5. Management Plan

The Management Plan is the centerpiece of the John Day Subbasin Plan. Blending the science and social conditions described in the Assessment, it describes desired direction for the subbasin. Plan direction begins with a vision, which takes into account socio-economic factors in the subbasin. Next, the plan defines biological objectives for the subbasin and prioritized strategies for aquatic species and habitats that are designed to achieve the objectives. It includes a prioritization framework to ensure that restoration efforts are conducted in the most efficient manner. In addition, it defines biological objectives and strategies for focal habitats used by terrestrial focal species in the subbasin. Finally, it identifies a framework for research, monitoring and evaluation to ensure that information will be collected and interpreted efficiently to guide future decisions.

5.1 Vision for the Subbasin

The vision for the John Day Subbasin is a healthy and productive landscape where diverse stakeholders from within and outside the subbasin work together to maintain and improve fish and wildlife habitat in a manner that supports the stewardship efforts of local land managers, makes efficient use of resources and respects property rights. The result will be sustainable, resource-based activities that contribute to the social, cultural and economic well-being of the subbasin and the Pacific Northwest.

5.1.1 Human Use of the Environment

The counties and communities of the John Day Subbasin offer unique social and economic challenges to natural resource managers. More than half the subbasin is privately-owned and most of the subbasin's residents rely upon its natural resources for their livelihood. The subbasin also contains lands important to two Indian tribes. Consequently, many subbasin residents maintain a strong connection with the land and its resources. Planning for the future requires acknowledgement of this situation and the need to work together to address interrelated social, environmental and economic challenges.

The John Day Subbasin lies within the ceded territories of two Indian tribes: the Warm Springs to the west (Figure 44) and the Umatillas to the north (Figure 45). These native people rely on the natural resources of the region for cultural and religious celebrations. Salmon and lamprey eels are among the significant aquatic species for the tribes. The tribes also gather a variety of native plants for personal and ceremonial use. See Section 3.2.1 for further discussion on the CTWSRO and CTUIR uses of the John Day Subbasin.

The John Day Subbasin includes portions of 12 Oregon counties. Two of these counties, Grant and Wheeler, lie almost entirely within the subbasin. These two counties are nearly completely reliant on the subbasin for social and economic development. John Day and Prairie City, with populations of 1,821 and 1,080 respectively, are the largest towns in the subbasin. Both towns lie in Grant County. Other subbasin residents are generally scattered across a rural landscape.

Most of these residents rely heavily on natural resources for their livelihood. While local communities are working to attract new businesses and industries, timber and cattle continue to be the primary industries in the subbasin (Oregon Blue Book 2003). To demonstrate, Table 63 displays recent cattle commodity figures for Grant and Wheeler counties.

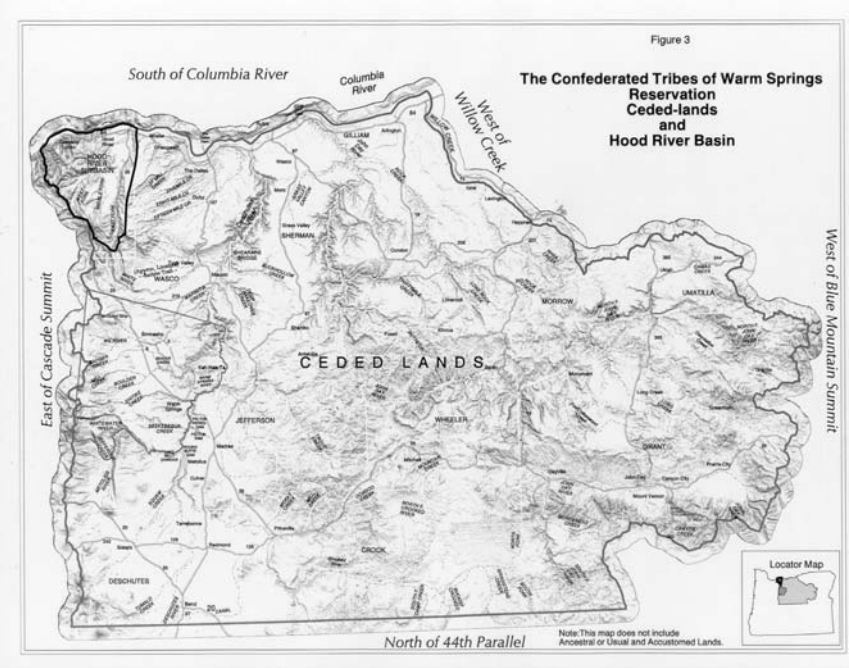


Figure 44. Ceded territory of the CTWSRO.

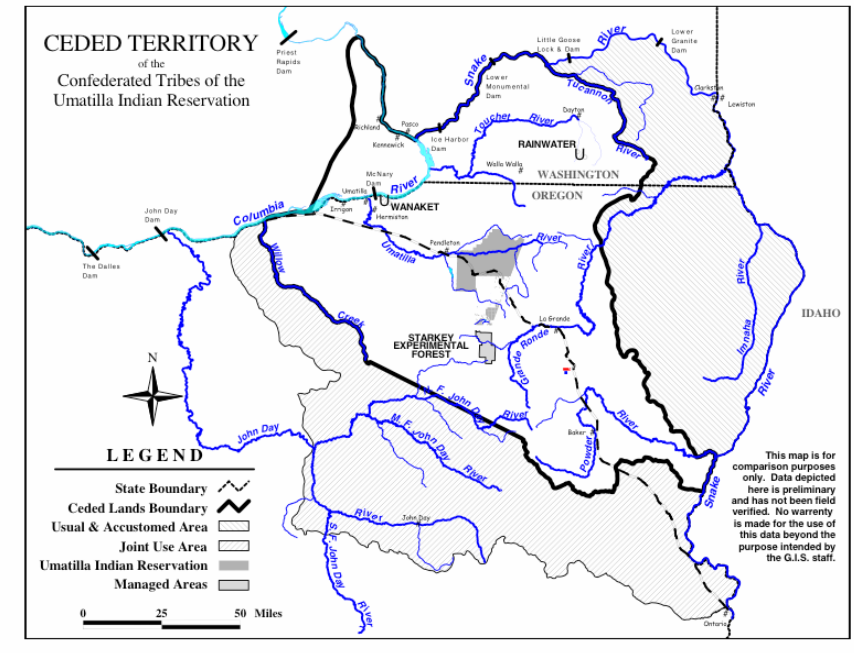


Figure 45. Ceded territory of the CTUIR.

Table 63. Cattle commodity figures for Grant and Wheeler counties (Oregon State University, AREC Department Commodity Reports)

County	No.	Value of Sales
Grant	54,000	$16,901,000
Wheeler	22,000	$6,851,000

However, as Figures 46 and 47 demonstrate, timber harvest in eastern Oregon has declined dramatically over the years, and is not expected to return to historic levels (Adams & Latta 2003). These industries have experienced a decline over the past 10 to 15 years. These declines have caused out-migration from the small communities of the region, in turn impacting local businesses. Already-small communities have become even smaller. Figures 48 and 49 show population data for Grant and Wheeler counties.

Currently, most counties in the John Day Subbasin are considered economically distressed, as measured by the US Economic Development Administration. This designation is based on 24-month unemployment rates and annual per capita income (Columbia Basin Socio-Economic Assessment 2000).

Business recruitment and retention are the top economic priorities for most counties within the John Day Subbasin. The exceptions are Grant County, which lists public infrastructure, and Wheeler County, which lists capacity building (Columbia Basin Socio-Economic Assessment 2000) as their top priorities. Recent ventures into tourism, fee hunting and value-added agriculture and timber products offer a potential draw for new businesses, but continue the reliance on natural resources. For example, fee hunting and paid recreational opportunities have brought $300,000 to Wheeler County and $250,000 to Grant County (OSU 2003).

Designation of the John Day as a Wild and Scenic River, development of the "Our Journey Through Time" Scenic Byway, and designation of the John Day Fossil Beds as a national monument are helping expand the leisure and hospitality industry in the subbasin. Within the past year, 10 "leisure and hospitality" jobs have been added in Grant County, although Wheeler County has lost 10 positions (Oregon Employment Department Workforce Analysis, March 2004).

Land ownership in the John Day Subbasin offers a final unique challenge. Fifty-nine percent of the land resources in the region are privately owned. Thus any plans for the future rely on cooperation with these landowners.

While humans, and their activities, have led to negative impacts to both aquatic and terrestrial species, humans are also part of the solution. It must be recognized that humans are also a component of the ecosystem and the combined efforts of private and public landowners are needed to achieve the goals and objectives set forth in this plan. A description of desirable future conditions includes recognition of sustainable communities as part of a sustainable ecosystem.

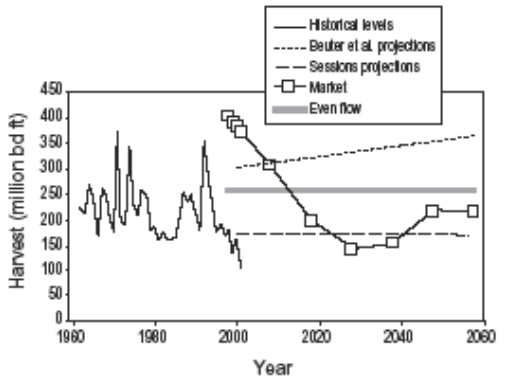


Figure 12. Projected base-case timber harvest levels for NIPF lands in eastern Oregon, derived using market-based and even-flow simulators. Historical levels and projections from Beuter et al. (1976) and Sessions (1991) shown for comparison.

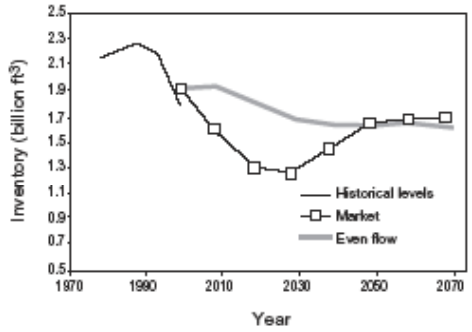


Figure 13. Projected base-case timber inventory for NIPF lands in eastern Oregon, derived using market-based and even-flow simulators.

Figure 46. Projected base case timber harvest and inventory levels for non-industrial private forestlands (NIPF) in eastern Oregon.

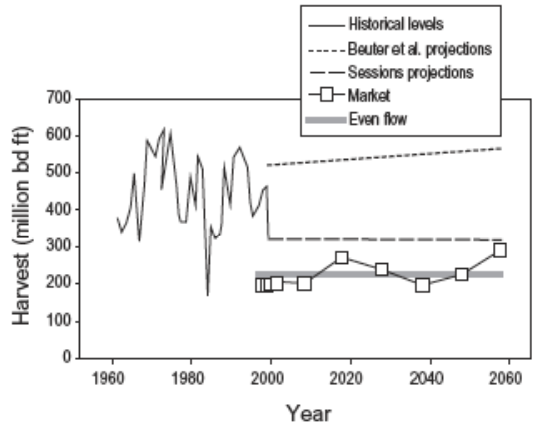


Figure 9. Projected base-case timber harvest levels on industrial lands in eastern Oregon, derived using market-based and even-flow simulators. Historical levels and projections from Beuter et al. (1976) and Sessions (1991) shown for comparison. Initial MIC distributions endogenous.

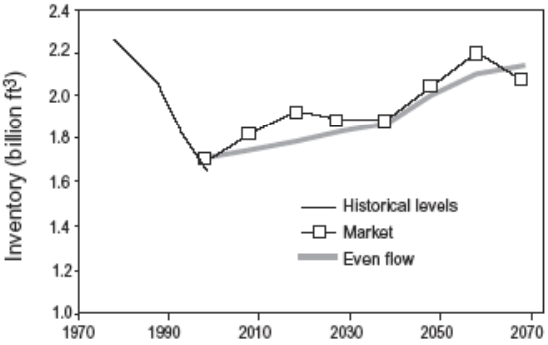
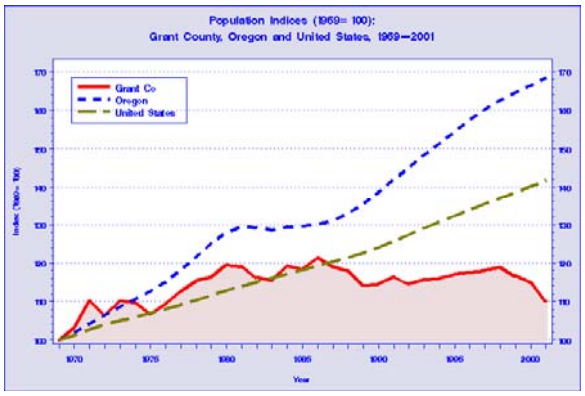
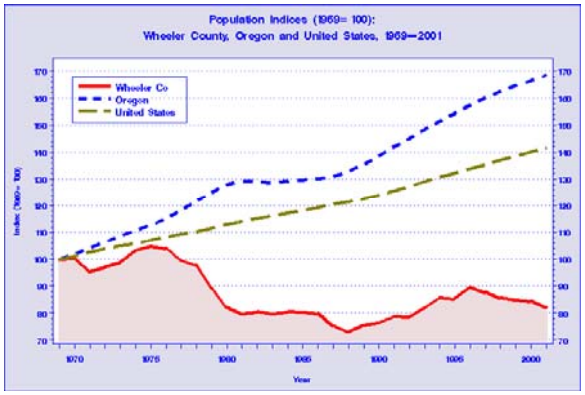


Figure 47. Projected base case timber harvest and inventory levels on industrial forestlands in eastern Oregon.



Grant County's population growth compared with the state and nation in a long-term context. Growth indices express each region's population in 1969 as 100, and the populations in later years as a percent of 1969 They allow for a direct comparison of the differences in population growth between regions although they may differ vastly in size. Washington State University Cooperative Extension Northwest Income Indicators Project.

Figure 48. Grant County population, 1969 - 2001.



Wheeler County's population growth compared with the state and nation in a long-term context. Growth indices express each region's population in 1969 as 100, and the populations in later years as a percent of 1969 They allow for a direct comparison of the differences in population growth between regions although they may differ vastly in size. Washington State University Cooperative Extension Northwest Income Indicators Project.

Figure 49. Wheeler County population, 1969 - 2001.

5.1.2 Aquatic Species

John Day Subbasin goals for aquatic species include the desire to maintain John Day Subbasin wild fish run at levels that will make it possible to provide a fishery. An additional goal is to have healthy, stable populations of fish that will result in the delisting of ESA-listed species and avoid the listing of other species.

The biological goals will focus on improving riparian and upland function as well as the numbers of fish. Long-term, habitat conditions should achieve site potential within 50 years and meet measurable objectives (see below) at ten-year intervals.

Habitat goals are used as well as biological goals because anadromous fish populations are affected by many variables within and outside the subbasin (see Section 3.3). Habitat conditions within the subbasin determine the potential of the subbasin to produce anadromous and resident fish. Habitat goals also give managers the ability to quantify watershed and habitat response.

Fish rearing densities and population structure are directly related to habitat conditions. Further refinement of the EDT model will enable planners to determine baseline conditions and subsequent 10, 20, 30 and 40-year interim goals. In the meantime, steady progress toward meeting site potential is imperative.

5.1.3 Terrestrial Species

As with aquatic species, habitat goals for terrestrial species focus on functionality of habitat in relation to species needs (see Section 3.2.2). The majority of terrestrial focal species are migratory. All migratory species included as focal species use habitats within the subbasin for reproduction, but all are affected by variables outside the subbasin (see Section 3.3.2). The terrestrial biological objectives in this plan emphasize productive habitats that contribute to the reproductive success and overall viability of the terrestrial focal species, support other wildlife and improve watershed health.

5.2 Biological Objectives and Prioritized Strategies

The NWPCC Vision for the Fish and Wildlife program states, "Wherever feasible, this program will be accomplished by protecting and restoring the natural ecological functions, habitats and biological diversity of the Columbia River Basin. In those places where this is not feasible, other methods that are compatible with naturally reproducing fish and wildlife populations will be used. Where impacts have irrevocably changed the ecosystem, the program will protect and enhance the habitat and species assemblages compatible with the altered ecosystem. Actions taken under this program must be cost-effective and consistent with an adequate, efficient, economical and reliable electrical power supply."

In setting the biological objectives for the subbasin, the technical teams considered the five aquatic focal species collectively and related them to the needed changes in habitat. Habitat conditions that benefit one species will likely benefit other aquatic and terrestrial species within that geographic area and may allow another focal species to use that specific habitat or area. Examples include: 1) decreases in high temperatures specifically aimed at redband and steelhead could also benefit bull trout and westslope cutthroat trout, and 2) decreases in fine sediment loads designed to benefit bull trout would also benefit the other focal species. The overriding idea is that most habitat parameters listed in the biological objectives are outside of optimal ranges for any of the five focal aquatic species. Therefore, any progress in movement toward these optimal ranges will likely benefit all species within those areas. The technical teams did not think that trying to divide biological objectives by species would be of any measurable benefit.

Biological objectives and prioritized strategies for aquatic and terrestrial species are presented in Sections 5.2.2 and 5.2.3, respectively.

5.2.1 Working Hypotheses

The subbasin assessment, biological objectives, and strategies are, in fact, a statement of how the planners believe the habitat conditions interact with aquatic focal species to produce the population distributions and abundances that are observed over time. It represents a working hypothesis of the John Day Subbasin, its focal species populations, and the complex ecological interactions well enough to design effective enhancement strategies. This working hypothesis also provides metrics to monitor progress and testable hypotheses to refine knowledge.

At its heart, the working hypothesis states that if the habitat restoration objectives are met, the focal species populations will respond in such ways that the aquatic species objectives will also be met. These objectives are stated in both qualitative and quantitative terms in the management section of this plan. This description of the working hypothesis also provides metrics to monitor progress and to refine knowledge. Actions to monitor progress toward objectives and fill critical information gaps are described in Section 5.4, Research, Monitoring, and Evaluation, of this plan.

5.2.2 Aquatic Species

5.2.2.1 Synthesis of Analytical Results

In order to compare assessment results across focal species, HUC5s were divided into quartiles based upon their restoration rankings derived from the EDT and QHA assessments. Those HUC5s ranked in the first quartile would yield the most benefits to focal species if the limiting habitat conditions were fully restored (Table 64, Figure 50).

While this ordering of HUC5s into quartiles based upon their potential restoration benefits can provide part of a prioritization framework for evaluating proposed projects, it is not sufficient by itself. The realized impacts of any particular project depend on the scope and quality of the project and the particular local problem being addressed. It is possible to have low-impact projects in the top quartile HUC5s just as it is possible to have high-quality and high-impact projects in HUC5s with lower overall restoration potential. Selection of future projects should consider the results of the EDT and QHA assessments, but must be tempered by knowledge of local conditions at the scale of specific projects.

Some of these HUC5s are important to more than one fish population as indicated in Table 64. Based solely on EDT and QHA results, four HUC5s are first quartile restoration areas for all three focal species assessed (Table 64). Two HUC5s are in the Middle Fork watershed (Big and Camp creeks) and two are in the Upper John Day watershed (Laycock and Strawberry creeks).

Westslope cutthroat trout, although not assessed with either QHA or EDT, have similar habitat requirements as other salmonids, so it is expected that any measures taken to benefit those species that were assessed with EDT or QHA (bull trout, steelhead, and chinook) should benefit cutthroat. HUC5s containing cutthroat do tend to be priority areas for other salmonids. Among

the priority HUC5s for restoration, six of the seven HUC5s in the John Day Subbasin containing cutthroat were also priority HUC5s for other assessed species (Table 64). Five HUC5s containing cutthroat appear among the protection priority HUC5s for the other species.

Geographic Overlap and Potential Interactions Between Focal Species

Distribution maps for each aquatic focal species (Figure 9 for summer steelhead, Figure 15 for spring chinook, Figure 20 for bull trout, Figure 30 for redband trout, and Figure 32 for westslope cutthroat trout) show that substantial areas of the John Day Subbasin are important to two or more species. The geographic overlap between species in the restoration areas and the distribution of cutthroat trout (Table 64) suggests that measures designed to restore one focal species will assist other focal species as well. The fact that all aquatic focal species are salmonids with similar habitat requirements (e.g. cold and clean water, minimal sediment in spawning areas, healthy riparian areas, no obstructions on migratory corridors that significantly affect fish passage) helps to support this conclusion.

However, there are possible adverse impacts between the focal species:

1.) Increased populations of redband/steelhead could result in increased hybridization with cutthroat trout. The causes, prevalence, and impact of this hybridization is a data gap which should be addressed with further research. The opinion of the technical team is that hybridization is a result of low cutthroat abundance. If this is true, increasing cutthroat abundance will decrease hybridization.
2.) Increased bull trout production may increase bull trout predation on other salmonids. Currently, bull trout populations are low and thus their impact on other salmon populations is likely minimal. If bull trout populations increase, and populations of other salmonids stay low, the impact of bull trout predation on other salmonids could increase. However, measures taken to increase bull trout populations should also increase the size of other salmonid populations, allowing those populations to withstand higher predation pressures from bull trout. If bull trout populations increased to such an extent that they seriously impacted other salmonids, managers could reduce the bull trout population by opening fisheries on the species.
3.) Density effects could result from producing more salmonids than the habitat can support. Given the present low abundance of salmonids, this "problem" is likely off in the future. With recent nutrient cycling research indicating the importance of salmon in transporting nutrients from saltwater to freshwater on freshwater productivity, increasing salmon abundance will likely increase freshwater capacity.

Properly Functioning Conditions Scenario

One restoration scenario was evaluated to compare with present and template conditions. This scenario is known as "properly functioning conditions" and represents habitat conditions that would allow all populations to exist in a healthy, self-sustaining condition with less than a 5% probability of extirpation over at least a 100-year period. It probably represents a "high end" restoration scenario.

Table 64. First quartile Geographic Areas for restoration as determined by EDT or QHA and compared to the presence of cutthroat.

Restoration Priority Areas													
Subbasin and	**Spring Chinook Population**				**Summer Steelhead Population**					**Bull Trout Population**			**Cutthroat**
Geographic Area	**M. Fork**	**N. Fork**	**Upper**	**Granite**	**M. Fork**	**N. Fork**	**Upper**	**S. Fork**	**Lower**	**M. Fork**	**N. Fork**	**Upper**	**Areas**
Middle Fork													
Big Creek	**X**				**X**					**X**			
Camp Creek	**X**				**X**					**X**			
Long Creek					X								
Lower MF JDR					X								
Upper MF JDR	X												
North Fork													
Cottonwood Creek						X							
Granite Creek				X									X
Lower Camas Creek		X											
NF JDR Big Creek		**X**		**X**		**X**							
NF JDR Potamus Creek		X		X		X							
Upper Camas Creek											X		
Upper NF JDR						X							
Upper John Day													
Beech Creek							X						X
Canyon Creek												X	X
Fields Creek							X					X	X
Laycock Creek			**X**				**X**					**X**	X
Strawberry Creek			**X**				**X**					**X**	X
Upper JDR			X									X	X
Upper Middle JDR												X	
South Fork													
Lower SF JDR								X					
Murderers Creek								X					
Lower John Day													
Bridge Creek									X				
JDR Johnson Creek								X	X				
Lower JDR Kahler Creek									X				
Mountain Creek									X				

Single species	X
Two species	X
Three species	**X**

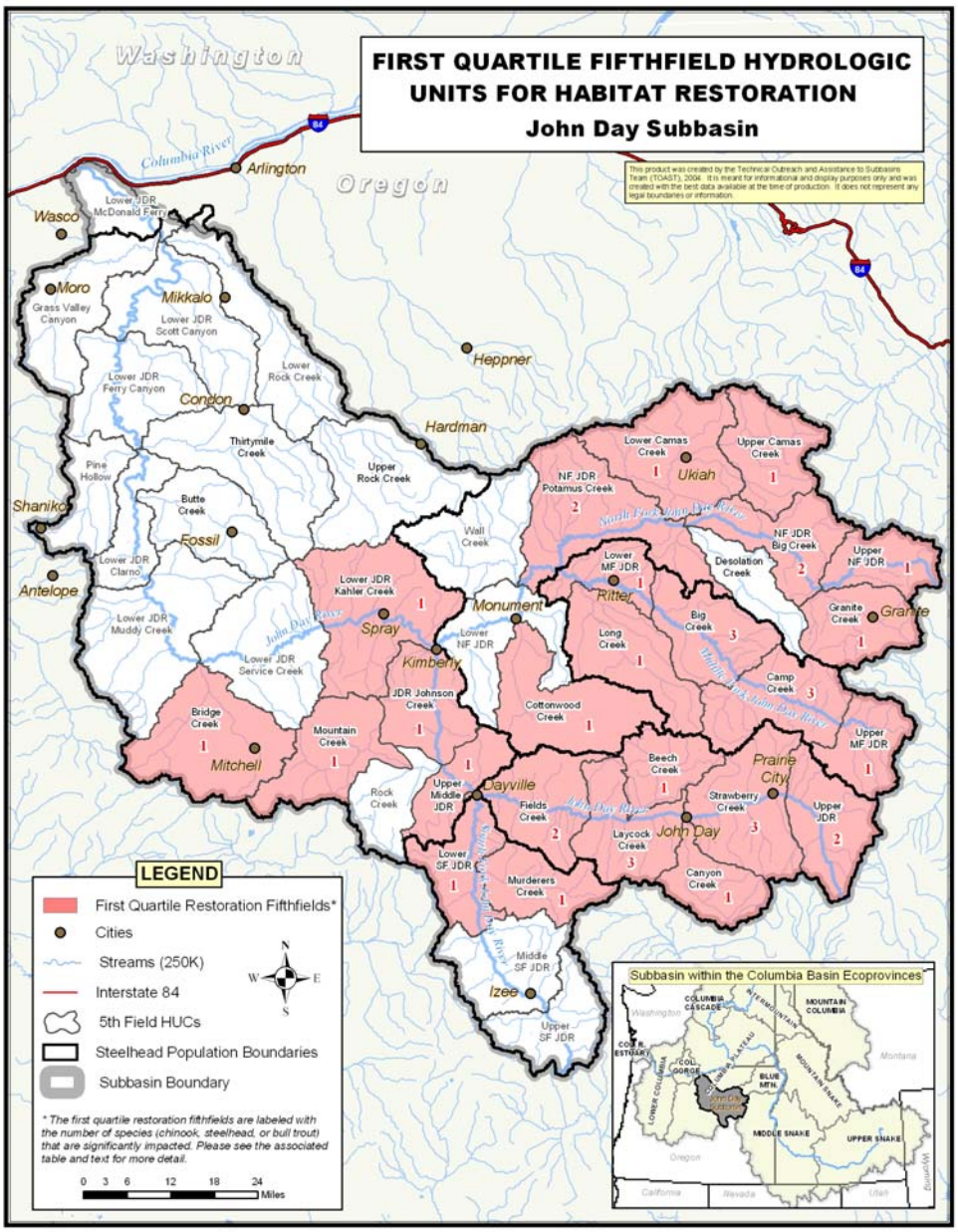


Figure 50. First quartile HUC5s for restoration potential of nine chinook and steelhead populations identified by EDT and QHA analysis in the John Day Subbasin.

The concept of properly functioning conditions (PFC) was developed by NOAA Fisheries, Washington Department of Fish and Wildlife, and the Puget Sound tribes for application to Endangered Species Act issues in Puget Sound. Properly functioning conditions create and sustain over time the physical and biological characteristics that are essential to conservation of the species, whether important for spawning, breeding, rearing, migration or other functions. The concept recognizes and accommodates the expected degraded conditions of city centers and industrialized areas and does not expect these areas to be restored to rural conditions. However, there are high expectations to modify and maintain certain ecological functions that remain crucial to salmon survival. PFC represents approximately 70% restoration of template conditions.

EDT estimates that restoring John Day Subbasin habitat to PFC would result in spring chinook population abundance that is 89% of the EDT-estimated historic abundance, and steelhead abundance that is 86% of the EDT-estimated historic abundance (Tables 65 and 66). PFC would restore virtually all of the diversity in John Day spring chinook and steelhead populations. PFC productivity increases for chinook would range from 90% (North Fork adults) to 780% (Middle Fork adults). PFC productivity increases for steelhead would range from 95% (North Fork juveniles) to 220% (Lower John Day adults).

Table 65. Baseline and PFC results from EDT modeling for summer steelhead populations.

	Abundance			Diversity Index		Adult Productivity		Juvenile Productivity	
Population	**Historic**	**Baseline**	**PFC**	**Baseline**	**PFC**	**Baseline**	**PFC**	**Baseline**	**PFC**
Lower John Day	10,108	1,292	8,540	18%	97%	2.8	8.9	67	205
Middle Fork	5,930	1,448	5,071	57%	100%	3.6	10.5	80	221
North Fork	14,698	4,870	12,535	53%	99%	4.7	9.5	105	205
South Fork	2,941	1,221	2,640	72%	99%	4.7	11.2	106	238
Upper John Day	5,912	1,737	5,187	39%	98%	4.2	12.8	98	273
Total	39,588	10,568	33,973						

Table 66. Baseline and PFC results from EDT modeling for spring chinook populations.

	Abundance			Diversity Index		Adult Productivity		Juvenile Productivity	
Population	**Historic**	**Baseline**	**PFC**	**Baseline**	**PFC**	**Baseline**	**PFC**	**Baseline**	**PFC**
North Fk JD	6,252	1,731	5,289	81%	100%	5.2	9.9	110	196
Granite Cr	1,059	85	896	41%	98%	2.2	10.6	76	210
Middle Fk JD	2,152	177	2,018	71%	100%	2.2	17.3	81	328
Upper JD	1,767	217	1,804	89%	100%	2.7	17.9	98	340
Total	11,230	2,210	10,007						

The biological objectives for steelhead and spring chinook represent on average about 99% and 70% of the PFC conditions, respectively, measured in term of juvenile productivity. There are several qualifications to this rather broad comparison, however. First, each population will respond differently, depending on the amount of habitat restoration actually implemented in

different areas of the subbasin. Second, the two numbers are not independent, since much of the chinook increases will occur because of improved tributary conditions which also benefit steelhead. Third, some of the population abundance objectives listed in Table 67 may be achieved through making new habitat available, rather than entirely by improvement in habitat presently occupied by steelhead and chinook.

Overall Aquatic Ecosystem Health

The concept of ecosystem health is complex and not always clearly defined. It incorporates broad ecological concepts such as complexity, connectivity, diversity, resilience and sustainability. Often health has been defined in a negative sense as departure from some historical or normative condition. Emerging thought (Costanza et al. 1992, Gunderson and Holling 2002) extends the ecological model of ecosystem health to include economic and social measures of health as well. Costanza et al. (1992) define ecosystem health in terms of vigor, organization and resilience (including the ability to produce products of economic value in a sustainable manner). Gunderson and Holling (2002) view complex systems (including ecosystems, economies, society and culture) in terms of adaptive cycles which can be characterized by measures of potential, connectedness, and resilience.

These integrative concepts of ecosystem health are, perhaps, goals toward which the subbasin plan should aspire. They are congruent with the Vision Statement of this plan and with the NWPCC's 2000 Fish and Wildlife Program, but require more information and effort to develop than is available at the present time.

Instead we note that neither the ecological nor the economic portions of the Vision Statement are met by the present condition of the John Day Subbasin. More than other subbasins, perhaps, the economic health of the John Day depends upon the natural environment. Yet the environment, including the aquatic focal species, has deteriorated since European settlement of the area. A description of these changes and their causes is found in Section 3.1, Subbasin Overview of this plan.

These changes can also be characterized by comparing changes in key features of the ecosystem as captured in EDT "template" and "current" habitat ratings. The following "Level 2 Attributes" were used as EDT input and had a primary effect on many of the limiting factors described above: streamflow, channel length, gravel embeddedness, fine sediment, maximum temperature.

- **Streamflow.** Natural patterns of streamflow have been altered as a result of subbasin development (see Section 3.1, Subbasin Overview, for a full description). In many locations the maximum spring flows have decreased and occur up to a month earlier than historically. This resulted from changes in upland vegetative cover, causing decreased infiltration of rainwater and snow melt, and disconnection of the water table from in-channel flow.

- **Channel length.** Significant reductions in channel length occurred in some portions of the subbasin as a result of channelization and cropland development. Channel straightening reduces the quantity and diversity of available habitat and increases channel

gradient, thus increasing the hydrologic power of the stream. The largest reductions in channel length occurred in the Upper Mainstem (44.9%), and mainstem of the Middle Fork (20.7%). Reductions of 10 to 20% occurred in North Fork tributaries, the mainstem of Granite Creek, and the mainstem of the South Fork.

- **Gravel embeddedness.** Increases in gravel embeddedness reduce the interstitial spaces in the stream bed. These are important areas for food production and provide refuges and resting areas for juvenile fish. Average EDT rating changes of more than 1.5 were reported for the mainstem South Fork, Lower John Day tributaries, mainstem Lower John Day, mainstem Upper John Day, and Upper John Day tributaries (largest impact listed first).

- **Fine sediment.** Fine sediment is composed of small particles suspended in the water column. It is an indicator of the amount of erosion occurring from upstream areas and can reduce primary and secondary production. It is the primary source of material causing gravel embeddedness. Average EDT rating changes of more than 1.5 were reported for Lower John Day tributaries, mainstem South Fork, mainstem Lower John Day, mainstem Middle Fork, Upper John Day tributaries, North Fork tributaries, and mainstem Upper John Day (largest impact listed first).

- **Maximum temperature.** Maximum water temperature typically increases as development occurs, primarily as a result of removal of stream shade, widening of stream channels, reduction of flow, and increases in over-ground runoff. As temperatures increase above about 50 degrees Fahrenheit, habitats become less favorable for salmonids. Average EDT rating changes of more than 1.5 were reported for the mainstem Lower John Day, Lower John Day tributaries, mainstem South Fork, and mainstem Middle Fork (largest impact listed first).

The aggregate effect of these and other changes is that important ecological processes have been disrupted in some areas, available habitat has been reduced and is less diverse, and habitat quality has been reduced in many areas.

5.2.2.2 Biological Objectives

Subbasin Biological Objectives

Biological objectives describe, in quantitative terms, the focal species performance needed to achieve the subbasin vision and the environmental conditions needed to provide those biological responses. Because the distributions of aquatic focal species are substantially overlapping and they are all salmonids, they all use and respond to changes in the same environment. Therefore, we describe the desired focal species performance objectives first and follow that with a single description of habitat objectives expected to support those focal species performances.

Steelhead and Chinook Salmon. Subbasin planners set recovery objectives based on a percentage of what they judged as historic run size (Table 67). EDT historic estimates were not

used as a base because they assumed out-of-subbasin effects are the same as current conditions, i.e. with the present hydropower system and lower river development in place. EDT historic estimates do not, therefore, represent a true template condition. Professional judgment estimates assumed historic habitat conditions (prior to European settlement) so are adjusted to take into account changes in habitat conditions throughout the entire Columbia River and John Day River systems, including the estuary.

Table 67. Subbasin objectives for chinook and steelhead escapement by population with historic and recent population estimates included.

	Current, Historic, and Projected Population Estimates					Sub-basin Plan Biological Objectives			
	Empirical for baseline yrs (1992-1997)[a]	EDT Baseline estimate (1992-1997)	Recent empirical (2000-2004 average)[a]	EDT Basin Potential Historic	Professional Judgment Estimated Historic	NOAA Interim Recovery Targets	Return to Mouth of JDR Target for Allowing Sport Fisheries	Adult and Jack Return to the Mouth of JDR Interim Goal (20-25 year)[c]	Adult and Jack Return to the Mouth of JD River (50 year)[c]
STEELHEAD POPULATION									
Upper Mainstem	1,369	1,737	1,849	5,912	10,164	2,000			
North Fork	3,345	4,870	5,935	14,698	25,578	2,700			
Middle Fork	1,534	1,448	3,483	5,930	10,934	1,300			
South Fork	690	1,221	1,344	2,941	5,586	600			
Lower Mainstem	3,355	1,292	9,774	10,108	17,738	3,200			
TOTAL	10,293[b]	10,568	22,385	39,589	70,000	9,800	10,294	29,400	49,000
CHINOOK POPULATION									
Upper Mainstem	538	217	1,353	1,767	6,280	N/A			
North Fork	1,139	1,731	2,554	6,252	22,280	N/A			
Middle Fork	431	177	942	2,152	7,680	N/A			
Granite Creek	501	85	667	1,059	3,760	N/A			
TOTAL	2,609	2,210	5,516	11,230	40,000	0	5,950	12,000	20,000

[a] For steelhead: Empirical estimates are based on 2,283 miles of steelhead spawning/rearing habitat as identified in the stream reach editor of EDT for the entire John Day Subbasin. The estimates were calculated as follows: Redd density according to index surveys for each subbasin x number of fish per redd x number of miles of spawning/rearing habitat (redd/mi X 1.67 X 2,283). There are limitations to using index redd counts to estimate numbers of adult steelhead. It is more valid to use index counts to determine trends in abundance, not actual numbers.

For chinook: Empirical estimates are derived by multiplying the number of redds observed during index spawning surveys times the ratio of redds observed in index surveys : extensive surveys times the number of fish per redd. As specified in Lindsay 1985, the historic value of "3" was used for the ratio of redds observed in index surveys : extensive surveys.

[b] Includes an average catch of 669 wild fish when a consumptive harvest on wild steelhead was allowed. The catch is not included in each subbasin estimate. Therefore, the sum of the subbasins is different than the total.

[c] The goal is defined as an average run year.

The subbasin plan objective for 50 years was derived by multiplying the professional judgment estimated historic run size by 0.7 for steelhead and 0.5 for chinook. This adjustment factor was derived taking into account habitat impacts since European settlement and the available restoration opportunities. The opportunities for steelhead are greater because it was felt the relative difference between what could be accomplished toward restoring habitat approaching historic conditions is higher in tributaries than in mainstem river reaches and steelhead are primarily tributary spawners. For chinook, which are primarily mainstem spawners, a higher percentage of the habitat has been developed for agricultural purposes that will never be restored to historic conditions. The interim goal for chinook is 60% of the 50-year goal, with the rationale being that achieving the first 60% is easier to accomplish than the remaining 40%.

Given what the technical team knows today, these goals are thought to be attainable. All goals are for average run sizes, not peak run-size estimates. Fishery harvest goals were not developed due to the timeframe for negotiating the specific numbers between the affected fishery management agencies.

The subbasin plan objectives for steelhead are considerably above those set by NOAA Fisheries as an interim recovery target. Baseline estimates for steelhead in both the 1992 to 1997 and recent five-year average already exceed the NOAA Fisheries targets. Since spring chinook are not listed under the Endangered Species Act, NOAA Fisheries has not set any targets for this population.

To provide faster information and feedback on progress toward these goals, and to more clearly link habitat restoration to the response in fish production, the objectives in Table 67 were translated into smolt production goals, which can be measured within the John Day Subbasin. This was done by applying the stated percentage increases at 25- and 50-year intervals to the estimated historic smolt-per-spawner productivity estimates from the EDT baseline assessment (Table 68). For more details, see Appendices R and T for summer steelhead and spring chinook, respectively. Progress toward many of these goals can be measured by the present smolt enumeration program. Concurrent monitoring of changes in habitat conditions resulting from restoration activities will allow the coordination team to resolve many of the uncertainties in the present assessment.

Table 68. Subbasin objectives in terms of smolt per spawner.

		HISTORIC ABUNDANCE	25-YR. INTERIM GOAL #	25-YR. INTERIM GOAL %	50-YEAR GOAL #	50-YEAR GOAL %	HISTORIC POTENTIAL	25-YR GOAL	50-YR GOAL
STEELHEAD POPULATIONS									
	Upper Mainstem	10,164	4,269	0.42	7,115	0.7	370	155	259
	North Fork	25,578	10,743	0.42	17,905	0.7	297	125	208
	Middle Fork	10,934	4,592	0.42	7,654	0.7	315	132	221
	South Fork	5,586	2,346	0.42	3,910	0.7	333	140	233
	Lower Mainstem	17,738	7,450	0.42	12,417	0.7	299	126	209
	TOTAL	70,000	29,400	0.42	49,000	0.7	323	136	226
CHINOOK POPULATIONS									
	Upper Mainstem	6,280	1,884	0.3	3,140	0.5	453	136	227
	North Fork	22,280	6,684	0.3	11,140	0.5	294	88	147
	Middle Fork	7,680	2,304	0.3	3,840	0.5	446	134	223
	Granite Creek	3,760	1,128	0.3	1,880	0.5	308	92	154
	TOTAL	40,000	12,000	0.3	20,000	0.5	300	113	188

The following objectives have been identified for steelhead and chinook in the John Day Subbasin:

Within 25 years:

1. Restore the freshwater productivity of steelhead and chinook populations to the 25-year levels identified in Table 68.
2. Restore adult returns of steelhead and chinook populations to the 25-year levels identified in Table 67.
3. Allow limited fisheries on the strongest populations.

Within 50 years:

4. Achieve the freshwater productivity of steelhead and chinook populations to the 50-year levels identified in Table 68.
5. Achieve adult returns of steelhead and chinook populations to the 50-year levels identified in Table 67.
6. All populations should be able to support annual fisheries.
7. Reestablish connected environments between existing populations to allow metapopulation interactions.
8. Some populations should be expanding beyond their baseline distributions.

Bull Trout. The following 25-year objectives were adapted from the USFWS Bull Trout Recovery Plan for the John Day River portion of the ESU. The 50-year objectives are intended to increase bull trout populations beyond the delisting objectives.

The goal of the bull trout recovery plan is to ensure the long-term persistence of self-sustaining, complex interacting groups of bull trout, distributed throughout the species' native range, so that the species can be delisted. To achieve this goal, the following objectives have been identified for bull trout in the John Day River Recovery Unit:

Within 25 years:

1. Increase the total estimated abundance of adult bull trout to at least 5,000 individuals distributed within the John Day River Recovery Unit.
2. Maintain current distribution of bull trout and restore distribution in previously occupied areas within the John Day River Recovery Unit.
3. Maintain stable or increasing trends in abundance of all bull trout populations.
4. Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies.
5. Conserve genetic diversity and reestablish connected environments between existing populations to provide opportunity for genetic exchange between populations.

Within 50 years:

6. All populations should show increasing trends in abundance or be at the capacity of the restored habitat.
7. The strongest populations should support predictable annual fisheries.

Redband Trout. Preliminary results from ongoing studies in other subbasins indicate there may be significant inter-breeding and switching of life history patterns between the resident and anadromous forms of *O. mykiss*. Assuming this pattern will be confirmed in the next few years, it makes most sense to manage steelhead and redband as a single group of interacting populations. Performance objectives for steelhead are described above.

The following objectives have been identified for redband trout in the John Day Subbasin. As with cutthroat trout, a quantitative baseline does not exist for redband trout populations. This baseline should be established within the first five years of implementing this plan. At that time, the following qualitative objectives should be converted to quantitative ones.

Within 25 years:

1. Achieve stable population sizes in all populations and increasing trends in half of the present populations.
2. Implement limited sport fisheries on the strongest recovering redband populations.

Within 50 years:

3. All populations should show increasing trends in abundance or be at the capacity of the restored habitat.
4. Reestablish connected environments between existing populations to allow metapopulation interactions.
5. Some populations should be expanding beyond their baseline distributions.
6. The strongest recovering populations should support predictable annual fisheries.

Cutthroat Trout. The present status of cutthroat populations cannot be easily quantified. Filling this information gap, in terms of cutthroat distribution and abundance, is a high-priority, short-term information need. This should be done within the next five years to establish an early baseline against which to measure future progress toward goals.

The following objectives have been identified for cutthroat trout in the John Day Subbasin. As with redband trout, cutthroat objectives can only be stated in qualitative terms at this time. When the quantitative baseline is established, these objectives should be restated in appropriate quantitative terms.

Within 25 years:

1. Achieve stable population sizes in all populations and increasing trends in half of the present populations.
2. The strongest recovering populations should support limited sport fisheries.

Within 50 years:

3. All populations should show increasing trends in abundance or be at the capacity of the restored habitat.
4. Reestablish connectivity between existing populations to allow metapopulation interactions.
5. Some populations should be expanding beyond their baseline distributions.
6. The strongest recovering populations should support predictable annual fisheries.

<u>Subbasin Habitat Objectives</u>

The following habitat objectives are expressed as restoration percentages of habitat loss quantified in the EDT Stream Reach Editor file (A listing of the 1264 stream reaches used in EDT can be found in Appendix H). That is "60%" means to restore 60% of the loss of habitat for a particular reach. In terms of the EDT or QHA ratings, that means to restore 60% of the difference between the template and the current condition.

Habitat improvements usually take several years to become fully effective. For instance, planting willow shoots to stabilize eroding stream banks and increase shading requires several years before willows grow large enough to provide most of the anticipated benefits. The team assumed a 10-year lag period, on average, before the full benefits of habitat restoration efforts will be expressed as changes in target fish species performance.

This lag period is significant because it means that habitat restoration needs to happen at a faster pace, if fish objectives are to be met by certain dates. Thus to meet a 25-year fish objective, all related habitat actions should be completed by year 15. Another 10 years will then be required for the changes to be fully effective and reflected in fish population performance. Therefore, habitat restoration objectives are expressed at 15-year and 40-year targets to meet 25-year and 50-year fish objectives.

Habitat objectives follow the logic for restoring steelhead populations, emphasizing tributary restoration, especially in the first 15 years. This is done for two reasons. First, like steelhead, the other aquatic focal species all depend on tributary habitats for the majority of the juvenile rearing phase of the life cycle. Thus, restoring tributary conditions will benefit the most species and populations. Second, it is more difficult and requires more time to restore mainstem habitats. The emphasis in mainstem restoration should be on halting further degradation and restoring localized spring chinook holding and spawning areas.

The habitat portion of biological objectives are stated in both quantitative and qualitative terms: quantitatively, to tie in with steelhead and chinook performance goals; and qualitatively, because the amount and location of efforts will depend to a large degree on available funding and participation of willing landowners, both of which are unknown at this time. As resources are identified and more is learned about habitat-fish interactions through research and monitoring, the habitat objectives should be stated in increasingly quantitative terms.

The following habitat objectives support the 25-year and 50-year biological objectives presented above.

Within 15 years:

1. Revise land use practices where necessary to prevent further declines in aquatic habitat quality and quantity.
2. Restore at least 40% of tributary habitat degradation in areas presently occupied by focal species in all first quartile restoration HUC5s.
3. Begin restoration efforts in tributary areas that currently block access by aquatic focal species to existing usable habitat.
4. Restore at least 30% of the degradation of mainstem habitats used by spring chinook for holding and spawning.

Within 40 years:

5. Restore at least 70% of tributary habitat degradation in areas presently occupied by focal species in all first quartile restoration HUC5s.
6. Restore at least 40% of tributary habitat degradation in areas presently unoccupied by focal species in areas near existing populations to allow for population expansion.

7. Restore at least 50% of the degradation of mainstem habitats used by spring chinook for holding and spawning.
8. Restore other mainstem reaches to the level that will allow interactions between existing populations in a metapopulation context.

5.2.2.3 Habitat Objectives to Address Limiting Factors

Habitat objectives have been established to address 12 different limiting factors. Following are the habitat objectives for each limiting factor.

Limiting Factor: Channel Stability
Definition: The effect of stream channel stability (within reach) on the relative survival or performance of the focal species; channel stability is considered with respect to streambed, banks and channel shape and location.
Objective: Bring vertical and lateral stream movement in balance with landscape and flow regime.

Limiting Factor: Chemicals
Definition: The effect of toxic substances or toxic conditions on the relative survival or performance of the focal species. Substances include chemicals and heavy metals. Toxic conditions include low pH.
Objectives: Address contamination associated with historic mining activities in the subbasin.
Maintain existing high water quality with respect to chemical contamination.

Limiting Factor: Competition
Definition: The effect of competition with hatchery-produced animals or with other species on the relative survival or performance of the focal species.
Objective: Manage subbasin fisheries for wild fish production.

Limiting Factor: Flow
Definition: The effect of the amount of streamflow, or the pattern and extent of flow fluctuations, within the stream reach on the relative survival or performance of the focal species. Effects of flow reductions or dewatering due to water withdrawals are included.
Objectives: Enhance base flows.
Moderate peak flows where appropriate.
Restore natural hydrographic conditions where appropriate.

Limiting Factor: Habitat Diversity / Key Habitat
Definition: The effect of the extent of habitat complexity within a stream reach on the relative survival or performance of the focal species; the relative quantity of the primary habitat type(s) utilized by the focal species during a life stage; quantity is expressed as percent of wetted surface area of the stream channel.
Objectives: Maintain riparian management objectives.
Provide adequate habitat components necessary for focal species.

Increase role and abundance of wood and large organic debris in streambeds.
Increase pool habitat (e.g. beaver ponds).
Maintain and improve quality and quantity of spawning grounds.
Decrease gradient; restore sinuosity.
Restore channel and floodplain connectivity.
Restore off-channel areas for high flow refugia.

Limiting Factor: Harassment

Definition: The effect of harassment, poaching or non-directed harvest (e.g. as can occur through hook and release fishing) on the relative survival or performance of the focal species.

Objectives: Create physical and educational conditions that provide for growth of both fish and wildlife and at the same time enhance enjoyment of natural resources without creating economic hardship or infringing on private property rights. Minimize direct mortality and stress to fish caused by human activity.

Limiting Factor: Obstruction

Definition: The effect of physical structures impeding movement of the focal species on its relative survival or performance within a stream reach; structures include dams and waterfalls.

Objective: Minimize artificial fish passage barriers.

Limiting Factor: Oxygen

Definition: The effect of the concentration of dissolved oxygen within the stream reaches on the relative survival or performance of the focal species.

Objective: Minimize unnatural factors that lead to fluctuations in levels of dissolved oxygen.

Limiting Factor: Predation

Definition: The effect of the relative abundance of predator species on the relative survival or performance of the focal species, considered apart from the influence of the amount of cover habitat used by the focal species.

Objective: Increase understanding and awareness of predators in the subbasin.

Limiting Factor: Sediment Load

Definition: The effect of the amount of fine sediment present in, or passing through, the stream reach on the relative survival or performance of the focal species.

Objectives: Minimize unnatural rates of erosion from upland areas.
Trap sediment on the floodplain as appropriate.
Bring the stream channel in balance with the water and sediment as supplied by the watershed.

Limiting Factor: Temperature

Definition: The effect of water temperature within the stream reach on the relative survival or performance of the focal species.

Objective: Moderate extreme stream temperatures through improvement of width-to-depth ratio, increased shade and floodplain connectivity.

Limiting Factor: Withdrawals/Entrainment

Definition: The effect of entrainment (or injury by screens) at water withdrawal structures within the stream reach on the relative survival or performance of the focal species. This effect does not include dewatering due to water withdrawals, which is covered by the flow correlate.

Objective: 100% of irrigation diversions are screened to prevent fish entrainment.

5.2.2.4 Restoration Strategies and Priorities

The character of restoration opportunities in the John Day Subbasin is unique. As noted throughout this plan, the John Day is renowned for its spring chinook salmon and summer steelhead populations, two of the last remaining intact wild populations of anadromous fish in the Columbia River Basin, though now considerably reduced from their historic abundance.

Further, the John Day River is the second longest free-flowing river in the continental United States. Because there are no large dams or other structures blocking anadromous fish passage in the subbasin, many cost-effective opportunities exist to rebuild these wild runs through habitat restoration. Currently, a variety of local historic and ongoing land use practices influence aquatic habitats in the John Day Subbasin. Successful aquatic habitat restoration in the subbasin will require widespread efforts to implement a range of project types.

The John Day Subbasin Coordination Team identified 10 broad restoration strategies and 42 specific types of actions that make up these strategies. The vast majority of watershed and fisheries habitat improvements projects that have been undertaken in the subbasin, as identified in the inventory, fit within these strategies and actions. The team anticipates that most of the work to be undertaken in the near future will also fit into this framework. These strategies and actions are described later in this section. For each strategy there are:

1. Overview: This overview gives a brief explanation of the strategy.
2. Activities that are part of the strategy: This section gives specific examples of types of actions that address the strategy.
3. Linkage between the Strategy and Habitat Objectives Identified in the plan: For each strategy there is a discussion on the linkage between that strategy and the habitat objectives. Table 69 on the following page summarizes the hypothetical linkages between restoration strategies and habitat objectives.
4. Geographic Relevance at the HUC5 Level: For each strategy, maps have been produced that display the relative priority for the strategy for each HUC5 watershed in the John Day Subbasin. The priorities are rated 1 to 4 with 1 being low priority, 2 being moderate priority, 3 being high priority and 4 being very high priority. Following is a description of how these priorities were established.

Table 69. Hypothetical Linkages between Restoration Strategies and Habitat Objectives

		Restoration Strategies									
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
Limiting Factors	**Habitat Objectives**	Passage	Fish Screens	Flow Restoration	In-stream Activities	Riparian Habitat Improvements	Pollution Control	Protect Existing Habitat	Upland Improvements	Education and Outreach	Manage Rec & Tribal Fisheries
Channel Stability	Bring vertical and lateral stream movement in balance with landscape and flow regime.	X			X	X		X	X	X	
Chemicals	Address contamination associated with historic mining activities in the subbasin.						X	X		X	
	Maintain existing high water quality with respect to chemical contamination.						X	X	X	X	
Competition	Manage subbasin fisheries for wild fish production.					X		X	X	X	X
Flow	Enhance base flows.			X		X		X	X	X	
	Moderate peak flows where appropriate.					X		X	X	X	
	Restore natural hydrographic conditions where appropriate.			X		X		X	X	X	
Habitat Diversity/ Key Habitat	Maintain riparian management objectives.							X		X	
	Provide adequate habitat components necessary for focal species.							X		X	
	Increase role and abundance of wood and large organic debris in streambeds.				X	X		X	X	X	
	Increase pool habitat (e.g. beaver ponds).			X	X	X		X	X	X	
	Maintain and improve quality and quantity of spawning grounds.	X		X	X	X		X	X	X	
	Decrease gradient; restore sinuosity.				X	X		X		X	

		Restoration Strategies									
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
Limiting Factors	**Habitat Objectives**	Passage	Fish Screens	Flow Restoration	In-stream Activities	Riparian Habitat Improvements	Pollution Control	Protect Existing Habitat	Upland Improvements	Education and Outreach	Manage Rec & Tribal Fisheries
	Restore channel and floodplain connectivity.	X			X	X		X		X	
	Restore off-channel areas for high flow refugia.				X	X		X		X	
Harassment	Create physical and educational conditions that provide for growth of fish and wildlife and enjoyment of natural resources.							X		X	X
	Minimize direct mortality and stress to fish due to human activity.	X	X			X		X	X	X	X
Obstruction	Minimize artificial fish passage barriers.	X	X	X				X		X	
Oxygen	Minimize unnatural factors that lead to fluctuations in levels of dissolved oxygen.			X		X	X	X	X	X	
Predation	Increase understanding and awareness of predators in the subbasin.							X		X	
Sediment Load	Minimize unnatural rates of erosion from upland areas.					X	X	X	X	X	
	Trap sediment on the floodplain as appropriate.	X			X	X		X		X	
	Bring the stream channel in balance with the water and sediment as supplied by the watershed.							X		X	
Temperature	Moderate extreme stream temperatures through improvement of width-to-depth ratio, increased shade and floodplain reconnectivity.			X	X	X		X	X	X	

		Restoration Strategies									
		A	B	C	D	E	F	G	H	I	J
Limiting Factors	**Habitat Objectives**	Passage	Fish Screens	Flow Restoration	In-stream Activities	Riparian Habitat Improvements	Pollution Control	Protect Existing Habitat	Upland Improvements	Education and Outreach	Manage Rec & Tribal Fisheries
Withdrawals/ Entrainment	100% of irrigation diversions are screened to prevent fish entrainment.		X					X		X	

Establishing Strategy Priority Rankings within HUC5s and Restoration Priority Rankings among HUC5s.

Three technical teams met to establish restoration priorities within sub-geographic areas of the John Day Subbasin. Each team set priorities within each HUC5 for restoration strategies and established a restoration priority ranking between HUC5s.

Tim Unterwegner, ODFW District Fish Biologist, participated on all three technical teams. The Middle and Lower John Day technical team also included Mark Berry (CTWSRO), Sue Greer (Wheeler SWCD), Jason Faucera (Sherman SWCD), and George Meyers (Gilliam SWCD). The Mainstem and South Fork John Day technical team included Linda Brown (CTWSRO), Tom Friedrichsen (USFS), and Larry Bright (USFS). The Middle Fork and North Fork technical team included Alex Conley (NFJDWC) and Linda Brown (CTWSRO).

EDT Restoration and Protection Priority Rankings provided the basis for prioritization between HUC5s (See Appendices S and U for EDT Diagnostic Reports identifying restoration and protection priorities.). The technical teams revised the rankings based on their professional opinion and local expertise. The largest general difference was EDT gave high priorities to HUC5s that contained mainstem reaches. While these HUC5s are of high importance to both the local and upstream spawning populations, the teams felt that restoration work in tributary streams would be the most cost-effective strategy to achieve mainstem improvements. Therefore, the team tended to rank HUC5s with large tributaries as higher priorities for restoration. Also, HUC5s that ranked highly for protection by EDT tend to be limited in their restoration opportunities by their relatively intact habitat. In the Lower John Day, EDT showed potential increases in steelhead abundance, productivity, and diversity with restoration in all HUC5s, while in the other population areas, many HUC5s are closer to historic habitat conditions and did not show potential for increases with restoration. Restoration priority rankings were based on opportunities for restoration as well as need. See Tables 70 to 75.

Strategy prioritization within each HUC5 was also based on a combination of EDT outputs (Limiting Factors identified as High, Medium, or Low priorities for Restoration as shown in Appendices S and U for summer steelhead and spring chinook, respectively) and professional opinion. In several cases, flow restoration was considered a high priority even though EDT may have ranked it lower. Flow restoration would likely improve several other limiting factors addressed by EDT, including key habitat quantity, habitat diversity, and temperature. Within each HUC5, 10 strategies were ranked as either 1=Low, 2=Moderate, 3=High, or 4=Very High Priority. These strategy priorities are presented in Tables 70 to 75.

The technical teams frequently rated six strategies as "Very High" or "High" priorities within the 43 HUC5s in the subbasin: Riparian Habitat Improvements, Improving Fish Passage, Upland Improvements, Fish Screening, Flow Restoration, and Protection of Existing Habitat. Improving and expanding on existing, successful efforts and applying these watershed strategies broadly will be critical to meeting restoration goals within the subbasin.

These restoration priority rankings established by the local technical teams were reviewed by the John Day Subbasin Coordination Team and presented to watershed councils and soil and water conservation districts for comment at regularly scheduled meetings. Following are tables showing the priority rankings for each of the three sub-geographic areas.

Table 70. Lower and Middle Mainstem John Day River (below Kimberly) Priority Rankings

		STRATEGY RANKS: 1=Low 2=Moderate 3=High 4=Very High									
		A	B	C	D	E	F	G	H	I	J
5th FIELD HUC by RANK	Restoration Priority Ranking 1 is Highest Priority	Passage	Fish Screening	Flow Restoration	In-stream Activities	Riparian Habitat Improvements	Control of Pollution Sources	Protect Existing Habitat	Upland Improvements	Education and Outreach	Manage Recreation & Tribal Fisheries
Bridge Creek	**1**	4	4	4	2	3	1	3	3	2	1
Thirty Mile Creek	**1**	4	4	4	2	3	1	2	3	2	1
Butte Creek	**2**	4	4	4	2	3	1	3	3	2	1
Upper Rock Creek	**2**	4	4	3	2	3	1	3	3	2	1
Pine Hollow	**3**	2	1	4	2	4	1	3	4	2	1
Lower JDR Muddy Creek	**3**	4	4	4	2	3	1	4	3	2	1
Lower JDR Ferry Canyon	**3**	2	2	3	2	3	1	4	4	2	1
Lower JDR Service Creek	**4**	2	4	3	2	4	1	3	3	2	1
Lower JDR Kahler Creek	**4**	4	4	4	2	3	1	3	3	2	1
Grass Valley Canyon	**5**	3	2	3	2	4	1	2	4	2	1
Lower JDR Scott Canyon	**6**	1	4	3	1	3	2	3	4	2	1
Lower Rock Creek	**6**	4	4	4	1	3	2	2	3	2	1
Lower JDR McDonald Ferry	**7**	1	1	2	1	3	2	4	4	2	1
Lower JDR Clarno	**7**	1	3	3	1	4	1	4	3	2	1

Table 71. Strategies Ranking for Lower and Middle Mainstem John Day River (below Kimberly)

STRATEGIES BY RANK	RANK
Protect Existing Habitat	1
Passage	2
Flow Restoration	3
Riparian Habitat Improvements	4
Fish Screens	5
Upland Improvements	6
In-stream Activities	7
Education and Outreach	8
Manage Recreation & Tribal Fisheries	9
Pollution Control	10

Table 72. Middle Fork and North Fork John Day River Priority Rankings

		STRATEGY RANKS: 1=Low 2=Moderate 3=High 4=Very High									
		A	B	C	D	E	F	G	H	I	J
5th FIELD HUC by RANK	Restoration Priority Ranking 1 is Highest Priority	Passage	Fish Screening	Flow Restoration	In-stream Activities	Riparian Habitat Improvements	Control of Pollution Sources	Protect Existing Habitat	Upland Improvements	Education and Outreach	Manage Recreation & Tribal Fisheries
Middle Fork											
Camp Creek	**1**	4	3	4	4	4	1	4	3	2	1
Upper MF John Day River	**2**	4	3	4	2	3	1	4	3	2	1
Long Creek	**2**	2	4	4	3	4	1	2	4	3	1
Big Creek	**3**	3	2	2	4	4	1	3	3	2	1
Lower Middle Fork	**4**	2	1	1	2	4	1	2	4	2	1
North Fork											
Granite Creek	**1**	4	3	2	3	3	4	3	2	3	2
Cottonwood	**1**	3	4	4	2	4	1	2	4	2	1
Upper Camas	**2**	3	1	2	3	3	2	3	2	2	1
Lower Camas	**2**	3	2	2	2	4	1	2	4	3	1
Desolation	**3**	3	1	1	3	3	1	3	2	2	1
Wall Creek	**4**	4	2	1	2	2	1	2	3	2	1
Lower NF	**4**	2	4	4	2	4	1	1	4	3	1
Potamus	**5**	3	1	1	2	2	1	2	3	2	1
Upper NF	**6**	4	1	1	1	1	1	4	1	2	1
NF JDR Big Creek	**6**	2	1	1	1	1	1	4	2	2	1

Table 73. Strategy Rankings for North Fork and Middle Fork John Day

STRATEGIES BY RANK	RANK
Protect Existing Habitat	1
Passage	2
Riparian Habitat Improvements	2
Fish Screen	3
In-stream Activities	4
Upland Restoration	4
Flow Restoration	4
Education and Outreach	5
Manage Recreation & Tribal Fisheries	6
Pollution Control	7

Table 74. Upper Mainstem and South Fork John Day River Priority Rankings

		STRATEGY RANKS: 1=Low 2=Moderate 3=High 4=Very High									
		STRATEGY									
		A	B	C	D	E	F	G	H	I	J
5th FIELD HUC by RANK	Restoration Priority Ranking; 1 is Highest Priority	Passage	Fish Screening	Flow Restoration	In-stream Activities	Riparian Habitat Improvements	Control of Pollution Sources	Protect Existing Habitat	Upland Improvements	Education and Outreach	Manage Recreation & Tribal Fisheries
Strawberry Creek	**1**	4	4	4	4	4	2	4	4	4	4
Laycock Creek	**2**	4	4	4	3	4	3	2	3	4	1
Canyon Creek	**3**	4	4	3	2	3	1	4	2	4	4
Upper Middle John Day	**4**	4	4	4	2	3	2	3	3	2	3
Upper John Day	**5**	4	4	4	2	2	1	4	2	2	4
Fields Creek	**5**	4	4	4	3	4	3	2	3	3	1
Middle South Fork J D	**5**	4	4	3	4	4	2	1	4	2	1
Upper South Fork J D	**5**	4	4	3	4	4	2	1	4	2	1
Beech Creek	**6**	4	4	3	3	4	1	2	3	3	1
Mountain Creek	**7**	4	4	3	3	3	1	2	2	2	1
Rock Creek	**8**	4	4	2	2	3	1	4	1	2	1
John Day Rv - Johnson Cr.	**9**	4	4	2	1	3	1	1	2	2	3
Lower South Fork	**9**	4	4	2	1	2	1	3	1	4	1
Murderer's Creek	**9**	4	2	2	3	2	1	2	3	3	1

Table 75. Strategies Ranking for Upper Mainstem and South Fork John Day River

STRATEGIES BY RANK	RANK
Protect Existing Habitat	1
Passage	2
Flow Restoration	3
Riparian Habitat Improvements	4
Fish Screens	5
Upland Improvements	6
In-stream Activities	7
Education and Outreach	8
Manage Recreation & Tribal Fisheries	9
Pollution Control	10

Detailed Discussion for Each Strategy

Strategy A: Improve Fish Passage

Overview. Improving fish passage by removing existing barriers and replacing them with fish passage-friendly alternatives can open up previously-inaccessible habitat for use by focal species, reduce stresses on traveling fish, and make it easier for fish to find critical refuges during times of low water and high temperature. Passage barriers may include culverts, irrigation diversions, small dams and other structures that impede fish migration and movement. A limited number of artificial structures in the subbasin block all upstream fish movement into otherwise useable habitat. Removing these structures has clear benefits and is of high priority. A far greater number of structures act as partial passage barriers that allow some fish to pass at some times, but restrict movement by other age-classes during some or all of the year. The benefits of replacing this type of barrier needs to be weighted against the associated costs on a case-by-case basis to ensure that significant biological gains will be made.

Activities that are Part of this Strategy:

A1: Replacing or Removing Culverts

Numerous culverts have been installed on state, county, and Forest Service roads in the John Day Subbasin; many of these act as barriers to fish movement by creating jumps or high-velocity flows that some or all fish are unable to navigate. These typically occur on smaller streams or in headwaters of larger streams. Replacing problematic culverts with structures that allow for unimpeded fish passage can greatly improve fisheries habitat. A number of culvert replacements have been completed on Forest Service, private and state roads, and more are being planned, especially on USFS lands. Inventories of possible passage barriers have been completed on USFS lands and for selected county and state roads; these need to be refined to identify those culverts for which replacement is a high priority. Less is known about the extent of passage barriers on private roads.

A2: Improving Irrigation Diversions

Small dams associated with irrigation diversions can act as significant passage barriers. These may be rock dams, gravel push-up dams or other structures (both temporary and permanent). These barriers can be replaced with fish-friendly diversion structures such as removable flash-board dams that incorporate passageways for fish, step-weirs and sub-surface infiltration galleries. They may also be eliminated by moving a point of diversion to a site that does not require building a dam, switching from a gravity to pump diversion, or consolidating a diversion with another fish-friendly diversion. Many such projects have been undertaken in the John Day Subbasin by irrigators working with the Grant, Monument and Wheeler SWCDs, the CTWSRO and the North Fork John Day Watershed Council, as detailed in the inventory. The Bureau of Reclamation has completed a set of GIS coverages of possible irrigation-related passage barriers based on photo interpretation of high resolution aerial photography. These coverages could be used as a starting point for a ground based inventory of irrigation related barriers or as reference for review of individual projects in relation to other potential barriers in a particular watershed.

A3: Addressing other Artificial Passage Barriers

Other artificial passage barriers include collapsed log bridges, a few rocked fords, and small dams. These occur in our subbasin, but are not widespread. Where they do occur, efforts to replace or supplement these with fish-friendly structures will have the same benefits as replacing culverts or irrigation-related barriers. Some of these may be indicated in the USBR passage barrier GIS coverages noted under A2.

Links between this Strategy and Habitat Objectives Identified in the Plan. The primary emphasis of passage improvement projects is to remove passage barriers. In doing so, many other objectives may also be addressed. Erosion, channel constriction, sedimentation and headcutting associated with poorly designed structures and/or catastrophic failure of structures can be eliminated. Quantity of available spawning grounds can be improved and sedimentation of spawning gravels may be reduced. Physiological stress on fish due to difficult passage through structures can be reduced. For links to habitat objectives, see Table 69, Strategies – Habitat Objective Linkages. Hypotheses relating this strategy to specific EDT variables used in the subbasin planning process are given in Table 76 below. Dispersal downstream relates to the degree of impact specific actions are anticipated to have downstream. The lag time estimates the time between a specific action and the desired biological effect.

Table 76. Linkage between Passage Improvements and EDT Attributes

	Physical Effects	EDT Attribute	Dispersal Downstream	Lag Time to Biological Effect
1	Obstructions			
	a. Removes barriers	Obstructions	None	None
		Riparian Function	Low	5-15 years
		Bed Scour	Low	Less than 5 yrs
		Channel Width	Low	Less than 5 yrs
		Gradient	Medium	Less than 5 yrs
2	Reduces/Eliminates stream alteration	Riparian Function	Low	5-15 years
		Channel Width	Low	5-15 years
		Hydro Confinement	Low	5-15 years
	Biological Effects			
1	Opens underutilized/unused habitat			
	a. Increases species diversity and numbers	Fish Community Richness	Medium	Less than 5 yrs
		Salmon Carcasses	High	Less than 5 yrs
		Fish Pathogens	Low	15 plus years
		Predation Risk	Low	Less than 5 yrs
	b. Improves nutrient cycle	Benthic Community Richness	High	Less than 5 yrs

Geographic Relevance at HUC5 Level. See Figure 51 for a display of the relative priority for improving fish passage for each HUC5 watershed in the John Day Subbasin. The priorities are rated 1 to 4 with 1 being low priority, 2 being moderate priority, 3 being high priority and 4 being very high priority.

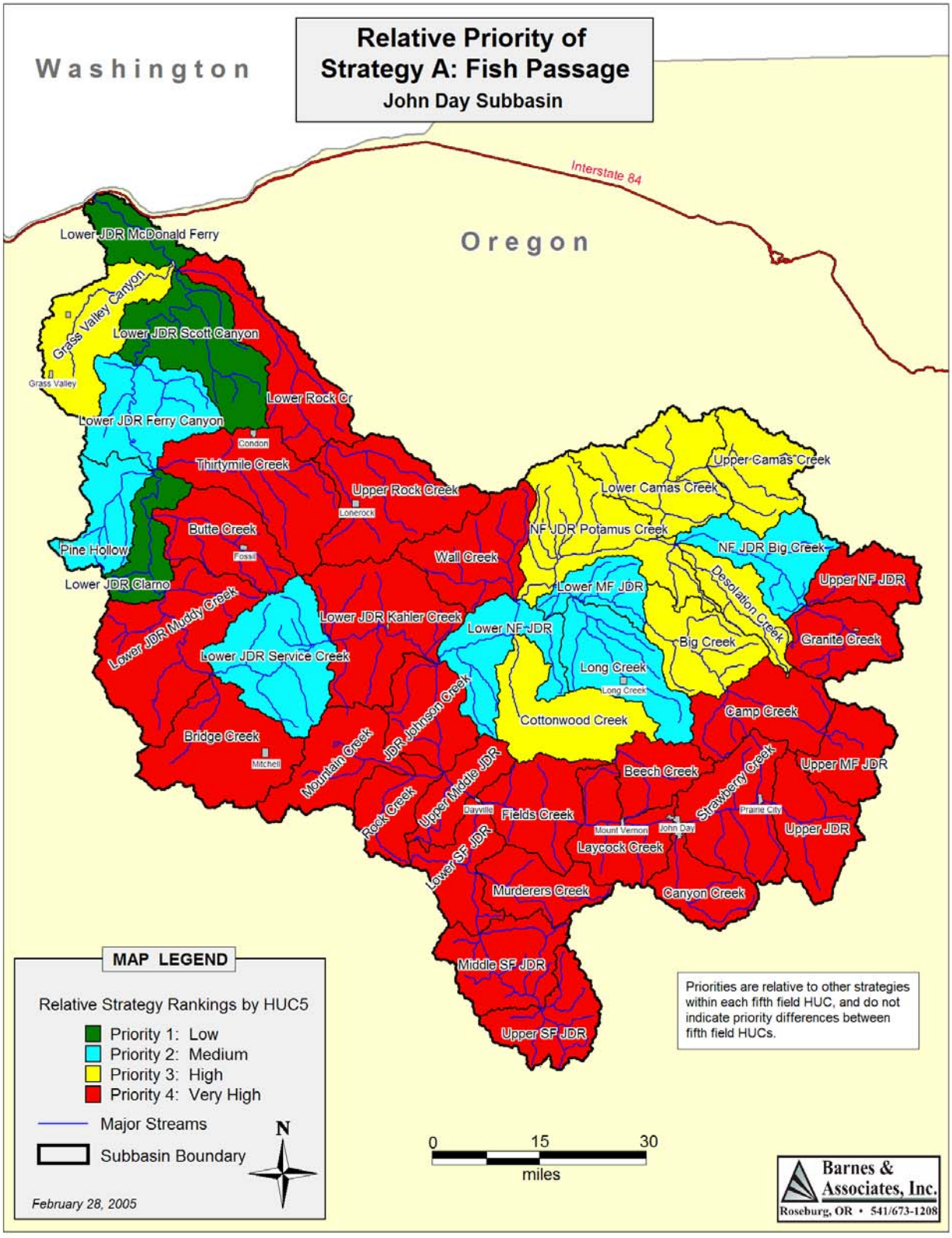


Figure 51. Map illustrating relative priority for improving fish passage by HUC5.

Strategy B: Install Fish Screens on Water Diversions

Overview. Unscreened diversions often result in fish entering and becoming trapped in irrigation and water supply systems, which can be a significant source of mortality. Fish screens installed on ditches and pumps effectively prevent this. Fish screening programs have been in place in the subbasin for over 30 years. Many irrigation diversions are already screened.

Activities that are Part of this Strategy:

B1: **Install Fish Screens on Irrigation Diversions**

Effective designs for fish screens for both ditch and pump diversions are available and have been widely used in the John Day Subbasin. In general, diversions that are either unscreened or inadequately screened (due to aging or inadequate design of the original screen) should be screened to eliminate any related mortality. Achieving 100% screening is a realistic goal in the John Day Subbasin provided that financial assistance continues to be available to landowners installing screens.

B2: Explore Potential to Screen Mining Diversions

In the upper subbasin, there are several areas where diversions are made for mining uses. The potential for working with miners to screen such diversions is unknown, but worth investigating, as they occur in areas where high densities of fry of focal species are present.

Links between this Strategy and Habitat Objectives Identified in the Plan. Screening diversions directly addresses its own specific objective and also may reduce stress caused to fish temporarily trapped in irrigation systems. For links to habitat objectives, see Table 69, Strategies – Habitat Objectives Linkages. Hypotheses relating this strategy to specific EDT variables used in the subbasin planning process are given in Table 77 below. Dispersal downstream relates to the degree of impact specific actions are anticipated to have downstream. The lag time estimates the time between a specific action and the desired biological effect.

Table 77. Linkage between Fish Screen Improvements and EDT Attributes

	Physical Effects	EDT Attribute	Dispersal Downstream	Lag Time to Biological Effect
	None Identified			
	Biological Effects			
1	Prevents loss of salmonids to unscreened irrigation diversions	Fish Community Richness	None	None

Geographic Relevance at HUC5 Level. See Figure 52 for a display of the relative priority for installing fish screens on water diversions for each HUC5 watershed in the John Day Subbasin. The priorities are rated 1 to 4 with 1 being low priority, 2 being moderate priority, 3 being high priority and 4 being very high priority.

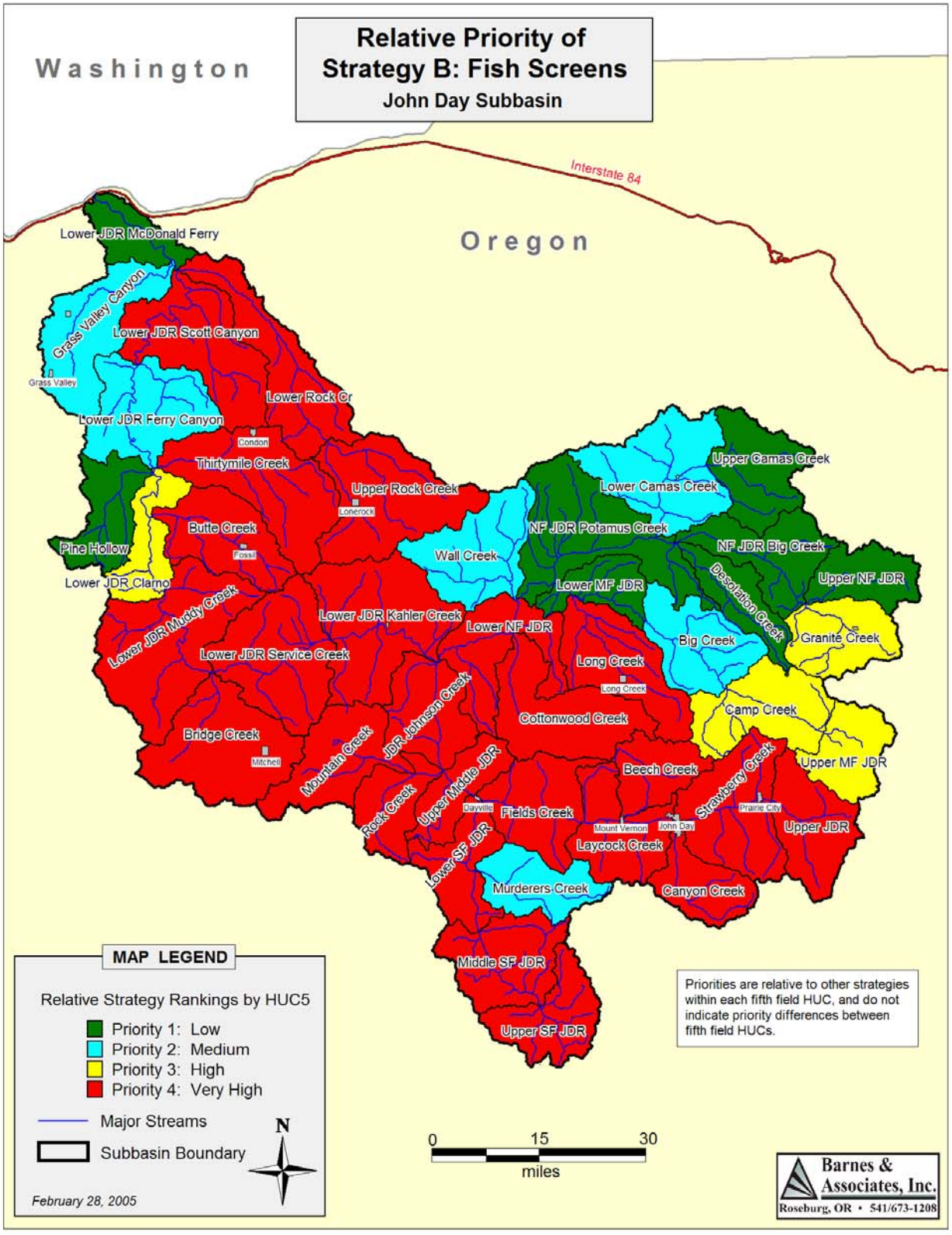


Figure 52. Map illustrating relative priority for installing fish screens by HUC5.

Strategy C: Flow Restoration

Overview. Low flows directly limit the extent of fish habitat and contribute to high water temperatures, poor fish passage, and reduced water quality. Flows can be enhanced by physically redirecting water flows in a manner that enhances stream base flows. Many other strategies described in this plan will also contribute to improved streamflows over time (e.g. restoration of riparian vegetation and efforts to reconstruct functional floodplains). Activities included as part of this strategy involve specific actions that actively redirect the flow of water.

Activities that are Part of this Strategy:

C1: In-stream Water Right Leases and Acquisitions

Converting consumptive uses of water to in-stream flows is a widely-used way to increase streamflows. Typically, irrigation water rights are leased, donated, or purchased and then left in-stream. This may include split-season leases in which the in-stream lease is only required during certain periods; leases may be a part of larger projects like the irrigation efficiency projects discussed below. Perhaps the best existing example is the upper Middle Fork of the John Day where short and long-term in-stream leases and acquisitions of irrigation rights have significantly increased summer/fall streamflows in an area where extensive irrigation occurs along streams with valuable fish habitat.

C2: Irrigation Efficiency Projects

Practices like piping irrigation ditches, improving water application efficiencies, adjusting cropping patterns, and better irrigation scheduling can be used to reduce the amount of water that must be diverted to produce a given crop. Such opportunities can allow for increased flow to remain in-stream while maintaining or even increasing agricultural productivity.

C3: Floodplain Aquifer Recharge Projects

In nearby subbasins (primarily the Walla Walla), projects are redirecting spring runoff into fields and/or recharge basins where it can soak in to floodplain aquifers that are anticipated to sustain late summer base flows. Similar efforts may be applicable in parts of the John Day Subbasin. Similar results may also be achieved by channel/floodplain restoration projects under strategies D and E.

C4: Off-stream Storage Basins

There is considerable local interest in creating off-channel storage basins where spring runoff could be stored and used for irrigation and/or to increase in-stream flows. Where suitable sites exist in close proximity to irrigated areas, this option can have considerable merit. Existing examples include small reservoirs that allow irrigators to cease all diversion from a creek in low flow periods while continuing to irrigate using stored water.

C5: Efforts to Improve Hydrological Connectivity between Springs and Streams

Springs in headwater areas provide much of the flow in area streams in late summer and fall. In some areas, poorly designed road networks, small impoundments and other disturbances have redirected spring flows away from downstream drainages and into areas where they do not contribute to sustaining streamflow. Reconnecting these springs

to downstream drainages can contribute to increased base flows and reduced water temperatures.

Links between this Strategy and Habitat Objectives Identified in the Plan. Increasing in-stream flow during low flow periods directly addresses the objectives of enhancing base flows and restoring natural hydrographs. Increased flow may also accelerate growth of riparian vegetation, deepen streams, facilitate fish passage through shallow reaches, and reduce temperature and improve dissolved oxygen levels, contributing to multiple objectives. For links to habitat objectives, see Table 69, Strategies – Habitat Objectives Linkages. Hypotheses relating this strategy to specific EDT variables used in the subbasin planning process are given in Table 78 below. Dispersal downstream relates to the degree of impact specific actions are anticipated to have downstream. The lag time estimates the time between a specific action and the desired biological effect.

Table 78. Linkage between Flow Restoration and EDT Attributes

	Physical Effects	EDT Attribute	Dispersal Downstream	Lag Time to Biological Effect
1	Restores portion of base flow	Flow Low	High	None
2	Decreases summer water temperature	Temp Max	High	None
3	Increases minimum channel width	Width Min	High	None
4	Moderates low dissolved oxygen	Dissolved Oxygen	High	None
5	Increase habitat quantity	Habitat-Backwater Pools	High	None
6	Facilitates passage in dewatered reaches	Obstructions	High	None
	Biological Effects			
1	Enhances benthos production	Benthos Community Richness	High	Less than 5 yrs
2	Increases base flow wetted area	Riparian Function	High	5-15 years
3	Increases available rearing habitat	Fish Community Richness	High	None

Geographic Relevance at HUC5 Level. See Figure 53 for a display of the relative priority for flow restoration for each HUC5 watershed in the John Day Subbasin. The priorities are rated 1 to 4 with 1 being low priority, 2 being moderate priority, 3 being high priority and 4 being very high priority.

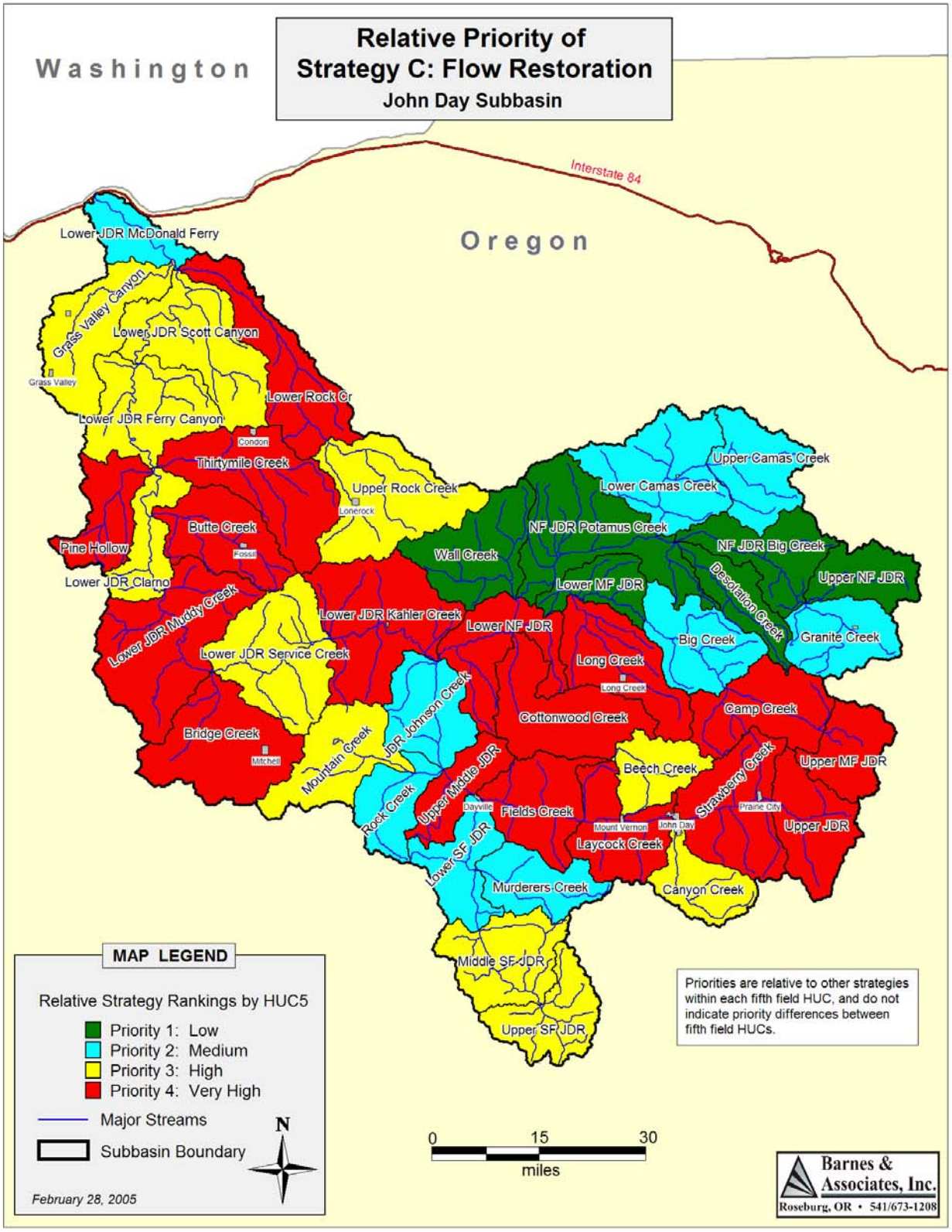


Figure 53. Map illustrating relative priority for flow restoration by HUC5.

Strategy D: In-Stream Activities

Overview. We defined in-stream activities as those that physically alter habitat features at or below bank-full flood levels. They typically strive to increase habitat diversity, through the creation of pools and in-stream structure and may also reduce chronic sediment inputs. In many cases in-stream activities may blend directly into Strategy E, Riparian Habitat Improvement.

Activities that are Part of this Strategy:

D1: Large woody debris placement

Many streams within the subbasin are considered to be deficient in woody debris. In some cases active efforts to place logs or simulated logs into streams may be warranted. These logjams can provide habitat complexity and cover for fish, trap spawning gravels, and scour out pool habitat.

D2: Channel restoration

In areas where channels have been artificially straightened, diked, or otherwise manipulated, active efforts to excavate a more natural channel form may be appropriate. In recent years 'Rosgen-style' channel reconstructions have become popular, and have increased habitat diversity and reconnected streams with their floodplains, increasing spring recharge of floodplain aquifers and associated late-season base flows. These efforts are generally coupled with floodplain restoration efforts as described under Strategy E.

D3: Bank protection/stabilization

In areas where chronic bank erosion problems exist, efforts to re-form banks to resist erosion and enhance in-stream habitat may be warranted. These efforts may include sloping back cut banks, installing rock barbs to redirect flows from banks to scouring pools, bioengineering of eroding surfaces, root wad and juniper revetments and other forms of bank protection. Such alternatives to traditional rock rip-rap are valuable options to address landowner needs in a manner that simultaneously improves fish habitat.

D4: Weirs and other structures

In areas where pool habitat is lacking, installing rock or log weirs designed to scour pools may be desired. While some early weir designs have proven to be less effective than desired, upstream V-weirs have worked well. Many weirs were installed in the 1980s and early 90s. In some areas, these weirs have succeeded in creating pools that have greatly improved the quality of fish habitat. Weirs installed on Wall Creek, Wilson Creek, and Desolation Creek on the Umatilla National Forest are good examples.

Links between this Strategy and Habitat Objectives Identified in the Plan. The in-stream activities described here may directly or indirectly contribute to the many objectives, depending upon the character of the specific project. For links to habitat objectives, see Table 69, Strategies – Habitat Objectives Linkages. Hypotheses relating this strategy to specific EDT variables used in the subbasin planning process are given in Table 79 below. Dispersal downstream relates to

the degree of impact specific actions are anticipated to have downstream. The lag time estimates the time between a specific action and the desired biological effect.

Table 79. Linkage between In-stream Activities and EDT Attributes

	Physical Effects	EDT Attribute	Dispersal Downstream	Lag Time to Biological Effect
1	Creates habitat types			
	a. Increases frequency of pools	Habitat-Pools	Low	Less than 5 y rs
	b. Increases pool tailouts	Habitat-Pool Tailouts	Low	Less than 5 yrs
	c. Collects spawning gravel	Habitat-Small Cobble	Low	Less than 5 yrs
	d. Reduce small and large cobble riffles	Habitat-Large Cobble	Low	5-15 years
	e. Increases backwater pools	Backwater Pools	Low	Less than 5 yrs
2	Modifies channel structure			
	a. Increases quatity of large wood	Large Woody Debris	Low	None
	b. Increases/reduces bed scour	Bed Scour	Low	Less than 5 yrs
	c. Reduces embeddedness	Embeddedness	Low	Less than 5 yrs
	d. Rebuilds streambanks/riparian vegetation	Riparian Function	Low	5-15 years
	f. Traps fine sediment in pools	Fine Sediment	Low	Less than 5 yrs
	g. Increases sinuosity	Channel Length	Low	5-15 years
		Gradient	Medium	5-15 years
	h. Increases wetted width	Width Max	Low	Less than 5 yrs
	Biological Effects			
1	Increase cover and adult holding pools	Predation Risk	Low	None
2	Retains carcasses	Salmon Carcasses	Low	None
3	Provide substrate for benthos	Benthic Community Richness	Low	Less than 5 yrs
4	Increases spawning area availability	Salmon Carcasses	Low	Less than 5 yrs

Geographic Relevance at HUC5 Level. See Figure 54 for a display of the relative priority for in-stream restoration activities for each HUC5 watershed in the John Day Subbasin. The priorities are rated 1 to 4 with 1 being low priority, 2 being moderate priority, 3 being high priority and 4 being very high priority.

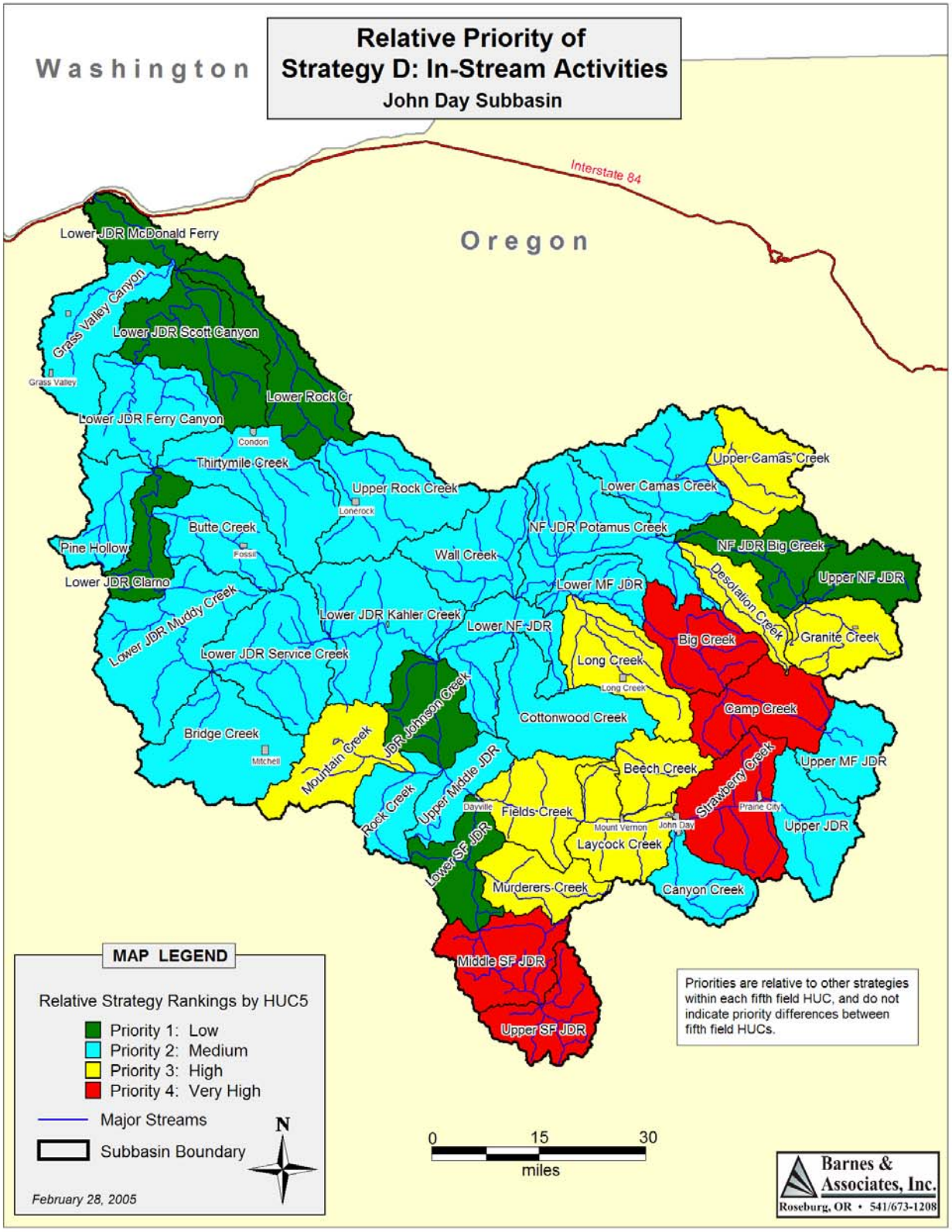


Figure 54. Map illustrating relative priority for in-stream activities by HUC5.

Strategy E: Riparian Habitat Improvements

Overview. Riparian areas include wetlands and the areas within the active floodplains of streams. Properly functioning riparian areas protect stream banks from excessive erosion, maintain site-appropriate channel forms, store water in floodplain aquifers, buffer overland inputs of sediment and other pollutants and provide cover and food for fish and wildlife. Riparian conditions in the John Day Subbasin vary widely from site to site. In many areas, enhancing riparian conditions is considered to be the single most important factor in improving habitat for juvenile salmonids. Many riparian improvement projects have been undertaken over the last 30 years throughout the subbasin. Riparian improvement remains a primary focus of most watershed enhancement programs in the subbasin.

Activities that are Part of this Strategy:

E1: **Management of Riparian Grazing**

Most of the John Day Subbasin is grazed by domestic livestock, a practice that has influenced vegetative succession in many riparian areas. While in many areas livestock and functioning riparian areas coexist, careful management is required to ensure that riparian values are protected. Many programs in the subbasin have worked with landowners to provide corridor fences along creeks to exclude livestock from riparian areas. There are also many successful cases where improved management has facilitated riparian improvements without total exclusion of livestock. Tools to facilitate effective management of domestic livestock in and near riparian areas include fencing, development of off-stream water sources, and pasture rotation/rest. Financial incentives and alternate sources of forage (e.g. grassbanks) may be of use. Working with livestock managers on both public and private lands has been a focus of riparian restoration efforts in the subbasin, and should remain so.

E2: Riparian Vegetation Management

Riparian vegetation can be enhanced through plantings of desired vegetation and control of undesired vegetation. Control efforts may include prescribed burning, thinning of woody species (including juniper thickets and overstocked forest stands), and mechanical, chemical and biological weed control. In riparian areas where natural regeneration of desired vegetation is inadequate, plantings may be an effective means to jump-start riparian recovery.

E3: Floodplain Restoration

In many areas, downcutting of streams, placer and dredge mining, diking and other disturbances have separated creeks from their historic floodplains. When this occurs, spring run off does not spread out and soak in, bankside vegetation may be scoured out even as floodplain vegetation suffers from reduced moisture, and off-channel refuges used by fish in high water periods are eliminated. Floodplain restoration efforts strive to recreate the essential connection between creeks and floodplains. Floodplain restoration may range from relatively passive approaches (e.g. improving grazing management to allow establishment of vegetation that traps sediment and raises a stream bed) to active approaches such as the breaching of old dikes and leveling of mine tailings with heavy

equipment. It may often be combined with channel reconstruction, as described under Strategy D.

E4: Beaver management

Beaver are a keystone species in many streams in our area. Appropriate management of beavers can help improve many riparian areas. In areas that can sustain beaver populations, their dams can help raise water tables, provide fish habitat and prevent downcutting. In other areas, such as newly-planted riparian areas, beaver activity may need to be discouraged until sufficient vegetation is established. In general, passive management of beaver is most appropriate, based on the idea that if the habitat is available, they will find their way there. Active management, including reintroduction and relocation, may be appropriate in some cases. Efforts to develop beaver habitat and undertake public education regarding the role of beaver and how to manage them should be encouraged.

Links between this Strategy and Habitat Objectives Identified in the Plan. Riparian habitat improvement efforts may directly contribute to many objectives. For links to habitat objectives, see Table 69, Strategies – Habitat Objectives Linkages. Hypotheses relating this strategy to specific EDT variables used in the subbasin planning process are given in Table 80 below. Dispersal downstream relates to the degree of impact specific actions are anticipated to have downstream. The lag time estimates the time between a specific action and the desired biological effect.

Table 80. Linkage between Riparian Habitat Improvements and EDT Attributes

	Physical Effects	EDT Attribute	Dispersal Downstream	Lag Time to Biological Effect
1	Reduces Sediment	Sediment	High	5-15 years
2	Increases shade	Temp Max	High	5-15 years
		Temp Min	High	5-15 years
		Icing	High	15 plus years
3	Narrows and deepens the channel	Width Max	Low	5-15 years
		Width Min	Low	5-15 years
		Icing	Medium	15 plus years
4	Produces in-stream wood	Wood	Medium	15 plus years
5	Reduces potential for headcutting	Confinement-Hydro	Low	15 plus years
6	Creates habitat types	Habitat-Beaver Ponds	Medium	15 plus years
		Habitat-Off Channel	Low	15 plus years
		Habitat-Glides	Low	15 plus years

Physical Effects		EDT Attribute	Dispersal Downstream	Lag Time to Biological Effect
		Habitat-Pool	Low	15 plus years
		Habitat-Pool Tailouts	Low	15 plus years
		Habitat-Backwater Pools	Low	15 plus years
		Habitat-Small Cobble	Low	15 plus years
		Habitat-Large Cobble	Low	15 plus years
7	Promotes riparian vegetation growth	Riparian Function	Low	15 plus years
8	Moderates high and increases low flows	Flow Low	High	15 plus years
		Flow High	High	15 plus years
9	Increases sinuosity	Channel Length	Medium	15 plus years
		Gradient	Medium	15 plus years
Biological Effects				
1	Increases food supply	Benthic Community Richness	Medium	15 plus years
2	Increases cover	Predation Risk	Low	15 plus years
3	Increases spawning populations and carcass availability	Salmon Carcasses	Medium	15 plus years
4	Lower water temperatures reduce rough and forrage fish	Fish Community Richness	High	15 plus years
5	Lower water temperature reduces stress induced pathogens	Fish Pathogens	High	15 plus years

Geographic Relevance at HUC5 Level. See Figure 55 for a display of the relative priority for riparian habitat improvements for each HUC5 watershed in the John Day Subbasin. The priorities are rated 1 to 4 with 1 being low priority, 2 being moderate priority, 3 being high priority and 4 being very high priority.

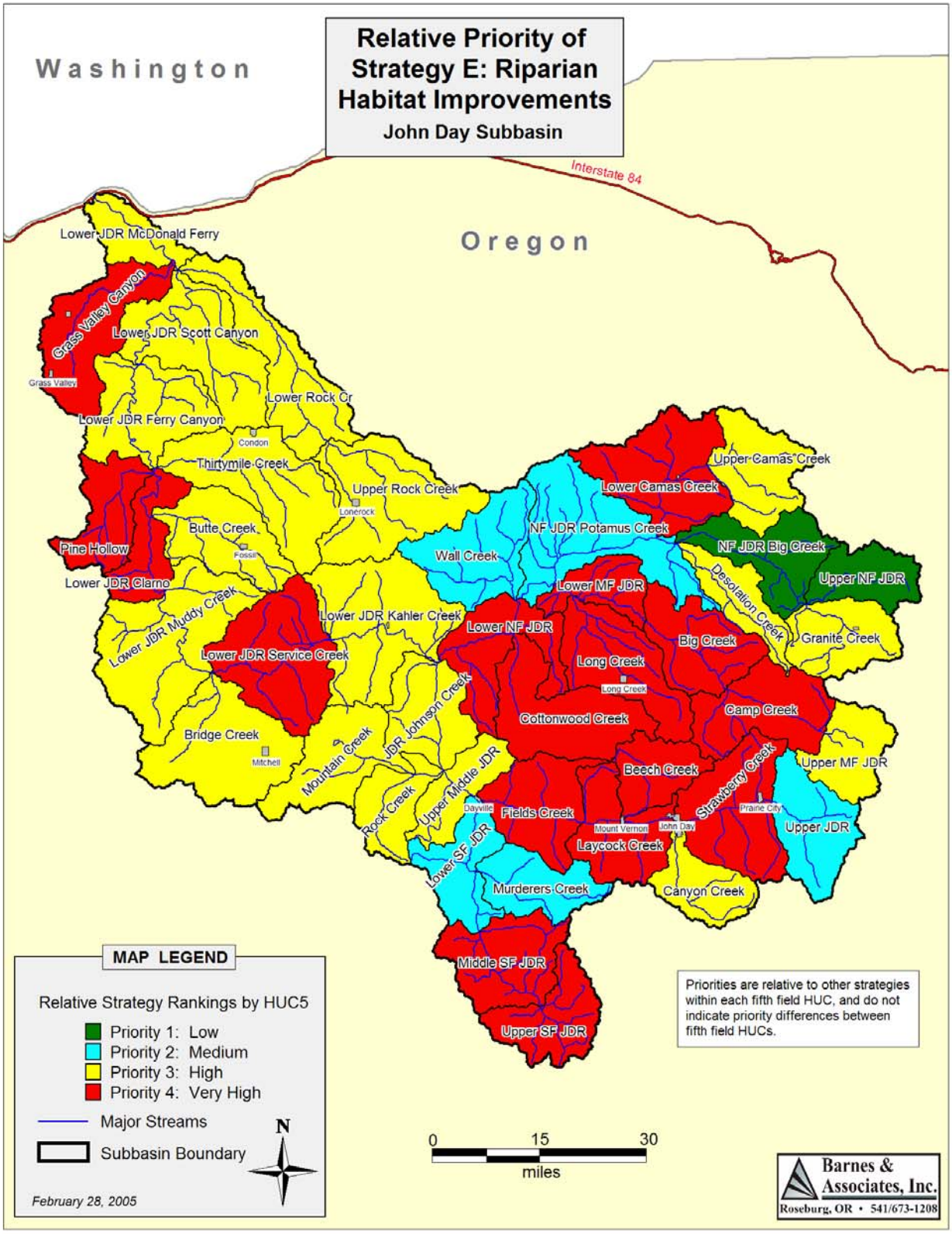


Figure 55. Map illustrating relative priority for riparian habitat improvements by HUC5.

Strategy F: Control Pollution Sources

Overview. In general, water quality in the John Day Subbasin is quite high. Point sources of pollution are rare, but should be addressed where they exist and significantly affect fisheries habitat. Existing point sources include discharges from historic mines (including several designated Superfund sites), faulty septic and waste treatment systems, and concentrated animal feeding operations. The actions described here focus on these point sources. Non-point sources of sediment and increased temperature can be addressed using the other strategies identified in this plan. Oregon DEQ's 303(d) list identifies water bodies in the subbasin that are deemed to be polluted. The Senate Bill 1010 Agriculture Water Quality Management Act and the DEQ's TMDL planning process both seek to identify and address pollution sources in the subbasin. See Section 3.1.2, Subbasin Existing Water Resources, for more information on these regulatory programs.

Activities that are Part of this Strategy:

F1: Remediation of Mine-related Discharges

In the upper North Fork and Granite Creek areas, there is a 150-year legacy of hardrock mining. At several sites, mine wastes have contaminated surface waters. In the past this has resulted in documented fish kills, and is believed to be associated with sub-lethal stress in fish as well. Efforts to clean up these sites should be given high priority.

F2: Best Management Practices for Development & Waste Management

Domestic septic systems and small wastewater treatment facilities can be sources of water contamination. While they are relatively limited in the John Day Subbasin, they should be managed according to applicable best management practices to ensure that they do not negatively impact fisheries habitat.

F3: Appropriate Management of Animal Feeding Operations

While few high intensity feed lots exist in the subbasin, many ranchers winter cattle in confined areas, often in close proximity to water sources. Larger operations are regulated as CAFO/AFOs by ODA and the EPA. Opportunities should be made available for any livestock operators who would like to reconfigure feeding operations to minimize any negative impacts on fisheries habitat. Typical improvements include creating stream-side buffers, containing/managing wastes and run-off, and providing alternative water sources.

F4: Return Flow Improvement Projects

In those areas where concentrated return flows from irrigation degrade water quality, projects that improve the quality of return flows may be appropriate. These may include piping return flows underground to cool them, installing settling ponds to reduce suspended sediment, and adjusting irrigation practices to reduce negative impacts. Several successful efforts to cool return flows have been completed between John Day and Prairie City on the upper mainstem.

Links between this Strategy and Habitat Objectives Identified in the Plan. The activities described as part of this strategy can directly contribute to reducing contamination from historic mines, maintaining existing high water quality, minimizing unnatural factors causing dissolved

oxygen fluctuations, and minimizing unnatural rates of erosion from uplands. For links to habitat objectives, see Table 69, Strategies – Habitat Objectives Linkages. Hypotheses relating this strategy to specific EDT variables used in the subbasin planning process are given in Table 81 below. Dispersal downstream relates to the degree of impact specific actions are anticipated to have downstream. The lag time estimates the time between a specific action and the desired biological effect.

Table 81. Linkage between Controlling Pollution Sources and EDT Attributes

	Physical Effects	EDT Attribute	Dispersal Downstream	Lag Time to Biological Effect
1	Provide localized thermal refugia	Temp Max	Medium	None
2	Reduce heavy metals	Misc. Toxic Waste	High	None
		Metals Water Column	High	None
3	Reduce run-off from confined animal feedlots	Nutrient Enrichment	High	None
4	Reduce non-point agricultural run-off	Riparian Function	High	Less than 5 yrs
		Nutrient Enrichment	High	Less than 5 yrs
5	Reduce nutrient loading	Dissolved Oxygen	High	Less than 5 yrs
	Biological Effects			
1	Increases aquatic insect production	Benthic Community Richness	Low	Less than 5 yrs
2	Reduces stress inducing pathogens	Fish Pathogens	High	Less than 5 yrs
3	Increases juvenile production	Fish Community Richness	High	None

Geographic Relevance at HUC5 Level. See Figure 56 for a display of the relative priority for controlling pollution sources for each HUC5 watershed in the John Day Subbasin. The priorities are rated 1 to 4 with 1 being low priority, 2 being moderate priority, 3 being high priority and 4 being very high priority.

Figure 56. Map illustrating relative priority for controlling pollution sources by HUC5.

Strategy G: Protect Existing High Quality Habitat Areas

Overview. Many areas in the John Day Subbasin currently provide high quality fish and wildlife habitat and/or are expected to do so in the near future given continuation of current management direction. Protecting these areas from deleterious changes is an essential part of maintaining and improving fisheries habitat in the subbasin. A wide variety of tools are available to protect habitat values on private and public lands.

Activities that are Part of this Strategy:

G1: Acquisition & Management of Land

Where extremely high habitat values are present, it may be desirable to purchase private lands with the specific goal of protecting and enhancing those habitat values. Existing examples in the John Day Subbasin include the Pine Creek, Forrest and Oxbow Conservation Areas which were purchased by the CTWSRO in conjunction with BPA.

G2: Acquisition & Management of Conservation Easements

Conservation easements are an effective tool for gaining assurances from a landowner that conservation values will be protected. In many cases, conservation easements may be preferable to outright land acquisition as they retain private ownership, are often compatible with economic uses of the land, are cheaper than acquisitions, and require less long-term maintenance. Much depends on the specific nature of the easement that is negotiated between the landowner and the purchaser of the easement. Existing examples in the subbasin include the Paige Ranch easement held by the Grant Soil and Water Conservation District and several easements held by the Rocky Mountain Elk Foundation.

G3: Adoption & Management of Cooperative Agreements

Cooperative agreements are an effective way for landowners and conservation partners to document voluntary commitments regarding protection of conservation values on private lands. Many such agreements have been signed as part of riparian improvement projects in the subbasin. These often document commitments made by landowners in exchange for technical, financial, and material assistance with conservation projects.

G4: Implementation of Special Management Designations On Public Lands

While most of the subbasin's public lands are managed as multiple-use areas in which fish and wildlife habitat protection is incorporated as one of several management objectives, specific areas with high habitat values can be managed under special designations that put a primary emphasis on protecting fish and wildlife habitat. Existing examples include wilderness areas, anadromous fish emphasis areas designated in forest plans, and the BLM's North Fork Trade Lands which have a congressional mandate for fish & wildlife conservation. While the subbasin planning process did not identify specific needs for new designations, many participants emphasized the need to maintain existing special-use designations meant to protect fisheries habitat.

Links between this Strategy and Habitat Objectives Identified in the Plan. Protection of existing high quality habitat areas is a broad strategy capable of contributing to meeting all of the biological habitat objectives identified in this plan. Many objectives are likely to be met just by

habitat protection and the associated natural recovery of upland and/or riparian areas. Land acquisitions, easements, and cooperative agreements may also facilitate the implementation of active restoration projects. The specific objectives addressed by each protection effort will vary, and must be assessed on a case-by-case basis. For links to habitat objectives, see Table 69, Strategies - Habitat Objective Linkages. Hypotheses relating this strategy to specific EDT variables used in the subbasin planning process are given in Table 82 below. Dispersal downstream relates to the degree of impact specific actions are anticipated to have downstream. The lag time estimates the time between a specific action and the desired biological effect.

Table 82. Linkage between Protecting High Quality Habitat Areas and EDT Attributes

Physical and Biological Effects		EDT Attribute	Dispersal Downstream	Lag Time to Biological Effect
1	Maintain and Protect current high quality habitat conditions	Flow High	High	None
		Flow Low	High	None
		Flow Interannual	High	None
		Channel Length	None	None
		Width Max	None	None
		Width Min	None	None
		Gradient	None	None
		Confinement-Hydro	None	None
		All Habitat Types	None	None
		Bed Scour	Low	None
		Icing	Medium	None
		Riparian Function	None	None
		Embeddedness	Medium	None
		Fine Sediment	Medium	None
		Wood	Low	None
		All Water Quality Parameters	High	None
		All Biological Parameters	Low	None

Geographic Relevance at HUC5 Level. See Figure 57 for a display of the relative priority for protecting high quality habitat areas for each HUC5 watershed in the John Day Subbasin. The priorities are rated 1 to 4 with 1 being low priority, 2 being moderate priority, 3 being high priority and 4 being very high priority.

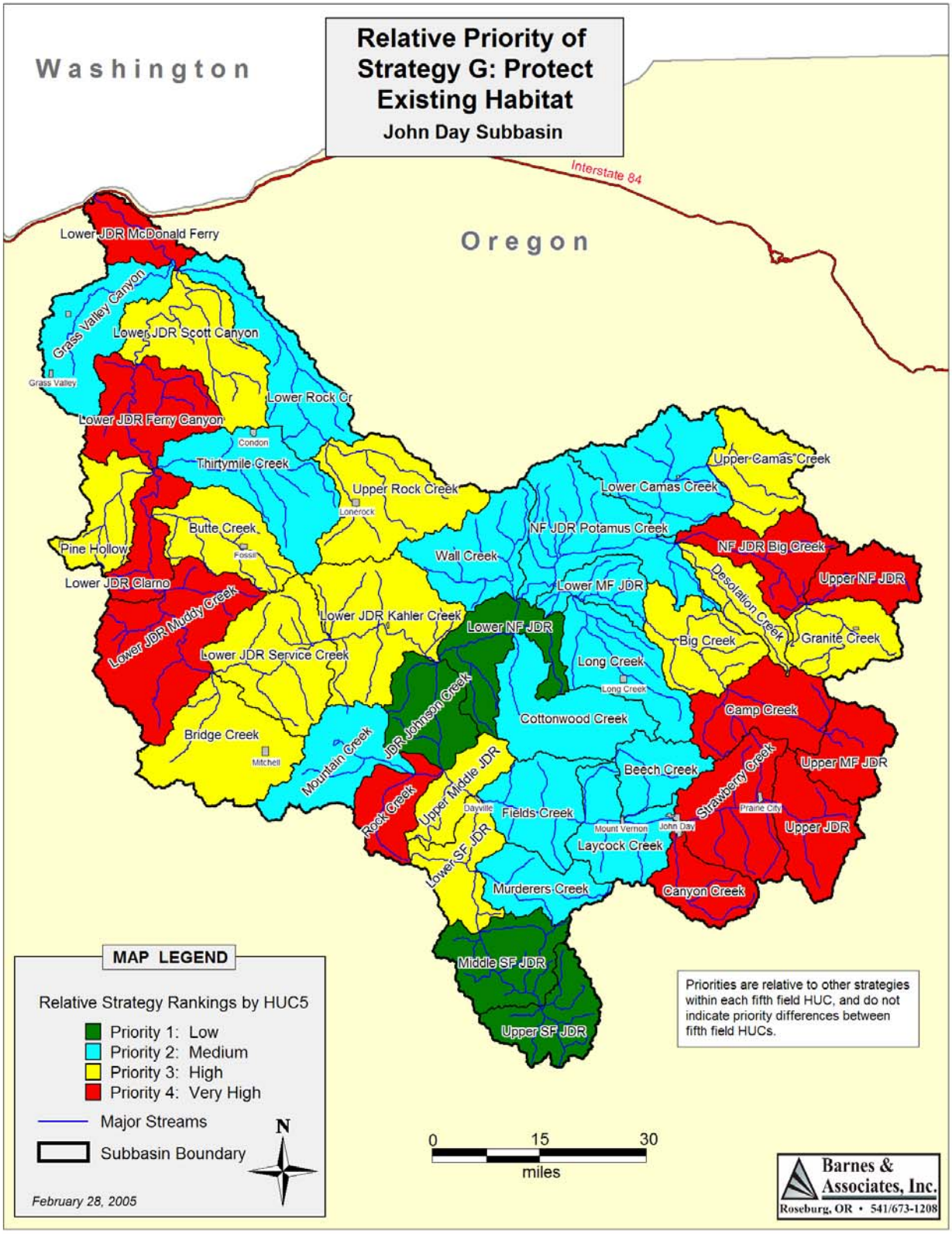


Figure 57. Map illustrating relative priority for protecting high quality habitat by HUC5.

Strategy H: Upland Improvement Projects

Overview. Upland improvement projects are those projects that are not in or directly adjacent to established stream courses. Upland improvements can be obtained through vegetative, structural, or management activities and are designed to improve water quality and overall watershed health. They generally aim to improve vegetation for wildlife, livestock, and human uses, filter pollutants (e.g. chemicals, nutrients, sediment), reduce erosion, increase the infiltration of precipitation and/or recharge groundwater aquifers.

Activities that are Part of this Strategy:

H1: Appropriate Livestock Grazing Management

Effectively managed grazing is a key element in maintaining upland health. Tools such as improved pasture fencing, livestock water developments, herding, salting, and proper stocking facilitate effective rotational grazing systems. Assistance should be available to ranchers who are interested in cost-shares and technical assistance that will improve grazing management.

H2: Minimize Sediment & Erosion Impacts from Forest Harvest Activities

Forestry operations should be conducted in a manner that minimizes negative effects on watershed values. Adherence to the Oregon Forest Practices Act is a key element in assuring this. Specific activities that may help minimize impacts include proper development and management of logging trails and roads, and effective design and installation of stream crossings.

H3: Wet Meadow Restoration

Seasonally-saturated wet meadows play a critical role in supporting a wide array of wildlife and plant species and in providing base flows to adjacent creeks and streams. Effective management of wet meadows will ensure that dense site-appropriate vegetation and a high water table are maintained. Efforts to retain moisture and stop any downcutting and gullying should be emphasized. Check dams, road drainage improvements in meadow areas, and appropriate grazing and vegetation management all play a role in properly managing these areas.

H4: Vegetation Management

The type and status of vegetation in upland areas have a great bearing on the hydrological functioning of a watershed and can significantly affect downstream fisheries habitat. Properly functioning upland vegetation will support a wide range of wildlife, promote infiltration of precipitation and the recharge of groundwater, prevent erosion and downstream sedimentation, and moderate peak flows and enhance base flows in adjoining waterways. Tools to be used to promote and maintain site-appropriate vegetation include reseeding, tree planting, weed control, brush management, juniper thinning, forest stand thinning, and prescribed burning. All of these activities strive to maintain vegetation species in appropriate densities and arrangements.

H5: Road System Management
Roads are an essential element in the subbasin's natural resource-based economy. Poorly constructed and maintained roads can also cause a range of environmental damages, including increased sedimentation and erosion, channelization of overland flows, increased flashiness of runoff, and reducing infiltration. Such road-related problems should be addressed wherever possible. Maintaining a high-quality road system will involve proper maintenance and improvement of active roads, drainage and stream crossing improvements, and rerouting, decommissioning and/or obliterating problematic road segments.

H6: Erosion and Runoff Control in Agricultural Areas
Agricultural operations can change the hydrology of a watershed, often resulting in increased erosion and sedimentation and flashier run-off of precipitation. Many tools exist that can be used to address these concerns, including:

Terracing and Water and Sediment Control Basins
These two practices capture, store, and safely release runoff during peak storm events and allow sediment to drop out of suspension in runoff (thus reducing offsite sedimentation damage to the watershed below).

Grassed Waterways, Filter Strips and Other Upland Vegetative Buffers
These practices reduce peak flow velocities as runoff moves through a watershed, allow sediment to drop out of suspension in runoff (thus reducing offsite sedimentation damage to the watershed below) and filter pollutants from runoff.

Crop Residue Management
Effective management of crop residues can decrease erosion by providing surface roughness, subsurface soil stability, and increased infiltration of runoff.

Cropping Systems
Different cropping systems have varied effects on erosion and weed cycles. Changing or modifying cropping systems may improve water quality through increased infiltration and reduced erosion.

H7: Developed Area Runoff Management
Areas of dense development can increase impervious areas, reducing infiltration and increasing the flashiness of runoff. Developed areas may also add contaminants to overland flows. While developed areas are quite rare in the subbasin, efforts should be made to minimize any negative hydrological effects of both existing and planned development.

Links between this Strategy and Habitat Objectives Identified in the Plan. Upland improvement efforts may directly contribute to many objectives. For links to habitat objectives, see Table 69, Strategies – Habitat Objectives Linkages. Hypotheses relating this strategy to specific EDT variables used in the subbasin planning process are given in the following two

tables. Table 83 shows the linkages for upland vegetation projects (controlling noxious weeds, controlling junipers, wetland and meadow restoration, and grazing management) and the EDT attributes. Table 84 shows the linkage between upland physical and structural projects (road management, timber harvesting management, mining, fire suppression, and subdivision developments) and the EDT attributes. Dispersal downstream relates to the degree of impact specific actions are anticipated to have downstream. The lag time estimates the time between a specific action and the desired biological effect.

Table 83. Linkage between Upland Improvement Vegetation Projects and EDT Attributes

	Physical Effects	EDT Attribute	Dispersal Downstream	Lag Time to Biological Effect
1	Alteration of hydrograph			
	a. Moderates high and increases low flows			
	b. Increases ground water storage	Flow High	High	5-15 years
		Flow Low	High	0-5 years
		Flow Interannual	High	5-15 years
		Temp Max	High	5-15 years
		Temp Min	High	5-15 years
		Icing	High	5-15 years
		Bed Scour	High	5-15 years
		Width Max	High	5-15 years
		Width Min	High	5-15 years
2	Reduction or increase of sediment	Fine Sediment	High	Up to 5 years
		Embeddedness	High	5-15 years
	Biological Effects			
1	Increases food supply	Benthic Community Richness	High	5-15 years
2	Cooler water increases habitat effectiveness	Fish Community Richness	High	5-15 years
3	Lower water temperature reduces stress induced pathogens	Fish Pathogens	High	15 plus years

Table 84. Linkage between Upland Physical/Structural Improvements and EDT Attributes

	Physical Effects	EDT Attribute	Dispersal Downstream	Lag Time to Biological Effect
1	Alteration of hydrograph			
	a. Moderates high and increases low flows			
	b. Increases ground water storage	Flow High	High	5-15 years
		Flow Low	High	5-15 years
		Flow Interannual	High	5-15 years
		Temp Max	High	5-15 years
		Temp Min	High	5-15 years
		Icing	High	5-15 years
		Bed Scour	High	5-15 years
		Width Max	High	5-15 years
		Width Min	High	5-15 years
2	Reduction or increase of sediment	Fine Sediment	High	Less than 5 yrs
		Embeddedness	High	5-15 years
3	Increased large wood availability	Wood	Medium	Less than 5 yrs
	Biological Effects			
1	Increases food supply	Benthic Community Richness	High	5-15 years
2	Cooler water increases habitat effectiveness	Fish Community Richness	High	5-15 years
3	Lower water temperature reduces stress induced pathogens	Fish Pathogens	High	15 plus years

Geographic Relevance at HUC5 Level. See Figure 58 for a display of the relative priority for upland improvement projects for each HUC5 watershed in the John Day Subbasin. The priorities are rated 1 to 4 with 1 being low priority, 2 being moderate priority, 3 being high priority and 4 being very high priority.

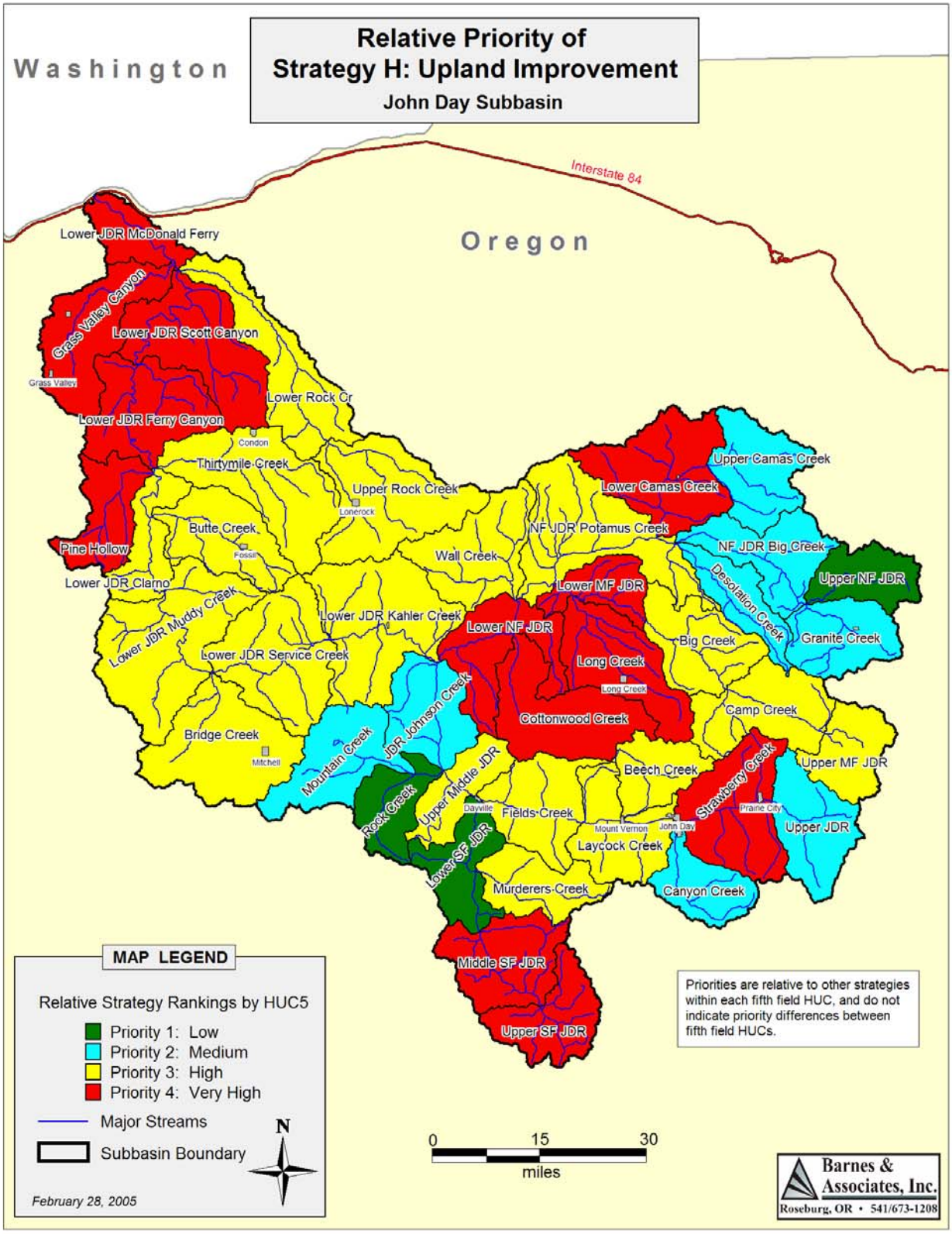


Figure 58. Map illustrating relative priority for upland improvement projects by HUC5.

Strategy I: Education/Outreach

Overview. Education and outreach efforts strive to provide ongoing information to the public concerning the value and importance of the John Day Subbasin and its natural resources. These efforts encourage sustainable use of natural resources in the subbasin by landowners, agencies, recreationists and the public at large.

Activities that are Part of this Strategy:

I1: Outreach to Resource Users and Managers
Promote the sustainable use of natural resources in the John Day Subbasin to landowners, agencies, recreationists and the public by providing information on and demonstrations of effective management and conservation practices.

I2: Use of Demonstration Projects
Showcase sustainability practices whenever possible in the subbasin, such as through the demonstration of riparian restoration and field tours.

I3: Outreach to Government Officials
Provide local government officials with ongoing information on sustainable use of natural resources in order to help guide sound decisions for land use and socio-economic development.

I4: Outreach to the General Public
Provide ongoing educational information on the sustainable use of natural resources in the John Day Subbasin to the public at large through e-newsletters, print and voice media, printed materials such as brochures; speaker forums, and natural resource organizations' websites and related internet links.

I5: Support of Regional Outreach Efforts
Support other efforts in the subbasin and the northwest that promote the sustainable use of natural resources.

Links between this Strategy and Habitat Objectives Identified in the Plan. Upland improvement efforts may directly contribute to many objectives. All habitat objectives identified in this plan can be affected by the actions of those whose attitudes and behaviors are influenced by education and outreach efforts. Education and outreach efforts may identify specific objectives that may be affected by behaviors promoted by that effort; other efforts may work more broadly to build general support for fish and wildlife conservation efforts in the subbasin. For links to habitat objectives, see Table 69, Strategies – Habitat Objectives Linkages. Hypotheses relating this strategy to specific EDT variables used in the subbasin planning process are given in Table 85 below. Dispersal downstream relates to the degree of impact specific actions are anticipated to have downstream. The lag time estimates the time between a specific action and the desired biological effect.

Table 85. Linkage between Education and Outreach with EDT Variables

Physical and Biological Effects		EDT Attribute	Dispersal Downstream	Lag Time to Biological Effect
1	Direct and indirect benefits	Virtually all	Basinwide	Variable lag dependent upon action taken

Geographic Relevance at HUC5 Level. See Figure 59 for a display of the relative priority for education and community outreach for each HUC5 watershed in the John Day Subbasin. The priorities are rated 1 to 4 with 1 being low priority, 2 being moderate priority, 3 being high priority and 4 being very high priority.

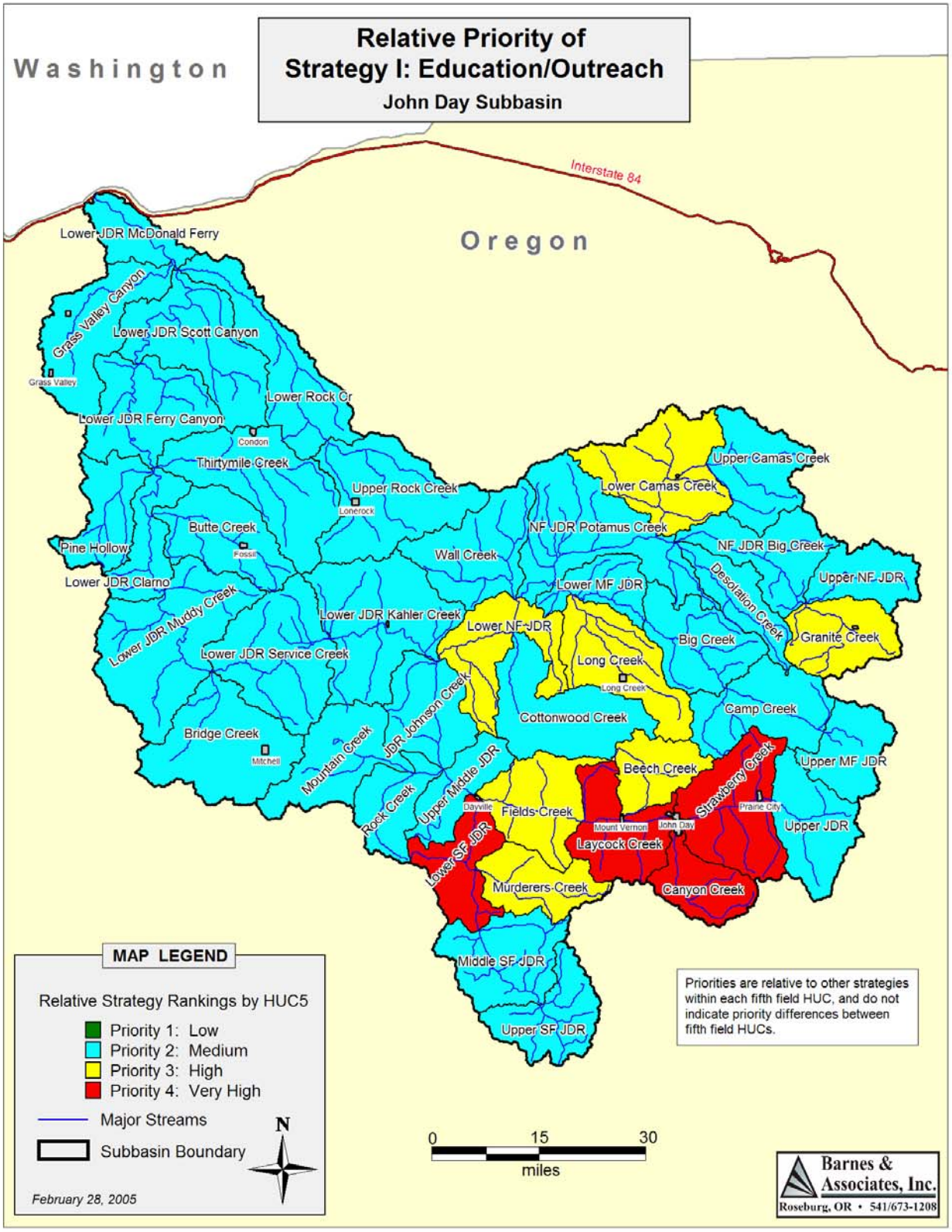


Figure 59. Map illustrating relative priority for education/outreach by HUC5.

Strategy J: Manage recreational and tribal subsistence and ceremonial fisheries to protect wild stocks and reduce impacts of hatchery and invasive species

Overview. Recreational and tribal fisheries on all indigenous fish species will be managed for long term sustainability. Long term sustainability is dependent on several factors, including abundance, productivity, reproductive independence, threat of hybridization with other species, and distribution.

Abundance is measured relative to what percentage of habitat is adequately seeded with juvenile fish. Productivity is a measure of how many adults are produced by each pair of spawning fish. Reproductive independence is the percentage of fish that result from wild versus hatchery fish spawning in streams. Threat of hybridization is a measure of what percentage of native species have cross-bred with non-native (introduced) species. Distribution is a measure of how much historically-occupied habitat is currently occupied.

Escapement goals for steelhead and bull trout will be consistent with NOAA Fisheries and US Fish and Wildlife recovery goals, respectively.

Activities that are Part of this Strategy:

1. Improvements in wild fish populations will be accomplished by enhancing and protecting habitat.
2. Habitat improvements and fish population recovery need to be documented by ongoing extensive monitoring and evaluation projects. These projects include steelhead and chinook adult spawning surveys, determining chinook and steelhead smolt-to-adult survival rates, determining affects of push-up dam removal, determining accuracy of historic steelhead spawning surveys, and determining effectiveness of converting out-of-stream water use to in-stream use.
3. When needed, recreational steelhead fisheries will require catch and release of un-marked (wild) fish and encourage harvest of marked hatchery fish that stray into the subbasin, consistent with the draft Fisheries Management and Evaluation Plan (ODFW 2002).
4. When steelhead populations recover to levels where recreational or tribal harvest will not jeopardize sustainability, a limited harvest of wild fish will be allowed, consistent with the draft Fisheries Management and Evaluation Plan.
5. Tribal subsistence and ceremonial fisheries management goals will be developed by the co-managers to ensure long term sustainability of steelhead and spring chinook populations.
6. When the chinook population reaches escapement goals, a limited recreational fishery will be allowed. Harvest goals will be developed by the affected tribes and fishery management agencies.
7. Recreational harvest of resident fish species will be managed to ensure long term productivity and abundance. This will be accomplished by restricting the number and size of resident fish that can be retained.
8. In order to reduce hatchery/wild fish interactions, no hatchery rainbow trout will be stocked in streams.
9. Where hatchery fish are used to supplement wild production of native fish in standing water bodies, fish incapable of reproducing (sterile) will be used.

Links between this Strategy and Habitat Objectives Identified in the Plan. The John Day Subbasin will be managed for wild fish production over hatchery production. The rationale for this is that the John Day River is one of the few remaining subbasins in the Columbia River drainage that is managed exclusively for wild anadromous salmonids. Because it is managed for wild fish production it has important scientific and cultural value throughout the state and the region. Survival rates of spring chinook and summer steelhead populations within the John Day Subbasin are being used as benchmarks to measure recovery of similar populations in other subbasins that are not managed for wild fish production.

This strategy directly addresses reducing direct mortality and stress from human activities and managing the subbasin for wild fish production. For links to habitat objectives, see Table 69, Strategies - Habitat Objective Linkages. Hypotheses relating this strategy to specific EDT variables used in the subbasin planning process are given in Table 86 below. Dispersal downstream relates to the degree of impact specific actions are anticipated to have downstream. The lag time estimates the time between a specific action and the desired biological effect.

Table 86. Linkage between Recreational and Tribal Fisheries with EDT Variables

	Physical Effects	EDT Attribute	Dispersal Downstream	Lag Time to Biological Effect
1	Tribal/State coordination	See below for benefits	NA	NA
2	Angling regulation	See below for benefits	NA	NA
3	Enforcement of regulations	See below for benefits	NA	NA
4	Maintain area closures	See below for benefits	NA	NA
	Biological Effects			
1	Manage to reach Plan fish population objectives	Fish Community Richness	Basinwide	15 plus years
		Carcasses	Basinwide	15 plus years
2	No stocking of flowing waters with hatchery fish	Predation Risk	Basinwide	None
3	Prevent introduction and spread of fish diseases	Fish Pathogens	Basinwide	0-5 years
4	Reduce hatchery/wild fish interactions	Fish Species Intro	Basinwide	5-15 years
5	Nutrient transfer from riparian corridor to ridgetops	Benthic Community Richness	Basinwide	15 plus years

Geographic Relevance at HUC5 Level. See Figure 60 for a display of the relative priority for managing recreational and tribal subsistence and ceremonial fisheries to protect wild stocks and reduce impacts of hatchery and invasive species for each HUC5 watershed in the John Day Subbasin. The priorities are rated 1 to 4 with 1 being low priority, 2 being moderate priority, 3 being high priority and 4 being very high priority.

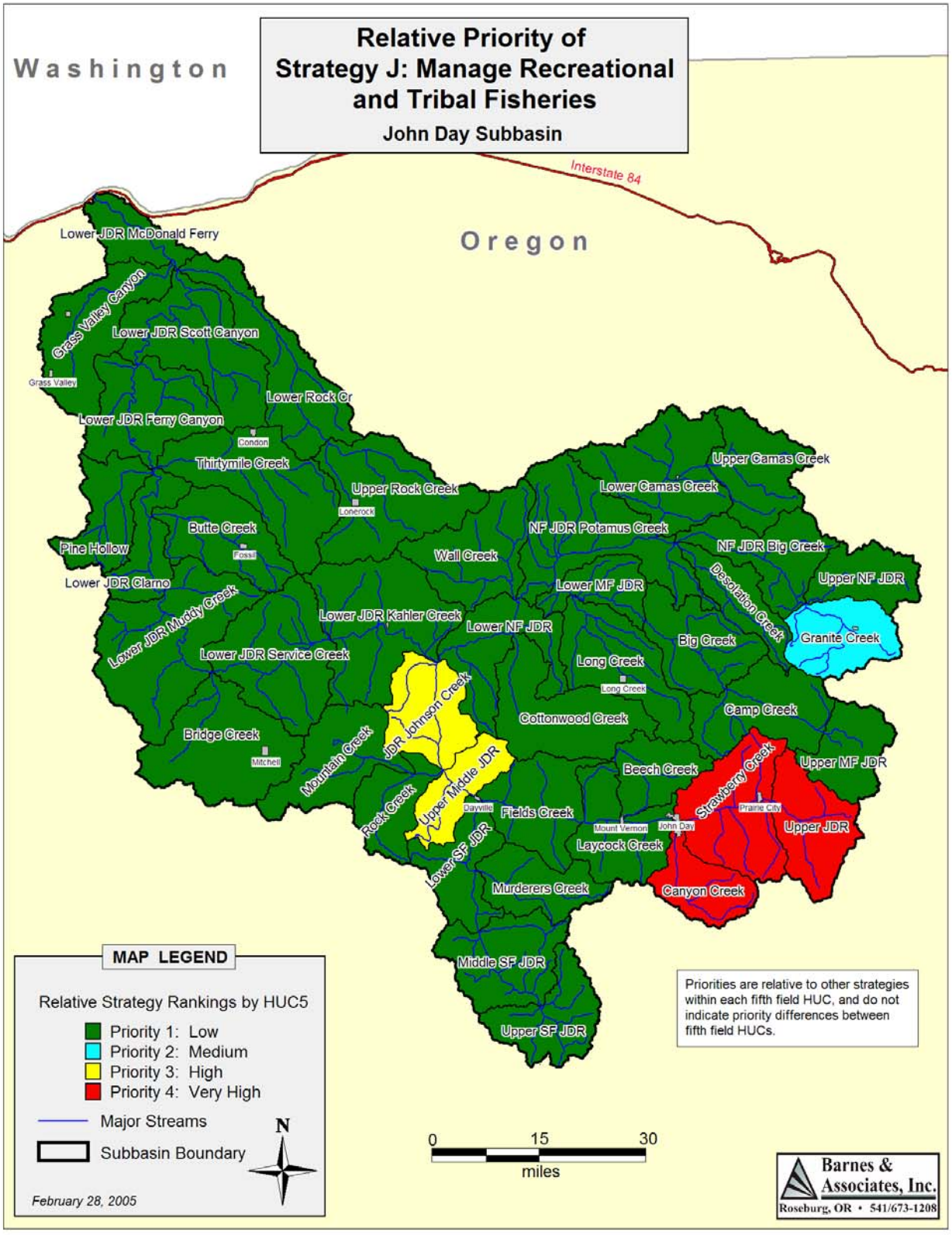


Figure 60. Map illustrating relative priority for managing recreational/tribal fisheries by HUC5.

5.2.2.5 Project Prioritization Framework

The John Day Subbasin is a large watershed with widespread fish habitat and diverse stressors. The wide dispersal of focal species throughout the subbasin and the need to address widespread changes in habitat make prioritizing specific actions challenging. Presented here is a prioritization framework that will help assess proposed projects to ensure that widespread restoration efforts are done in the most efficient manner. Fisheries project proposals will be evaluated based on three sets of criteria that address 1) the benefits to focal species, 2) technical soundness, and 3) socio-economic appropriateness. The specific criteria identified by the coordination team are listed here and discussed in detail below.

Set 1) Benefits to Focal Species

1. The project addresses a direct threat to focal species.
2. The project improves habitat quality for focal species in priority areas (as identified in the subbasin plan).
3. The project improves habitat quality in other areas used by focal species.
4. The project improves habitat in areas that do not now, but could potentially support focal species.
5. The project benefits terrestrial wildlife as well as aquatic species.

Set 2) Technical Soundness

1. The project relies on sound principles established by research and/or local experience.
2. The project addresses the need for monitoring and evaluation.

Set 3) Socio-economic Appropriateness

1. The project complements local efforts/organizations.
2. The project has community and/or landowner support.
3. The project integrates with economic uses of the watershed.
4. The project promotes awareness and education about watershed functions.
5. The project creates benefits that are long-term and self-sustaining.

Use of Criteria

Reviewers will assess the degree to which each project meets these criteria on a qualitative basis (e.g. a very high, high, medium, low ranking). The criteria in Set 1, Benefit to Focal Species, are listed hierarchically, so that a project that ranks high based on criteria 1 is a higher priority than one that ranks high on other criteria, but does not address criteria 1. The other two sets of criteria are not organized hierarchically. The onus is on project sponsors to explain why their proposal is a priority, with reference to these criteria. All project proposals should provide the information needed to address these criteria. Project proposals that develop quantitative hypotheses about how fish populations will respond to proposed activities are highly encouraged, but not required. The EDT model developed for this subbasin plan is a powerful tool for developing such hypotheses that should be made available to those developing project proposals.

Discussion of Criteria

Set 1: Benefits to Focal Species

The primary focus of NWPCC Fish and Wildlife program fisheries projects is on restoring fish populations affected by the Columbia River power system. Funded projects must have clear benefits to focal fish species (in this plan, these have been identified as summer steelhead, spring chinook, redband trout, bull trout and cutthroat trout). Criteria to assess relative benefit to focal species are listed below in order of priority:

1) The project addresses a direct threat to focal species.

Highest priority should be given to projects that eliminate or reduce direct causes of mortality for focal species. Examples include screening projects that prevent fish from entrapment in irrigation systems, fish-friendly diversions that eliminate regular in-stream use of heavy equipment, mine remediation projects that prevent toxic spills and associated fish kills, passage barriers that cause mortality by preventing access to refugia, and rewatering of stream reaches used by focal species and chronically dewatered by irrigation withdrawals. Addressing causes of direct mortality will reduce immediate threats to focal species, help land owners, managers and others avoid potential liability under the ESA, and help BPA and other FCRPS partners address NOAA Fisheries mitigation requirements.

2) The project improves habitat quality for focal species in priority areas.

One of the key features of this subbasin plan is its identification of priority HUC5 watersheds based on a synthesis of EDT's quantitative modeling and local knowledge. High priority should be placed on projects that protect and improve focal species habitat in priority areas and address the limiting factors/priority strategies identified for those areas. Factors to consider in setting this ranking include the number of focal species that will benefit, the degree to which habitat quality will be improved, the degree to which a self-sustaining situation is created, and the cost-effectiveness of the project. Quantitative hypotheses of fish response to project implementation will be especially useful here.

3) The project improves habitat quality in other areas used by focal species.

Otherwise strong proposals that address areas that provide habitat for focal species but are not in areas specifically identified as priority areas in the subbasin plan can be valuable and should be encouraged. An example would be a proposal that provides a simple and cost-effective means to restore a small area with excellent habitat potential in a larger watershed that did not rank high because there are few such areas in it. There may be excellent opportunities that arise in such areas (due to landowner interest and other factors) that may serve as key catalysts for future work in priority areas. These opportunities should be seized whenever possible, though proposals that are otherwise equal and meet criteria 1 and 2 will generally be higher priority.

4) The project improves habitat that does not now, but could potentially support focal species.

While the highest priorities should be on protecting and enhancing currently utilized habitat, there may be valuable opportunities for enhancing currently unoccupied habitat to facilitate recolonization by focal species. Such proposals should explain what factors currently inhibit use of the project area and how the project will address those.

5) The project benefits terrestrial wildlife as well as aquatic species.
While fisheries projects are the primary focus of this plan, terrestrial wildlife species can also benefit from fisheries restoration projects. Projects that benefit other forms of wildlife are to be given higher priority than otherwise equivalent projects that do not.

None of these criteria are meant to automatically prioritize in-stream or riparian projects higher than upland projects. The coordination team emphasizes that upland projects often have significant effects on in-stream habitat through changes in sediment transport, runoff and groundwater recharge. These upland projects are encouraged as long as the rationale linking them to specific improvements in fish habitat is clearly articulated and technically sound.

Set 2: Technical Soundness
The second set of criteria focuses on the technical soundness of the proposed projects. Higher priority should be given to projects that are 1) based on the best existing information and that 2) strive to assess remaining uncertainties through monitoring and evaluation.

1) The project relies on sound principles established by research and/or local experience.
This assessment is traditionally the role of the ISRP. We believe that local partners can also provide valuable additional assessments based on experience with past project implementation and local knowledge at all levels (within agencies, landowners, others), and that this information should be solicited and provided to Power Planning Act decision-makers.

2) The project addresses the need for monitoring and evaluation.
Projects must identify how they will address uncertainties and evaluate the effectiveness of project implementation. High priority should be given to projects that articulate a well-thought out, practical, and cost-effective monitoring and evaluation strategy. Projects may do so by proposing new monitoring and research activities and/or by demonstrating how previous work or concurrent work by others makes this unnecessary. Efforts that document linkages between project activities and fish production should be a high priority.

Set 3: Socio-Economic Integration
The third set of criteria focuses on the socio-economic integration of proposed projects. When evaluating among proposals that are all technically sound and have clear benefits to focal species, additional priority should be given to projects that utilize existing local resources, build on community needs and interests, and foster awareness of watershed resources and how local decisions affect them. The following criteria are intended to help evaluate these factors.

1) The project complements local efforts/organizations.
Projects that establish strong partnerships with existing locally-based organizations and capitalize on their experience should be given high priority. Projects that do not demonstrate strong linkages to local partners and/or require creating significant new organizational infrastructure should be carefully reviewed.

2) The project has community and/or landowner support.
Conservation is often a contentious topic in the John Day Subbasin. Projects that undertake habitat improvement in a manner that addresses local concerns and builds landowner support for

programs should be high priority. Projects that become locally unpopular can have negative impacts on the success of other conservation projects in the area. Project proposals should provide information that allows reviewers to assess existing and anticipated local responses to project activities.

3) The project integrates with economic uses of the watershed.
The economies of the John Day Subbasin are built on the area's natural resources. Projects that help sustain local economic activities while ensuring conservation best practices should have high priority.

4) The project promotes awareness and education about watershed functions.
While the primary focus of NWPCC/BPA projects should be on implementing on-the-ground conservation projects, projects that work to build communication with subbasin stakeholders and encourage dialogue on watershed and fisheries issues should be encouraged.

5) The project creates benefits that are long-term and self-sustaining.
Projects that create self-sustaining situations that minimize the need for ongoing operations and maintenance resources are to be given higher priority than those that do not.

Watershed Level Prioritization
This prioritization framework is meant to ensure that projects funded by BPA and the NWPCC focus on using appropriate strategies in high priority areas. Given the scale of the subbasin and the strategic nature of this plan, the plan generally does not provide the specificity needed to decide which specific on-the-ground actions to take (i.e. the framework may provide a high priority to screening ditches in a given watershed but will not say which ditches in that watershed are the highest priorities). These site-specific decisions will generally be made by the project sponsor in conjunction with other local decision makers. This plan does provide several tools that should assist future efforts at a more fine-grained analysis. The EDT model that has been developed should be made available to project planners so that they can conduct the reach-scale analyses for specific areas, a level of analysis not feasible because of the size of the subbasin. In addition, the project database developed as part of the inventory (See Appendix X) can easily be queried based on geography, giving information about projects already implemented in any given watershed and stream. This query/report process will facilitate area-specific gap analysis as part of the project implementation process.

5.2.3 Terrestrial Species

Objectives and strategies for terrestrial species include an overall general objective and several strategies that address the entire subbasin, followed by specific objectives and strategies for each of the focal habitats.

General Objective: Complete a comprehensive review by 2007 of each of the nine focal habitat types in the John Day Subbasin, which can then be used to prioritize and guide habitat preservation and restoration activities.

Strategies:

1. Refine and ground truth data on the location, size, spatial distribution and land ownership of each of the focal habitat types existing in the subbasin.
2. For each of the focal habitat types, determine the quality of all existing habitat in the subbasin and its ecological function as related to the habitat needs of selected focal species and other obligate species (see Table 22).
3. Refine and update data currently available on the protected status of each focal habitat.
4. Identify areas not currently supporting focal habitats that, if converted to the focal habitat, would enlarge remnant size or provide connectivity between two or more extant remnants.
5. Identify areas spatially isolated from extant remnants of focal habitat that could be rehabilitated to provide new reservoir habitats for selected focal species and other obligate species.
6. Use data obtained by Strategies 1 to 5 to create GIS overlays with areas prioritized for protection, enhancement, or restoration for each focal habitat type.

Justification: The most obvious of these limitations is the lack of information on the quality of most focal habitat and its ecological function with regard to the selected focal species and other obligate species. Although the General Objective is not a biological objective in the sense of providing a quantitative expression of biological and physical changes needed to address the limiting factors, it is included in the management plan because it forms the most necessary and integral step towards achieving the remaining objectives for each focal habitat type. Because of its importance in guiding the biological objectives for each focal habitat type, the General Objective is a short-term objective with an anticipated date of completion of 2007. However, it should be noted that action on strategies associated with other objectives should not wait until the completion of the General Objective because much can be done with the current state of knowledge. Completing the General Objective will enhance existing efforts by providing the necessary information to form an integrated plan for each wildlife habitat that will be guided not only by opportunities that present themselves but also by a more holistic understanding of the protective status and condition of each habitat in the subbasin.

PONDEROSA PINE

Biological Objective 1:
Ensure that conservation plans are developed for and applied to all old growth ponderosa pine community on publicly-owned land, with emphasis on retention of old growth stands, by 2020. Voluntary private landowner participation will be included in this effort. Conservation plans must be in compliance with environmental laws, professionally-developed and peer-reviewed.

Strategies:

1. Use results generated from General Objective 1 to identify which public agencies have old growth ponderosa pine under their jurisdiction and work with land managers

with those agencies to develop conservation plans for those forest areas not currently managed with a formal conservation plan.
2. Work with voluntary landowners to develop conservation plans for old growth ponderosa pine occurring on privately-owned land.

Justification: This objective cannot be quantified until the completion of General Objective 1 because it is not known how much old growth ponderosa pine currently exists in the subbasin or how much of it is currently protected. Conservation plans designed to encourage stands of ponderosa pine with old growth characteristics are desirable because 1) managers suspect that the amount of old growth remaining in the subbasin is small, 2) old growth ponderosa pine is the only stage that provides the habitat characteristics needed by the white-headed woodpecker and other obligate ponderosa pine species, and 3) the ecological functions and inter-relationships associated with old growth forest cannot be quickly replaced.

Biological Objective 2:
Use the results of General Objective 1 to target the enhancement of degraded ponderosa pine habitat in the John Day Subbasin by 2020.

Strategies:
1. Develop and assign recommended conservation and management practices based on the ecological needs of the ponderosa pine forest-type, the white-headed woodpecker and other ponderosa pine obligate species. These practices should prescribe and promote land management practices that contribute to:
    - a mosaic of different even-aged stands making up an uneven-aged forest landscape
    - retention of large patches (minimum of 825 acres) of open mature/old growth-dominated ponderosa pine
    - retention of some dead and dying trees
    - low densities of other conifers, including lodgepole pine, white pine, and/or Douglas-fir, to complement the dominant old growth ponderosa pine component
    - 2.5 snags per acre, with each snag > 24 inches diameter at breast height (DBH), i.e. 4.5 feet above ground level
    - canopy closures between 30 and 50%
2. Work with public land agencies to implement the recommended conservation and management practices.
3. Encourage organizations and entities who work with private landowners to protect, enhance or create wildlife habitat (e.g., ODFW, ODF, USFWS, USDA, TNC, Rocky Mountain Elk Foundation) to implement the recommended conservation and management practices.

Justification: This objective uses information concerning habitat quality provided by General Objective 1 and ecological requirements of the ponderosa pine forest type, focal and obligate species to create and disseminate conservation and management practices to

public agencies, non-government organizations and private groups. These management practices will be specifically tailored to the conditions found in the John Day Subbasin.

Practices will vary depending on habitat condition and protected status, and may include:

- reducing the density of trees through the use of timber harvest
- conducting prescribed burns or allowing natural fire to stimulate plant growth, reduce unwanted woody and herbaceous species, and kill larger trees that will be future snags
- creating snags by mechanical means to achieve the targeted density of snags
- managing timber harvest levels via acquisition, easement, agreement, and/or conservation plans to achieve and protect desired habitat conditions
- managing livestock grazing to protect desired seral and phenological stages of plant growth and to minimize potential for noxious/exotic plant introductions due to ground disturbance
- using livestock grazing to achieve desired seral and phenological stages of plant growth
- using timber harvest to achieve desired seral stages of woody plant growth
- using chemical, mechanical, and biological methods to treat and suppress exotic plants
- seeding or planting herbaceous and woody plants to restore reduced or missing structural components
- Dixon (1995b) reported that white-headed woodpecker breeding territories in Oregon are approximately 800 acres in fragmented forest. A smaller parcel size may not meet white-headed woodpecker habitat requirements (depending on condition of the ponderosa pine area). Eight hundred twenty-five acres is an adequate parcel size to address all conditions, including edge effect and inaccuracy in measuring parcel size.

Biological Objective 3:
Ensure that natural ecological processes that are necessary for a functional habitat for focal and obligate species, such as fire and the retention of downed logs, are allowed to proceed.

Strategies:

1. Include the retention and occurrence of natural ecological processes as part of the recommended conservation and management practices for ponderosa pine community.
2. Explain the role of natural ecological processes to public land agencies and entities and organizations that work with private landowners to protect, create, and/or enhance wildlife habitat. Demonstrate and explain how natural ecological processes can be used to accomplish recommended conservation and management practices.

Justification: Fire is a significant factor in creating vegetation structure and composition in this habitat. Historically, this forest community experienced frequent low-severity fires. In the John Day Subbasin, fire suppression combined with grazing creates conditions that support invasion by Douglas-fir and western juniper.

Biological Objective 4:
Promote and guide the restoration of ponderosa pine community in the John Day Subbasin by the year 2020, with each restored area having a minimum parcel size of 825 acres. The amount of restoration (area in acres) is dependent on available funds and personnel.

Strategies:

1. Using data generated from General Objective 1, identify areas that, if converted back to ponderosa pine, would increase remnant size, establish connectivity between remnants of extant ponderosa pine, or allow for the introduction of fire management strategies.
2. Use conservation plans, including habitat programs, to convert these areas to ponderosa pine.

Justification: One-third of the area of this habitat type in the Pacific Northwest is imperiled (Anderson *et al*. 1998) and potentially not functioning as a viable biome. Some of the ponderosa pine habitat identified by IBIS has a vegetative composition not dominated by ponderosa pine. The combination of fire suppression and grazing in this community has favored other conifers such as Douglas-fir and western juniper. It is important to convert degraded ponderosa pine areas to viable ponderosa pine community to create new biome reservoirs and increase connectivity between extant ponderosa pine habitat.

MIXED CONIFER

Biological Objective 1:
Ensure that conservation plans are developed for and applied to mixed conifer habitat on publicly-owned land, with emphasis on maintenance of large tracts of ecologically-functional, mature (dominant trees from 100 to 300 years old), structurally and biologically diverse mixed conifer forest stands, by 2020. Voluntary private landowner participation will be included in this effort. Conservation plans must be in compliance with environmental laws, professionally-developed and peer-reviewed.

Strategies:

1. Use results generated from General Objective 1 to identify which public agencies have ecologically functional, mature (dominant trees from 100 to 300 years old), structurally and biologically diverse mixed conifer forest stands under their jurisdiction and work with land managers with those agencies to develop conservation plans for those forest areas not currently managed with a formal conservation plan.
2. Work with voluntary landowners to develop conservation plans for ecologically functional, mature, structurally and biologically diverse mixed conifer forest stands occurring on privately-owned land.
3. Use results generated from General Objective 1 to identify which public agencies have mature, structurally and biologically diverse mixed conifer forest community

under their jurisdiction and work with land managers with those agencies to develop conservation plans for those forest areas not currently managed with a formal conservation plan.

4. Work with voluntary landowners to develop conservation plans for mature, structurally and biologically diverse mixed conifer forest occurring on privately-owned land.

Justification: This objective cannot be quantified until General Objective 1 is completed because it is not known how much mature, structurally and biologically diverse mixed conifer forest community currently exists in the subbasin or how much of it is currently protected by conservation plans meeting the criteria of the John Day Subbasin Plan. A large acreage of mature, structurally and biologically diverse forest will be targeted for conservation planning because 1) this forest stage provides the habitat characteristics needed by the pileated woodpecker and other obligate mixed conifer forest species, and 2) mature forest dominated by trees at least 100 years old cannot be quickly replaced once destroyed.

Biological Objective 2:
Identify and biologically assess 244,000 acres of mixed conifer forest with limited or no conservation status by the 2018.

Strategies:

1. Use results generated from General Objective 1 to identify mixed conifer forest community with limited or no conservation status.
2. Use results generated from General Objective 1 to determine the functional ecological status of the forest areas identified in Strategy 1.

Justification: Quantification of this objective may be revised upon completion of General Objective 1 because it is not known how much mixed conifer forest with limited or no conservation status exists. The assessment generated by this Objective will be used to accomplish Biological Objective 3.

Biological Objective 3:
Begin development of conservation plans for 244,000 acres of mixed conifer forest with limited or no conservation status by 2020.

Strategy:

1. Use results generated from General Objective 2 to identify which public agencies have mixed conifer habitat with limited or no conservation status under their jurisdiction and work with these agencies to initiate development of environmental law-compliant, professionally-developed and peer-reviewed conservation plans for these forest areas..

Justification: Quantification of this objective may be revised upon completion of Biological Objective 2. Biological Objective 2 will quantify the amount of mixed conifer forest with limited or no conservation status.

Biological Objective 4:
Use the results of General Objective 1 to target the enhancement and restoration of 30% of degraded mixed conifer habitat in the John Day subbasin by 2020.

Strategies:

1. Develop and assign recommended conservation and management practices based on the ecological needs of the mixed conifer forest type, pileated woodpecker and other mixed forest obligate species. These practices should prescribe and promote land management practices that contribute to:
    - complex multi-layered closed canopies with a major component of large trees (>90 feet in height) and high basal area
    - forest tracts with minimized isolation from extensive forest and connectivity to other extant mixed conifer community
    - retention of mature seed producing trees
    - protection and enhancement of aspen stands within mixed conifer forest
    - retention of numerous uneven-aged individual trees and an understory of smaller woody plants with emphasis on multi-conifer species composition including lodgepole pine, Douglas-fir, western larch, Engelmann spruce, subalpine fir and white pine
    - retention of dead and dying trees 39 to 69 feet tall, 100 to 300 years old, and >20 inches DBH
    - the presence of dead and dying wood, with an abundance of insects
    - retention of connected forest tracts that are the maximum size possible
    - a minimum forest parcel size of 2000 acres (Bull and Jackson 1995).
2. Work with public land agencies to implement the recommended conservation and management practices.
3. Encourage organizations and entities who work with private landowners to protect, enhance, or create wildlife habitat (e.g., ODFW, ODF, USFWS, USDA, TNC, Rocky Mountain Elk Foundation) to implement the recommended conservation and management practices.

Justification: This objective uses information concerning habitat quality provided by General Objective 1 and ecological requirements of mixed conifer forest type, focal and obligate species to create and disseminate conservation and management practices to public agencies, non-government organizations, and private groups. These management practices will be specifically tailored to the conditions found in the John Day subbasin. Practices will vary depending on habitat condition and protected status, and may include:

- removing or reducing the density of trees through the use of timber harvest to remove undesirable woody plants
- conducting prescribed burns or allowing natural fire to stimulate plant growth, promote structural and biological diversity and species richness and kill larger trees that will be future snags
- creating snags by mechanical means to achieve the targeted density of snags
- managing timber harvest via acquisition, easement, agreement, and/or conservation plans to achieve and protect desired habitat conditions

- managing livestock grazing to protect desired seral and phenological stages of plant growth and to minimize potential for exotic plant introductions due to ground disturbance
- using livestock grazing to achieve desired seral and phenological stages of plant growth
- using timber harvest to achieve desired seral stages of woody plant growth
- using chemical, mechanical, and biological methods to treat and suppress exotic plants
- seeding or planting herbaceous and woody plants to restore reduced or missing structural components

A target of 30% was set because of the large area occupied by this biome, and because a large percentage of this biome is in some level of protected status. Managers assume that a small percentage of mixed conifer forest is heavily degraded. An estimate of area for enhancement based on 30% treatment of degraded mixed conifer habitat is 73,000 acres. Improving habitat on 73,000 acres by 2020 could be possible if adequate funding is provided.

Biological Objective 5:
Ensure that natural ecological processes that are necessary for a functional habitat for focal and obligate species, such as fire and the retention of prone woody material, are allowed to proceed.

Strategies:

1. Include the retention and occurrence of natural ecological processes as part of the recommended conservation and management practices for mixed conifer forest community.
2. Explain the role of natural ecological processes to public land agencies and entities and organizations that work with private landowners to protect, create, and/or enhance wildlife habitat. Demonstrate and explain how natural ecological processes can be used to accomplish recommended conservation and management practices.

Justification: Fire suppression over time has promoted less fire-resistant, shade-intolerant trees. In general, the current stands of trees at all seral stages have low snag density, high tree density, and are composed of smaller and more shade-tolerant trees (IBIS).

INTERIOR CANYON SHRUBLANDS

Biological Objective 1:
Ensure that conservation plans are developed for and applied to interior canyon shrubland on publicly-owned land by 2020. Voluntary private landowner participation will be included in this effort. Conservation plans must be in compliance with environmental laws, professionally-developed, and peer-reviewed.

Strategies:

1. Use results generated from General Objective 1 to identify which public agencies have interior canyon shrubland under their jurisdiction and work with land managers in those agencies to develop conservation plans for those canyon shrubland areas not currently managed with formal conservation plans.
2. Work with voluntary landowners to develop conservation plans for canyon shrubland occurring on privately-owned land.

Justification: This objective cannot be quantified until the completion of General Objective 1 because it is not known how much interior canyon shrubland is currently managed and/or protected with a formal conservation plan in the subbasin. Fire suppression, grazing management, and exotic, invasive plants occurring on grassland and shrub-steppe habitat adjacent/proximate to canyon shrubland can potentially change habitat patch size, structure and composition of this habitat type. Also, canyon shrubland is the most extensive habitat type in the John Day Subbasin that provides the habitat components needed by California bighorn sheep. Protecting California bighorn sheep habitat is important because the present area and distribution of suitable bighorn sheep habitat and the number of native, wild sheep in Oregon are significantly less than historic levels.

Biological Objective 2:
Use the results of General Objective 1 to target the enhancement of 50% of degraded interior canyon shrubland habitat in the John Day Subbasin by 2020.

Strategies:

1. Develop and assign recommended conservation and management practices based on the ecological needs of the canyon shrubland community-type, California bighorn sheep and other canyon shrubland obligate species. These practices should prescribe and promote land management practices that contribute to:
    - retention of connected canyon shrubland tracts with maximized parcel sizes
    - exclusion of domestic and exotic sheep and goat species in occupied and potential California bighorn sheep habitat
    - the presence of a species-rich and diverse native plant community, represented by a mix of tall and medium height shrubs, bunchgrasses, forbs, and low density of large woody plants
    - minimizing the presence of exotic, invasive plants
2. Work with public land agencies to implement the recommended conservation and management practices.
3. Encourage organizations and entities who work with private landowners to protect, enhance, or create wildlife habitat (e.g., ODFW, ODF, USFWS, USDA, TNC, Rocky Mountain Elk Foundation) to implement the recommended conservation and management practices.

Justification: This objective uses information concerning habitat quality provided by General Objective 1 and ecological requirements of canyon shrubland community-type, focal and obligate species to create and disseminate conservation and management

practices to public agencies, non-government organizations, and private groups. These management practices will be specifically tailored to the conditions found in the John Day Subbasin. Practices will vary depending on habitat condition, protected status, special conditions, and may include:

- working with landowners to seek solutions for removal of exotic feral sheep from private lands that contain bighorn sheep habitat or that are proximate to occupied or potential wild sheep habitat
- identifying private landowners who raise or potentially could raise domestic sheep and goats in areas proximate to occupied or potential bighorn sheep habitat.
- communicating with domestic sheep producers to introduce them to the risk of disease transmission from domestic sheep and goats to wild sheep
- work with sheep producers to develop mutually beneficial ways to minimize the possibility of domestic sheep/goats coming in contact with wild sheep
- securing escape and lambing habitat for bighorn sheep by maintaining habitat connectivity between herbaceous plant dominated slopes and steep, rocky outcroppings and rimrocks
- removing or reducing the density of undesirable large woody plants by timber harvest/mechanical methods
- conducting prescribed burns or allowing natural fire to stimulate plant growth, promote structural and biological diversity and species richness, and reduce unwanted woody and herbaceous species
- managing and guiding land uses via conservation plans, agreement, acquisition, and/or easement, to achieve and protect desired habitat conditions
- managing cattle grazing to protect desired seral and phenological stages of plant growth and to minimize potential for exotic plant introductions due to ground disturbance
- using cattle grazing to achieve desired seral and phenological stages of plant growth
- using chemical, mechanical, and biological methods to treat and suppress exotic invasive plants
- seeding or planting herbaceous and woody plants to restore reduced or missing structural components

A target of 50% was selected given the limited knowledge of the condition of most canyon shrubland habitat in the subbasin. It was chosen because managers assumed that a minimum of half of the approximate 164,000 acres of canyon shrubland in the subbasin is degraded at some level, and improving habitat on 82,000 acres by 2020 could be possible if adequate funding is provided.

Biological Objective 3:
Ensure that natural ecological processes, such as fire, that are necessary for a functional habitat for focal and obligate species, are allowed to proceed.

Strategies:

1. Include the retention and occurrence of natural ecological processes as part of the recommended conservation and management practices for the canyon shrubland community.
2. Explain the role of natural ecological processes to public land agencies and entities and organizations that work with private landowners to protect, create, and/or enhance wildlife habitat. Demonstrate and explain how natural ecological processes can be used to accomplish recommended conservation and management practices.

Justification: Fire was a significant factor in creating vegetative structure and composition in this habitat. Historically, this community experienced a fire return interval of 25 years. In parts of the John Day Subbasin, livestock grazing combined with fire suppression has favored woody plants in canyon shrubland habitat. Shrub patch size and height have increased while the density of larger trees has decreased. Slopes and adjacent grasslands with vigorous tall shrubs and larger trees are generally unsuitable for bighorn sheep.

Biological Objective 4:
Promote and guide the treatment of 2000 acres of exotic, noxious plants in canyon shrubland habitat John Day Subbasin by the year 2020, with priority given to occupied or potential bighorn sheep range.

Strategy:

1. Using data generated from General Objective 1, identify areas that, if restored to a predominantly native plant community, would increase patch size, establish connectivity between remnants of extant canyon shrubland, or allow for the introduction of fire management strategies.

Justification: Approximately 2500 acres of this habitat type are negatively impacted by the presence of invasive, exotic plants (Don Farrar, Gilliam County Weed Board, personal communication, 2004). It is important to convert areas infested with exotic, invasive plants to viable canyon shrubland community to create new biome reservoirs, increase connectivity between extant canyon shrubland habitat, and to improve the suitability of bighorn sheep habitat. Treating 2000 acres could be possible if adequate funding is available.

SHRUB-STEPPE

Working Hypotheses
Major factors affecting this focal habitat type are agricultural conversion (including the conversion of CRP lands back into croplands), alteration of fire regimes, exotic plant invasion, purposeful seeding of non-native grasses, and livestock grazing. These factors result in direct habitat loss, fragmentation and degradation. The greatest factor resulting in degradation of existing shrub-steppe habitat is the proliferation of exotic weeds, particularly cheatgrass. Cheatgrass, in turn, affects the fire regime of the shrub-steppe habitat type. The invasion of

weeds is facilitated by the loss of cryptogamic crusts (a complex association of living cyanobacteria, microfungi, lichens and mosses that live within and immediately on top of the soil in arid and semi-arid regions of the world, forming a cohesive crust that resists wind and water erosion (Belnap and Lange 2001)) resulting from soil disturbances associated with tillage and livestock grazing. Non-native animal species, including nest competitors (e.g., European starlings, house sparrows), nest parasites (e.g., brown headed cowbirds), and domestic predators (e.g., cats, dogs) also negatively affect obligate species in the habitat. The effects of non-native species are magnified by habitat fragmentation. Additionally, shrub-steppe habitats in proximity to agricultural, recreational, and residential areas may be subject to high levels of human disturbance. All of these factors are responsible for significant reductions in shrub-steppe obligate species.

Desired Functional Conditions/Key Environmental Correlates

Shrub-steppe habitat is highly variable depending on site conditions. Sound management will maximize the inherent habitat capabilities, which will then support the species best adapted to those habitats. However, general ranges of key environmental correlates that will support the sage sparrow, and most other obligate shrub species (e.g, loggerhead shrike, burrowing owl, sage thrasher) are as follows: "ecologically appropriate" refers to the potential vegetation of the site, considering hydrology, soils, topography, and natural ecosystem processes. Objectives for grass and open ground cover for burrowing owl are based on Green and Anthony (1989).

- late seral big sagebrush or bitterbrush with patches of tall shrubs with a height greater than three feet
- mean sagebrush cover of 5 to 30%
- mean native herbaceous cover 10 to 20% with <10% cover of non-native annual grass or forbs
- mean open ground cover, including bare ground and cryptogamic crusts > 20%
- mean native forb cover > 10%
- density of burrows associated with a healthy populations of burrow providers (e.g., badgers, ground squirrels)

Biological Objective 1: Increase the protected status of up to 25% of remaining high quality shrub-steppe habitat with little protection to medium or high level protection by 2020. Protection priorities, guided by the completion of General Objective 1 and existing information, will be based on the current habitat status and potential ecological function of the habitat with regard to focal and other obligate species and will target tracts that 1) are large (> 300 acre tracts, if possible) and contiguous, 2) have the potential to restore connectivity, and/or 3) add to existing protected areas.

Strategies:

1. Work with public land managers who have high quality shrub-steppe habitat remaining within their jurisdiction to ensure that all of it is administratively protected at a medium or high level.

2. Protect existing shrub-steppe habitat on private land at the desired level by using cooperative agreements, conservation easements, and where desirable, fee title acquisition of strategic lands.

Justification: Remaining high quality shrub-steppe habitat is highly fragmented, generally occurs in small patches, and is primarily in private ownership. Increasing protected status of approximately 25% of the remaining shrub-steppe that occurs within the subbasin would be a significant step towards protecting a biologically significant portion of the remaining high quality shrub-steppe acreage. The target is believed to be feasible with adequate funding. Tracts greater than 300 acres are a high priority for protection because 300 acres is the minimum size capable of supporting the sage sparrow.

Biological Objective 2: On lands not considered "protected," and where ecologically appropriate within large remaining patches of sagebrush habitat, initiate actions to maintain or provide: >50% of the landscape in a mid- to late-seral stage with canopy cover >15% and at least one contiguous tract >1000 acres with high quality conditions (See sage sparrow species account in Appendix D for further information on sage sparrow habitat needs.).

Strategies:

1. Implement measures that reduce non-native understory plants (primarily cheatgrass).

2. Modify livestock grazing practices, as necessary, to reduce the negative impact on shrub-steppe vegetation and to decrease the spread of exotic weeds.

3. Identify the ecological potential of each habitat microsite to be restored (e.g., basin big sage with bare soil or dune understory, Wyoming big sage with cryptogamic crust understory, bitterbrush with sand understory) and conduct specific practices to restore sites toward that potential.

4. Provide private landowners with management, technical, and financial assistance as they work to enhance shrub-steppe habitat using Strategies 1 to 3.

Biological Objective 3: Use information produced through implementation of General Objective 1 to identify and prioritize lands converted to agriculture which, if converted to shrub-steppe, would increase remnant size or establish connectivity between remnants of extant shrub-steppe lands.

Strategies:

1. Encourage the NRCS to alter CRP bid point allocations to enhance the enrollment acreages of lands that are adjacent to existing shrub-steppe or lands that would provide connectivity between remnants of extant shrub-steppe.
2. Alter the program requirements of the CRP to require that enrolled tracts that are either adjacent to extant shrub-steppe or that provide connectivity between remnants of shrub-steppe are converted to shrub-steppe habitat rather than grassland only.
3. Increase the duration of CRP contracts from 10 years to 20 years.

INTERIOR GRASSLAND

Working Hypotheses

Major factors affecting this focal habitat type are agricultural conversion (including the conversion of CRP back into cropland), exotic weed invasion, purposeful seeding of non-native grasses, overgrazing, and human-altered fire regimes. These factors result in direct habitat loss, fragmentation and degradation. The largest factor in habitat degradation is the proliferation of annual grasses and exotic plants such as cheatgrass and noxious weeds, which either replace or radically alter native bunchgrass communities. This invasion of exotic weeds is facilitated by the loss of cryptogamic crusts resulting from soil disturbances associated with tillage and livestock grazing. Non-native animal species, including nest competitors (e.g., European starlings, house sparrow), nest parasites (e.g., brown headed cowbirds), and domestic predators (e.g., cats, dogs) also impact native species productivity. The effects of non-native species are magnified by habitat fragmentation. Additionally, grassland habitats in proximity to agricultural, recreational and residential areas may be subject to high levels of human disturbance. All of these factors are responsible for significant reductions in grassland obligate species.

Desired Functional Conditions/ Key Environmental Correlates

For Native Grasslands

- native bunchgrass cover > 15% and comprising than 60% of total grassland cover
- tall bunchgrass > 10 inches tall
- shrub cover < 10%

For Non-Native and Agricultural Grasslands (e.g. CRP lands)

- grass forb cover > 90%
- shrub cover < 10%
- variable grass heights (6 to 18 inches)

Landscape Level

- patch size greater > 100 acres or multiple small patches greater than 20 acres, within a mosaic of suitable grassland conditions.

Biological Objective 1: Increase the protected status of 5% of the existing native grasslands with low or no protection into medium or high level protection by 2020. Protection, guided by the completion of General Objective 1, will be prioritized based on the current or potential ecological function of the habitat with regard to the Grasshopper Sparrow and other obligate grassland species and will target tracts that 1) are large (> 100 acres, if possible) and contiguous, 2) have the potential to restore connectivity, and/or 3) add to existing protected areas.

Strategies:

1. Protect functional grasslands on private lands at the desired level using cooperative agreements, conservation easements and, where desirable, fee title acquisition.

2. Work with tribal and public land managers who have native or ecologically functional interior grassland under their jurisdiction to ensure that those grasslands are administratively or legally protected at the desired level.

Justification: The target of 5% of existing native grasslands is believed to be an achievable target that would improve the ecological welfare of the subbasin. This target will be refined through adaptive management based on research associated with General Objective 1. This biological objective and Biological Objective 2 are the highest priority objectives for interior grassland habitat because they "build from strength" (i.e., efforts to improve wildlife habitat begin with protecting and supporting the most productive habitat first).

Biological Objective 2: Use findings in General Objective 1 to prioritize enhancement and restoration activities which increase the extent and quality of high quality native grasslands.

Strategies:

1. Work with public land managers who have native or ecologically functional interior grassland to implement management practices that result in grassland conservation.
2. Support the full funding and implementation of integrated weed management plans in the subbasin.
3. Work with private and public landholders to reestablish native plant communities where practical and cost effective.
4. Develop cooperative agreements to protect, restore, and maintain grassland habitats on public and private lands.
5. Modify livestock grazing practices, as necessary, to reduce negative impacts on grassland vegetation and to decrease the spread of exotic weeds.

Biological Objective 3: Encourage reduction of non-native annual grassland or low yielding dryland agricultural land not currently enrolled in farm subsidy programs and move these lands toward higher quality native grassland by 2020.

Strategies:

1. Provide financial and technical assistance to private land managers in rehabilitating annual grassland to ecologically functional perennial grassland with the condition that a long term management plan is established along with the rehabilitation.
2. Use the results of General Objective 1 to prioritize agricultural lands for conversion to grassland habitat with a minimum parcel size of 300 acres. These conversions will enlarge, provide connectivity, upgrade protection status, and/or enhance interior grasslands in the subbasin.
3. Work with the NRCS to alter the CRP bid point allocation to reflect ecological need as assessed in the habitat mapping conducted in Objective 1. This would increase the likelihood that habitat identified as ecologically significant in the subbasin would be enrolled into CRP, and would enhance the size, distribution and connectivity of ecologically functional parcels.

Biological Objective 4: Improve the ecological function and duration of benefits of all grassland habitat currently enrolled in CRP as well as lands that will be enrolled in the future.

Strategies:

1. Work with the NRCS and other public policy makers to develop recommendations to the U.S. Congress to modify the Farm Bill so that CRP contracts are extended from 10 to 20 years.
2. Work with the NRCS to improve the ecological function of agricultural lands enrolled in CRP by increasing the minimum conservation practice requirements so that they provide ecological function for interior grassland focal or obligate species on any established grassland occurring in enrolled lands.

HERBACEOUS WETLANDS

Existing information on wetlands in the subbasin is greatly limited. These habitats are typically small in total area or linear in nature (riparian wetlands) and badly underrepresented in most surveys and data bases. Wetlands habitats are important to a disproportionately large number of species.

Working Hypotheses

Desired Functional Conditions/ Key Environmental Correlate

Biological Objective 1:
Determine the population status and distribution of Columbia spotted frog as well as other native amphibian species in the John Day Subbasin.

Strategies:

1. Conduct a literature review of recent amphibian surveys in the subbasin to determine where recent information on amphibian populations resides.
2. Conduct surveys of remaining areas in the subbasin for which no information or no recent information on the population status and distribution of Columbia spotted frogs and other amphibians is available.
3. Produce a report and GIS data layer describing the population status of all amphibians encountered on the surveys or in the literature search.

Biological Objective 2:
Restore, enhance and/or create wetland habitat in the John Day Subbasin where feasible.

Strategies:

1. Conduct a strategic review of potential wetland areas in the John Day Subbasin to prioritize wetland habitats into core habitat areas and potential restoration areas. The review would classify all current wetlands either as naturally-occurring or as artificially created wetlands. In addition the review would identify areas that historically had naturally-occurring wetlands. Each area would be prioritized by ease of enhancement or restoration. The review would be used to target management work.

2. Enhance degraded naturally-occurring wetland habitat on public or private land using moist soil techniques to establish permanent open-water refuge with a minimum water level as habitat for Columbia spotted frogs (Baldassarre and Bolen 1994).
3. Create new wetland habitat in association with or connected to extant naturally-occurring wetlands in the subbasin. New wetlands would be created either through joint management projects with private and public landowners on their properties or through the enhancement of properties acquired as habitat mitigation areas in the subbasin.
4. Restore wetland habitat in areas identified through the strategic review and historic sources (e.g., USGS maps, old aerial photos, National Wetland Inventory, IBIS database) as formerly having naturally-occurring wetland habitat. New wetlands would be created either through joint management projects with private and public landowners on their properties or through the enhancement of properties acquired as habitat mitigation areas in the subbasin.
5. Work with federal agencies to target wetland conservation and development programs such as the USDA's "Wetland Reserve Program" or USFWS's "Partners for Wildlife Program" in areas prioritized as restoration areas in the subbasin.

WESTERN JUNIPER AND MOUNTAIN MAHOGANY WOODLANDS

Biological Objective 1:
Ensure that conservation plans are developed for and applied to western juniper and mountain mahogany woodlands on publicly owned land by 2020 with emphasis on recognition of the differences in this community between the upper and lower parts of the John Day Subbasin, and with further emphasis on managing this community to provide components of habitat for ferruginous hawk. Voluntary private landowner participation will be included in this effort. Conservation plans must be in compliance with environmental laws, professionally-developed, and peer-reviewed.

Strategies:
1. Use results generated from General Objective 1 to identify which public agencies have western juniper and mountain mahogany woodlands under their jurisdiction and work with land managers in those agencies to develop conservation plans for those juniper/mahogany woodland areas not currently managed with formal conservation plans.
2. Work with voluntary landowners to develop conservation plans for western juniper and mountain mahogany woodland habitat occurring on privately-owned land.

Justification: This objective cannot be quantified until the completion of General Objective 1 because it is not known how much western juniper and mountain mahogany woodland is currently managed with formal conservation plans in the subbasin. Fire suppression, grazing management, and exotic, invasive plants occurring on western juniper and mountain mahogany woodland have contributed to changing the vegetative

species and structural composition of this community. The same factors have also contributed to significantly increasing the distribution of juniper/mahogany woodland (see Table 57). Increased distribution of this habitat has resulted in the encroachment of this community into adjacent interior grassland and shrub-steppe habitats. In addition, juniper/mahogany woodland is the most extensive habitat type in the John Day Subbasin that provides the habitat components needed by ferruginous hawk. Condition (structure and composition) of juniper/mahogany areas, impact to adjacent/proximate habitat types, and value as ferruginous hawk habitat should all be considerations when developing conservation plans for western juniper and mountain mahogany community sites.

Biological Objective 2:
Use the results of General Objective 1 to target the enhancement of western juniper and mountain mahogany woodland habitat in the John Day Subbasin by 2020.

Strategies:

1. Develop and assign recommended conservation and management practices based on the ecological needs of western juniper and mountain mahogany woodland community-type, ferruginous hawk and other juniper/mahogany woodland obligate species. These practices should prescribe and promote land management practices that contribute to:
    - retention of isolated juniper and groups of isolated juniper in ferruginous hawk nesting areas, particularly in the lower John Day Subbasin
    - retention of mature, short (< 33 feet in height) juniper for ferruginous hawk nesting trees
    - a reduction in western juniper density on some sites, particularly in the upper subbasin, to restore and enhance components of big game winter range by improving undergrowth productivity
    - a reduction in western juniper density on some sites, particularly in the upper subbasin, to restore and enhance low elevation California bighorn sheep habitat by improving undergrowth productivity and reducing visual obstructions
    - retention of some western juniper >13 feet in height in juniper density reduction areas to approximate natural fire survival
    - an increase in mountain mahogany density and vigor on selected sites to improve big game forage and to increase this habitat component for other western juniper/mountain mahogany obligate species
    - the presence of a species rich and diverse native plant community, represented by juniper of various heights, a mix of shrubs of various heights, bunchgrasses, and forbs
    - minimizing the presence of exotic, invasive plants
2. Work with public land agencies to implement the recommended conservation and management practices.
3. Encourage organizations and entities who work with private landowners to protect, enhance, or create wildlife habitat (e.g., ODFW, ODF, USFWS, USDA, TNC, Rocky Mountain Elk Foundation) to implement the recommended conservation and management practices.

Justification: This objective uses information concerning habitat quality provided by General Objective 1 and ecological requirements of western juniper/mountain mahogany woodland community-type, focal and obligate species to create and disseminate conservation and management practices to public agencies, non-government organizations, and private groups. These management practices will be specifically tailored to the conditions found in the John Day Subbasin. Practices will vary depending on habitat condition, protected status, special conditions, and may include:

- removing or reducing the density of western juniper by timber harvest/mechanical methods
- conducting prescribed burns or allowing natural fire to stimulate plant growth, promote structural and biological diversity and species richness, and discourage unwanted woody and herbaceous plants
- managing and guiding land uses via conservation plans, agreement, acquisition, and/or easement, to achieve and protect desired habitat conditions
- managing cattle grazing to protect desired seral and phenological stages of plant growth and to minimize potential for exotic plant introductions due to ground disturbance
- using cattle grazing to achieve desired seral and phenological stages of plant growth
- using chemical, mechanical, and biological methods to treat and suppress exotic invasive plants
- seeding or planting herbaceous and woody plants to restore reduced or missing structural components

Biological Objective 3:
Ensure that natural ecological processes, such as fire, that are necessary for a functional habitat for focal and obligate species, are allowed to proceed.

Strategies:

1. Include the retention and occurrence of natural ecological processes as part of the recommended conservation and management practices for western juniper and mountain mahogany woodland community.
2. Explain the role of natural ecological processes to public land agencies and entities and organizations that work with private landowners to protect, create, and/or enhance wildlife habitat. Demonstrate and explain how natural ecological processes can be used to accomplish recommended conservation and management practices.

Justification: Fire is a significant factor in influencing distribution and patch size of western juniper/mountain mahogany woodland community. The presence of fire will contribute to retarding the extension of this community-type into interior grassland and shrub-steppe habitat types. Influencing a fire interval of 30 to 50 years on some juniper/mountain mahogany sites will arrest juniper invasion into other habitat-types, and will contribute to maintaining juniper densities at desired levels on juniper/mahogany

sites. Fire can contribute to herbaceous plant productivity, and promote structural and biological diversity and species richness.

Biological Objective 4:
Promote and guide the treatment of 3000 acres of exotic, noxious plants in western juniper/mountain mahogany habitat John Day Subbasin by the year 2020.

Strategy:

1. Using data generated from General Objective 1, identify areas that, if restored to a predominately native plant community, would increase patch size, establish connectivity between remnants of extant western juniper/mountain mahogany woodland, or allow for the introduction of fire management strategies.

Justification: Approximately 5000 acres of this habitat type are negatively impacted by the presence of invasive, exotic plants. It is important to convert areas infested with exotic, invasive plants to viable western juniper and mountain mahogany woodland community to create new biome reservoirs, increase connectivity between extant juniper/mountain mahogany woodland habitat, and to improve the suitability of habitat for ferruginous hawk and other obligate juniper/;mahogany woodland species. Treating 3000 acres could be possible if adequate funding is available.

UPLAND ASPEN FOREST

Biological Objective 1:
Ensure that conservation plans are developed for and applied to upland aspen forest on publicly owned land by 2020. Voluntary participation by private landowners with aspen forest occurring on their property will be included in this effort. Conservation plans must be in compliance with environmental laws, professionally-developed, and peer-reviewed.

Strategies:

1. Use results generated from General Objective 1 to identify which public agencies have aspen forest under their jurisdiction and work with land managers with those agencies to develop conservation plans for those aspen forest areas not currently managed with a formal conservation plan.
2. Work with voluntary landowners to develop conservation plans for aspen forest occurring on privately-owned land.

Justification: This objective cannot be quantified until the completion of General Objective 1 because it is not known how much upland aspen forest is currently managed with formal conservation plans in the subbasin. Development of formal conservation plans for a maximum amount of aspen forest is suggested because 1) the amount of aspen forest occurring in the subbasin is small, 2) this forest type has experienced a significant reduction across the western United States, thereby making each aspen stand important to maintaining the genetic integrity of the species, and 3) aspen forest provides the habitat characteristics needed by the red-naped sapsucker and other obligate aspen forest species.

Biological Objective 2:
Identify and biologically assess aspen forest areas with limited or no conservation status in the John Day Subbasin by 2009. Contact landowners/managers of these forest areas by 2012 to encourage and assist them in initiating conservation action.

Strategies:

1. Use results generated from General Objective 1 to identify aspen forest community with limited or no conservation status.
2. Use results generated from General Objective 1 to determine the functional ecological status of the forest areas identified in Strategy 1.
3. Provide functional status report and conservation information to landowners/managers of aspen forest areas identified Strategy 1.
4. Provide conservation assistance sources and information to landowners/managers of aspen forest areas identified in Strategy 1.

Justification: Identification of aspen stands with limited or no conservation status and diminished ecological integrity is a priority because these stands are at the greatest risk of becoming non-viable and being lost as a genetic source for the species. Aspen forest areas with limited or no conservation status are likely to occur on privately-owned land. Information about aspen and guidance on how to receive assistance in protecting and enhancing aspen could be incentive for landowners/managers to conserve aspen stands under their control.

Biological Objective 3:
Use the results of General Objective 1 to target the enhancement, restoration and protection of upland aspen forest in the John Day Subbasin by 2020.

Strategies:

1. Develop and assign recommended conservation and management practices based on the ecological needs of the aspen forest type, red-naped sapsucker, and other obligate species. These practices should prescribe and promote land management practices that contribute to:
    - an increase in the density and distribution of aspen forest in the John Day Subbasin
    - identification and preservation of genetically-unique aspen stands
    - protection of a component of aspen overstory in each aspen stand to ensure root system viability
    - recruitment of aspen root suckers into older age classes of trees (sapling size and larger)
    - aspen forest stands with an even-aged overstory of mature trees and understory of uneven-aged regeneration
    - minimizing the invasion of conifer species into aspen stands
    - a habitat mosaic consisting of aspen community adjacent to mixed conifer and/or riparian areas with emphasis on vegetative species richness
    - retention of aspen and other trees with shelf fungus

- retention of > 1.5 snags per acre in aspen forest stands with emphasis on trees >39 feet in height and minimum 10 inch DBH
- aspen forest patch size of > 10 acres
- retention of large living trees in aspen stands that will function as future snags

2. Work with public land agencies to implement the recommended conservation and management practices.
3. Encourage organizations and entities who work with private landowners to protect, enhance, or create wildlife habitat (e.g., ODFW, ODF, USFWS, USDA, TNC, Rocky Mountain Elk Foundation) to implement the recommended conservation and management practices.

Justification: This objective uses information concerning habitat quality provided by General Objective 1 and ecological requirements of aspen forest type, focal and obligate species to create and disseminate conservation and management practices to public agencies, non-government organizations and private groups. These management practices will be specifically tailored to the conditions found in the John Day Subbasin. Practices will vary depending on habitat condition and protected status, and may include:

- removing or reducing the density of undesirable large woody plants by timber harvest/mechanical methods
- conducting prescribed burns or allowing natural fire to stimulate plant growth, promote structural and biological diversity and species richness, and kill larger trees that will become future snags
- creating snags by mechanical means to achieve the targeted density of snags
- collecting and storing roots from John Day Subbasin aspen stands to preserve existing genes
- managing and guiding land uses via conservation plans, agreement, acquisition, and/or easement, to achieve and protect desired habitat conditions
- managing timber harvest via acquisition, easement, agreement, and/or conservation plans to achieve and protect desired habitat conditions
- managing livestock grazing to protect desired seral and phenological stages of plant growth and to minimize potential for exotic plant introductions due to ground disturbance
- using livestock grazing to achieve desired seral and phenological stages of plant growth
- using chemical, mechanical, and biological methods to treat and suppress exotic plants
- seeding or planting herbaceous and woody plants to restore reduced or missing structural components
- constructing/installing physical barriers (including caging individual plants and fencing entire stands) to protect aspen plants for domestic and wild herbivores

Biological Objective 4:
Ensure that natural ecological processes that are necessary for a functional habitat for focal and obligate species, such as fire and decomposition of prone woody substrate, are allowed to proceed.

Strategies:

1. Include the retention and occurrence of natural ecological processes as part of the recommended conservation and management practices for upland aspen forest community.
2. Explain the role of natural ecological processes to public land agencies and entities and organizations that work with private landowners to protect, create, and/or enhance wildlife habitat. Demonstrate and explain how natural ecological processes can be used to accomplish recommended conservation and management practices.

Justification: Fire has a significant role in maintaining the viability of aspen forest. Aspen will colonize sites after fire or other stand disturbances through seed dispersal or root sprouting. Root suckering following fire is an important mechanism for an aspen stand to maintain dominance on a given site. Aspen rejuvenation due to fire has been greatly reduced since 1900 (Shirley 2004), and subsequently, the amount of aspen forest has declined significantly. The presence of fire is important in ensuring this habitat is ecologically functional.

5.3 Consistency with ESA/CWA/Tribal Treaty Requirements

This John Day Subbasin management plan is consistent with the requirements of the Endangered Species Act, Clean Water Act and Tribal Treaty rights. This management plan, as well as the multitude of management plans that are utilized in this subbasin (see Section 4.2), is designed to meet or exceed these legal requirements. Furthermore, many state laws and regulations (see Section 4.1.1) such as ODFW regulations and policies, Oregon Forest Practices Act, CWA programs administered by the Oregon DEQ and ODA's Water Quality Management Area Plans (1010 Plans) provide guidelines for management activities to be consistent with these requirements.

Endangered Species Act

Five terrestrial wildlife species and two aquatic species present in the John Day Subbasin are currently listed as threatened or endangered by the state of Oregon and/or the federal government. As of April 12, 2004, six plant species which are documented or suspected to occur in the John Day Subbasin are threatened or endangered by the state of Oregon. These species and their status are listed in Table 87.

Table 87. Wildlife, plant and fish species of the John Day Subbasin listed as threatened or endangered at the state or federal level (ODFW 2003, USFWS 2003, USFS 1999).

Common Name	Scientific Name	Status
Wildlife:		
bald eagle	*Haliaeetus leucocephalus*	OR and US: Threatened
Canadian lynx	*Lynx canadensis*	US: Threatened
peregrine falcon	*Falco peregrinus*	OR: Endangered
Washington ground squirrel	*Spermophilus washingtoni*	OR: Endangered
wolverine	*Gulo gulo*	OR: Threatened
Plant:		
South Fork John Day (Wats.) Barn milk-vetch	Astragalus diaphanus var. diurnus	OR: Threatened
Peck's milk-vetch	Astragalus peckii	OR: Threatened
Red-fruit lomatium	Lomatium erythrocarpum	OR: Endangered
Oregon Semaphore grass	Pleuropogon oregonus	OR: Threatened
Spalding's campion	Silene spaldingii	OR: Endangered
Arrow-leaf thelypody	Thelypodium eucosmum	OR: Threatened
Fish:		
bull trout	Salvelinus confluentus	US: Threatened
steelhead	Oncorhynchus mykiss	US: Threatened

Management activities will meet all of the requirements of both state and federal laws as they pertain to the Endangered Species Act. The management objectives outlined in this plan are designed to assist with the recovery of listed species and prevent other species from needing listed status.

Clean Water Act

In the John Day Subbasin, the federal Clean Water Act is implemented largely through the state's preparation of water quality standards, Total Maximum Daily Loads (TMDLs) and the TMDL implementation processes of designated management agencies. The Oregon Department of Environmental Quality has identified streams throughout the subbasin as water quality-limited for temperature as well as fecal coliform bacteria, pH, sedimentation, dissolved oxygen and biological criteria (see Tables 5 through 8 for lists of water quality-limited streams in the subbasin). TMDL monitoring was initiated in 2002 and is still underway. Numeric goals are scheduled for preparation by 2006.

The implementation of the TMDL process occurs through management planning, typically refinements of existing plans or programs such as the Agricultural Water Quality Management Area Plans (SB 1010), the Oregon Forest Practices Act, county comprehensive plans and federal policies on Forest Service lands. These plans vary from voluntary to proscriptive (though all should have reasonable assurance of implementation); management oversight is normally conducted through the local, state or federal land use authority. Initiative-based restoration/protection and public funding dovetails with TMDL implementation and is an important implementing mechanism. Subbasin planning is recognized as a key effort that supports TMDL implementation and will be recognized in the TMDL water quality management planning process. Subbasin planning may be referenced as providing interim targets and adaptive management strategies that support TMDL attainment. It is envisioned that the two programs are complementary, and likely will have goals in common. To support integration, DEQ TMDL staff have been involved throughout the subbasin planning process.

Tribal Treaty Rights

North American tribes, in treaties signed with the United States in 1855, reserved rights to fish, game, berries, root and associated plants and animals necessary to maintain their cultural religion. This subbasin plan was designed to help meet the requirements of these treaties. For example, one of the goals of the plan is to maintain the John Day Subbasin as a wild fish system and reach populations that will sustain a fishery for both the tribes and the general population. Management strategies were developed to reach this goal utilizing the EDT process, other supporting information and local expertise which included tribal representatives.

The terrestrial species are also important to the tribes. This component of the plan recognizes the importance of a wide variety of habitats that are important for a multitude of species. It also develops strategies to assure these habitats are available at an acceptable level.

Representatives of both the CTUIR and the CTWSRO were involved in this planning process. These representatives were helpful in identifying important tribal issues such as those identified in Section 3.2.1 of this plan.

5.4 Research, Monitoring and Evaluation

The General Framework

Research, monitoring and evaluation are all processes conducted within a decision making context. Research and monitoring are information gathering processes. Evaluation involves the interpretation of information from all sources to support decisions and help to determine future actions.

NWPCC Subbasin Planning Framework. The Northwest Power and Conservation Council asked subbasin planners to develop future goals and objectives within the context of present environmental conditions and the biological status of fish and wildlife resources. Whether planners used the EDT model or other tools, the assessment process involves four components (Figure 61). The combination of biological performance characteristics of a focal species and the environmental conditions needed to produce that performance are called Biological Objectives in the context of subbasin planning.

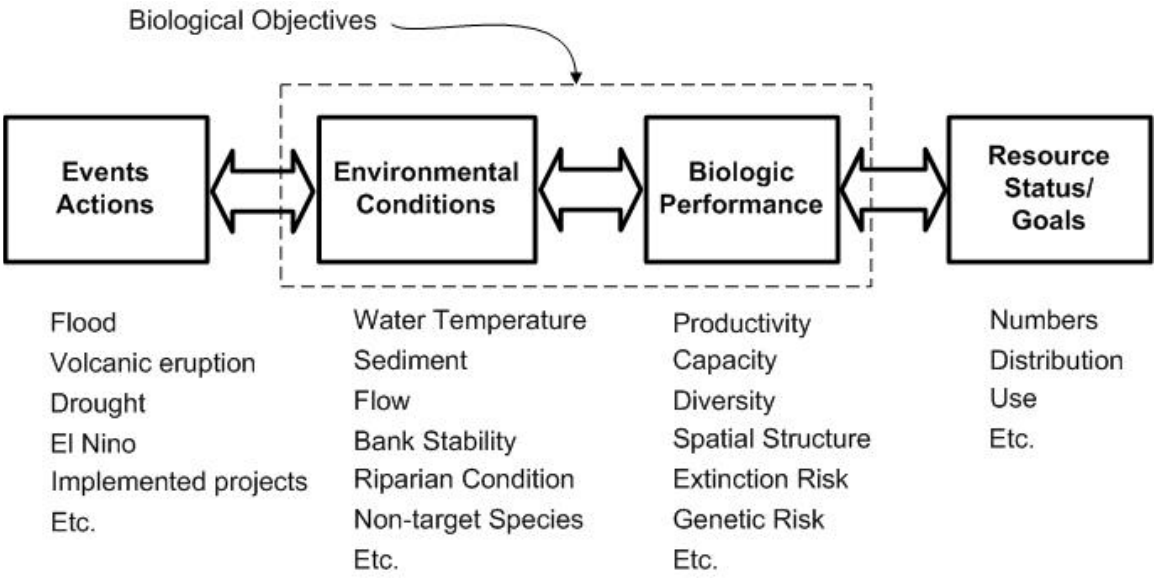


Figure 61. Subbasin assessment framework.

As a general rule, monitoring projects measure the specific parameters within each of the four boxes (e.g. how many fish, how much movement toward or away from goals and objectives, how many of each type of project, in-stream flow) and research projects try to determine the relationships between the boxes (e.g. how does in-stream flow affect survival and total production, how have environmental conditions changed as a result of projects implemented).

Evaluation is a specific activity in addition to information gathering. Each monitoring or research activity will, of course, do some evaluation of its own data to answer fairly narrow questions. Evaluation in the context of subbasin planning and management, however, considers and

analyzes information from all sources in the context of achieving broad scale or longer-term objectives and goals.

Adaptive Management Process. This broader role for evaluation within an adaptive management context can be seen in Figure 62. The results of evaluation activities are reported to groups or individuals (usually policy makers) who can modify program goals and planned actions to keep them consistent with each other and with biological and ecosystem realities. Research and monitoring results are used to update the scientific foundation so that the knowledge base for actions remains current and incorporates the best technical knowledge.

The following research and monitoring needs have been identified while conducting assessment and inventory activities under this plan.

Research Needs

Numerous research needs have been identified locally and regionally during the subbasin planning process. The following research needs specific to the John Day Subbasin were identified during assessment and inventory work to fill critical information or knowledge gaps. Some of these needs may be appropriately addressed at a provincial or regional level. In those cases, the coordination team will coordinate to ensure regional studies incorporate and address local needs.

These research needs are descriptive only. Specific studies to address these needs will be developed during implementation of the subbasin plan. The order of the following research needs does not imply any prioritization.

Evaluate Restoration Potential of the Lower Subbasin. With the increasing focus on conservation of steelhead, the restoration potential of the lower subbbasin has become a topic of increasing interest. Both the EDT analysis and expert opinion emphasizes that historically the lower subbasin produced a much greater proportion of the subbasin's steelhead than it does today (25% vs. 13% by EDT). More research is needed to understand how easily that productive potential can be recovered. Some have emphasized that the poor habitat conditions in the lower subbasin mean that restoration efforts are best focused on the upper subbasin, where higher quality habitat has been retained. Others have countered that the inherently high productivity of specific areas in the lower subbasin (some of which are believed to rear a class of smolts in 1 year, compared to the 2-3 years typical in the upper subbasin) mean that target restoration efforts in the lower subbasin should be a high priority. Research into production capacity and intensive monitoring of selected restoration activities should be conducted to improve our understanding of the productivity and response to restoration efforts of key sites in the lower subbasin. This subbasin plan calls for fisheries habitat restoration and protection to occur in both lower and upper portions of the subbasin to maximize potential production and minimize loss of diversity.

Declines in Granite Creek Spring Chinook. Granite Creek spring chinook is the only chinook population that is showing a declining trend in abundance. This may be due to habitat or biological factors unique to this population or it may be due to a redistribution with its near

neighbors in the North Fork and Middle Fork. In any case the reasons for the decline in the Granite Creek population need to be determined to inform an appropriate management response.

Bull Trout Migration. The distribution and habitat needs of resident populations of bull trout in the John Day Subbasin are relatively well understood and knowledge of population status and trends is improving via the "Migratory Patterns, Structure, Abundance and Status of Bull Trout Populations from Subbasins in the Columbia Plateau and Blue Mountain Provinces." However, the nature and role of migrant life histories and spawning distribution of both migratory and resident populations is poorly understood. However, connectivity between individual populations within the subbasin and possibly with other subbasin populations via the Columbia River is presumed to be important for maintaining genetic interchange. Even less is known about whether and how habitat conditions along migration routes affect these movements.

Studies should include describing both similarities and differences between the existing individual populations and the effects of habitat restoration on their abundance and migratory behavior.

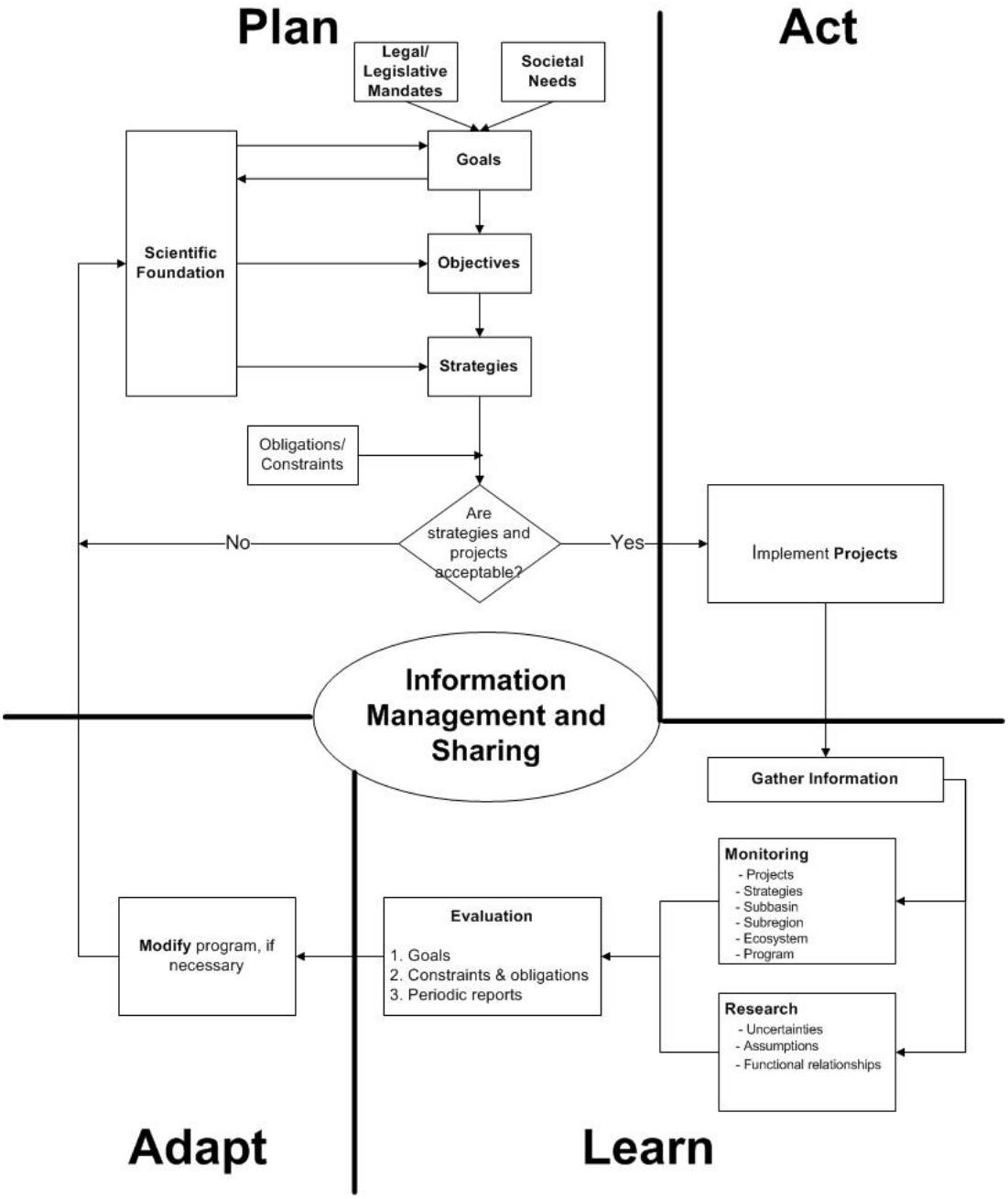


Figure 62. The adaptive management cycle, showing the roles of research, monitoring and evaluation.

Effects of Hatchery Strays. Marked steelhead and chinook from other areas have been found in increasing numbers in recent years (ODFW 2001, Ruzycki, et al. 2004). Their probable origins should be determined by genetic evaluation against the growing baseline information for Columbia Basin chinook and steelhead.

Uncertainties Concerning the Relationships between Ecological Conditions, Stochastic Variability and Salmonid Production. Most of the EDT and QHA input during these assessments depended upon personal experience and best professional judgment. This was adequate for the level of accuracy of the tools and decisions at this point. However, finer-scale analyses in the future must be based on local data and processes if they are to be maximally useful. Local studies of ecological processes should be conducted over the next several years to inform development and application of new assessment tools.

Coordinate with Regional Research Efforts (Tier 3 Studies). The John Day Subbasin is the only remaining large subbasin which does not contain major hatchery programs. As such, it offers unique opportunities to study certain ecological issues of regional importance. Conversely, issues of local importance (e.g. bull trout migration and hatchery stray issues) may be best addressed by a multiple-subbasin design. Local managers need the support to participate in and coordinate with regional research and monitoring efforts, as appropriate.

Improve Analytical Tools. The John Day Subbasin proved to be, perhaps, an extreme test of the EDT model. Assessment work demonstrated two general shortcomings of the web-based version of EDT. First, the large number of reaches and attributes apparently caused problems with the basic operation of the web-based model. Mobrand staff had to intervene frequently to get the model to produce baseline and diagnostic reports.

A more significant problem with the EDT model is that it may not adequately represent anadromous populations and habitats in the interior Columbia Basin. The EDT rating guidelines were initially developed for westside streams and may not adequately describe conditions in eastside streams. During the rating process, for instance, adjustments were made to rating guidelines and attribute categories (especially for woody debris, flow, and temperature) to better represent conditions in the John Day.

Again, EDT rules do not allow chinook to move into tributaries to rear. This is the dominant life history pattern for most spring chinook populations in the John Day, and perhaps in other eastside river systems. Patches to the model were able to better represent total chinook abundance, but it is felt they inadequately accounted for changes in diversity and productivity. See the EDT methods discussion in Section 3.2.3 for a more complete description of model shortcomings.

At the same time we encountered problems with the EDT model, others were developing smaller-scale analytical tools which better represent some local conditions and ecological processes. One example is the streamflow model being developed by ODEQ. Various other agencies are using erosion and pesticide tracking models, for instance, which are useful for understanding a variety of ecological processes.

Improved analytical tools will be needed to maintain subbasin plans in an adaptive management framework in the coming decades. They should share several key features:

1. Be based on ecological conditions and processes found in the interior Columbia Basin,

2. Allow incorporation and integration of models which better represent specific local conditions and processes,
3. Share similar input/output and structural features so they can be used together to evaluate ecological process and ecosystems. Indeed future tools will be most useful if they share an "open-source" approach for their development and maintenance.
4. Allow easier examination of model sensitivities and response to environmental variation. Key parameters, for instance, should be flexible to operate either deterministically (using an average value) or stochastically (with a user-supplied mean and variance).

Although the limitations of present assessment tools were most dramatically demonstrated during the John Day assessment, the solution can only be developed by a regional, inter-agency effort.

Monitoring Needs

The information needed as input for the EDT model is a good characterization of the habitat and fish populations within the John Day Subbasin – whether or not EDT is the assessment tool of choice – and should be maintained over time. These data provide a core description of the ecosystem likely to be useful to other future assessment tools and methods.

A number of related inter-agency monitoring efforts are underway and will affect any monitoring effort for this subbasin plan. The John Day Subbasin has been designated as a pilot subbasin for developing an RME plan under the ESA Federal Hydropower Biological Opinion. Should the pilot program be successful, it will be extended to all listed ESUs throughout the Columbia Basin. On a broader scale (western states from California to Alaska and, potentially, British Columbia) the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) and the Northwest Environmental Data Network (NED) are other inter-agency efforts to develop core standards for monitoring and data management. Although a simple listing of these efforts may appear fragmented and overlapping, in practice there is substantial convergence and cooperation because of overlapping membership among the groups.

The following subbasin plan monitoring needs should be implemented in coordination with these related inter-agency initiatives.

Complete the Characterization of River Reaches Using EDT Attributes. The reach rating database developed for this assessment can serve as a baseline approximation against which to compare future habitat changes. However ratings for the un-rated portions of the subbasin should be completed in the near future to provide a complete database. This includes the approximately 280 reaches which were associated with rated portions of the subbasin and the 106 reaches (and associated obstacles) above presently impassable barriers. This database of habitat conditions should be updated about every five years to measure progress in improving habitat conditions.

Coordinate with Local and Regional Programs and Practices for Tier 1 and 2 monitoring and data management. The needed coordination with the above described regional programs involves two steps. First, those efforts need to be made aware of the monitoring needs of this plan. Second, monitoring to meet plan needs should incorporate standards and processes adopted at the regional level. This can be accomplished by coordination team participation in activities of the regional efforts. This may require additional support for, especially, travel cost incurred by core team members. Additional funds will likely be needed for training local monitoring staffs in the new standard procedures and protocols when they become available. Trends for focal species should be updated annually in most cases.

Typical parameters useful for evaluating population status and trends include:
For Adult Fish – number, age, sex, fecundity, distribution
For Juvenile Life Stages – number, distribution, condition factor

Viable Salmonid Population Parameters. The NOAA Fisheries' Interior Technical Recovery Team is developing a set of parameters with which to characterize viable salmonid populations under the ESA. Many of these parameters were used during the assessment conducted for this plan (e.g. abundance of adults and juveniles, age and sex structure of populations, fecundity, etc.). However, the TRT will describe additional parameters spatial structure and diversity. Upon completion of the TRT work, Viable Salmonid Population parameters should be incorporated into monitoring programs under this plan. This monitoring should occur annually for most parameters and more frequently as appropriate for individual life stages.

Cutthroat Status Trends and Requirements. Given the extremely localized distribution of cutthroat trout in the John Day Subbasin and our limited knowledge of them, encourage ODFW and the USFS Forest Service to undertake a fine-scaled assessment of Westslope cutthroat populations in the John Day Subbasin that assesses population trends and identifies any specific actions to be undertaken to maintain and enhance cutthroat stocks.

Lamprey Status Trends and Requirements. We need to improve our understanding of lamprey population dynamics and habitat requirements in the John Day Subbasin.

Metapopulation Behavior. As habitat conditions improve and fish populations increase in abundance, it is anticipated populations will extend their present distributions. The persistence, productivity and health of each species will depend on how its individual populations interact with each other. This can provide a buffering mechanism when local conditions may cause declines in individual populations. The nature and intensity of these metapopulation interactions should inform management decisions and restoration strategies. Similarities and differences between populations should be determined and the rate of movement between populations monitored at periodic intervals.

Inter-Species Interactions. As populations rebuild, the frequency and intensity of inter-species interactions is likely to increase also. Whether these are straightforward (e.g. predation of bull trout on cutthroat and redband) or subtle, they can have unexpected effects on individual populations and on the ability to reach subbasin goals. Total fish abundance and community richness should be monitored periodically in key areas of the subbasin.

Project Inventory and Tracking. We need to refine the inventory of restoration projects and programs initiated as part of this planning process, tie it to a GIS system, set up regular updates to maintain an up-to-date resource, and make the inventory available for both localized gap analysis by project proponents and synthesis of subbasin-wide activities for regional discussions.

Passage Barrier Inventory. While there are some local inventories of passage barriers, there is no comprehensive inventory of fish passage barriers in the John Day Subbasin. A passage barrier inventory should be completed in the near future.

Coordinate Water Quality Monitoring. Several agencies (e.g. ODEQ, USFS, USGS, CTUIR, CTWSRO, ODFW, SWCDs) conduct various water quality monitoring programs. These efforts should be examined for coverage of the subbasin and potential duplication. Cost savings or a more robust monitoring effort may be possible by closer coordination between agencies and programs. This monitoring occurs at various time scales, usually from several times an hour to monthly.

Updated OWRD Subbasin Report. Hydrologists throughout the subbasin use the 1986 report as a basis for watershed analyses, project design and management plans. It describes water uses in the subbasin and summarizes water use by watershed (Lower John Day, North Fork, Middle Fork and Upper John Day). An updated version of this Subbasin Report would be extremely helpful for adaptive management of water throughout the subbasin, including locating those areas in need of flow restoration. Ideally, this report would discuss the effects of return flows on late season in-stream flows.

Monitor Aquatic Invertebrates. Evaluation of aquatic invertebrates is a good indicator of water quality. Expanding existing efforts by DEQ, OSU Extension, and CTWSRO would help identify water quality issues within the subbasin.

Accounting of Channel Geometry. An accurate accounting of the channel geometry compared to "potential" or "historic" would be very useful. One paleo flood study has been completed, but a more comprehensive look at sedimentation and carbon dating of the layers within terraces would help analyze the relations between climate change/land use and channel geometry (such as cross-sectional area, slope, sinuosity and channel shape). This information will help determine reasonable restoration objectives for in-stream habitat and channel restoration.

Large Woody Debris Goals. A study that identifies large woody debris goals based on landform and elevation in the John Day Subbasin would be useful. Large wood needs in streams are frequently based on studies conducted west of the Cascades.

Conifer Density Studies. There is a need for studies and follow-up monitoring to determine the effects of conifer density on base streamflows, peak streamflows and timing of streamflows.

Vegetation Characterization. An electronic vegetation characterization layer consistent across the entire subbasin would be extremely useful for linking agencies with private landowners when describing existing conditions. Satellite imagery could be utilized with an extensive ground

truthing effort to produce, ideally, a layer of one-meter pixel resolution. Very few watershed analysis or land management plans can address issues at the landscape scale due to a lack of a landscape level vegetation layer that can later be used at the project scale.

Refined Terrestrial Habitat Typing. There is a need to identify terrestrial habitat types at a finer scale. The habitat type maps currently available are at a very coarse scale, often leading to questions of accuracy and limiting their use.

Incorporate GRTS/EMAP and GIS-based Sampling Framework. One of the early regional standards to emerge is that future monitoring programs should incorporate a statistically sound, scalable, and GIS-based sampling framework. All of the databases and analytic results developed for this plan incorporated a GIS framework. We have subsequently met with EPA research staff and determined that the John Day river reach system developed for this plan can be fit within their Generalized Random Tessellated Sampling framework (GRTS).

This will allow future monitoring efforts to be conducted in a statistically valid and scalable manner. Monitoring results can then be used by others at larger spatial scales, consistent with their statistical sampling design. The next step toward full integration is to add the subbasin plan monitoring parameters to the EPA GRTS database. This should be done in the near future.

Adaptive Management Needs

Capacity Needs. The John Day Coordination Team is interested in building the local capacity to support project proponents, participate in regional discussions and planning processes and coordinate the implementation and evaluation of the extensive restoration efforts under way in our subbasin. This will require ongoing support for subbasin-wide coordination and local plan maintenance (especially monitoring and periodic updating of the subbasin assessment and plan elements).

The John Day Subbasin is remote and sparsely populated. The coordination team does not have available the same kinds and amounts of technical skills available to some other subbasins. Additional support will be needed in, at least, the areas of GIS support, database design and data management, statistical design and analysis, and modeling.

Evaluation Needs. The evaluation process needed at the scale of this subbasin plan is broader and more complex than that needed for individual project activities conducted under this plan. Subbasin Plan evaluation involves coordinating multiple individual data elements across projects, analysis of complex data sets, and interpretation of these analyses in the context of Plan objectives and goals.

Dedicated resources (staff time and operating expenses) will be needed on a continuing basis to maintain integration of data and information across projects and activities, and on a periodic basis to conduct analyses and produce reports for stakeholder and regional groups.