Coeur d'Alene Tribe
Fish and Wildlife Program

Habitat Protection Plan

Coeur d'Alene Tribe Department of Natural Resources
Fish and Wildlife Program
850 A Street, P.O. Box 408
Plummer, ID 83851-0408

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Habitat Protection Plan

Prepared For
BPA Project #1990-044-00
Implementation of Fisheries Enhancement Efforts on the Coeur d'Alene Reservation

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I. INTRODUCTION

Throughout the last century, the cumulative effects of anthropogenic disturbances have caused drastic watershed level landscape changes throughout the Reservation and surrounding areas (Coeur d' Alene Tribe 1998). Changes include stream channelization, wetland draining, forest and palouse prairie conversion for agricultural use, high road density, elimination of old growth timber stands, and denuding riparian communities. The significance of these changes is manifested in the degradation of habitats supporting native flora and fauna. Consequently, populations of native fish, wildlife, and plants, which the Tribe relies on as subsistence resources, have declined or in some instances been extirpated (Apperson et al. 1988; Coeur d' Alene Tribe 1998; Lillengreen et al. 1996; Lillengreen et al. 1993; Gerry Green Coeur d' Alene Tribe wildlife Biologist, personal communication 2002). For example, bull trout (*Salvelinus confluentus*) are not present at detectable levels in Reservation tributaries, westslope cutthroat trout (*Oncorhynchus clarki lewisi*) are not present in numbers commensurate with maintaining harvestable fisheries (Lillengreen et al. 1993, 1996), and the Sharp-tailed grouse (*Tympanuchus phasianellus*) are not present at detectable levels on the Reservation (Gerry Green, Coeur d' Alene Tribe wildlife biologist, personal communication).

The Coeur d'Alene Tribe added Fisheries and Wildlife Programs to their Natural Resources Department to address these losses and protect important cultural, and subsistence resources for future generations. The Tribal Council adopted by Resolution 89(94), the following mission statement for the Fisheries Program: "restore, protect, expand and re-establish fish populations to sustainable levels to provide harvest opportunities". This mission statement, focused on fisheries restoration and rehabilitation, is a response to native fish population declines throughout the Tribe's aboriginal territory, including the Coeur d' Alene Indian Reservation (Coeur d' Alene Tribe 1998). Implicit in this statement is a commitment to provide native subsistence resources in the present and near future as well as the long-term by employing all the mitigation and conservation measures available to them.

The development of this Habitat Protection Plan is intended to provide additional planning level guidance as the implementation of conservation measures moves forward. The purpose of this plan is to develop a systematic approach to habitat restoration that will ultimately lead to self-perpetuating, harvestable populations of native fish, wildlife and botanical species. Specifically, it is our intention to apply the principles and analyses presented in this plan to prioritize future restoration efforts that receive funding under the Northwest Power Planning Council's Resident Fish and Wildlife Mitigation Programs. Using an ecosystem restoration approach based on landscape ecology concepts (Primack 1993), the basic premise of the plan is to 1) protect functioning habitat conditions and 2) restore degraded habitat conditions. This plan focuses on habitat conditions at the watershed scale (macrohabitat) rather than on the needs of single species and/or species guilds. By focusing restoration efforts at a macrohabitat level, restoration efforts target all native species inhabiting that area. This approach marks a paradigm shift that emphasizes ecological based restoration rather than species-specific restoration.

Traditionally, fish managers and wildlife managers have approached restoration independently, often dedicating resources to a single species by focusing on specific habitat types on a small spatial scale (microhabitat) (Robinson and Bolen 1989, Marcot et al. 2002). This management

technique has done little to curb declines despite large budgets (Pianka 1994). Restoration on a landscape level has shown promising results (Holling 1992) and many riparian and wetland restoration projects throughout the northwest have inadvertently improved habitats for non-targeted species. Landscape level restoration addresses the overall habitat condition of the regional area (macrohabitat), restoring the native species composition, density, and diversity by restoring the native ecosystem function.

In the context of the development and implementation of this Habitat Protection Plan, it is important to understand that this is primarily a conservation tool, and is not intended to displace efforts that mitigate for lost resources. This plan is intended to primarily address long-term conservation needs and may not accommodate immediate short-term needs that address lost resources. Therefore, areas selected to address short-term mitigation needs may not be located in the high priority areas identified in this Plan. It needs to be clear that these projects and areas are no less important than those identified in this Plan.

RELATIONSHIP TO COLUMBIA BASIN FISH AND WILDLIFE PROGRAM

Past mitigation within the Coeur d'Alene subbasin has occurred primarily through implementation efforts of the Coeur d'Alene Tribe as off-site protection, mitigation, enhancement and compensation activities called for under Section 4(h) of the Pacific Northwest Electric Power Planning and Conservation Act and the Northwest Power Planning Council Fish and Wildlife Program. The activities identified within this plan provide partial mitigation for the extirpation of anadromous fish resources from usual and accustomed harvest areas and Reservation lands. Additional mitigation is also needed to address impacts to resident fish and wildlife populations and habitats attributable to development of the Federal Columbia River Power System (Goal 1, Objective 1 and Goal 2, Objective 1: Coeur d'Alene Subbasin Summary 2000).

This plan shares the NPPC Fish and Wildlife Program (2000) objectives of: maintaining biological diversity in the Upper Columbia River basin; maintaining genetic integrity by preserving wild fish stocks; providing needed habitat protection; and increasing run sizes and resident fish populations by implementing effective restoration projects.

The ISRP in their document 2002-11 state, *"…we recommend that administrators and scientists participating in the Council's Fish and Wildlife Program focus attention on identifying, as soon as possible, the overall spatial array of watersheds and habitat units needed to protect important populations. The ISRP believes that the best long-term strategies for protecting fish and wildlife habitat and restoring viable populations are to purchase lands, conservation easements, and water rights for instream flow. The greatest scientific confidence for protecting the needs of populations resides in protecting as many areas maintained by natural processes as possible, at least until specific needs are better understood…".* The Tribe feels that this plan addresses the ISRP's concerns by identifying high and medium priority parcels important to protecting the larger important fish populations within each watershed. The plan also identifies individual parcels of land contributing to the long term health of the population from which, the Tribe could approach the landowners with options of purchase, conservation easements or voluntary participation. Additionally, this plan identifies the areas needed to protect in order to maintain as many of the natural processes as possible within each of the target watersheds.

RATIONALE FOR HABITAT ACQUISITION AND PROTECTION

Management rights acquisition is the most effective and cost efficient tool available to ensure the long-term availability of habitats for native fish and wildlife species and for providing stable, healthy and natural watershed functions. Management rights acquisition as discussed in this document may take several forms, including legislative enactment by the Tribal Council, fee-title purchase, conservation easements, and voluntary contracts; with fee-title purchase being a preferred method. Regardless of the method employed, it is quite apparent that incentive based conservation is the only realistic way to engage landowners in this area.

Many rural landowners within the area addressed by this plan rely on various extractive uses of lands that would otherwise provide the most productive wildlife and fish habitats. Landowners are reluctant to sign long-term agreements that restrict use of their lands largely because of economic uncertainty. Even if landowners were willing to agree to negotiate a lease on their lands for wildlife habitat, leases have a set duration, generally not to exceed 25 years, and do not protect habitats into perpetuity. In addition, agreements generally lack an enforcement prerogative and compliance is largely at the discretion of the landowner. Landowners engaged in agricultural endeavors are reluctant to lease their most productive lands for other purposes. As an example, there are an estimated 24,043 acres of potential wetland/riparian habitats within the Project Area (Table 1), however only 319 of these acres are enrolled in the Natural Resource Conservation Service's Conservation Reserve Program (data provided by the Natural Resource Conservation Service 2001). These Conservation Reserve Program lands are largely along the periphery of the agricultural lands and none of the broad floodplains that could support proper riparian/wetland functions in the Project Area are enrolled.

Through this Habitat Protection Plan, potential acquisition sites will be prioritized primarily for their ability to promote watershed health and provide habitat for the target species. Acquired properties will be free of all liens, clouds on the title and encumbrances that may hinder management. These lands will be managed by the Coeur d'Alene Tribe to provide, to the fullest extent possible, habitat for native fish and wildlife and functions that will promote the health of the watershed. Following acquisition, baseline evaluations will be completed, a site-specific management plan will be produced, protection and restoration strategies will be implemented as directed by the plan, and monitoring of selected parameters to evaluate the effectiveness of management implementation will commence.

As a template to test the effectiveness of this plan, five Reservation watersheds have been identified for analysis. These watersheds include Lake Creek, Benewah Creek, Evans Creek, Alder Creek, and Rock Creek. Rock Creek is a tributary to Hangman Creek and the remaining watersheds flow either directly or indirectly into the southern end of Coeur d' Alene Lake (Figure 1). These watersheds were chosen for their relative importance to current fish and wildlife restoration efforts on the Reservation, however the concepts and mechanisms included in this plan may serve as a template that can be applied in other watersheds at the discretion of Tribal managers.

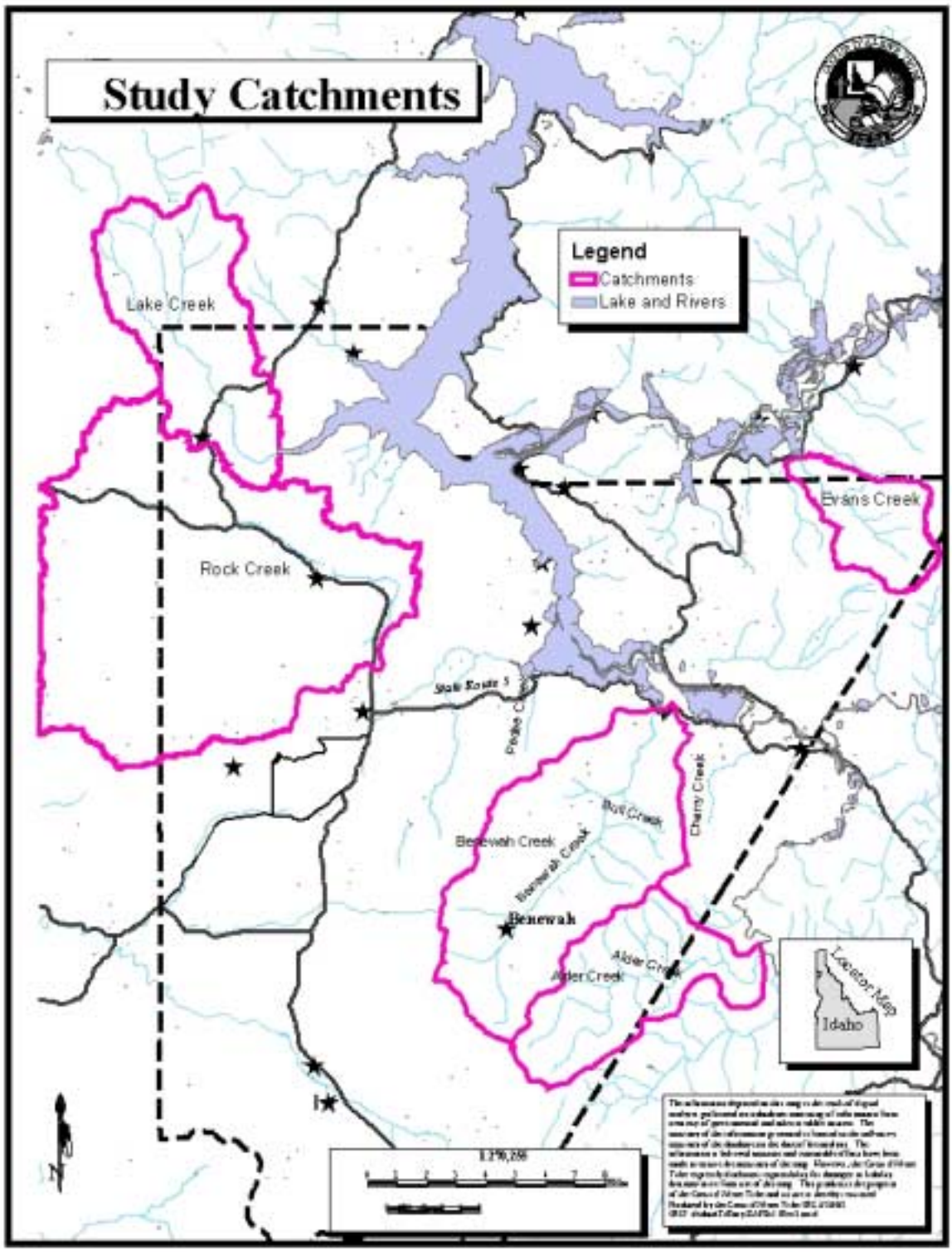

Figure 1: Locations of the five watersheds in this plan.

Section I

HABITAT PROTECTION PLAN OBJECTIVES

1. Coordinate fish and wildlife management at the watershed scale.

Coordinating one project or a series of projects to simultaneously address fish and wildlife species will require application of ecosystem principles. Traditionally, fisheries habitat management has focused on microhabitat conditions within the wetted perimeter where fish are confined. For example, if it is known that primary pool habitat is lacking within a stream, fish managers may prescribe the installation of structures that promote pool formation. In this hypothetical situation, the lack of pool habitat is a symptom of a larger problem, which is likely affecting wildlife and botanical communities. Therefore, addressing the problem, rather than the symptom, is likely to synergistically benefit many species.

Wildlife managers have traditionally focused on acquiring management rights to large areas (macrohabitats) in an effort to remove the source of degradation. Wildlife species are not confined to specific localized habitats and may range across watersheds and many different microhabitat conditions. Ecosystem restoration or macrohabitat restoration restores the natural function of natural watershed processes. Normative processes result in natural microhabitats, eventually resulting in landscape conditions characteristic of the native landscape and ultimately leading to populations of native species commensurate with native conditions.

2. Prioritize restoration/mitigation areas and create a template for application to larger areas.

The focus of this objective is to develop a data management system that is capable of prioritizing areas throughout a watershed using the best available science as well as management discretion to identify areas that are the most likely to exhibit positive fish and wildlife population response. This plan, in its written form, assigns priorities for specific parcels located in each of the target watersheds. These priorities, however, are only based on data that is available on or before June 2002. As more information is collected and projects are implemented, the documented knowledge of specific areas will increase. As additional data becomes available we expect priority areas to change and therefore, the process of assigning priorities is designed to be an adaptive process.

3. Create a central data repository to facilitate management decisions.

A scientifically justified restoration plan for acquiring management rights requires background data to support the model. Housing fish, wildlife, and population data in an organized database, linked to geographic location, and allowing updates will allow the plan to be dynamic and traceable through time. Additionally, a structured database will help to reveal data gaps and/or incomplete information.

The data from which the prioritization matrix is generated is housed in a Microsoft Access database. This database is capable of being updated as new information is collected. A detailed description of this database and its management are described in the next section.

4. Expand habitat protection measures available to the Tribe.

Various management acquisition techniques are used by other resource protection organizations. Outlining advantages and disadvantages of various techniques, as well as creating a checklist for implementing the various techniques will streamline implementation of restoration and conservation priorities.

The current strategies used by the Tribe for management acquisition include negotiating fee-title purchases and voluntary, non-binding agreements with private landowners. In order to, engage more landowners to participate in fish and wildlife restoration; this plan explores other options that are available.

5. Provide justification for future management actions.

Granting organizations often want assurance that money is being spent in areas with a high likelihood of success. Identifying projects using a process designed to improve natural ecosystem function throughout the watershed allows more assurance to granting organizations than choosing projects based solely on opportunity or availability.

Results, generated by the database associated with this report, detail candidate areas for restoration. Parcel prioritization will continue to be updated as new data is collected, however, the basic methods used to rank parcels will remain the same. This continuous updating allows for real-time changes to be presented to grantors in a justified fashion allowing for monitoring of project success relative to limiting factors and species response. Each grant opportunity is unique, however, presenting an approach that details a systematic schedule for restoration that coordinates fish, wildlife, and ecological function is deficient in most grant applications.

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II. METHODS FOR PRIORITIZING HABITATS FOR PROTECTION

OVERVIEW

This Habitat Protection Plan prioritizes potential restoration sites at the watershed scale by overlaying habitat and limiting factor data with land ownership information using databases and geographic information systems to provide the organizational framework (*Figure 2*). Due to the unrealistic expectation of acquiring land management rights throughout entire watersheds, it is necessary to systematically prioritize individual parcels within watersheds that are most likely to provide the greatest benefit to the native ecology of the watershed. The implementation process of this plan applies the most current habitat-limiting factors data and westslope cutthroat trout population densities to each property parcel within a watershed. Each parcel is prioritized into one of three priority categories via a prioritization matrix, indicating the relative urgency each parcel warrants regarding restoration action. Next, measures such as securing funding and coordinating agreements with appropriate landowners take place in preparation for on the ground implementation (*Figure 3*).

The structure of this plan is based at the watershed level. Watershed scale, in this plan, are 2nd order watersheds with watershed areas of 8,491 acres to 4th order watersheds with watershed areas of 67,349 acres (Lillengreen *et al.* 1993 and 1996). Working through the model to achieve effective watershed restoration requires the completion of each of the five previously listed objectives.

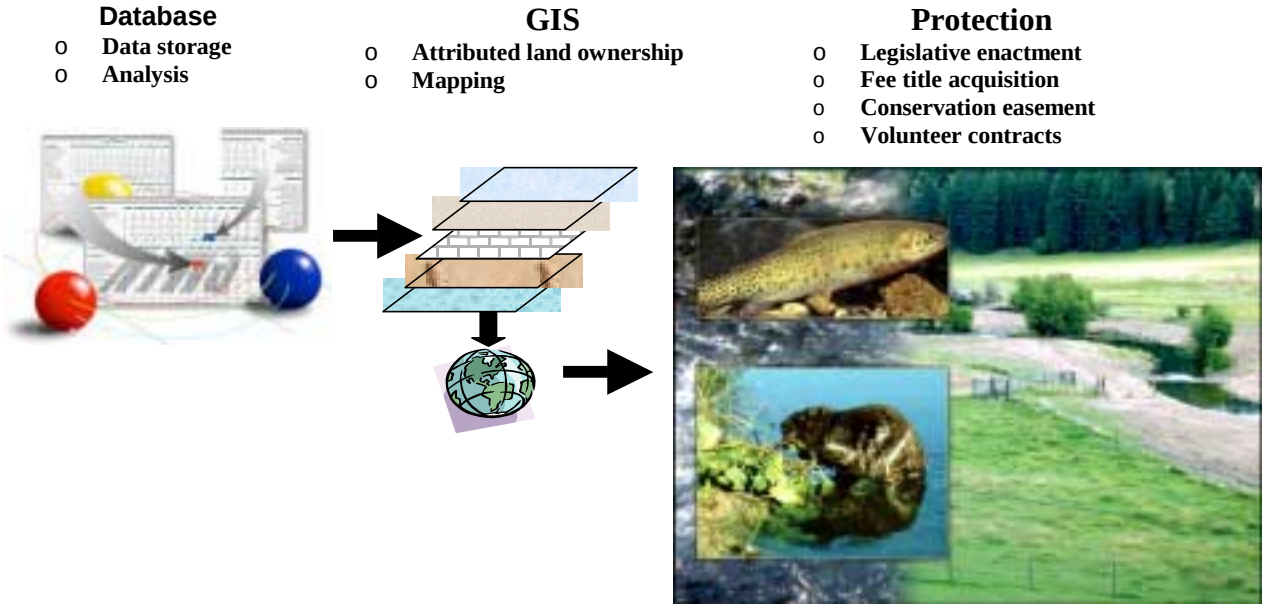

Figure 2: Organizational framework for the Habitat Protection Plan.

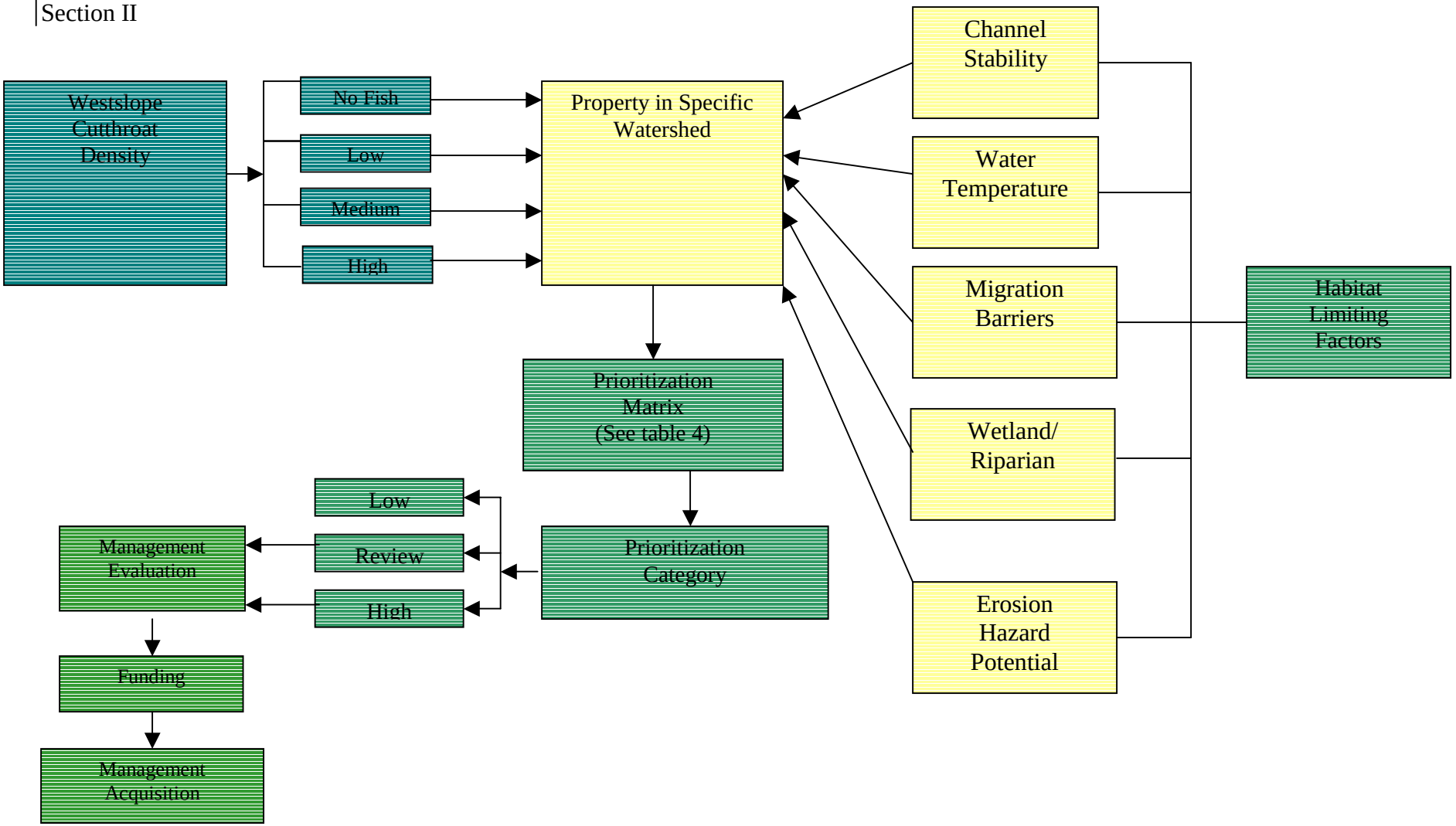

Figure 3: Procedural schematic illustrating the implementation process for the plan.

Section II

FISH AND WILDLIFE SPECIES AS PRIORITY INDICATORS

Four wildlife species and two fish species were chosen as indicator species for this plan. These species represent the health of natural ecological conditions throughout the respective watersheds of this plan and are assumed to represent the health of other native fish, wildlife, and plant species. Each of the six species requires specific habitat complexities that combine to form the foundation of ecosystem function. Monitoring changes in populations will facilitate long-term evaluation of project success.

Bull trout

Bull trout are a species native in the five watersheds comprising this plan. They represent the native apex predator of the aquatic systems and are habitat specialists, requiring complex habitats, cool water, and unembedded substrate. Therefore, they have been selected as an indicator species for the plan. Due to the piscivorous nature of bull trout, it is assumed that healthy populations of bull trout represent healthy population levels of native species such as mountain whitefish, sculpin, redside shiner, and northern pikeminnow commensurate with natural conditions. A quantifiable number or density describing a healthy bull trout population is currently unavailable and likely to be unique within each watershed, however it is certain that current populations are severely depressed.

Westslope cutthroat trout/Interior redband rainbow trout

These two species effectively combine as the second aquatic indicator species. These two species occupy similar niches (Behnke 1992). However, do not naturally occur in the same sub-watersheds throughout the Spokane River Watershed (Behnke 1992).

Historically, rainbow trout did not occur above barrier falls in the Spokane River Basin and westslope cutthroat did not occur below barrier falls (Behnke 1992). Four of the watersheds (Alder Creek, Benewah Creek, Evans Creek, and Lake Creek) selected for this plan occur above Spokane Falls, a natural migration barrier. Therefore, in these watersheds westslope cutthroat are the indicator species. Conversely, Rock Creek is a tributary to Latah Creek, which flows into the Spokane River below the Spokane Falls and was accessible to anadromous fish migrations. Therefore, in this watershed, redband rainbow trout are the indicator species. Historically, these species comprised a great deal of the Tribe's diet (Scholz et al. 1985), therefore they are logically included as indicator species to represent pristine fluvial environments and the link with the native human community.

Wood duck

Wood duck habitat suitability described herein is largely based on the results of habitat suitability index models detailed in Sousa and Farmer (1983). Wood duck needs are generally met between the shoreline and a water depth of 1.8 m. The maximum tolerable flow velocity has been reported as 1.3 m/sec, however broods seldom use areas with currents greater than 0.44 m/sec. A ratio of 50% to 75% cover to 25% to 50% open water is preferred in breeding and brood rearing habitat.

An abundance of downed timber, characteristic of a riparian gallery forest, provides suitable year-round cover. Young trees and mature shrubs with low overhead and lateral growth provide optimal cover for breeding adults. Shrubs that form a dense canopy approximately 0.6 m above the water surface provide ideal shrub cover. Important limiting factors in successful wood duck reproduction include availability of suitable nesting cavities and the ability of protein foods (invertebrates) for pre-breeding females. The most suitable cavity trees are mature living bottomland hardwood trees from 60 to 90 cm dbh and containing cavities at least 2 m above ground and an entrance size of 9 to 30.5 cm. Conifers and dead trees rarely provide suitable cavities.

Wood ducks forage for mast, fruits from bottomland hardwood trees, domestic grain, seeds, shrubs, aquatic herbaceous plants, early spring plants, and invertebrates in areas of shallow water (<30 cm) to the forest floor. Wood ducks were chosen to represent late successional development of riparian areas and healthy gallery forest conditions.

Muskrat

Muskrat habitat suitability, described herein, is largely characterized based on habitat suitability index models described in Allen and Hoffman (1984). Muskrats are primarily herbivorous, preferring to feed on the basal portions of aquatic vegetation followed by rhizomes and leaves. Broad-leaved cattail (*Typha latifolia*) is a highly preferred muskrat food and marshes dominated with cattails can support up to seven times the densities of muskrats as marshes dominated by other types of emergent vegetation. Other important food plants include sweetflag (*Acorus calamus*), waterlily (*Nymphaea* spp.), arrowhead (*Sagittaria* spp.), and sedge (*Carex* spp.). In addition to being a food source, densities of emergent vegetation must be sufficient to accommodate lodge construction.

Suitable muskrat habitat requires a permanent supply of still or low velocity water. High quality muskrat habitat is described as 50% or more of the area covered with dense, emergent vegetation. Water stability has more direct effect on habitat quality than does water depth and is known to limit muskrat populations by displacing lodges and changing the availability of emergent vegetation. High quality muskrat habitat along streams generally has an abundance of retreats such as downfall, lodged debris, deep pools, backwaters, undercut banks and is bordered by dense herbaceous vegetation. Further, intensive livestock grazing is known to have detrimental effects on muskrat density due to decreased vegetative cover, increased bank erosion, and trampling of burrow systems.

Beaver

Beaver habitat, described herein, is largely characterized based on Habitat Suitability indices described in Allen (1983). Suitable beaver habitat must contain all of the following:

- Stable aquatic habitat providing adequate water.
- Channel gradient of less than 15%.
- Quality food species present in sufficient quantity.

For the purposes of this plan, beaver represent scrub/shrub wetland habitat. Despite beavers year round preference for herbaceous vegetation over woody vegetation, herbaceous vegetation is not available throughout the year. Therefore, beavers diet shifts to available woody shrubs and trees in the late fall when herbaceous vegetation has become desiccated. Literature suggests that herbaceous vegetation will probably not limit the potential of an area to support a beaver colony, however total biomass of winter food cache plants (woody plants) may be limiting, thus the applicability to scrub/shrub wetlands.

Suitable woody vegetation are those deciduous species that commonly occur in riparian habitats including aspen (*Populus tremuloides*), willow (*Salix* spp.), cottonwood (*P. balsamifera*), and alder (*Alnus* spp.). Woody stems preferred by beavers are less than 10.1 cm dbh.

Beavers require a permanent supply of water and prefer a seasonably stable water level. Beavers can usually control water depth and stability on small streams, ponds, and lakes; however, larger rivers and lakes where water depth and/or fluctuation cannot be controlled are often partially or wholly unsuitable for beavers. Therefore, this plan will use beavers as indicator species for palustrine wetlands associated with stream floodplains exhibiting gradients less than 15% and valley widths greater than 46 m.

Northern Goshawk

The northern goshawk prefers habitat characteristics of dense climax coniferous forests. The goshawk is the largest accipter and its shortened tail and shortened wings are specifically adapted for navigating through dense forests. They are largely a resident bird; however there may be some seasonal migration. The goshawk feeds on prey species such as grouse, hares, and squirrels that inhabit climax forests. For that reason, goshawks are an effective indicator species of the health of climax forests.

MACROHABITATS AS PRIORITY INDICATORS

Five macrohabitats, critical to the persistence of one or more or the indicator species, are the analysis mechanism that facilitates coordination between fisheries management and wildlife management. Macrohabitats are defined here as broad landscape level habitat conditions. A specific macrohabitat may provide life-support functions for different species and/or life stages, and natural or anthropogenic disturbance factors are likely to affect conditions in adjoining habitats, creating the potential for multi-species fish and wildlife management by implementing one project.

Channel stability

Channel stability is key to the full expression of natural stream function (Rosgen 1996) and is therefore central to large-scale stream restoration. The pattern, plan and profile of stream systems develop naturally to provide for dissipation of the kinetic energy of moving water and the transport of sediment. The meander geometry and associated riffles and pools within a system adjust in such a way that maintaining equalibrium between the sediment load and kinetic energy of the stream minimizes the energy

expended on natural processes (Rosgen 1996). Consequently, straightening stream channels ultimately leads to a state of disequilibria or instability.

An accelerated morphological change of the stream, characteristic of channel instability, directly affects habitats for bull trout, westslope cutthroat trout, and interior redband rainbow trout. Microhabitats used by these species at various life stages are degraded and/or eliminated, thereby decreasing the carrying capacity of the stream. Degradation of aquatic habitat also affects invertebrate populations, which comprise an important trophic structure component for aquatic and terrestrial communities and justifies the coordination of fish and wildlife management efforts.

Evaluation of stream channel stability is based on the methodology first developed by Pfankuch (1975) and later revised to apply to various stream channel types by Rosgen (1996). In the field, channel stability is quantitatively evaluated and assigned a number using the methods developed by Pfankuch (1975) (Appendix A). Rosgen (1996) qualitatively assigns a value of excellent, good, fair, and poor relative to channel type and quantitative number (Appendix B). Stability is considered limiting if the qualitative evaluation is poor and is assigned a matrix value of 1 (Table 1). Channel stability with a qualitative ranking of fair or good is assigned a matrix value of 0. If no data is available, relative to channel stability, it is assigned a matrix value of 0.

Water temperature

Temperature has a substantial influence on the distribution of salmonids both within and across watersheds (Rieman et al. 1997) and can be an indicator of overall watershed health. The native aquatic biota of the five streams addressed by this report evolved with the natural thermal regime of each individual watershed. Temperature data is unavailable for times prior to Euro-American settlement, however it is widely accepted that low maximum temperatures characterize most western streams that historically supported salmonids. Ultimate upper incipient lethal temperature (UUILT) is 20.9^0C for bull trout (Selong et al. 2001) and 25.6^0C for rainbow trout (Hokanson et al. 1977). Research specific to thermal tolerances of westslope cutthroat (O. c. lewisi) has not been completed (Selong et al. 2001, Brad Shepard, Montana Cooperative Research Unit, personal communication), however Selong et al. (2001) interpolated data in Dickerson and Vinyard (1999) and concluded that the UUILT for cutthroat trout (O. c. sp.) is close to 25^0C. Managing stream temperatures so as not to exceed the UUILT is inappropriate; rather these temperatures represent conditions that were not likely present in the native ecosystem. Managing stream temperatures to produce peak growth conditions is a desirable outcome.

Peak growth for bull trout occurs at 13.2^0C (Selong et al. 2001) and rainbow trout experience peak growth at 17.2^0C (Hokanson et al. 1977). Bull trout feeding consumption decreases significantly ($P<0.001$) when temperatures are greater than 16^0C (Selong et al. 2001) but maintain 98% survivorship for 60-day trials at 18^0C (Selong et al. 2001). Although research has not been completed to estimate the peak growth temperature of westslope cutthroat (Selong et al. 2001, Brad Shepard, Montana Cooperative Research Unit, personal communication) it is assumed to be slightly warmer

than for bull trout. For the purposes of this plan, we assume that the peak growth temperature for westslope cutthroat is similar to rainbow trout, at 17.2^{0}C (Hokanson et al. 1977) and that feeding activity of westslope cutthroat decreases when temperatures exceed 18^{0}C. Therefore, since bull trout, westslope cutthroat, and rainbow trout exhibit decreased activity at temperatures exceeding 18^{0}C, stream temperatures exceeding 18^{0}C are considered limiting for the purposes of this plan and assigned a matrix value of 1. Water temperatures less than or equal to 18^{0}C are assigned a matrix value of 0. If temperature data is not available for that parcel a value of 0 is assigned.

Migration barriers

Artificial barriers to fish migrations can severely impact populations of migratory fish by limiting available spawning and rearing habitat. Anthropogenic structures such as culverts, diking, and/or channelization can be sources of blockages and are considered limitations in this plan, however, natural blockages such as falls are not considered limiting factors. If a migration barrier is present on a parcel, it is assigned a matrix value of 1. If no barriers are present or if no data is available it is assigned a matrix value of 0.

Wetland/riparian habitat

Wetland habitat is defined based on wetland classifications described in Cowardin et al. (1979), historic habitat conditions (Coeur d' Alene Tribe et al. 1998), and suitable habitat conditions for beaver (Allen 1983), muskrat (Allen and Hoffman 1984), and wood duck (Sousa and Farmer 1983). Historic and current wetland systems on the Coeur d' Alene Indian Reservation consist of palustrine, lacustrine, and riverine systems (Coeur d' Alene Tribe et al. 1998). Reservation wide wetland loss estimates suggest that 83% (21,417 acres) of palustrine habitat has been lost since settlement, including 75% (5,064 acres) of wetlands in the five watersheds addressed in this report (Coeur d' Alene Tribe et al. 1998). The losses of palustrine wetland encompass several classes referred to in Cowardin (1979) as persistent emergent wetlands, scrub-shrub wetlands, and forested wetlands.

The palustrine classes identified above are mostly associated with floodprone areas near both perennial and intermittent streams (Coeur d' Alene Tribe et al. 1998). Therefore, selection of indicator species was chosen to represent the largely riparian wetlands with characteristic gallery forest wetlands (wood duck), persistent emergent wetlands (muskrat), and scrub-shrub wetlands (beaver). It is apparent that indicator species habitats will overlap wetland classes; therefore, to be considered successful, all three palustrine wetland classes must be improved in order to observe measurable results in overall indicator species populations. Because of their position in the landscape as transitional areas between uplands and the aquatic environment, improving components of wetland function is likely to be paralleled by improvements in both the physical and biological indicators found in the aquatic environment.

The most significant limiting factor related to wetland habitat is loss of functions and values (Coeur d' Alene Tribe et al. 1998). The watersheds under consideration were considered to be limiting for wetland habitat when areas that supported historic wetlands,

as indicated by the presence of hydric soils in 1933, no longer exhibited functional characteristics as shown on current National Wetland Inventory (NWI) maps produced by the USFWS (1990). These "lost" wetlands were assigned a matrix value of 1 in the ranking process that is discussed below (see "Ranking Priority Areas").

Erosion hazard potential (EHP)

Erosion hazard potential is intended to represent the risk of soil loss from upland areas subjected to anthropogenic disturbance factors. The presence of increased erosion hazard potential is most likely associated with a disturbing anthropogenic activity and habitat fragmentation.

A map coverage depicting Erosion Hazard Potential was derived from an unweighted ranking of soil-erodibility factors, hillslope gradient, an index of vegetative root depth, surface curvature, and road density. Soil-erodibility factors (K), derived from the most recent soil surveys of Benewah and Kootenai counties (Weisel 1980, 1981), combined with slope provided the first set of evaluation criteria. The soil erodibility factors were grouped into low (K < 0.25), medium (K between 0.25 and 0.40), or high (K > 0.40) categories. These categories were combined with slopes that were assigned a low (< 30% slope), medium (30% - 65% slopes) or high (> 65%) erosion potential. The output of this first combination was categorized into low, medium, or high erosion potentials and combined with vegetation associations that were assigned low (medium density forests, high density forests, water and wetlands), medium (brush lands, regenerating forests, low-density forests, developments and grasslands) or high (agricultural lands) erosion potentials. The output of this second combination was categorized into low, medium or high erosion potential and combined with surface curvatures that were assigned a low (convex), medium (flat), or high (concave) erosion potential. The low, medium and high outputs from the third combination were combined with the road coverages grouped into low (no roads), medium (paved, gravel, and railroad beds), high (dirt roads) or very high (stream crossings) erosion potentials. The final output of this matrix assigned a low, moderate, high or very high Erosion Hazard Potential to each 10 m^2 grid on the Coeur d'Alene Reservation.

Erosion hazard potential is considered limiting in this plan if it has a classification of high or extreme. Classifications of high or extreme are assigned a matrix value of 1 and classifications of low or moderate are assigned a matrix value of 0 as described below (see "Ranking Priority Areas").

DATABASE

General Use and Introduction

Microsoft Access is an electronic relational database-management system that enables you storage, organization, and manipulation of information in an electronic format (figure 3). In Access, databases consist not only of the basic data, but also of the related items used to work with the data. This database consists of different types of objects called

tables and queries. Other objects called forms, reports, macros, and modules can be developed as the need and expertise arises.

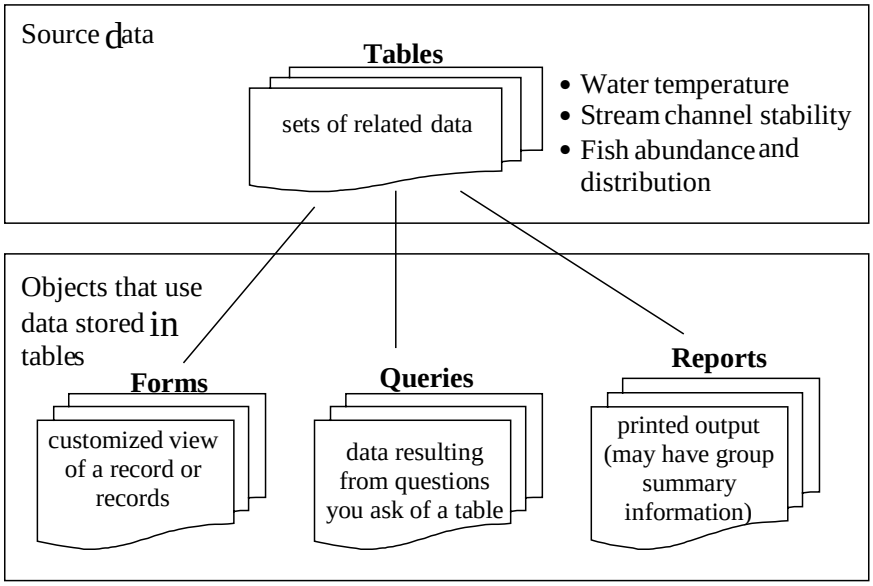

Figure 4: General structure of a Microsoft Access database

Database Structure

Database Program: Microsoft Access

Database Name: Master.mdb

Database Tables: 6

Database Queries: 3

Database Function: Data repository for aquatic habitat information and population density of westslope cutthroat trout that collectively describe the condition of the waters of the Coeur d' Alene Reservation. These data will serve the GIS database by applying physical habitat and population information with specific geographic locations in each watershed, which can then be displayed in relation to other spatial data sets.

Tables are used to store a collection of related information in a spreadsheet type arrangement of records and fields. Ultimately, all forms, reports, and queries are based on the data stored in tables. This database contains five tables: Master Index, Stream Temperature, Channel Stability, Fish Density, and Migration Barriers. Queries enable the user to ask question of, analyze, and select data that are stored in tables. Querying enable you to select certain pieces of information such as particular fields or records and sort, calculate, and summarize data, thus enabling you to analyze trends. This database contains three queries: Maximum Weekly Mean Temperature, Average Fish Density, and Master Query.

The query titled "Master Query" is where data from other tables and queries are synthesized and displayed. In this query, all of the available habitat information and fish

population information are displayed relative to the stream reach in which they occur. Data synthesized in this query may be exported into the GIS system and used as the foundation for creating maps and has the capability of being maintained and regularly updated by Coeur d' Alene Tribal fisheries and water quality managers. Directly and indirectly, the "Master Query" uses data from six tables and two queries. Below, each table and query are described and details of relationships between tables and queries are explained

Tables

Master Index

This table is the foundation table in the database and establishes the geographic locations from which physical data may be applied. These data were manually input into the computer and coordinated with specific geographic locations and coded such that they are easily imported and useable in the spatial (GIS) system. Locations in this table are based on stream reach information that has been previously collected. For the five reference watersheds, 59 reaches have been identified; therefore, 59 records occur in this table. As more streams are assessed and more reaches are identified, the number of records will increase while still maintaining the integrity of the table. The following five fields are present in this table:

- GIS ID: This field is the primary key in the database and originates from the reach code assigned in the GIS system. It is critical that any new stream reaches are assigned a code in coordination with GIS staff. The code used is [stream name, Reach #].
- Watershed: This field displays the watershed that the reach occurs in.
- Stream name: Name of the stream.
- Stream reach: The streams reach number.
- Site name: The site name is necessary because data collection methods often include multiple reaches. For example; temperature data loggers were not deployed in each reach. Data was collected at key areas throughout each stream; therefore data collected at specific sites is potentially applicable to multiple reaches. This field allows data collected at a specific site to be applied to the appropriate reaches.

Stream Temperature

This table currently has 7,107 records in eight fields. In this table, each stream site has one temperature data point for each day. This data point is an average of all the data collected for that day, at that site (daily mean). A weekly mean is then calculated by averaging the values for the previous seven days.

- Site name: Same as described in the Master Index table description.
- Stream name: Same as described in the Master Index table description.
- Date: Month/day/year data was collected
- Daily mean: Average temperature for that site on that day.
- Weekly mean: Average temperature for that day and the previous six days.

- Month: Month data was collected.
- Day: Day that data was collected.
- Year: Year that data was collected.

Channel stability

Channel stability is one of the five limiting factors identified in this plan. Stream channel stability is based on the evaluation methodology first developed by Pfankuch (1975) and later revised to apply to various stream channel types by Rosgen (1996). In the field, channel stability was evaluated and assigned a quantitative rating based on the methods developed by Pfankuch (Appendix A). These ratings are then assigned a qualitatively value of excellent, good, fair, and poor after Rosgen (1996) (Appendix B). Both the quantitative stability rating and the qualitative stability value are recorded in this table relative to individual stream reaches. The table titled "***Pfankuch-Rosgen"*** displays the factors that influence the final stability rating. Only the qualitative value is queried and used in the prioritization process as a limiting condition. For the purposes of this plan stream channels with a poor stability rating are considered limiting. Table fields include:

- GIS ID: Same as described in the Master Index table description.
- Watershed: Same as described in the Master Index table description.
- Site name: Same as described in the Master Index table description.
- Stream name: Same as described in the Master Index table description.
- Stream reach: Same as described in the Master Index table description.
- Channel type: The channel type for each stream reach using methods described in Rosgen (1996).
- Stability value: Quantitative channel stability values determined using methods described in Pfankuch (1975).
- Stability rating: Qualitative channel stability ratings determined using methods described in Rosgen (1996).

Fish Density

This table displays the density of westslope cutthroat trout in each stream reach where data is available, for each year between 1996 and 2000. The density value consists of the number of fish per 100 square meters collected during low flow electrofishing surveys. Information from this table is further condensed in the query "***Average cutthroat density"*** to display an average density over the years sampled. Updating data in the fish density table will automatically update information in the Average cutthroat density query. The fields in this table include:

- GIS ID: Same as described in the Master Index table description.
- Watershed: Same as described in the Master Index table description.
- Stream name: Same as described in the Master Index table description.
- Stream reach: Same as described in the Master Index table description.
- Year: Year data was collected.
- WSC density/100 sq M: This field displays the density (cutthroat/100 M^2). These data are calculated by: #cutthroat/[(sample area width * sample area length)/100].

Migration Barriers

This table displays stream reaches that have man-made barriers to migrating fish. Potentially, barriers may be limiting to fish population health and is therefore included in prioritization analysis. However, data collected on the five watersheds included in this plan contain no barriers. Its utility here may serve as a template when applied to watersheds that do have migration barriers. Fields included in this table include:

- GIS ID: Same as described in the Master Index table description.
- Watershed: Same as described in the Master Index table description.
- Site name: Same as described in the Master Index table description.
- Stream name: Same as described in the Master Index table description.
- Stream reach: Same as described in the Master Index table description.
- Barriers: identifies whether migration barriers are present in that stream reach.

Queries

Maximum weekly temperature

This query organizes data into two fields based on information found in the table *All Streams temp years 97-00* (see previous description). The objective of the query is to find and display the maximum weekly mean temperatures for each site name (site names may apply to multiple reaches). Table 1 below displays the month and day that a hypothetical site exhibits its maximum weekly average water temperature. This query is designed to select and display the value of 23^0C in this scenario. Averaging the weekly average temperatures between years was considered, however, doing so potentially masks the bottleneck created by elevated water temperature in a specific year.

Data seen in this query will be automatically updated as new information is the table *All Streams temp years 97-00* is updated.

Table 1: Hypothetical example showing how maximum weekly mean temperature is calculated.

Year	**Month/day**	**Max. weekly mean temp.**
1997	5 August	15
1998	10 August	16.5
1999	18 July	17
2000	22 July	23

Query fields include:

- Site name: Same as described in the Master Index table description. In this query, data is grouped by the site name. Currently there are 19 sites; therefore, this query has 19 records.
- Max of weekly mean: This field is designed to select the maximum value from the weekly mean field in the source table for each site name.

Average cutthroat density

The source table for this query is *Fish Density*. Data is organized by stream reach or the GIS ID. This query uses information from the field WSC density/100 sq m, in the source

table, to calculate the density of westslope cutthroat trout by averaging the densities found in each year's sample. For example, hypothetical stream reach #1 has the following density measurements calculated for the following years:

- 1996-8 fish/100 m^2
- 1997-6 fish/100 m^2
- 1998-12 fish/100 m^2
- 1999-22 fish/100 m^2
- 2000-13 fish/100 m^2

The average density calculated in this given query scenario is 12.2-fish/100 m^2. Query fields include:

- GIS ID: Same as described in the Master Index table description. Data is grouped by this field.
- Avg. of WSC density/100 sq m: Density data in this field are averaged over the number of years that data is available.

Master query

This query synthesizes and displays the data from the six tables and two other queries in the Access database. This query is the cornerstone of the ranking process. What makes it unique is that it is automatically updated when data from source tables and/or queries are updated. Therefore, individual source tables may be maintained by professionals working in Tribal programs and used for their purposes while simultaneously updating this query. The benefit relative to the planning process is that prioritization results will always be updated base on the latest information. Furthermore, by simply manipulating data (such as years data was collected) long-term evaluations of individual parcels can be displayed in a time-lapse fashion. This query includes the following fields (listed with source table):

- GIS ID: From *Master Index* (table).
- Watershed: From *Master Index* (table).
- Stream name: From *Master Index* (table).
- Stream Reach: From *Master Index* (table).
- Site name: From *Master Index* (table).
- Stability rating: From *Channel stability* (table).
- Max of weekly mean (temperature): From *Maximum weekly mean temperature per stream* (query).
- Avg. of WSC density/100 sq. M: From *Average cutthroat density* (query).

Limitations of existing data sets

The data describing conditions in the different watersheds of this Plan are in various stages of completion and present some limitation with regard to their application. In particular the influence that smaller watersheds (<1000 acres) have on the quantity and timing of steam flows and transport and deposition of fine sediment as discussed by

Swanston (1991) are not well represented by the existing data and therefore their importance in influencing the distribution and abundance of fish is under valued.

Incomplete and/or broadly interpreted data sets are not likely to have the precision necessary for pinpointing specific locations causing the degradation within a watershed. However, the data used in this planning process represents the latest available science and has sufficient resolution to prioritize parcels where the cumulative effects of degradation are expressed and where restoration is most needed. The strength of this project lies in our ability to easily refine priorities as additional data becomes available. Assessment and monitoring/evaluation efforts that take place in the future will provide increased resolution at finer scales to improve the ranking of individual parcels and allow for relative comparisons of parcels that receive the same priority.

An important objective of this initial ranking process is to identify data gaps in order to prioritize further data collection efforts. With this in mind, the limitations of specific data sets are discussed in the sections that follow.

Trout Density

Westslope cutthroat data, used for estimating densities, was collected at specific sites within stream reaches and is assumed to represent the condition of the entire reach. In most cases, data collection for a specific reach was conducted at one time during the year at low flow conditions (summer/fall). Data collected in a specific reach over multiple years has been averaged and that value is represented in the database. The limitation to these data is that the value does not represent the habitat conditions or the life history requirements at different times of the year. Thus, information in the database is likely a relatively precise method of estimating low flow rearing conditions but is lacking in identifying other critical habitats such as spawning areas and winter refuge. Of the 600 miles of perennial and intermittent streams in the test watersheds, westslope cutthroat density is available for 63.5 miles (10.6%).

Increasing the number of sample locations in each reach during low flow conditions, estimating utilized and potential spawning habitat, and estimating critical winter habitat areas will all increase the precision of the prioritization matrix. The precision of the prioritization matrix can also be improved by adding population information for other indicator species.

Channel Stability

Channel stability is determined based on the results of habitat surveys conducted by the Coeur d'Alene Tribe Fisheries Program in 1993 and 1994. Stability information is available for 43 of the 59 surveyed reaches and encompasses 51 of the 600 total stream miles in the test watersheds (8.5%). This is somewhat misleading, in that, the entire Rock Creek watershed has not been surveyed and accounts for 274 of the 549 miles of stream lacking channel stability data. Delineating all reaches in each watershed and assigning a channel stability rating for each stream reach will improve the precision of the prioritization matrix.

Water Temperature

Water temperature data included in this plan was collected using continuous recording thermographs at 19 different sites throughout the five watersheds and analyzed to display the maximum weekly mean temperature for each reach. Data was generally extrapolated to nearby reaches when temperature profiles were judged to be similar. One of the 19 sites where data was collected is located on the North Fork Rock Creek and is not associated with reach data. The 18 remaining temperature collection sites currently represent 54 reaches in the four plan watersheds draining into Coeur d' Alene Lake. To increase the precision of the prioritization matrix, temperature data should be collected in additional stream reaches. Stream reaches currently lacking temperature data are shown is *Table 2*.

Table 2: Streams and reaches lacking temperature data.

Watershed	Stream	Reach	Miles
Benewah	Bull Creek	1	1.94
Benewah	Coon Creek	1	1.75
Benewah	WFK Benewah	1-2	1.94
Rock	All streams except NFK Rock Creek	No reaches surveyed	273.60

Migration Barriers

Unnatural barriers to migrating fish have not been identified from available data in the five test watersheds. Relatively thorough surveys in the Alder Creek, Benewah Creek, Evans Creek, and Lake Creek Watersheds have been conducted, but similar data does not exist for the Rock Creek Watershed. To increase the precision of the prioritization matrix, complete surveys delineating stream reaches and specific barriers would be required.

RANKING PRIORITIY AREAS

Fundamental ecosystem restoration begins by removing the sources of perturbation(s) that fall outside the normal range of environmental variability. This plan prioritizes areas with the most degraded conditions that are most likely to exhibit a positive response from indicator species when habitat conditions are protected or restored. This prioritization is an objective process and based on available data. If no data exists for a particular parcel, habitat conditions are assumed to be adequate. As a result, parcels receive a lower relative ranking as the amount of data available for the parcel decreases. This approach was deemed an appropriate way to identify data gaps while reducing the subjectivity related to identifying project sites.

This plan, in its written form, assigns priorities for specific parcels located in each of the target watersheds. These priorities, however, are only based on data that is available on or before June 2002. As more information is collected and projects are implemented, the documented knowledge of specific areas will increase. As additional data becomes available we expect priority areas to change and therefore, the process of assigning priorities is designed to be an adaptive process.

In the ranking process, each of the macrohabitat types discussed above is assigned a value of 1 or 0 for each property parcel. A value of 1 indicates a limiting condition for that particular macrohabitat type on a given parcel while a 0 indicates a suitable conditions or a gap in the available data. A total limiting factor score for each parcel is calculated by adding all the assigned macrohabitat scores in that parcel,+ with a maximum score for any given parcel of 5.

Next, a value is assigned to each parcel based on the population status of the appropriate fish indicator – either westslope cutthroat/rainbow trout. Using the density of westslope cutthroat/rainbow trout to determine parcel prioritization rather than other species is done for two main reasons: 1) bull trout density in the five watersheds is undetectable; and 2) population information is not available for any of the other indicator species. Fish populations are categorized according to the following assigned values (*Table 3*):

Table 3: Matrix scores for various categories of westslope cutthroat trout density.

Category	Density Range	Matrix score
No fish	0	0
Low density	0-2 fish/100 square meters	1
Moderate density	>2-10 fish/100 square meters	2
High density	>10 fish/100 square meters	3

The value assigned to each parcel for cutthroat/rainbow trout density is added to the total value for macrohabitat conditions, thereby creating a maximum value for each parcel of 8. However, within the prioritization matrix, it is possible to add different habitat limiting categories and/or population characteristics for different species that will increase the precision of ecosystem representation.

The database calculates values for each parcel and organizes them into three priority categories based on the available data: 1) Low priority; 2) Review priority; and 3) High priority (*Table 4*).

The three categories assigned via the prioritization matrix are based on empirical data and represent the ecological conditions of the parcel. Parcels in the "low" category are eliminated from further consideration as potential management acquisition sites. Parcels in the "review" category require further review prior to management right acquisition (this is discussed in more detail in the section "Field evaluation of review properties") and those scoring a 13 or greater (out of a possible 20) in table 3 are elevated to a "high" priority. Parcels in the "high" priority are candidates for immediate management right acquisition.

Table 4: Property ranking matrix. Matrix colors indicate parcel prioritization category- green is low priority, yellow is review priority, and red is high priority.

Limiting Factors	Cutthroat Trout Density			
	No Fish 0	**Low 1**	**Medium 2**	**High 3**
0	0	1	2	3
1	1	2	3	4
2	2	3	4	5
3	3	4	5	6
4	4	5	6	7
5	5	6	7	8

DISPLAYING LANDOWNER AND PRIORITY INFORMATION USING ARCIMS

To view areas of limited habitat condition the Coeur d'Alene Tribe has set up an interactive web site for viewing queries of many of the GIS data layers (*Figure 5*).

Follow the following steps to view the data:

1) Using Internet Explorer go to the Tribal GIS Program web site http://gis-ims and then go to the tools section of the page (it has a button that looks like a hammer).
2) Once on the tools page click on the link for the "Fisheries Demo".
3) You will then need to click the link that says "Click for the arcims application"
4) You will then be put into the interactive mapping template. From this template you can zoom in or out using the buttons found at the top of the page. Zoom in to your selected area of interest using the appropriate button.
5) You can then turn on additional layers (such as the Stream Stability, or Stream Temperature layers) by checking on the layers and then pressing the "Refresh Layers" button.
6) Other layers such as the erosion hazard potentials and historic wetlands can also be turned on or off.
7) To view areas of current protection you have your choice of two layers. They include the CRP Layer and Tribal Restoration Sites. To turn on or off these layers check the layer and then press the "Refresh Layers" button.
8) Lastly to view the current ownership of lands you can turn on the "Ownership" layer by checking off the layer and then pressing the "Refresh Layers" button. To view whom the current owner is you then can select the hyperlink tool (it looks like a lighting bolt) and then select the parcel of

interest. A web page should come up with the current owners name and mailing address.

9) Additional information can be found using the help button (see appendix A.). The help button describes what various functions of the ArcIMS interface do.

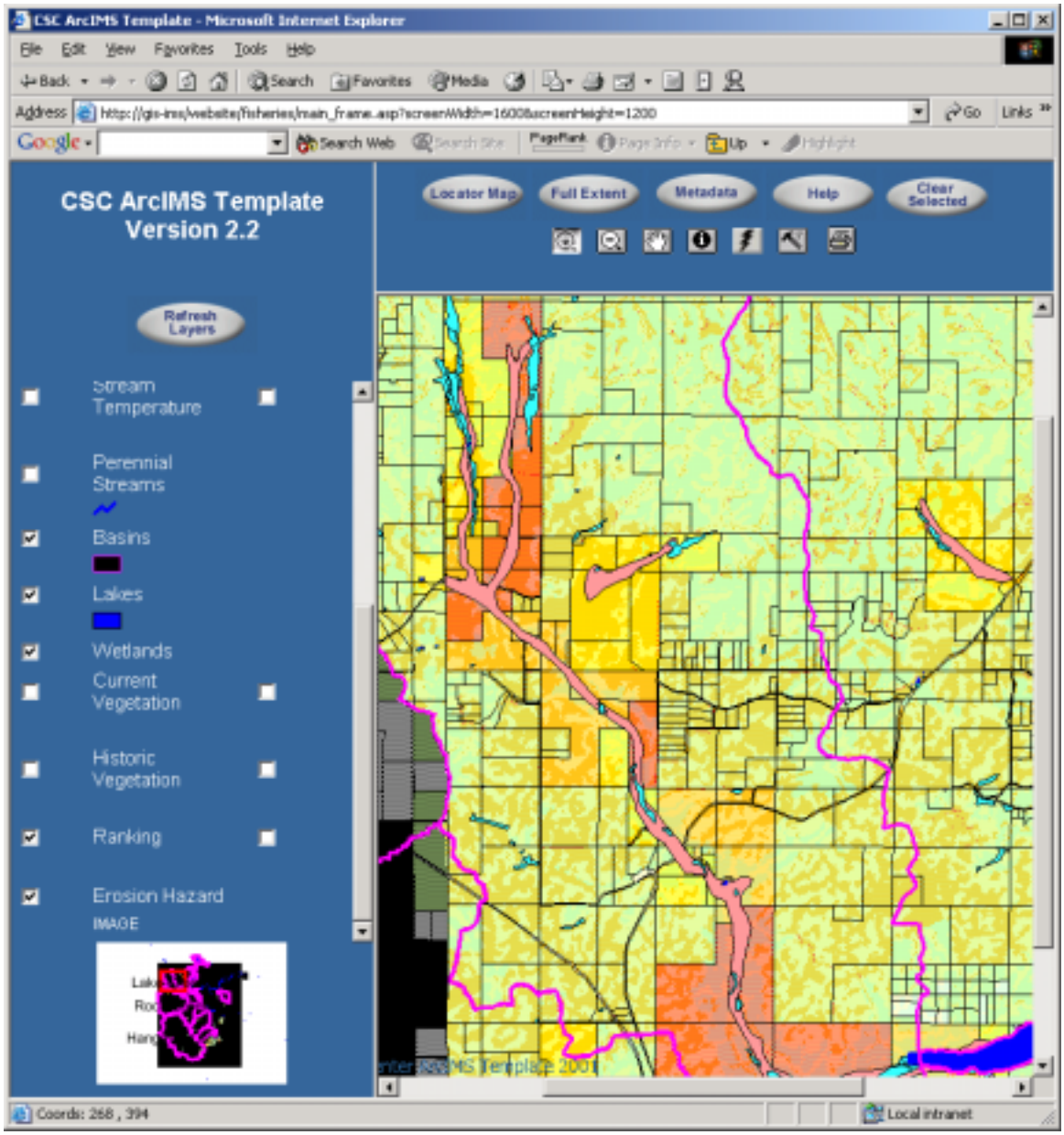

Figure 5. View of the ArcIMS web site, zoomed into the Lake Creek Watershed.

III. Priority Areas

The five test watersheds have 600 miles of stream habitat, including intermittent and perennial streams. Of the 600 miles, 531 miles are currently unsurveyed. The watersheds encompass a total area of 149,973 acres of which 129,410 acres (86.3%) are categorized as low priority, 12,343 acres (8.2%) are categorized in the review category, and 7,911 acres (5.3%) fall in the high priority category (*Figure 6*). Ownership in these watersheds is 85.8% private, 5% Tribal trust, 9% individual Tribal allotments, and 0.2% owned by the State of Idaho.

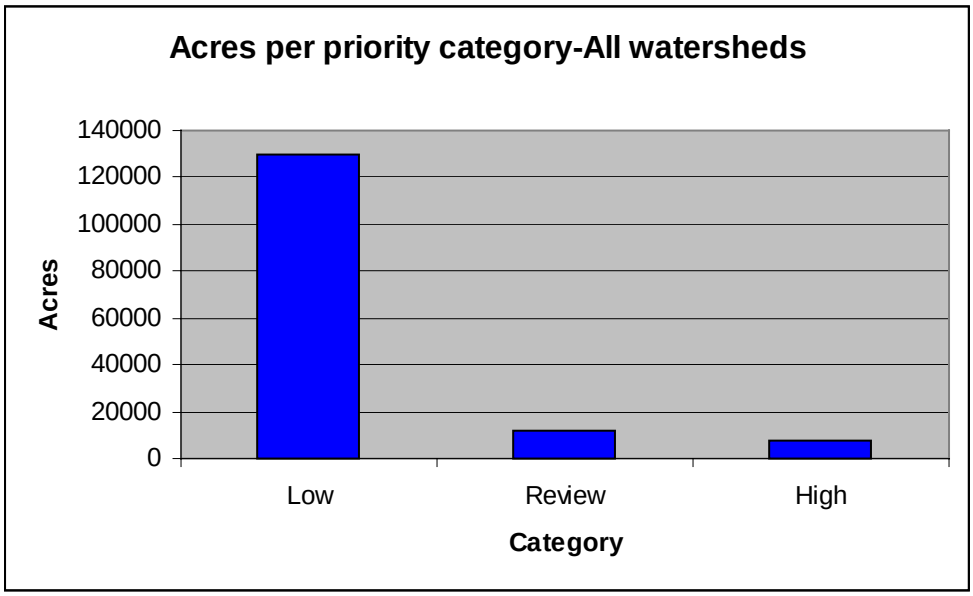

Figure 6: Total watershed area by priority category for the five watersheds covered by this Plan.

Generally, urgent and high priority areas occur along stream corridors and decline in priority as the distance from the streams increase. This does not suggest that upland areas are of relatively low importance in the watershed. Rather, the priority is to protect areas that will benefit the largest diversity of indicator habitats, thereby realizing benefits to both fish and wildlife species.

A high percentage of areas with lost wetlands and/or high erosion hazard potential exist in low priority areas throughout the watersheds, whereas a small percentage of areas exhibiting limiting water temperature and/or bank stability conditions exist in the low priority category (*Figure 7*). Again, this is not suggesting that upland and wetland habitat are of lower importance in the watershed, but rather reinforce the focus of prioritizing areas that are most likely to benefit ecosystem function. The cause of the disproportion is that wetlands and EHP habitats may exist in parcels where functional stream habitats do not exist. In the situation where lost wetlands and EHP occur in parcels without stream habitat, the maximum value from the prioritization matrix is 2 out of a possible 5 points (for habitat), increasing the probability that that parcel will be prioritized in the low category. Conversely, wetlands and EHP conditions, occurring in parcels with limiting temperature and bank stability conditions, will score at least 4 out of the 5 possible points

for habitat in that parcel. The exaggerated percentage of wetland and EHP habitat types in the low category is exacerbated due to the extraordinary loss of wetland habitat and increased erosion hazard potential associated with anthropogenic development. These large areas are recorded in the database in acres (an area measurement), which are disproportionate to the linear measurements (miles) used to record water temperature and bank stability. A complete listing of all high priority properties is provided in Appendix D.

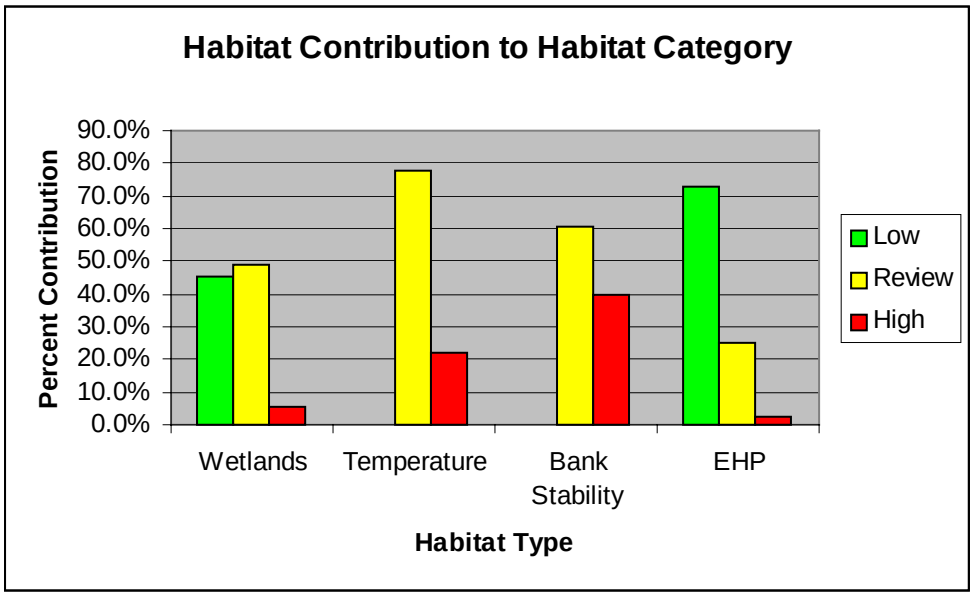

Figure 7: Distribution of limiting factors across the three priority categories.

ALDER CREEK WATERSHED

The Alder Creek Watershed has 70.4 total miles of stream habitat. Of the 70.4 miles, 53.3 miles are currently unsurveyed. The watershed encompasses 17,286 acres. Of the total watershed area; 13,237 acres (76.6%) are categorized as low priority, 3,647 acres (21.1%) in the review category, and 402 acres (2.3%) in the high category (*Figure 8*). Watershed ownership consists of 15,621 acres (90.4%) of private ownership and 1,665 acres (9.6%) of tribal ownership.

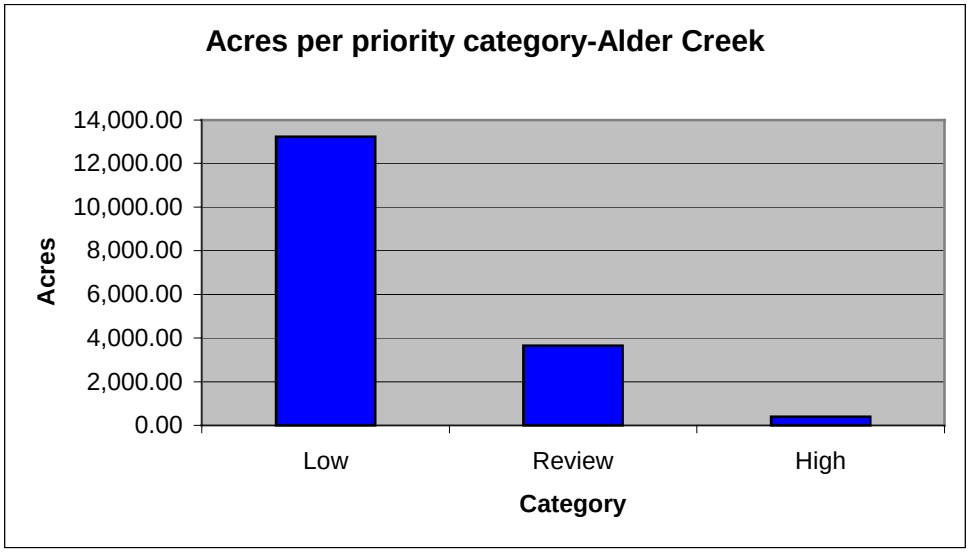

Figure 8: Total area by priority category in the Alder Creek Watershed.

The map labeled *Figure 9* displays priority categories geographically. The relatively small area categorized as high priority in the watershed does not suggest that habitat conditions are more intact than watersheds with more high priority areas. Rather, the lack of high priority areas in the Watershed is a result of depressed westslope cutthroat populations.

In the prioritization matrix, increasing cutthroat density increases the priority due to the likelihood of protecting refuge habitat for native species. The low density of cutthroat in the watershed may suggest that refuge conditions do not currently exist in the watershed and therefore result in lower priority categories. However, the presence of a small block of high priority area, in roughly the middle of the watershed, exposes a core area that may be a source population and an area to begin watershed restoration. This core area and the parcels surrounding this core area should be carefully examined when planning restoration strategies.

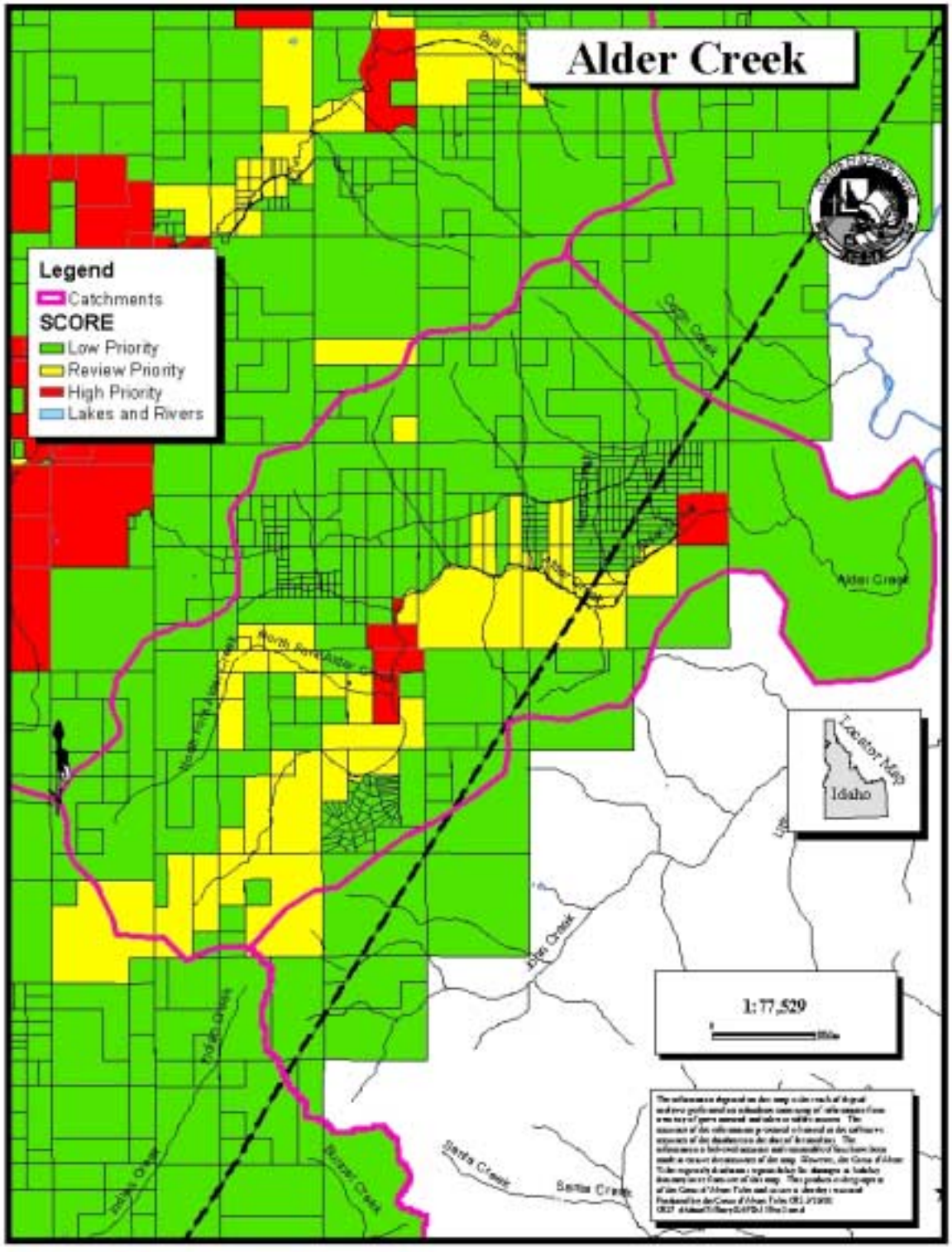

Figure 9: Geographic prioritization in the Alder Creek Watershed.

BENEWAH CREEK WATERSHED

The Benewah Creek Watershed has 136.2 total miles of stream habitat. Of the 136.2 miles, 111.1 miles are currently unsurveyed. The watershed encompasses 33,789 acres. Of the total watershed area; 25,549 acres (75.6%) are categorized as low priority, 3,970 acres (11.8%) in the review category, and 4,271 acres (12.6%) in the high category, (*Figure 10*). Watershed ownership consists of 32,832 acres (97.2%) of private ownership and 958 acres (2.8%) of tribal ownership.

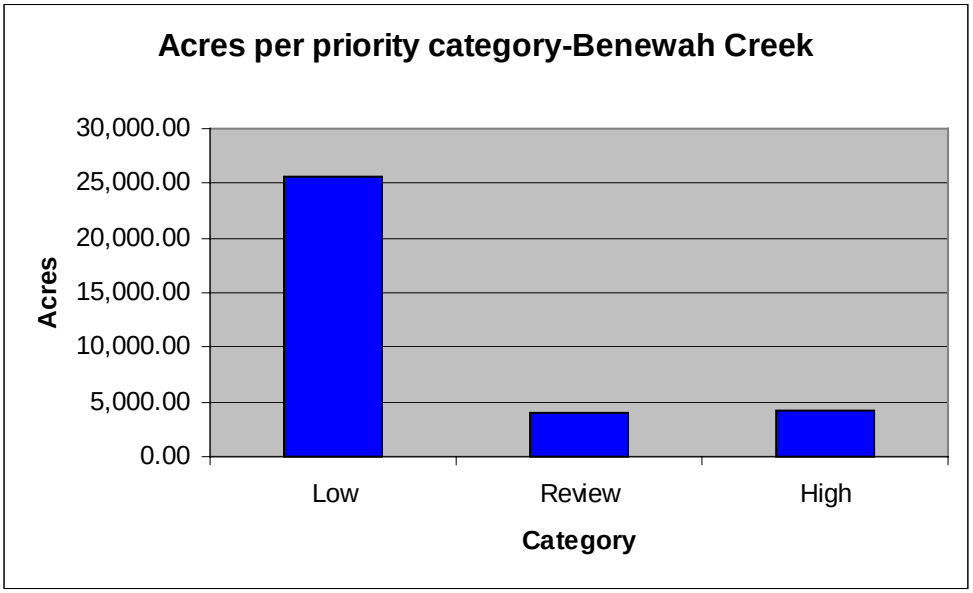

Figure 10: Total area by priority category in the Benewah Creek Watershed.

High priority parcels are most common in the upper 2/3 of the watershed (*Figure 11*). These parcels are generally associated with stream corridors and suggest that imperiled cutthroat populations face further declines as a result of degraded habitat conditions.

The frequency of high priority areas throughout the watershed above Coon Creek suggest that cutthroat are finding refuge in degraded habitat conditions throughout the upper areas of the watershed. Therefore, despite poor macrohabitat conditions, there appears to be sufficient areas of suitable microhabitats that are capable of maintaining the population through the critical times of the year. Protecting and/or restoring natural conditions in these parcels may be an opportunity to increase the sustaining conditions of the suitable microhabitats. The underlying assumption of increasing cutthroat populations to sustainable harvest levels is that they will exhibit a positive response to habitat improvements.

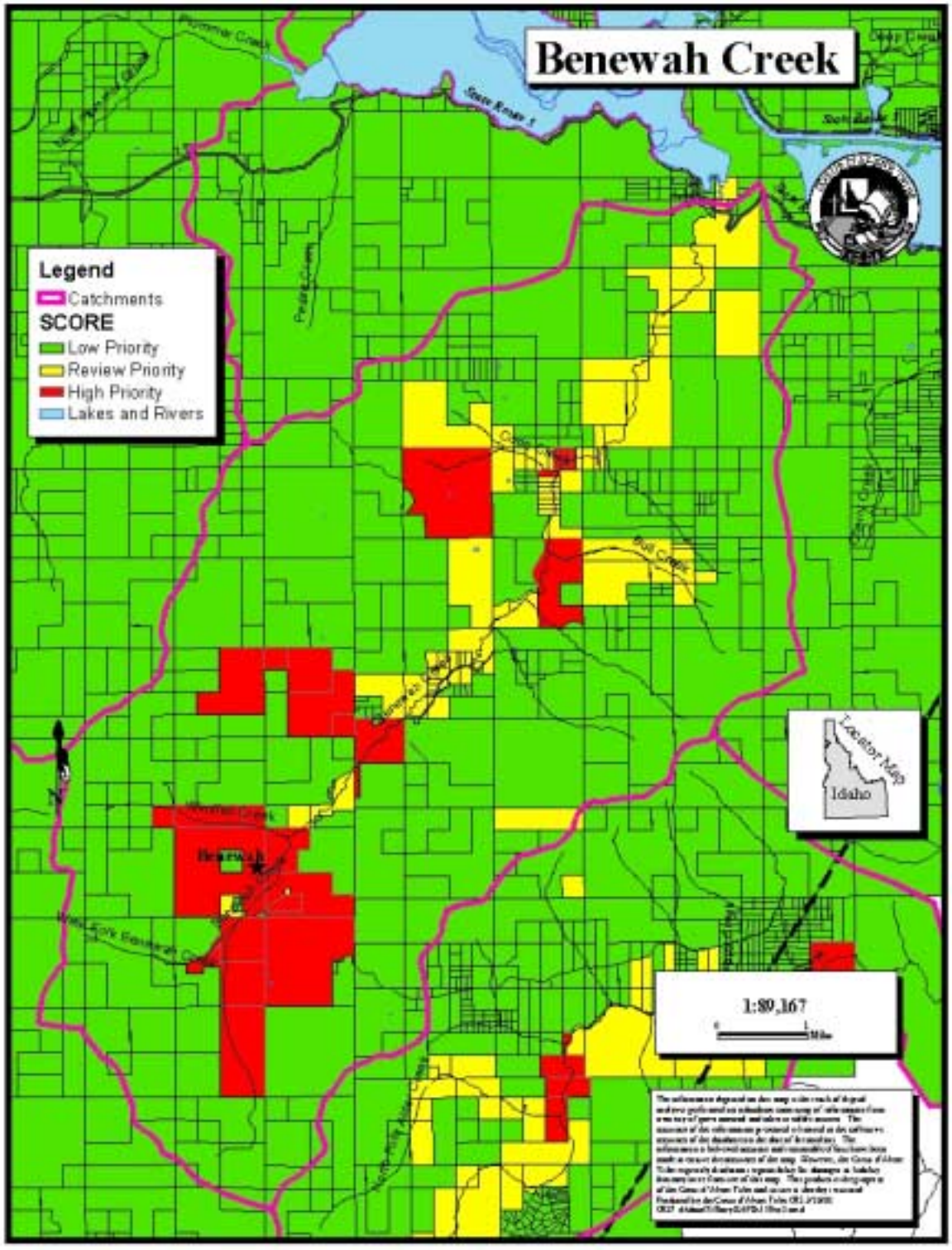

Figure 11: Geographic prioritization in the Benewah Creek Watershed.

EVANS CREEK WATERSHED

The Evans Creek Watershed has 29 total miles of stream habitat. Of the 29 miles, 20.1 miles are currently unsurveyed. The Watershed encompasses 8,492 acres. Of the total watershed area; 5,396 acres (63.5%) are categorized as low priority, 1,997 acres (23.5%) in the review category, and 1,098 acres (12.9%) in the high category (*Figure 12*). Watershed ownership consists of 5,853 acres (68.9%) of private ownership and 2,639 acres (31.1%) of tribal ownership.

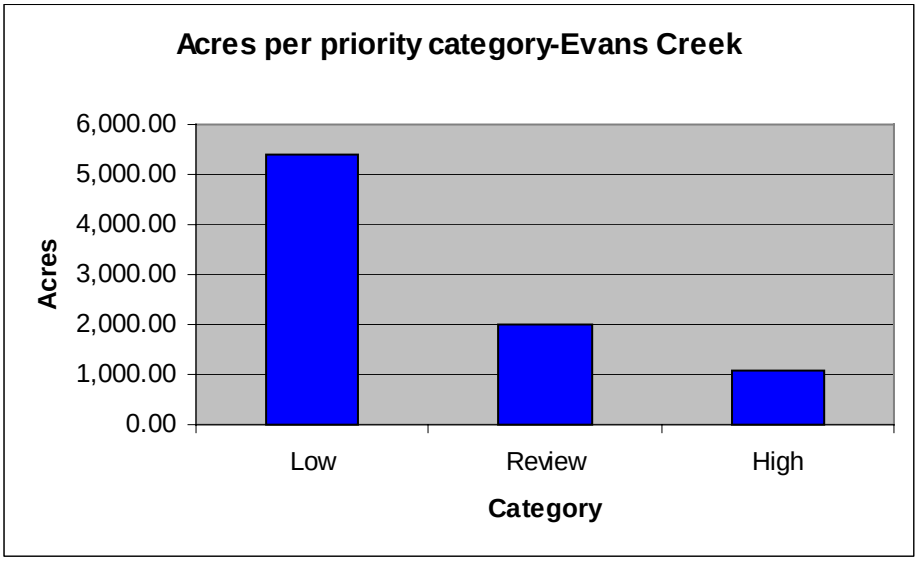

Figure 12: Total area by priority category in the Evans Creek Watershed.

Water temperatures throughout the entire Evans Creek Watershed are below the 18^0C threshold defined as limiting in this plan and there are no artificial migration barriers. Cutthroat populations, throughout the watershed, are generally in the high density category although it is unclear whether water temperature and cutthroat density are a cause and effect relationship.

In parcels with high cutthroat densities, two of the five macrohabitats must be limiting to elevate the parcel to a high priority category. Such parcels appear in the lower 2/3 of the watershed (*Figure 13*). These parcels can be qualitatively characterized as marginally degraded habitat with good cutthroat populations. Therefore, in the case of Evans Creek Watershed, high priority category parcels are identified largely focused on habitat protection as opposed to rehabilitation. High priority parcels present opportunities for increasing densities from an adequate source population in a relatively short time frame since the cool water component of the habitat already exists. Further, for the same reason, Review category parcels should be carefully evaluated, as their potential contribution to population increases may be significant.

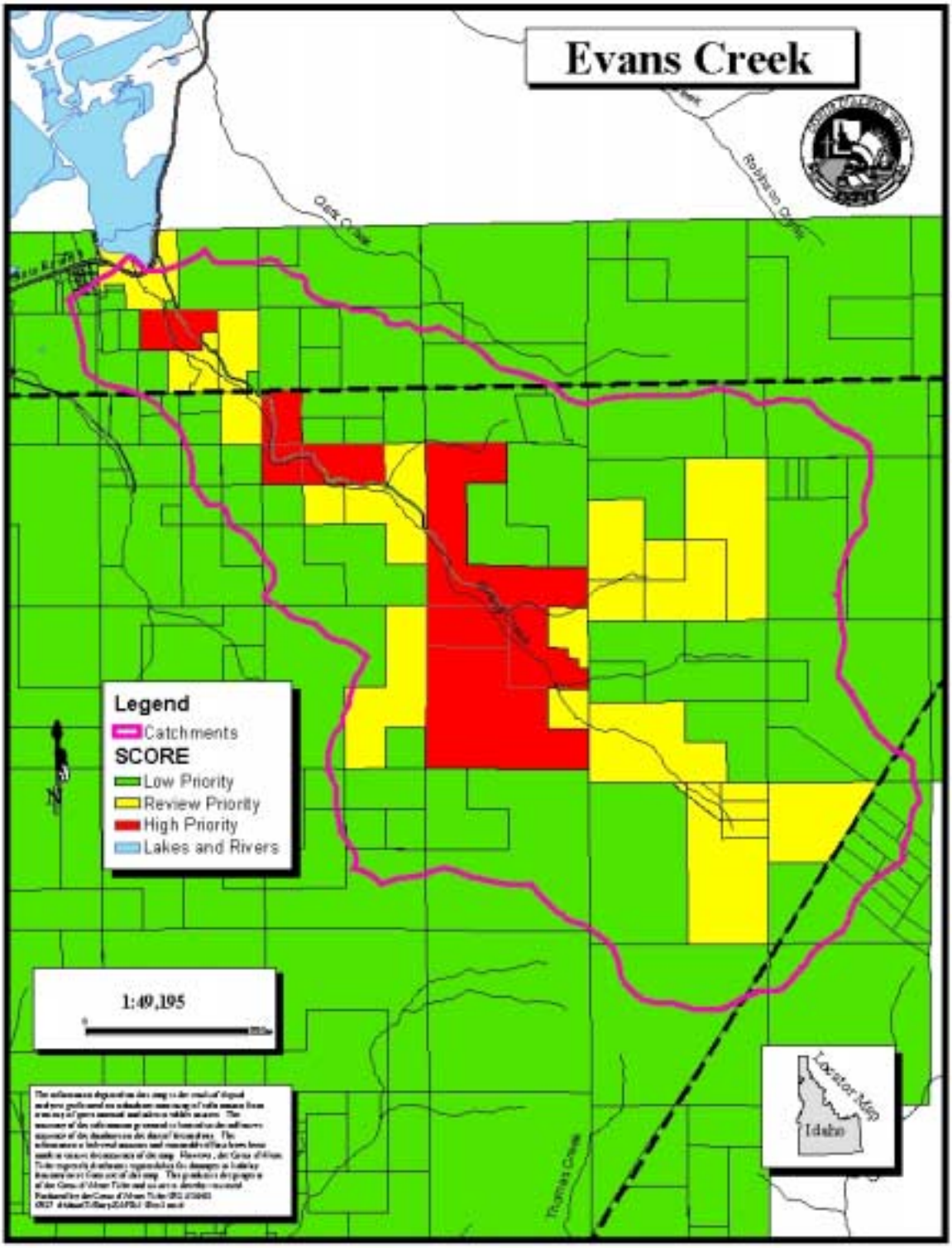

Figure 13: Geographic prioritization in the Evans Creek Watershed.

LAKE CREEK WATERSHED

The Lake Creek Watershed has 90.9 total miles of stream habitat. Of the 90.9 miles, 72.4 miles are currently unsurveyed. The Watershed encompasses 23,056 acres. Of the total watershed area; 17,879 acres (77.6%) are categorized as low priority, 2,729 acres (11.8%) in the review category, and 2,139 acres (9.3%) in the high category (*Figure 14*). Watershed ownership consists of 22,042 acres (95.6%) of private ownership, 157.7 acres (0.7%) of tribal ownership, 802.5 acres (3.5) of tribal allotments, and 53.9 acres (0.2%) owned by the State of Idaho.

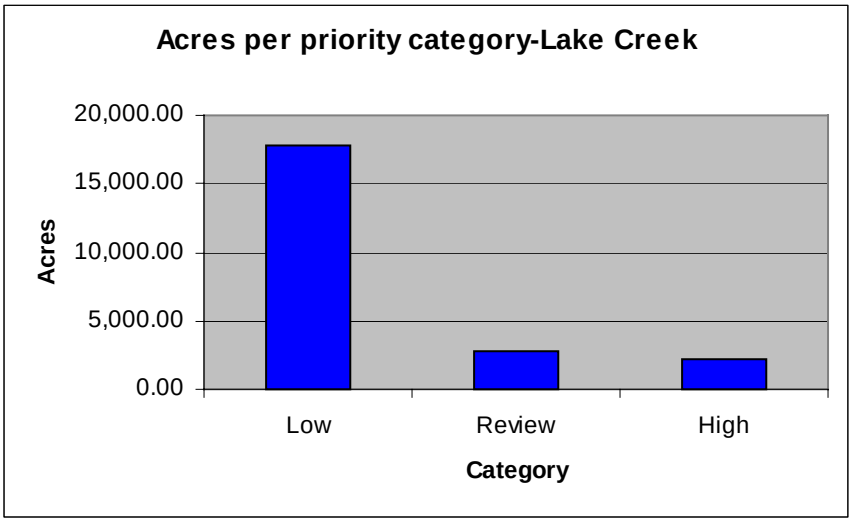

Figure 14: Total area by priority category in the Lake Creek Watershed.

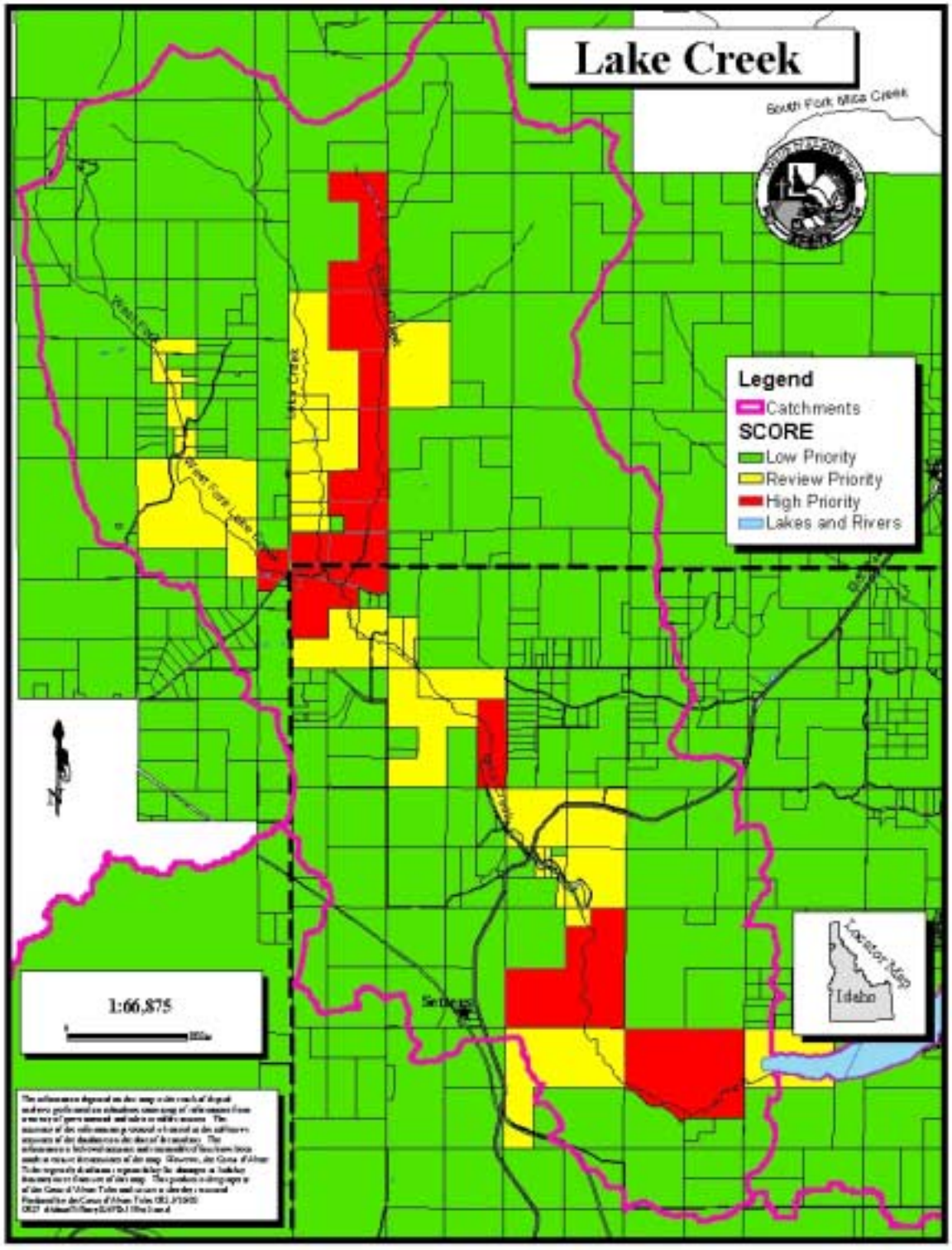

Figure 15: Geographic prioritization in the Lake Creek Watershed.

ROCK CREEK WATERSHED

No formal habitat survey has been completed within the Rock Creek watershed. The Watershed encompasses 67,349 acres. Due to the lack of survey information and the plan method of assuming non-limiting conditions in areas with no data, the entire watershed is in the low prioritization category (Figure 16). Watershed ownership consists of 58,841 acres (85.9%) of private ownership, 2,131 acres (3.2%) of tribal ownership, 7,138 acres (10.6) of tribal allotments, and 240 acres (0.4%) owned by the State of Idaho. The Rock Creek Watershed (Figure 15) has 273.6 total miles of stream habitat.

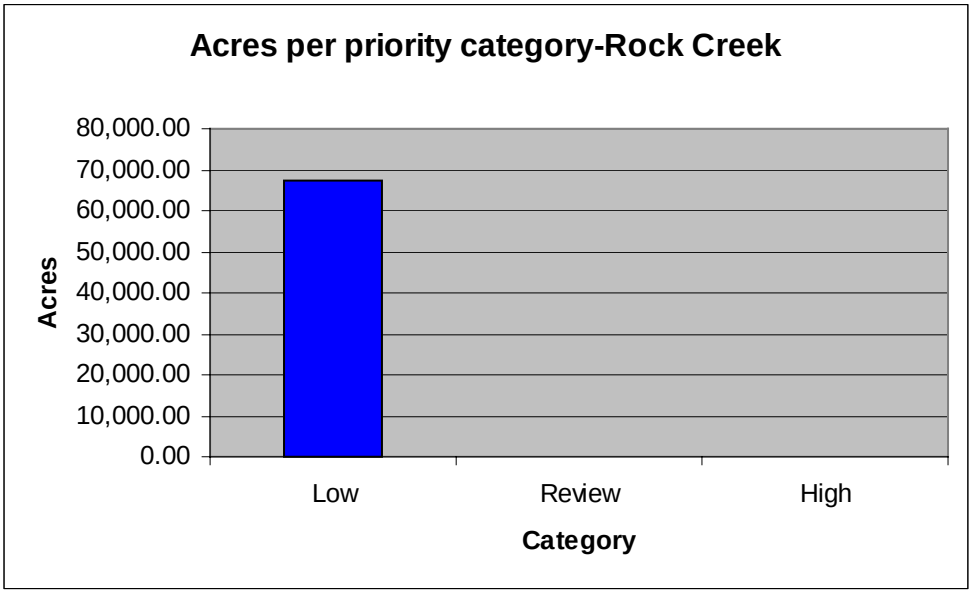

Figure 16: Total area by priority category in the Rock Creek Watershed.

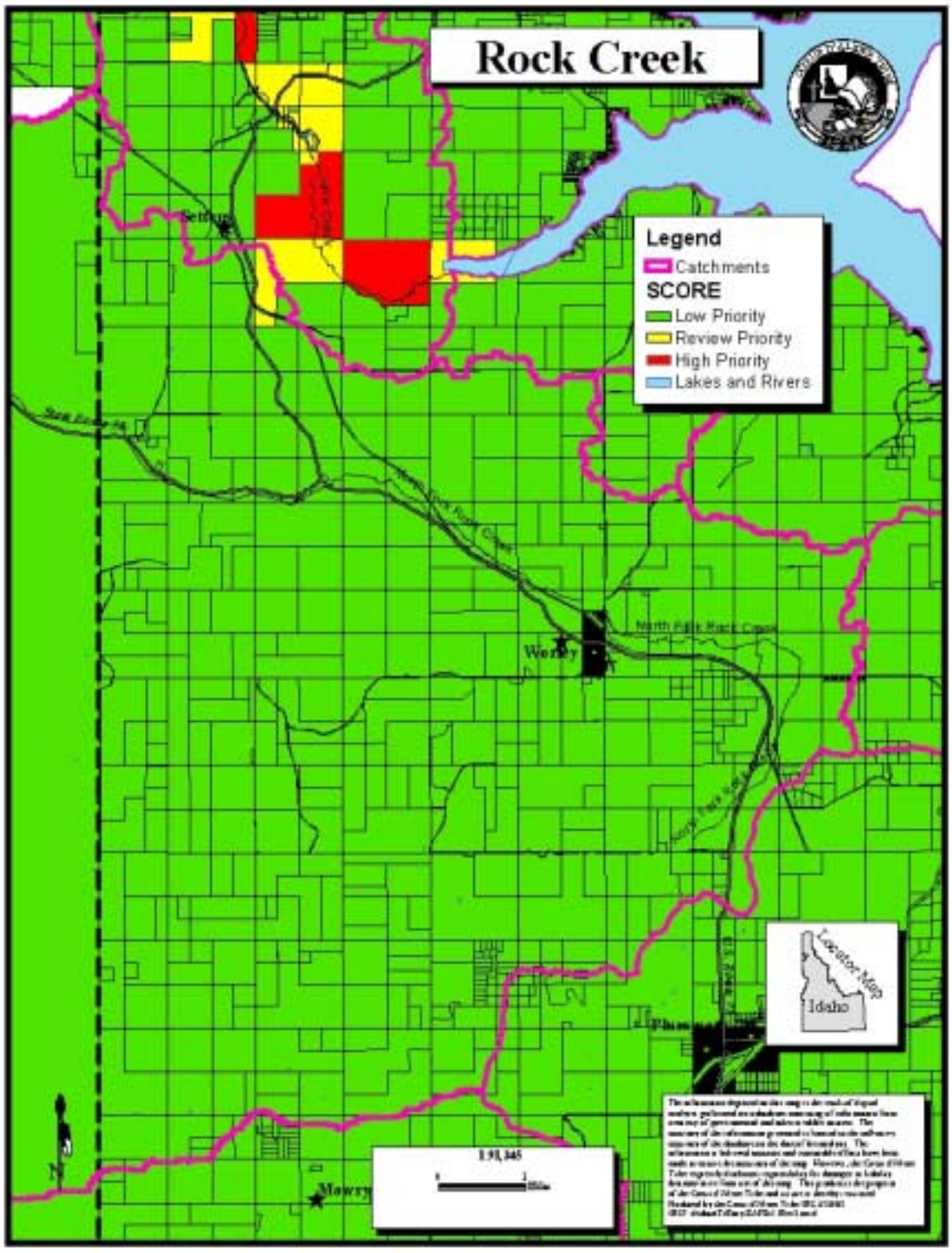

Figure 17: Geographic prioritization in the Rock Creek Watershed.

IV. Methods for Implementing Protection Measures

SCHEDULE FOR IMPLEMENTING PLAN

Planning for project implementation is coordinated on a watershed basis that includes the participation and involvement of private landowners, state and federal agencies, and other Tribal programs. Significant progress was made in recent years to integrate stringent protection measures for riparian dependent resources into management plans adopted by the Coeur d'Alene Tribal Council. Additional efforts detailed in our program call for development of consolidated memoranda of agreement to address forest road standards and guidelines and schedules for road closure and obliteration on Tribal and privately owned forestlands within the Reservation boundaries. Furthermore, this plan serves as a model for adaptive management through implementation based on watershed assessment and limiting factor analysis, sharing data and objectives with partnership agencies and private landowners, and incorporating effectiveness and trend monitoring to evaluate project responses. This plan should be implemented immediately upon final review and acceptance.

FIELD EVALUATION OF "REVIEW" PROPERTIES

The management evaluation is a means of subjectively comparing parcels with similar ecological conditions and is not intended to establish priority throughout the watershed. A field evaluation for a subset of the ranked parcels was deemed necessary, however, given the limitations of some data sets and the importance for evaluating non-quantifiable parameters of each parcel. In particular the influence that smaller watersheds (<1000 acres) have on the quantity and timing of steam flows and transport and deposition of fine sediment as discussed by Swanston (1991) are not well represented by the existing data and therefore their importance in influencing the distribution and abundance of fish is under valued.

Numerical scoring of the criteria in *Table 5*, taken cumulatively, yield a scoring of the overall merits of potentially competing projects and provides further justification for pursuing management rights acquisition. Working through the criteria and answering the 10 review questions can result in a maximum score of 24 points. We suggest that parcels scoring 16 or greater should be considered for management rights acquisition.

The first question, regarding landowner interest, carries the most weight because without landowner interest the project cannot move forward. Parcels are also assigned a relatively higher priority when potential projects have long-term benefits (30+ years) that will accrue with minimal out-year costs. An additional criteria intended to address data gaps gives priority to parcels that exert a demonstrable influence on processes affecting the abundance and distribution of target species. Furthermore, projects are given slightly higher priority when they are consistent with the activities of other management agencies, protect from immediate threats, contain unique and/or rare habitat conditions, and promote core habitat areas and patch connectivity. Parcels are to be evaluated individually, requiring field visits and landowner interviews to complete.

Table 5: Management evaluation criteria and scores for properties requiring further review and evaluation.

	CRITERIA	SCORE
1	**Landowner is a willing participant**	
a	Yes	5
b	No	0
2	**Term of Benefits**	
a	0-10 years	1
b	10-30 years	2
c	30+ years	3
3	**Does the parcel have mapped/unmapped qualities that exert a demonstrable influence on processes affecting the abundance and distribution of target species**	
a	Yes	5
b	No	0
4	**Habitat will rebound unassisted**	
a	Yes	1
b	No	0
5	**Project will create bow wave costs**	
a	Yes	0
b	No	1
6	**Consistent w/ management activities of other agencies**	
a	Yes	1
b	No	0
7	**Immediacy of threatened impact on the property**	
a	High potential for immediate impact	2
b	Moderate potential for immediate impact	1
c	No evidence of threat or minimal threat	0
8	**Protection of sensitive and/or ESA species**	
a	No sensitive habitat protected	0
b	Protects habitat of one sensitive/ESA species	1
c	Protects habitat of more than one sensitive/ESA species	2
9	**Does the site contain unique or rare habitats**	
a	Parcel contains ordinary, widely distributed habitats	0
b	Parcel contains unusual /narrowly-distributed habitat types	1
10	**Connectivity with other protected habitats and/or corridors**	
a	Marginal or no connectivity	0
b	Moderate connectivity	2
c	Good connectivity	3

Section IV

SITE SPECIFIC ASSESSMENT AND PLANNING MEASURES

A variety of assessment, planning, and enhancement activities may occur on prioritized sites, depending upon the specific needs and possibilities of each location. Assessment and planning involves (1) filling data gaps in our knowledge of acquired parcels, (2) identifying the activities that degraded the parcels, and (3) developing a comprehensive, ecologically based restoration strategy. Some of the potential enhancement activities include wetland construction and restoration, fencing, riparian enhancement, noxious weed control, and revegetation.

Costs for these activities have been estimated whenever possible (as with engineering designs, costs depend on site-specific conditions and circumstances). The estimates listed are based on the best current information and on similar projects undertaken elsewhere on the Reservation. For some activities, costs cannot be estimated at this stage in the planning process but will be included in annual work plans.

The methods and techniques the Tribe will use can be grouped into four broad categories: (1) assessment, (2) protection, (3) passive restoration, and (4) active restoration.

Inventory and Analysis
An important initial component of any restoration plan is an evaluation of the ecological status of existing riparian and aquatic systems. This analysis should identify other landscape linkages and attempt to identify and rank limiting factors. With this information, a more comprehensive, ecologically based strategy can be developed.

Baseline Fisheries Habitat Data Collection (where applicable)
While good fisheries information does exist for parts of the Reservation, very little was collected specifically with bull trout and/or wetland and riparian restoration objectives in mind. The data collected will be used for planning purposes as well as future monitoring and evaluation efforts.

Monitoring Strategy Development
An interdisciplinary group will be established to develop, and formalize a monitoring and evaluation strategy and produce an integrated monitoring plan.

PROTECTION MEASURES AND ESTIMATED COSTS

Measures that fall under the protection heading involve identifying the best available remaining habitats and protecting them. The protection of intact ecosystems is often less expensive and can have greater importance to the overall restoration effort than restoring degraded systems. Protecting intact wetland and riparian areas, for example, is important because: (1) intact areas are key sources of biological diversity; (2) intact wetland and riparian areas provide reference sites to guide restoration activities; (3) there is a risk of failure when attempting to restore degraded areas; and (4) protection of intact wetland and riparian areas can often be more cost effective than restoring degraded areas. When selecting one of the following protection measures, two primary considerations will be: (1) preservation and promotion of Tribal self-government and Tribal jurisdiction over Tribal natural resources; and (2) avoidance of the creation of any restrictions on the title

of a parcel for acquisition that would be an impediment to placement of such title into trust status. Protection measures include:

Legislative Enactment of the Tribal Council

The Tribal Council is vested with the power to regulate the uses and disposition of tribal property, and to protect and preserve tribal property, wildlife and natural resources. The Council is further vested with the power to adopt resolutions or ordinances to effectuate any of its powers. The Council may adopt an appropriate legislative enactment committing the Tribes to protecting restored wetlands, riparian areas, and other habitat in perpetuity when this is deemed appropriate.

Fee Title Purchase

High priority land that includes specific riparian and/or wetland habitat or other habitats that exert a demonstrable influence on processes affecting the abundance and distribution of target species might be acquired in fee from willing sellers. These lands would then be transferred to the federal government to be held for the benefit of the Tribes, and would be managed in perpetuity specifically for fish and wildlife production. Other incidental uses would have to be compatible with those purposes, as determined by supporting biological information. Recent transactions of properties similar to those that might be acquired in this process show that prices range widely. Costs will depend on market value.

Easements

An easement is an interest one person has in the land of another. The Tribes may choose to convey an easement for fish, wildlife, wetlands, and/or riparian conservation purposes to the federal government or a conservation organization on lands acquired and restored by the Tribes. Alternatively, the Tribes may choose to contract with an existing landowner who does not want to sell his parcel for the right to restore natural resources on that landowner's parcel and then concurrently acquire a perpetual easement from the landowner in the name of the federal government or a conservation organization for fish, wildlife, wetlands, and/or riparian conservation purposes.

Costs of developing conservation easements include the cost of initial easement reports, title searches, recording fees, etc. Additional costs may be required for additional easement appraisals and to secure the charitable contribution involved with the easement. These costs will vary widely depending upon the circumstances.

The provisions of each easement are tailored to the particular property and individual landowner. The specific restrictions are detailed in the easement document and the landowner conveys to the land manager the responsibility to enforce these restrictions. The conservation easement is binding on all future owners of the property because, unlike a covenant, the easement restrictions travel with the deed.

Easement provisions address such issues as subdivision of the property, construction of roads or buildings, agriculture, or timber harvest among others. An easement restricts development to the degree necessary to protect the significant natural values of the property or enhanced values of the property. Sometimes construction is totally prohibited, often not.

In addition to knowing that the property's conservation values will be preserved forever, the landowner may receive significant tax benefits. The property must meet Internal Revenue Service requirements defining conservation purposes and must be donated to a qualifying organization. In general, the value of the easement donation is the difference between the property's fair market value without the easement and its fair market value with the restrictions in place. The property value difference may result in a reduction in property taxes. It is important to discuss these potential financial benefits with an attorney or tax advisor because each landowner's situation is different.

Steps Leading to Successful Conservation Easements

The following steps are provided as a template towards the successful arrangement of a conservation easement:

1. **Evaluate Property**: Tribal representatives will visit the property to evaluate its ecological, recreational, potential value, or scenic values and make a preliminary determination as to whether it meets the resource criteria for accepting easements.

2. **Discuss Landowner's Objectives and Review Alternatives**: Tribal representatives will meet with the landowner to discuss their objectives for the property and review the options for uses, restrictions, resource protection, management, and the costs associated with completing the easement. The landowner will be advised to consult a Tax advisor and/or legal consultant.

3. **Request Tribal Policy Approval**: Tribal representatives and associated legal council will jointly develop a conservation easement document, which will contain very specific restriction language. This document will be presented to Tribal policy makers for review and final acceptance of conditions.

4. **Check Title and Mortgage**: Research and obtain information pertaining to the proof of good title and status of existing mortgage on the property. If there is a mortgage, the lender must subordinate its rights in the property to the Tribe's rights as the easement holder in order for the easement to qualify for an income tax deduction. It is recommended that other property rights (e.g. mineral rights) be subordinated as well.

5. **Prepare Baseline Documentation Report**: Following Tribal policy approval, a mutually agreed upon consultant will begin preparation of a "Baseline Documentation Report" to describe the condition of the property at the time of the donation.

6. **Draft Easement**: Tribal representatives and legal counsel will prepare a draft easement document that reflects both the landowner and tribal objectives. The easement document is then reviewed by respective legal counsel. Provisions relating

to objectives may be revised at this time. A legal description of the precise area to be covered by the easement is required. A formal survey is usually not required

7. **Obtain An Appraisal**: If it is determined that the easement donation will qualify as a charitable gift, the tribe may assist the landowner in selecting an appraiser to analyze the market value of the property before and after the easement. The Tribe can provide the landowner with a list of appraisers who have expressed an interest in appraising easements.

8. **Sign Easement**: After a final review of the documents, the Tribe and the landowner will sign the easement and baseline documentation report. The easement document is then recorded in the appropriate recorder's office.

9. **Submit Form 8283 to the IRS**: Advise the landowner to attach IRS form 8283 (for "Noncash Charitable Contributions") to their income tax return that is submitted for the year in which the easement was donated.

Sample Conservation Restrictions and Reservations

Landowners often want to reserve some development rights. The following checklist details some of the more commonly considered easement restrictions and reservations.

Common Reserved Rights

- The right to use the property for all purposes not inconsistent with the easement.
- The rights to sell, give, or otherwise convey the property, provided that the terms of the easement are honored.
- The right to maintain or replace existing buildings on the property.
- The right to continue recreational uses of the property.
- The right to develop a limited number of additional residential homesites.
- The right to control access by any person or the general public.

Common Restrictions

- No further subdivision of the property.
- Limited development within buffer zones to protect wildlife habitat.
- No storage of toxic wastes.
- No underground storage of hazardous or toxic substances.
- No industrial or commercial use of the property.
- No surface mining.
- No draining or filling of wetlands on the property.

Restrictive Covenants

A restrictive covenant is a provision in a deed limiting the use of the property and prohibiting certain uses. The Tribe may choose to convey a restrictive covenant to the federal government or a conservation organization preventing any uses of a Tribally acquired restoration site that are incompatible with use of the site as a restored wetland, riparian area, or other habitat in perpetuity.

Passive Restoration

Passive Restoration involves modifying or halting activities that are causing degradation or that are preventing the ecosystem from recovering. Many riparian areas are capable of rapid recovery with a modification of land use. Two common examples of passive ecological restoration are the re-watering of streams after years of withdrawal for agricultural or municipal purposes and the improved management of livestock grazing in riparian areas. Passive restoration measures could include any of the following (alone or in combination):

Site-specific Habitat Management Plans
Management plans for fish and wildlife resources or their habitats are developed to guide the management and use of lands acquired, placed under easement or agreement, or leased. These plans would outline how the lands will be managed to achieve the conservation purposes. They could include guidelines for human uses, the use of fire as a management tool, and specific passive and active restoration measures. Costs will vary depending on the site.

Riparian, Wetland and Sensitive Area Fencing
Fencing of riparian, wetland, and sensitive habitats and key associated habitats could be undertaken to protect areas from overuse by livestock or other human activities. Current contracting costs for fencing projects are averaging approximately $1.50 per foot of fence or $7,824 per mile.

Special Closures
Closures, short-term or long-term, could be used to protect habitat values from human disturbance or human caused degradation.

Offsite Water Development
Development of off-site water facilities for livestock could alleviate livestock degradation of habitat in sensitive areas. Development of stock watering structures can range from $1,500 to $2,500.

Transportation System Improvements and Road Management
Improving the transportation system and road management can significantly reduce sediment entering streams and improve wildlife habitat. Road management will consider: Best Management Practices (BMPs), road spacing and density standards, season of use restrictions, and transportation planning. Culverts range in cost from $315 to $1,825. Road obliteration costs range from $500 to $5000 per mile. Other costs will vary and some may be covered by other Tribal programs.

Controlling the Spread of Nonnative Wetland and Riparian Species
Public education and outreach activities could be directed at preventing the unintentional introduction of nonnative wetland, riparian, and aquatic species. Controlling the spread of nonnative species will also require continuing and expanding current control programs. Costs will vary depending on the species being controlled.

Improved Forest Practices
Best Management Practices (BMPs) and variable-width Stream-side Management Zones (SMZs) could be used to protect sensitive riparian areas from logging impacts. Specific recommendations for management are provided in the Tribal document "Recommendations for riparian buffer strips for the protection of water, fish and wildlife resources on the Coeur d'Alene Reservation".

Irrigation and Agricultural Water Management
Better management of on-farm and canal return-flow waters could improve water quality and fish and wildlife habitat, especially for bull trout. Passive measures to reduce sediment and nutrient export from agricultural operations (including pasture, crop, and confined feeding areas) could be implemented. Costs will vary.

Improved Public Education on Land Stewardship
Educational media such as pamphlets and videos that focus on approaches to land stewardship could be prepared and disseminated.

Active Restoration

In some situations, the injury to an ecosystem has been so great that simply modifying or stopping the injurious activity is not enough. Without some kind of active restoration the ecosystem will remain degraded indefinitely. Active restoration measures could include any of the following (alone or in combination):

Fish Habitat Improvement Projects
In many cases, this measure could be carried out in conjunction with stream restoration work. For example, root wads both stabilize a new meander and provide cover for fish. Both of these are short-term measures; root wads will rot, but not before the riparian vegetation reestablishes and stabilizes the bank and provides natural cover. The costs of habitat improvement projects vary widely, depending on stream conditions.

Stream Channel Restoration
Restoration of stream channels could be undertaken to restore the integrity of both fish and wildlife habitat to a more natural state. Channel restoration work can range from $50 to $100 per linear foot, depending on the project.

Wetland, Riparian, and Associated Upland Habitat Restoration and Enhancement
Seeding of native and other grasses and forbs and plantings of vascular plants, forbs, shrubs, and trees could be used to restore or enhance degraded riparian and wetland habitats. Costs can range from $500 to over $10,000 per acre.

Creation of Wetland and Riparian Habitat
Habitat creation could be used to replace impaired or destroyed habitat features in wetland and riparian zones. Costs can range from $500 to over $15,000 per acre.

Irrigation and Agricultural Water Treatment
Treatment of on-farm and canal return-flow waters could be used to improve water quality and fish and wildlife habitat. Costs will vary. Measures could include: treatment wetlands, detention ponds, retention ponds, and pump-back systems.

Controlled or Prescribed urns
Controlled or prescribed urns can be used to improve wildlife habitat for a variety of species. Costs vary.

Timber Harvest
Timber harvesting, when done to meet vegetative structural and compositional goals, can be a valuable tool for improving wildlife habitat. Costs vary.

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Appendix A Channel Stability Evaluation Index

Table A-1: Pfankuch's (1976) channel stability evaluation index.

CHANNEL STABILITY (PFANKUCH) EVALUATION
AND STREAM CLASSIFICATION SUMMARY (LEVEL III)
Reach Location _____ Date _____ Observers _____
Stream Type _____

Category		**EXCELLENT**	
UPPER BANKS	1 Landform Slope	Bank Slope Gradient <30%.	2
	2 Mass Wasting	No evidence of past or future mass wasting.	3
	3 Debris Jam Potential	Essentially absent from immediate channel area.	2
	4 Vegetative Bank Protection	90%+ plant density. Vigor and variety suggest a deep dense soil binding root mass	3
LOWER BANKS	5 Channel Capacity	Ample for present plus some increases. Peak flows contained. W/D ratio <7.	1
	6 Bank Rock Content	65%+ with large angular boulders. 12"+ common.	2
	7 Obstructions to Flow	Rocks and logs firmly imbedded. Flow pattern without cutting or deposition. Stable bed.	2
	8 Cutting	Little or none. Infreq. Raw banks less than 6"	4
	9 Deposition	Little or no enlargement of channel or pt. bars.	4
BOTTOM	10 Rock Angularity	Sharp edges and corners. Plane surfaces rough.	1
	11 Brightness	Surfaces dull, dark or stained. Gen. not bright.	1
	12 Consolidation of Particles	Assorted sizes tightly packed or overlapping.	2
	13 Bottom Size Distribution	No size change evident. Stable mater. 80-100%	4
	14 Scouring and Deposition	<5% of bottom affected by scour or deposition	6
	15 Aquatic Vegetation	Abundant Growth moss-like, dark green perennial. In swift water too.	1
		TOTAL	

Category		**GOOD**	
UPPER BANKS	1 Landform Slope	Bank Slope Gradient 30-40%	4
	2 Mass Wasting	Infrequent. Mostly healed over. Low future potential.	6
	3 Debris Jam Potential.	Present, but mostly small twigs and limbs.	4
	4 Vegetative Bank Protection	70-90% density. Fewer species or less vigor suggest les dense or deep root mass.	6
LOWER BANKS	5 Channel Capacity	Adequate. Bank overlows rare. W/D ratio 8-15	2
	6 Bank Rock Content	40-65%. Mostly small boulders to cobbles 6-12"	4
	7 Obstructions to Flow	Some present causing erosive cross currents and minor pool. filling. Obstructions newer and less firm.	4
	8 Cutting	Some, intermittently at outcurves and constrictions. Raw banks may be up to 12"	6
	9 Deposition	Some new bar increase, mostly from coarse gravel.	8
BOTTOM	10 Rock Angularity	Rounded corners and edges, surfaces smooth, flat.	2
	11Brightness	Mostly dull, but may have <35% bright surfaces.	2
	12 Consolidation of Particles	Moderately packed with some overlapping.	4
	13 Bottom Size Distribution	Distribution shift light. Stable material 50-80%.	8
	14 Scouring and Deposition	5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	12
	15 Aquatic Vegetation	Common. Algae forms in low velocity and pool areas. Moss here too.	2
		TOTAL	

Table A-1: Pfankuch's (1976) channel stability evaluation index (cont.).

Category		**FAIR**	
UPPER BANKS	1 Landform Slope	Bank slope gradient 40-60%	6
	2 Mass Wasting	Frequent or large, causing sediment nearly year long.	9
	3 Debris Jam Potential	Moderate to heavy amounts, mostly larger sizes.	6
Protection	4 Vegetative Bank	<50-70% density. Lower vigor and fewer species from a shallow, discontinuous root mass	9
LOWER BANKS	5 Channel Capacity	Barely contains present peaks. Occasional overbank floods. W/D ratio 15 to 25.	3
	6 Bank Rock Content	20-40% with most in the 3-6" diameter class.	6
	7 Obstructions to Flow	Moder. Frequent, unstable obstructions move with high flows causing bank cutting and pool filling.	6
	8 Cutting	Significant. Cuts 12-24" high. Root mat overhangs and sloughing evident Moder. Deposition of	12
	9 Deposition	new gravel and course sand on old and some new bars.	12
BOTTOM	10 Rock Angularity	Corners and edges well rounded in two dimensions.	3
	11 Brightness	Mixture dull and bright, ie 35-65% mixture range.	3
	12 Consolidation of	Mostly loose assortment with no apparent overlap.	6
Particles		Moder. Change in sizes. Stable materials 20-50%	12118
	13 Bottom Size	30-50% affected. Deposits & scour at obstructions, constrictions, and bends.	
Distribution		Some filling of pools.	3
	14 Scouring and	Present but spotty, mostly in backwater. Seasonal algae growth makes rocks slick.	
Deposition			
	15 Aquatic Vegetation		
		TOTAL	

Category		**Poor**	
UPPER BANKS	1 Landform Slope	Bank Slope Gradient 60%+.	8
	2 Mass Wasting	Frequent or large causing sediment nearly year long or imminent danger of same.	12
	3 Debris Jam Potential	Moder. To heavy amounts, predom. larger sizes.	8
Protection	4 Vegetative Bank	<50% density, fewer species and less vigor indicate poor, discontinuous and shallow root mass.	12
LOWER BANKS	5 Channel Capacity	Inadequate. Overbank flows common. W/D ratio >25.	4
	6 Bank Rock Content	<20% rock fragments of gravel sizes, 1-3" or less.	8
	7 Obstructions to Flow	Sediment traps full, channel mitigation occurring.	
	8 Cutting	Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	16
	9 Deposition	Extensive deposits of predom. fine particles. Accelerated bar development.	16
BOTTOM	10 Rock Angularity	Well rounded in all dimensions, surfaces smooth.	4
	11 Brightness	Predom. bright 65%+ exposed or scoured surfaces.	4
	12 Consolidation of	No packing evident. Loose assortment easily moved.	8
Particles		Marked distribution change. Stable materials 0-20%.	16
	13 Bottom Size	More than 50% of the bottom in a state of flux or change nearly year long.	24
Distribution		Perennial types scarce or absent. Yellow-green, short term bloom may be present.	4
	14 Scouring and		
Deposition			
	15 Aquatic Vegetation		
		TOTAL	

Appendix B Channel Stability Conversions

Table B-1: Conversion of quantitative ratings of channel stability to qualitative values (good, fair, poor) for various channel types, after Rosgen (1996).

Channel Type	Good	Fair	Poor
A1	38-43	44-47	48+
A2	38-43	44-47	48+
A3	54-90	91-129	130+
A4	60-95	96-132	133+
A5	60-95	96-142	143+
A6	50-80	81-110	111+
B1	38-45	46-58	59+
B2	38-45	46-58	59+
B3	40-60	61-78	79+
B4	40-64	65-84	85+
B5	48-68	69-88	89+
B6	40-60	61-78	79+
C1	38-50	51-61	62+
C2	38-50	51-61	62+
C3	60-85	86-105	106+
C4	70-90	91-110	111+
C5	70-90	91-110	111+
C6	60-85	86-105	106+
D3	85-107	108-132	133+
D4	85-107	108-132	133+
D5	85-107	108-132	133+
D6	67-98	99-125	126+
DA3	40-63	64-86	87+
DA4	40-63	64-86	87+
DA5	40-63	64-86	87+
DA6	40-63	64-86	87+
E3	40-63	64-86	87+
E4	50-75	76-96	97+
E5	50-75	76-96	97+
E6	40-63	64-86	87+
F1	60-85	86-105	106+
F2	60-85	86-105	106+
F3	85-110	111-125	126+
F4	85-110	111-125	126+
F5	90-115	116-130	131+
F6	80-95	96-110	111+
G1	40-60	61-78	79+
G2	40-60	61-78	79+
G3	85-107	108-120	121+
G4	85-107	108-120	121+
G5	90-112	113-125	126+
G6	85-107	108-120	121+

Appendix C ArcIMS Tool Descriptions

Locator Map: A smaller map that shows your current geographic location.

Full Extent: Zooms to the full extent of all the themes in a view.

Metadata: This button will provide a metadata record for the data layer that is active at the time of selection.

Help Button: Lets you get help about any of ArcIMS's buttons or tool choices.

Zoom In: Zooms in on a view, centered on a position or area you define with the mouse.

Zoom Out: Tool: Zooms out from a view, centered on a position or area you define with the mouse.

Pan Tool: This tool lets you pan a view or a layout by dragging the display in any direction with the mouse. To pan, move the cursor anywhere over the view or layout, hold down the mouse button, and drag in any direction. Release the mouse button to leave the display in your desired position. ArcIMS will update the display to fill in any blank areas revealed in your pan.

Identify tool: Use this tool to display the attribute values of a feature shown in a view or table.

Query Builder: Lets you query data according to tabular attributes by building a query expression.

Print Tool: Lets you print a layout of the current map with data layers, title, scale bar, and north arrow.

Refresh Layers: Refresh Layers

Data Layers: A list of the data layers to view in the map area. One or more data layers can be selected to display in the map area. They can also be selected as active for queries or identifies.

Map Area: Area that displays the data layers currently "turned on".

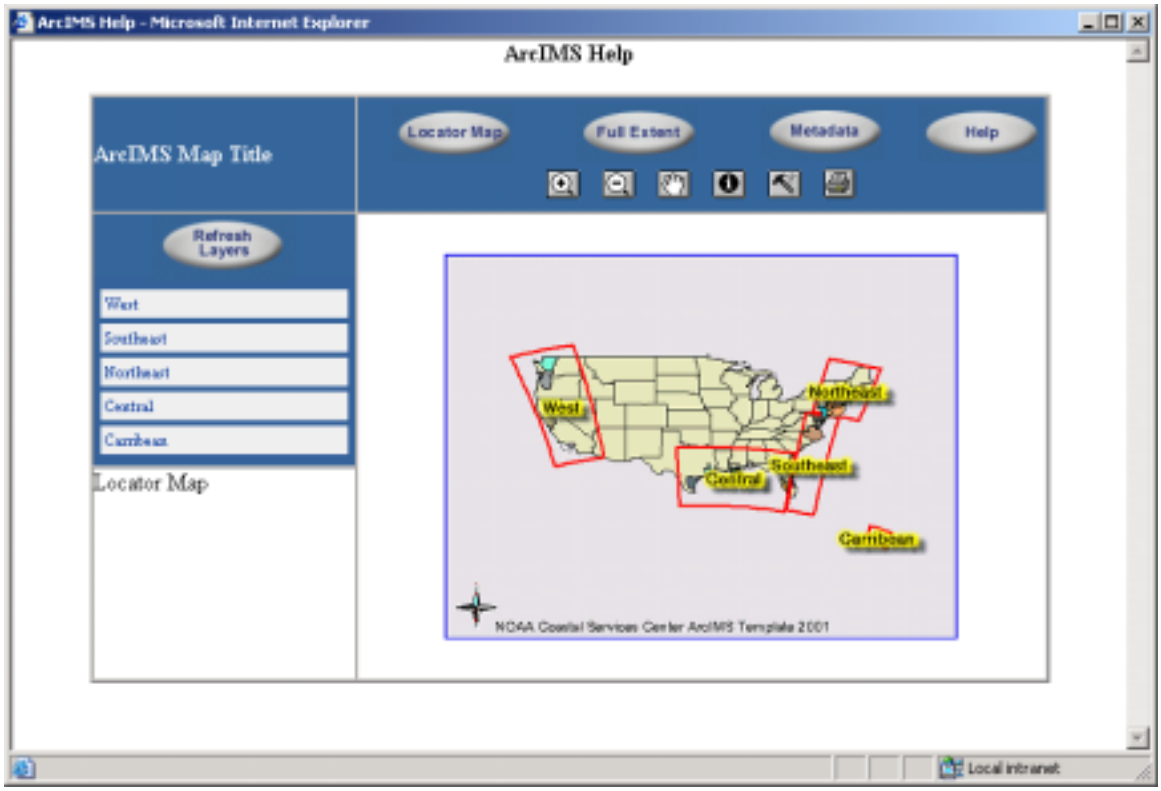

Figure. Help screen for ArcIMS that is available using "Help Menu Button".

Appendix D Listing of High Ranking Parcels

Table. Preliminary list of high-ranking parcels for four Reservation watersheds.

Basin Name	Parcel_ID	Acres	Score by Ranking Criteria*						Total Score
			#1	#2	#3	#4	#5	#6	
Alder Creek	RP45N03W258000A	160.06	1	0	0	1	1	2	5
Alder Creek	RP000300330012A	12.39	1	0	1	1	1	1	5
Alder Creek	RP45N03W336601A	79.96	1	0	1	1	1	1	5
Alder Creek	RP44N03W040100A	70.33	1	0	1	1	1	1	5
Alder Creek	RP44N03W041001A	79.64	1	0	1	1	1	1	5
Benewah Creek	RP46N03W330300A	10.26	0	0	0	1	1	3	5
Benewah Creek	RP46N03W330300A	10.06	0	0	0	1	1	3	5
Benewah Creek	RP46N03W330300A	9.95	0	0	0	1	1	3	5
Benewah Creek	RP46N03W330300A	10.11	0	0	0	1	1	3	5
Benewah Creek	RP46N03W321700A	582.48	1	0	0	0	1	3	5
Benewah Creek	RP46N03W330300A	10.04	0	0	0	1	1	3	5
Benewah Creek	RP45N03W041200A	270.26	1	0	0	1	1	2	5
Benewah Creek	RP45N04W121000A	160.01	1	0	0	1	1	3	6
Benewah Creek	RP45N04W123000A	40.01	1	0	0	1	1	3	6
Benewah Creek	RP45N04W111800A	279.59	1	0	0	1	1	3	6
Benewah Creek	RP45N04W122000A	240.37	1	0	0	1	1	3	6
Benewah Creek	RP45N04W129000A	40.11	1	0	0	1	1	3	6
Benewah Creek	RP45N03W181800A	173.65	1	0	0	1	1	3	6
Benewah Creek	RP45N03W181800A	13.57	1	0	0	1	1	3	6
Benewah Creek	RP45N04W149000A	40.15	1	0	0	1	1	2	5
Benewah Creek	RP45N04W146500A	120.65	1	0	0	1	1	2	5
Benewah Creek	RP45N04W159000A	40.23	1	0	0	1	1	2	5
Benewah Creek	RP45N04W242500A	139.93	1	0	1	1	1	2	6
Benewah Creek	RP45N04W231000A	557.97	1	0	1	1	1	2	6
Benewah Creek	RP45N04W244800A	240.28	1	0	1	1	1	3	7

Basin Name	Parcel_ID	Acres	Score by Ranking Criteria*						Total Score
			#1	#2	#3	#4	#5	#6	
Benewah Creek	RP45N04W246500A	37.08	1	0	0	0	1	3	5
Benewah Creek	RP45N04W251200A	555.06	1	0	0	0	1	3	5
Benewah Creek	RP45N04W261200A	160.65	1	0	1	1	1	3	7
Benewah Creek	RP45N04W264300A	1.08	1	0	1	0	1	2	5
Benewah Creek	RP45N04W264401A	5.58	1	0	1	0	1	2	5
Benewah Creek	RP45N04W264801A	40.23	1	0	1	0	1	2	5
Benewah Creek	RP45N04W268000A	160.45	1	0	1	0	1	3	6
Benewah Creek	RP45N04W351200A	321.60	1	0	1	0	1	3	6
Evans Creek	47N02W-03-7800	20.54	1	0	1	0	1	2	5
Evans Creek	47N02W-03-7800	18.42	1	0	1	0	1	2	5
Evans Creek	47N02W-03-5000	29.30	1	0	1	0	1	2	5
Evans Creek	47N02W-02-6300	38.49	0	0	1	0	1	3	5
Evans Creek	47N02W-02-6300	12.21	0	0	1	0	1	3	5
Evans Creek	47N02W-12-3800	257.26	0	0	1	0	1	3	5
Evans Creek	47N02W-11-0800	61.79	0	0	1	0	1	3	5
Evans Creek	47N02W-11-3200	8.71	0	0	1	0	1	3	5
Evans Creek	47N02W-11-3200	29.15	0	0	1	0	1	3	5
Evans Creek	47N02W-11-0800	14.26	0	0	1	0	1	3	5
Evans Creek	47N02W-12-3800	56.63	0	0	1	0	1	3	5
Evans Creek	47N02W-13-2600	80.76	0	0	1	0	1	3	5
Evans Creek	47N02W-13-1000	111.43	0	0	1	0	1	3	5
Evans Creek	47N02W-13-1600	359.27	0	0	1	0	1	3	5
Lake Creek	49N06W-25-2100	236.98	0	1	1	0	1	3	6
Lake Creek	49N06W-36-1200	157.93	1	1	1	0	1	3	7
Lake Creek	49N06W-36-7600	79.72	1	1	1	0	1	3	7
Lake Creek	48N06W-01-2000	165.95	1	1	1	0	1	3	7
Lake Creek	48N06W-01-8600	70.92	1	1	1	0	1	3	7
Lake Creek	48N06W-12-0400	85.31	1	1	1	0	1	3	7
Lake Creek	48N06W-12-2600	55.24	1	0	1	0	1	3	6
Lake Creek	64316.9007	42.14	0	0	1	0	1	3	5
Lake Creek	48N06W-12-2600	18.64	1	0	1	0	1	3	6

Basin Name	Parcel_ID	Acres	Score by Ranking Criteria*						Total Score
			#1	#2	#3	#4	#5	#6	
Lake Creek	48N06W-12-0400	57.42	1	1	1	0	1	3	7
Lake Creek	48N06W-12-3750	5.22	1	0	1	0	1	3	6
Lake Creek	48N06W-12-4000	127.54	1	1	1	0	1	3	7
Lake Creek	64316.9007	10.70	0	0	1	0	1	3	5
Lake Creek	48N05W-17-0200	118.55	1	0	1	1	1	1	5
Lake Creek	48N05W-28-8200	462.81	1	0	1	1	1	2	6
Lake Creek	48N05W-34-1400	445.47	1	0	1	1	1	1	5
	Total Acres 7912.55								