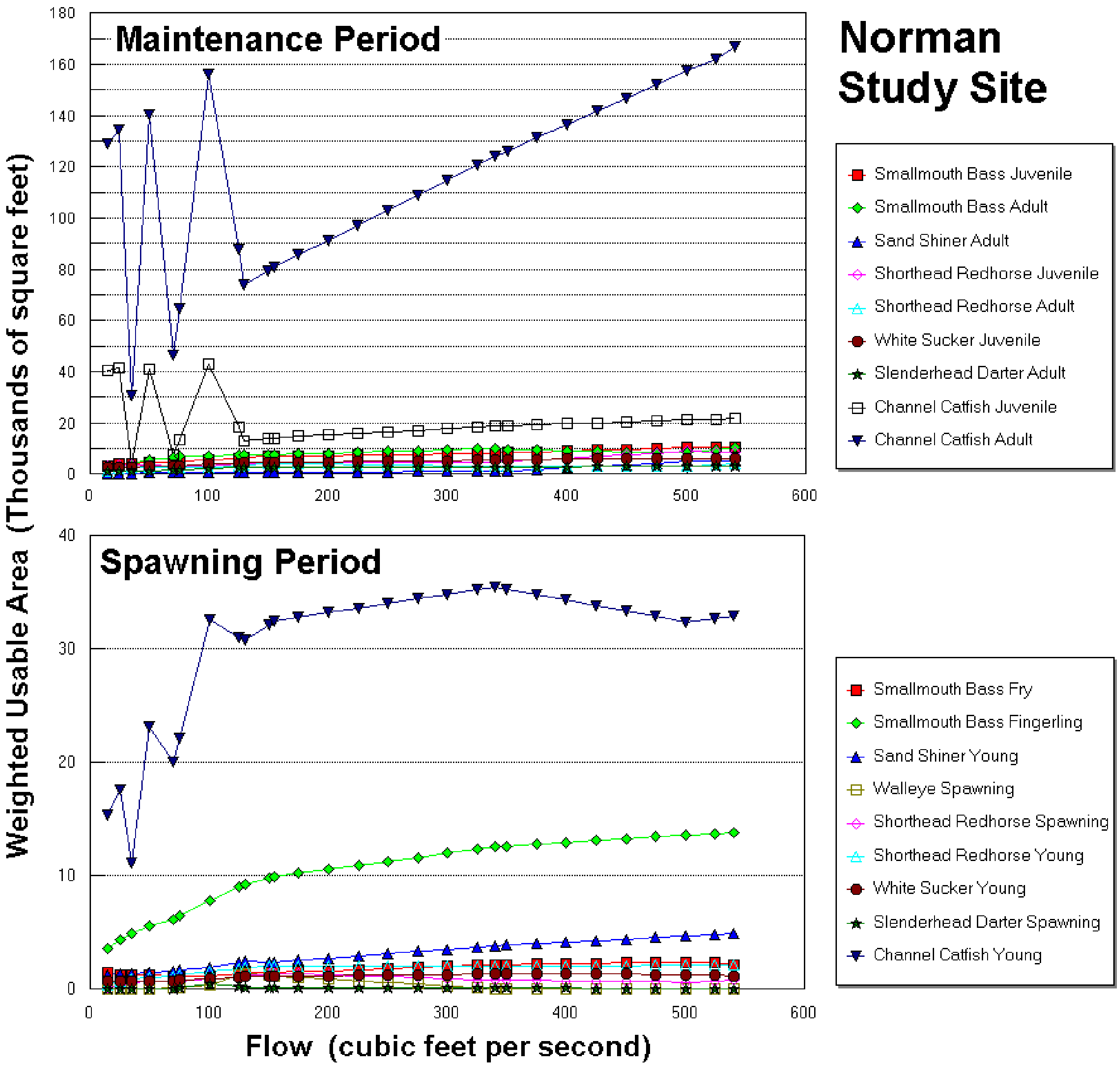

Figure 3.7.—Weighted usable area versus flow by species of fish during maintenance and spawning periods at the Norman study site.

The seasonal instream-flow regime would maintain, for the Sheyenne River, an average of 61 percent of the maximum WUA for all species during the maintenance period of the year and 66 percent of the maximum WUA for all species during the spawning period of the year. For the Red River, the corresponding values would be 50 and 70 percent, respectively. These percentages compare favorably with those established for the Platte River in Nebraska, where the U.S. Fish and Wildlife Service developed a flow regime for fisheries which provided approximately 72 percent of the optimum physical habitat for all groups of fish analyzed. (See the Biological Opinions for the Kingsley Dam and North Platte/Keystone Diversion Dam Projects, Nebraska — FERC Project Nos. 1417 and 1835.)

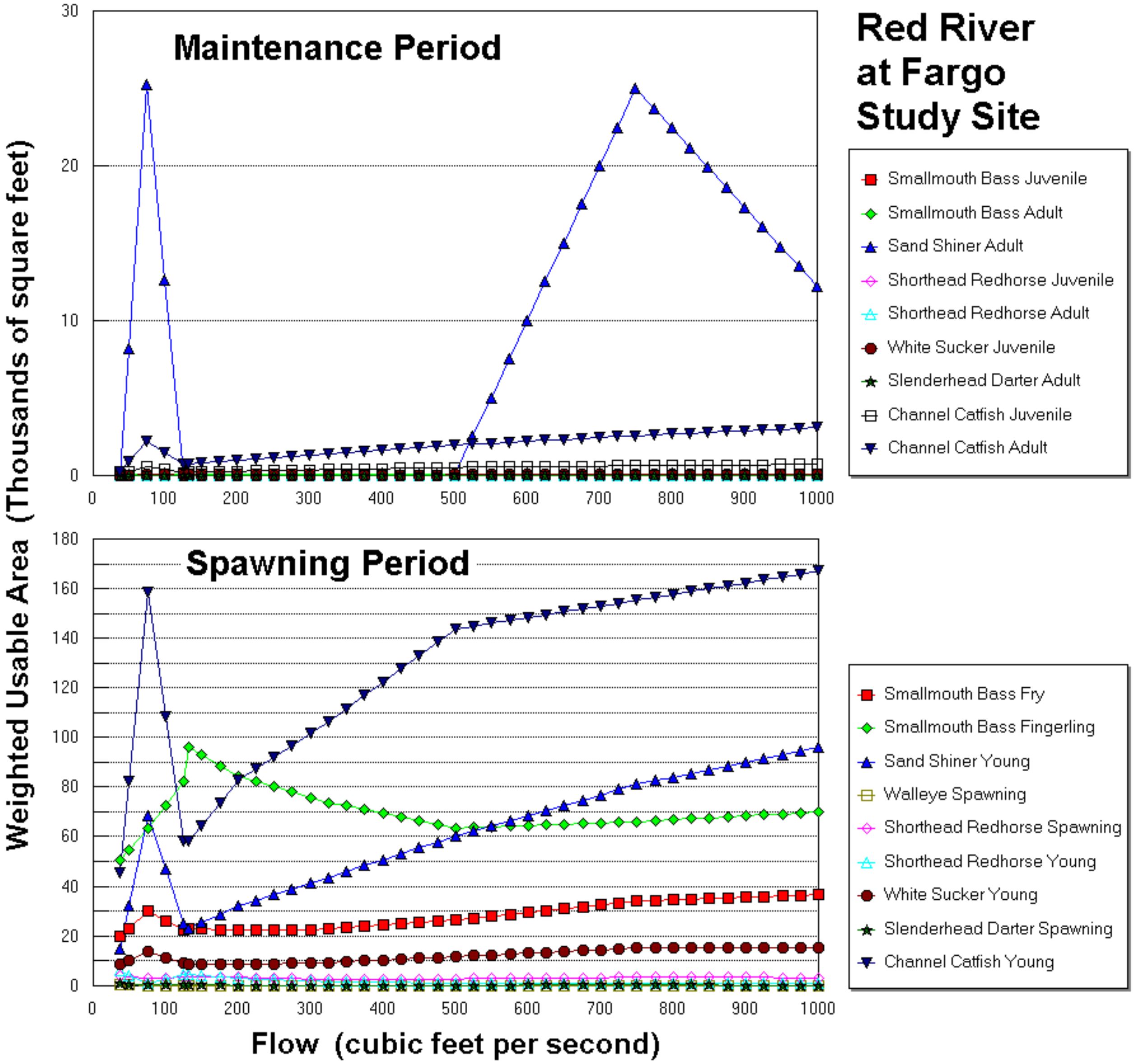

Figure 3.8.—Weighted usable area versus flow by species of fish during maintenance and spawning periods at the Red River study site at Fargo.

RIPARIAN CORRIDOR MAINTENANCE NEEDS ASSESSMENT

The seasonal instream-flow regime for maintaining the riparian corridors of the Red and Sheyenne Rivers was developed by first evaluating the relationships between streamflow and riparian water-table elevations along these rivers, just as Jackson et al. (1987) had done for the San Pedro River in Arizona. Secondly, the seasonal instream-flow regime for aquatic life maintenance was reviewed to identify conditions necessary to *maintain* the existing flood-plain forest community in its present status. These conditions are described in the following list.

Table 3.1.—Sheyenne River and Red River of the North Seasonal Instream-Flow Regime for Aquatic Life and Riparian Corridor Maintenance and Water Quality Improvement

Location	Flows in Cubic Feet Per Second (cfs)[1]												
	Jan	Feb	Mar	Apr	May [2]	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WQI [3]
Sheyenne River													
Harvey, ND	15	15	25	25	25	25	15	15	15	15	15	15	16
Warwick, ND[4]	25	25	100	100	100	100	25	25	25	25	25	25	89
Cooperstown, ND	50	50	125	125	125	125	50	50	50	50	50	50	18
Baldhill Dam, ND	50	50	125	125	125	125	50	50	50	50	50	50	- -
Valley City, ND	50	50	125	125	125	125	50	50	50	50	50	50	50
Lisbon, ND[4]	70	70	225	225	225	225	70	70	70	70	70	70	41
Kindred, ND[4]	50	50	155	155	155	155	50	50	50	50	50	50	81
West Fargo, ND[4]	50	50	100	100	100	100	50	50	50	50	50	50	- -
Harwood, ND	50	50	100	100	100	100	50	50	50	50	50	50	64
Red River of the North													
Wahpeton, ND	100	100	450	450	450	450	100	100	100	100	100	100	- -
Hickson, ND	100	100	450	450	450	450	100	100	100	100	100	100	450
Fargo, ND[4]	100	100	450	450	450	450	100	100	100	100	100	100	[5] 336
Halstad, MN	200	200	1,125	1,125	1,125	1,125	200	200	200	200	200	200	723
Grand Forks, ND	440	440	2,160	2,160	2,160	2,160	440	440	440	440	440	440	533
Drayton, ND	480	480	2,610	2,610	2,610	2,610	480	480	480	480	480	480	NC
Emerson, Manitoba, Canada	520	520	3,060	3,060	3,060	3,060	520	520	520	520	520	520	NC

[1] Maintenance flows provided for the months of July-February; spawning flows provided for the months of March-June.
[2] Riparian corridor maintenance flows would be met by the aquatic life maintenance flows and the natural riverine flow regime. Incorporating recommendations to **improve** the riparian corridor maintenance flow would require the provision of overbank flows annually or semiannually along both rivers. It is recommended that flows in excess of channel capacities be provided between late May and early July to assist in pioneering species germination and growth. Out-of-channel flows should persist over a 2-week period and precede cottonwood and willow seed disbursal by approximately 1 week. This flow scheme should produce adequate moist soil conditions to benefit seed germination and growth.
[3] WQI = maximum flows needed for water quality improvement (the existing streamflow plus the additional flow needed to meet the water quality standard) for each station for all months throughout the year. Flow estimates based on dissolved oxygen were used if they were the only estimates available. Dashes (- -) indicate that no water quality standards were exceeded for the period of analysis with the existing streamflow regime. NC = no water quality flow calculation made. Aquatic life maintenance flows that are lower than the water quality flows could result in exceedences of specific water quality standards, depending on the seasonality factor.
[4] Flow regime based on actual data collection (either Reclamation or Houston Engineering, Inc. sites; flow regimes for all other sites based on estimated needs).
[5] WQI value for reach below Fargo, based on North Dakota Department of Health data.

1. Maintain perennial streamflow at the level of the seasonal instream-flow regime (Table 3.1). This should ensure the availability of shallow groundwater for the roots of existing riparian vegetation.

2. Maintain a moist seedbed and shallow groundwater for rooted seedlings to help ensure adequate moisture is available for the establishment of pioneering species. This moisture is generally supplied by spring runoff and flooding (natural riverine flow regime). Stream diversions, excessive groundwater pumping, or streamflow regulation (provided by dams) can prevent the spring runoff moisture needed for seed sprouting and rooting within the flood plain. Stream diversions should be managed in a way so as to maintain spring runoff conditions along the Red and Sheyenne Rivers.

3. Implement measures to allow for natural revegetation of trees and shrubs on both rivers. This would assist in maintaining the riparian corridors. Removal of tree seedlings by livestock grazing and trampling is probably one of the greatest threats to the riparian community.

4. Maintaining natural successional change appears to be the most prudent management option for riparian corridor maintenance, even though the riparian zone is narrow or nonexistent in some areas. Artificial wholesale planting of riparian vegetation is not recommended here for the Sheyenne River or the Red River of the North. If the problem of riparian area encroachment were to worsen in the future, then riparian protection and reestablishment in problem areas should be considered.

Different conditions would be required in order to *improve* the existing flood-plain forest community by improving the pioneering species community (cottonwood-willow complex) and changing the plant dominance. Simply changing the hydrograph to lessen the number of “dry” water-year types on the Red and Sheyenne Rivers would not appreciably improve the riparian corridor and species diversity. Water alone cannot maintain the system. Here are conditions that would tend to improve the flood-plain forest community.

1. Alluvial bar formation and lowering the rate of stage drawdown on the river after flooding might provide some positive benefits for the riparian corridor. One result would be greater landscape diversity (i.e., reestablishment of the cottonwood-willow complex in a lower flood-plain position). Alluvial bars might be formed mechanically or constructed indirectly through the use of river-training devices such as jetties or gabbions. They would provide a seedbed for cottonwood-willow germination. Gradually lessening the rate of river stage drawdown after floods would allow better seedling survival rates. In lieu of these actions, areas of the existing riparian corridor could be selectively manipulated to improve species diversity and improve the riparian area vegetational complex (e.g., mechanically removing existing vegetation and planting different kinds of vegetation).

2. Providing large, nondamaging out-of-bank flows annually or semiannually along both rivers would help improve the flood-plain forest community. If sufficient water is

available, nondamaging overbank flows should be provided to assist in the germination and growth of pioneering species. (For example, along the Red River of the North at Fargo, the channel capacity is about 1,000 cfs and the maximum nondamaging flood flow is estimated to be 3,000 cfs. Therefore, flows between 1,000 and 3,000 cfs would help improve the riparian community.) The U.S. Army Corps of Engineers has determined nondamaging out-of-channel flows for many reaches of the Red and Sheyenne Rivers (Daniel Reinartz, U.S. Army Corps of Engineers, St. Paul District, Personal Communication). Ideally, such flows should continue through a 2-week period during late May or early July and should precede cottonwood and willow seed disbursal by approximately 1 week. This flow scheme should produce adequate moist soil conditions to benefit pioneer species' seed germination and growth.

This improvement recommendation is just that, a recommendation to *improve* the existing riparian corridors. In its absence, the aquatic life maintenance flows are expected to be sufficient to maintain the existing flood-plain forest community.

WATER QUALITY IMPROVEMENT OPPORTUNITIES AND NEEDS ASSESSMENT

The water-quality component of the instream-flow needs assessment evaluated historic streamflow data against the stream-specific water quality standards and analyzed the relationships between water quality and flow. For pollutants that exceeded the water quality standards over a large range of flow, it was recommended that they be controlled or reduced through in-basin measures. These pollutants are phosphorus, nitrate, ammonia, and fecal coliform. The application of best-management practices could reduce non-point-source contributions of phosphorus and nitrate, and the point-sources could be controlled through more restrictive limitations on permits issued under the National Pollutant Discharge Elimination System (NPDES). The source of ammonia is generally treated effluent discharges or the conversion of nitrate to ammonia under reducing conditions. It can be controlled best at the source in a treatment plant. Dissolved oxygen (D.O.) levels would be most effectively maintained by controlling biological oxygen demand (BOD) loadings, although D.O. levels may also be affected by environmental conditions, such as icing. The fecal coliform data were limited, but it appears that the source is urban storm runoff. Coliform levels exceeded standards over a large range of flow rates and would need to be controlled by the application of best-management practices to urban storm runoff.

Other water-quality parameters that had exceedences at low flow rates, such as boron, chloride, and percent sodium, may be improved by imports of water with lower concentrations to the Sheyenne and Red Rivers. The instream flow needs for water quality were estimated by using a mixing equation to calculate the amount of dilution needed to reduce these parameters below levels set by water-quality standards. The results are shown in Table 3.1.

Since passage of the Federal Water Pollution Control Act Amendments in 1972, the Federal policy has been that flow augmentation for water quality improvement should not be considered a beneficial use of water. No economic benefits would accrue to such a use, even though it may yield environmental benefits. In other words, although flow releases to streams could be made for water quality improvement, economic benefits of these releases could not be claimed. Water quality improvements would be incidental to water deliveries for other project purposes. Water quality improvement flows (Table 3.1) are generally less than the seasonal instream flows described for maintenance of aquatic life and riparian corridors.

FLOW-RELATED RECREATIONAL OPPORTUNITIES AND NEEDS ASSESSMENT

North Dakota's river recreation is important to the residents of the state, with 42 percent of adults participating in some type of river recreation in 1996 (NDPRD 1997). Changes in the way a river is operated would have an impact on any residents who wish to use the river for recreation in the future. Changes in historic flows may produce increased benefits for some users and decreased benefits for others. The fact that most river recreation occurs during the summer months is problematic throughout the western United States. The peak season for river recreation coincides with the time of greatest water demand for other purposes (i.e., agriculture, flood control, municipal and industrial, and fish and wildlife).

There may be some opportunities for river managers to minimally increase recreation use without significantly altering existing flows. For instance, some immediate benefits might be achieved by (1) increasing public access; (2) providing public information on the available recreation opportunities; (3) providing a limited number of support facilities such as boat launch sites, trails, and swim beaches; and (4) cleaning up rivers. Managers would have to monitor the carrying capacities of various river segments and determine when those capacities have been reached, so that they could avoid negative impacts to other resources and other users. Implementing the described seasonal instream-flow regime for aquatic life and riverine riparian corridor maintenance could cause minor, but not significant, impacts to the recreational use of either the Sheyenne River or the Red River of the North.

During the high-flow period of the year (March-June), the seasonal instream-flow regime would maintain a perennial stream throughout each representative river reach, but the magnitude of the flows would generally be less than the mean seasonal flows of record (approximately one-half the magnitude of the historic flows). The existing hydrograph would be somewhat flattened. During the low-flow period of the year (July-February), the seasonal instream-flow regime would maintain a perennial stream throughout each representative river reach, but the magnitude of the flows would vary between the upper and lower watersheds on the Sheyenne River — generally being greater than historic flows in the upper watershed and less than historic flows in the lower watershed. For the Red River of the North, the described seasonal flows would be lower for the low-flow period of the year. The existing hydrograph for this period would also be somewhat flattened, but not as much as during the high-flow period.

The effects that the seasonal instream-flow regime would have on canoeing range from poor to excellent, depending on the river segment and site location of the canoeing experience. Its effects on other recreation activities were not fully discussed or analyzed.

It is important that both rivers be managed by river segments according to river access points, types of use, and physiography of the river. Strategies applied to the management of one river segment are most likely not applicable to other segments. Portions of the rivers that flow through urban areas should be managed as high-density use areas, whereas remote sections should be managed as low-density use areas with little development.

River-based recreation may at times compete for water with reservoir-based (flat-water) recreation, with instream flows established for uses such as water quality and fish and wildlife, and with other priority uses such as agriculture and municipal and industrial supplies. It will be important for managers of both rivers and reservoirs to consider such interactions in the future. A systematic approach for coordinated river management by a variety of water users may be necessary to assure a diversity of quality outdoor recreation experiences. A public information program which effectively monitors existing recreation use and future demand may be required. At some point in the water drawdown process, visitors become dissatisfied with the quality of water recreation available and either leave the area or turn to other types of activities. This happens when the physical, social, facility, and/or ecological carrying capacity limits have been reached.

There may be opportunities to accommodate minimal increases in recreation use on both the Sheyenne River and the Red River of the North even if there are no changes in historical flows. Studies that would be beneficial are those that: (1) determine the type of recreational uses within each river segment, (2) determine and describe the physical characteristics within the river segments, (3) determine the carrying capacity limits within each segment, and (4) determine future recreation demand and the potential effects on other resources. Determining limits of use within each river segment would indicate whether or not facility improvements or other changes need to be considered. Limits should be calculated by river segments based on projected instream flows. To comprehensively manage recreation and other resources in the river system, managers must determine what the future recreation demand would be and what impact the projected uses would have on other resources. Long-term monitoring of recreation use would determine when use capacity limits have been reached.

Managers may be able to disperse river users more widely by providing additional access points, through either purchase or lease of lands or rights-of-way along both river corridors. This may help alleviate the feeling of overcrowding which has been expressed by the public.

As the demand for recreation use increases, it may compete with other uses of the limited water supplies within the Sheyenne-Red River of the North basin. If future recreation demands are to be met, changes in infrastructure and management programs may be needed. Without these changes, public health and safety, as well as the character of the natural environment could be compromised. Decisionmakers should continue to communicate and address the impacts that future demand may have on the limited water supplies and other resources within the Red River basin. They should strive to look for creative solutions to accommodate future demand.

RECREATIONAL ECONOMICS ASSESSMENT

The recreational economics assessment addressed changes in recreational activities due to changes in the seasonal instream-flow regime: changes in use, regional economic impacts, and economic benefits. Modifying instream flows for fish species and aquatic habitat can have a significant effect on water-based recreational use. Changes in river flow rates and depths influence the types of recreation that can be supported and the quality of the recreation experience. The most difficult part of estimating the recreational impacts from changes in instream flows is estimating changes in visitation that are likely to occur as a result of changing water velocities and depths. This analysis relied heavily on an earlier U.S. Fish and Wildlife Service (1978) analysis of recreation activities associated with instream flows.

Changes in recreational use resulting from changes in instream flows have an impact on the local economy and influence the benefits of river-based recreation. The regional economic impacts of recreation expenditures are fundamentally different from the benefits of recreation. Benefits represent the value of recreation activities to participants, whereas regional impacts represent the influence of recreation activities on sales, income, and employment in the region. Both the regional impacts and recreational benefits from changes in instream flows in the Red River of the North and the Sheyenne River are estimated in this analysis. Regional impacts were estimated using the U.S. Forest Service IMPLAN (IMpact analysis for PLANning) model (1993) and recreational expenditure data collected by the North Dakota Parks and Recreation Department (NDPRD). The economic benefits from changes in river recreation were based on a recreation travel cost model for six North Dakota rivers, which include the Red River of the North and the Sheyenne River (Piper 1998).

Current levels of recreation use were estimated for the Red River of the North and the Sheyenne River using NDPRD survey data (1997). Use was separated by type of activity and location along the rivers. The estimated changes in use due to changes in river flows were based on the probabilities of undertaking different types of activities at various water depths and velocities. The changes in probabilities were converted into changes in river recreation trips. Using average recreation expenditure data from the NDPRD survey, the increase in recreation-related expenditures resulting from instream flow changes was estimated. These expenditure data were then used to estimate regional impacts. Last, the benefits from increased river recreation visits as a result of implementing the seasonal instream-flow regime were estimated.

The NDPRD collected information on river-related recreation activities by river location and type of activity, river recreation-related expenditures, the importance of river recreation compared to other types of recreation and public services, and the benefits of North Dakota river recreation. The survey indicated that, in 1996, about 20.2 percent of all North Dakota river recreation visits were to Red River of the North sites and 5.6 percent were to Sheyenne River sites (representing 711,400 and 197,200 recreation visits, respectively). Table 3.2 shows the estimated number of water-contact recreation visits to the Red River of the North and the Sheyenne River.

Table 3.2.—Water-based recreation use during 1996 on Red River of the North and Sheyenne River

Activity	Red River of the North		Sheyenne River	
	Percentage of Recreation [1]	Number of Visits	Percentage of Recreation [1]	Number of Visits
Boating	1.56	11,100	1.57	3,100
Canoeing	0.76	5,400	3.15	6,200
Fishing	14.11	100,400	14.02	27,600
Swimming	0.18	1,300	0.92	1,800

[1] Relative to total water- and non-water-based recreation visits.

The visitation estimates represent a base-flow level of use. In order to evaluate the effect of changes in instream flows on recreation activity, recreation visitation at the seasonal instream-flow regime level was estimated and compared to the base-flow use. The effect of changes in streamflows on recreational activities can vary a great deal depending on the type of activity under consideration. Using the base conditions and the U.S. Fish and Wildlife Service (1978) report, the probabilities were calculated for each stream-measurement location (instream-flow study site) and the current levels of use at these locations were correlated with the calculated probabilities. The probabilities were then recalculated for each measurement location using the stream depths and velocities from the described seasonal instream-flow regime. The change in probabilities was then used to estimate a proportional change in recreational use.

It should be recognized that the referenced U.S. Fish and Wildlife Service study generalizes the response of recreation participants to changes in stream conditions. Different streams have different characteristics which may have a more important impact on recreation use than water depth and velocity. However, without site-specific recreation data covering a variety of instream flow conditions, a site-specific analysis could not be done.

This analysis indicated that implementing the seasonal instream flow regime would result in essentially no impact on river recreation (an increase of 320 visits annually) and, therefore, would result in no river recreation benefits or regional economic impacts.

LEGAL AND INSTITUTIONAL ANALYSIS OF STATE WATER LAW

A legal and institutional analysis of State water law was conducted to identify legal and institutional instream-flow-related opportunities and needs for the Sheyenne River and the Red River of the North, North Dakota and Minnesota. The analysis emphasized North Dakota Water Law. The analysis was considered an update to Nelson et al. (1978), a report in which the U.S. Fish and Wildlife Service's Biological Services Program had identified and evaluated the most promising institutional methods for reserving instream flows to benefit fish and wildlife in North Dakota. The text that addresses legal issues associated with the protection of North Dakota instream flows was taken from several sources, but primarily from Krenz (1998), Delmore (1997), and Sagsveen (1977), from supplementary information provided by the staff of the North Dakota State Water Commission, and from information posted on the North Dakota Water Law web site (http://www.swc.state.nd.us/html/legal.html).

In a 1986 survey of the United States and Canadian provinces, Reiser et al. (1989) identified legislation protecting instream flow in 16 States, 12 of which were west of or along the 100th meridian. Instream flow regulations in the Western States have more recently been reviewed by McKinney and Taylor (1988) and MacDonnell et al. (1989). Thirteen of the States have specifically designated recreation as a legitimate reason for protecting instream flows (i.e., beneficial use). Only six of the States allow for protection of instream flows for aesthetic or scenic reasons. However, several of the States allow instream flow rights to protect water quality as a way of protecting aesthetic quality. In several states, natural resource department personnel consider water quality protection to be the means for preserving aesthetic quality of riverine areas (Shelby et al. 1982). Aquatic life, water quality, and recreation are directly benefitted by the designation of other uses as a “beneficial use.” In California, the State’s granting and regulation of permits and licenses, water quality management, and application of the public trust doctrine all offer opportunities that sometimes have the effect of protecting instream flows (Gray 1989).

The traditional requirements for a valid water claim in the West include: (1) intent to apply the water to a beneficial use, (2) actual diversion of water from a naturally occurring water body, and (3) application of the water to a beneficial use within a reasonable time. The designation of “beneficial use” water rights for preserving fish and wildlife habitat, water quality, or for maintaining riverine resources for recreational use has not been the primary impediment to instream flow regulations (Shelby et al. 1982). The difficultly most often encountered is the traditional requirement that water be diverted from natural water courses in order to establish a water right under the Prior Appropriation doctrine (Tarlock 1978, 1979). The appropriation doctrine emphasizes diversion under the principles of beneficial use and “first in time” being “first in right.”

North Dakota Water Law

Section 3 of Article XI of the North Dakota Constitution states, “All flowing streams and natural water courses shall forever remain the property of the state for mining, irrigating and manufacturing purposes.” The appropriation of water in the State of North Dakota is by statute the responsibility of the State Engineer. Chapter 61-04 of the North Dakota Century Code (N.D.C.C.) addresses the appropriation of water in the State. The State Engineer has adopted rules contained in Chapters 89-03-01, 89-03-02, and 89-03-03 of the North Dakota Administrative Code. The manner in which hearings are conducted by the State Engineer pursuant to the provisions of Chapter 61-04 are bound by Chapter 28-32 of the N.D.C.C., more commonly known as the Administrative Agencies Practice Act.

Chapter 61-04 requires that an appropriation of water involve an actual diversion and works before a water permit may be issued. The legislature has not provided a mechanism for the issuance of water permits specifically for the preservation of a naturally occurring instream flow. However, under existing state law, a water permit can be issued for a project to divert or store water and release it to maintain an instream flow. An applicant for a water right could specifically receive the right to impound water in a reservoir or dam for the purpose of making releases of the water impounded to augment streamflows. The water released would be protected from appropriation by others. The existing water permit issued for the Garrison Diversion Project allows project water to be delivered to satisfy instream flow needs and the water is protected from downstream diversion under existing state law.

N.D.C.C § 61-04-06 (emphasis added below) lists the factors the State Engineer must consider in making a determination about whether to issue a water permit. That section provides, in part:

> The state engineer shall issue a permit if the state engineer finds all of the following:
>
> 1. The rights of a prior appropriator will not be unduly affected.
> 2. The proposed means of diversion or construction are adequate.
> 3. The proposed use of water is beneficial.
> 4. <u>The proposed appropriation is in the public interest</u>. In determining the public interest, the state engineer shall consider all of the following:
>   a. The benefit to the applicant resulting from the proposed appropriation.
>   b. The effect of the economic activity resulting from the proposed appropriation.
>   c. <u>The effect on fish and game resources and public recreational opportunities.</u>
>   d. The effect of loss of alternate uses of water that might be made within a reasonable time if not precluded or hindered by the proposed appropriation.
>   e. Harm to other persons resulting from the proposed appropriation.
>   f. The intent and ability of the applicant to complete the appropriation.

As shown here, there are six factors (4.a.-f.) that the State Engineer must consider when determining whether a proposed appropriation is in the public interest, and one of these is the effect on fish and game resources and public recreational opportunities. This is the avenue through which impacts to aquatic resources are considered in the existing appropriation process.

When there are competing applications for water from the same source, and the source is insufficient to supply all applicants, the State Engineer is required to adhere to the following order of priority in determining whether the proposed appropriation is in the public interest (N.D.C.C. § 61-04-06.1, Preference in granting permits):

1. Domestic use.
2. Municipal use.
3. Livestock use.
4. Irrigation use.
5. Industrial use.
6. Fish, wildlife, and other outdoor recreational uses.

If, when evaluated and balanced with the other factors, the State Engineer determines that the potential effect on fish and game resources or public recreational opportunities would be detrimental and that, on a whole, the public interest would not be served by issuance of a water permit, he or she may deny the permit or may issue the permit with conditions to protect fish and game resources or public recreational opportunities. Such a condition could require, for instance, that water may be diverted from a stream or lake only when flows exceed a certain level. If an applicant requests a permit to impound water, a condition could be added to require releases to be made to augment flows. The determination of what elements of the public interest are impacted, and what the public interest requires is committed to the sound discretion of the State Engineer (*Shokal v. Dunn*, 707 p. 2d 441, 1985).

Reservations of water, water permits for instream flow associated with the construction of works, Attorney General's opinions/Judicial opinions, specific legislation, Water Commission policies, and Federal authority are also addressed in the Phase 1, Part B report.

Minnesota Water Law

Minnesota Statute 103G.265 requires the Minnesota Department of Water Resources to manage water resources to ensure an adequate supply to meet long-range seasonal requirements for domestic, agricultural, fish and wildlife, recreational, power, navigation, and quality control purposes. The Water Appropriation Permit Program exists to balance competing management objectives that include both development and protection of Minnesota's water resources.

Water law in Minnesota is governed by riparian rights. Riparian water rights, or eastern water law, state that the owner of land containing a natural stream or abutting a stream is entitled to receive the natural flow of the stream limited only by the equal rights of the other riparian owners. The riparian owner is protected against the diversion of water except for domestic purposes upstream from his property and from the diversion of excess flood flows toward his property.

The Minnesota Department of Natural Resources has established minimum instream flows using a hydrologic method (i.e., 90 % exceedence flow) as a guideline. Using this method, the Minnesota Department of Natural Resources established a minimum instream flow for the Red River of the North of 38 cfs at Fargo, North Dakota.

Legal and Institutional Analysis Summary

It does appear that there are means and measures available in North Dakota Water Law to protect instream flows, whether it be by appropriations, judicially, acquisition and transfer, water quality enforcement mechanisms, or in the planning process. Minnesota also appears to have a mechanism in place by which the State can establish minimum instream flows.

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