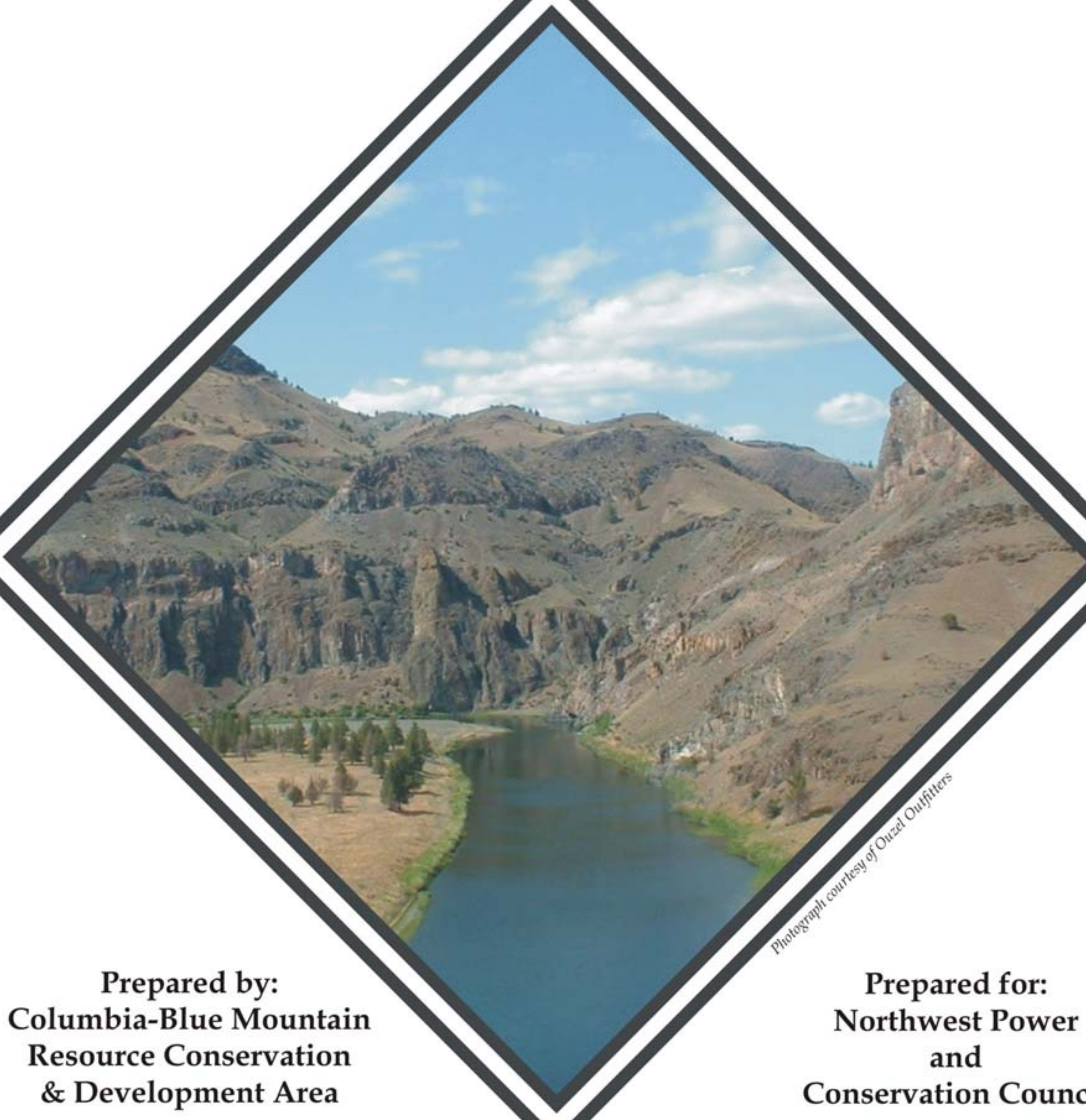
John Day Subbasin Revised Draft Plan



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Prepared for:
Northwest Power and Conservation Council

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Acronyms

AgWQM	Agricultural Water Quality Management Act
AgWQMAP	Agricultural Water Quality Management Area Plans
BCWC	Bridge Creek Watershed Council
BLM	U.S. Bureau of Land Management
BPA	Bonneville Power Administration
BRT	Biological Review Team
CAFO	Confined Animal Feeding Operation
CBMRC&D	Columbia-Blue Mountain Resource Conservation & Development Area
CCRP	Continuous Conservation Reserve Program
CEP	Coordinated Enforcement Program
cfs	cubic feet per second
CREP	Conservation Reserve Enhancement Program
CRFMP	Columbia River Fish Management Plan
CRITFC	Columbia River Intertribal Fish Commission
CRMP	Coordinated Resource Management Planning
CRP	Conservation Reserve Program
CTUIR	Confederated Tribes of Umatilla Indian Reservation
CTWSRO	Confederated Tribes of the Warm Springs Reservation of Oregon
CWA	Clean Water Act
DBH	diameter at breast height (4.5 feet above ground)
DEAR	Deer Enhancement & Restoration
DEQ	Oregon Department of Environmental Quality
DPS	distinct population segment
DSL	Division of State Lands
EDT	Ecosystem Diagnosis and Treatment model
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Power System
FS	U.S. Forest Service
FSA	U.S. Farm Service Agency
GA	geographic area
GRTS	generalized random tessellated sampling
GSWCD	Grant Soil and Water Conservation District
HCP	Habitat Conservation Plan
HUC	hydrologic unit code
HUC5	fifth field watershed
IBIS	Interactive Biological Information System
ICBEMP	Interior Columbia Basin Ecosystem Management Project
INFISH	Inland Native Fish Strategy Environmental Assessment
ISWR	in-stream water right
JAR	juvenile-to-adult ratios

JD	John Day
JDR	John Day River
MCR	Mid-Columbia River
MF	Middle Fork
MJDWC	Mid John Day Watershed Council
MNF	Malheur National Forest
MOA	memorandum of agreement
NED	Northwest Environmental Data Network
NF	National Forest
NF	North Fork
NFJDWC	North Fork John Day Watershed Council
NFWF	National Fish and Wildlife Federation
NIPF	non-industrial private forestlands
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOALE	Northeastern Oregon Assembled Land Exchange
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NWPCC	Northwest Power and Conservation Council
NWPPC	Northwest Power Planning Council
O & M	Operation and Maintenance
OAR	Oregon Administrative Rule
OCG	Oregon Subbasin Planning Coordinating Group
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
OOSE	out-of-subbasin effects
OSP	Oregon State Police
OSU	Oregon State University
OWC	Oregon Wildlife Coalition
OWEB	Oregon Watershed Enhancement Board
OWRD	Oregon Water Resources Department
OWT	Oregon Water Trust
PACFISH	Environmental Assessment for the Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California
PDO	Pacific Decadal Oscillation
PFC	properly functioning conditions
PNAMP	Pacific Northwest Aquatic Monitoring Partnership
QHA	Qualitative Habitat Assessment model
R&E	Restoration and Enhancement Board
RD	Ranger District
RHCA	Riparian Habitat Conservation Area
RM	river mile
RME	Research, Monitoring and Evaluation

RPA	Reasonable and Prudent Alternative
SAR	smolt-to-adult return rate
SF	South Fork
SSWCD	Sherman County Soil and Water Conservation District
SWCD	Soil and Water Conservation District
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TOAST	Oregon Technical Outreach and Assistance Team
TRT	Technical Recovery Team
UNF	Umatilla National Forest
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WC	watershed council
WCT	westslope cutthroat trout
WHIP	Wildlife Habitat Incentives Program
WSWCD	Wheeler Soil and Water Conservation District
WWNF	Wallowa – Whitman National Forest

1. Executive Summary

Overview

The John Day Subbasin Plan is one of 62 plans throughout the Columbia Basin that will guide implementation of the Northwest Power and Conservation Council's (NWPCC, or Council) Fish and Wildlife Program for the next 10 to 15 years. The NWPCC is required to mitigate for fish and wildlife losses resulting from hydropower dams built on the Columbia River. Subbasin plans will help direct Bonneville Power Administration (BPA) funding of projects that protect, mitigate, and enhance fish and wildlife that have been adversely affected by the development and operation of the Columbia River hydropower system. NOAA Fisheries, the U.S. Fish & Wildlife Service and other federal and state agencies with jurisdiction in this region will also use the plans.

The subbasin plan reflects wide stakeholder involvement. This involvement began in February 2003 when natural resource specialists and other subbasin stakeholders came together to initiate the planning process. At that time the stakeholders requested that the Columbia-Blue Mountain Resource Conservation & Development Area (CBMRC&D) lead the process. They also created the John Day Subbasin Coordination Team (coordination team), consisting of the following organizations:

- Sherman County
- Grant Soil and Water Conservation District (SWCD)
- Gilliam County SWCD
- Monument SWCD
- Wheeler SWCD
- Wasco County SWCD
- Sherman County SWCD
- North Fork John Day Watershed Council
- Mid John Day Watershed Council
- Gilliam-East John Day Watershed Council
- Bridge Creek Watershed Council
- Paleo Project
- Oregon Department of Fish and Wildlife
- Oregon Water Resources Department
- Oregon Department of Environmental Quality
- U.S. Bureau of Reclamation
- U.S. Bureau of Land Management

The coordination team played a key role during the planning process. As a first step, each of the coordination team members signed a Memorandum of Agreement that specified the stakeholders on the coordination team, the method for decision-making, expectations of the team, the fiscal agent, an outline of the planning process, and the structure for public involvement. They developed a work plan, which was approved by NWPCC in May 2003, and chose subcontractors to serve as the project manager, technical writer and public outreach coordinator. The subcontractors began work on the assessment, inventory, and management plan on July 21, 2003. The formal contract from NWPCC was signed on August 27, 2003.

During the next nine months, the coordination team worked with subcontractors to draft the John Day Subbasin Plan. The initial draft – developed in half the time originally provided by the NWPCC to develop a complete assessment, inventory, and management plan – was delivered to the NWPCC on schedule on May 28, 2004. However, upon review by the Independent Scientific Advisory Board, the NWPCC decided additional time and funding was needed to do further work on the plan and revise the May 28 draft.

This revised draft incorporates revisions made by the coordination team as requested by the NWPCC in October 2004. Funding was authorized from the NWPCC and the Oregon Watershed Enhancement Board to complete the revision. In October 2004 the coordination team reconvened to begin the revision process. The CRITFC, under the leadership of Phil Roger, played a key role in the revision process by completing the assessment as well as assisting with other sections of this plan. Revisions to the plan, including substantial improvements to the assessment and management plan, were completed and the revised draft submitted to the NWPCC on March 15, 2005.

Key Components of the Plan

The John Day Subbasin Plan includes:

- An assessment, providing the technical foundation for the plan, of the current condition of fish and wildlife in the subbasin and their limiting factors.
- An inventory of recent and ongoing projects to protect, mitigate, and enhance fish and wildlife in the subbasin.
- A management plan describing the coordination team's vision for the subbasin, biological and habitat objectives, and prioritized strategies for achieving those objectives in the subbasin.

Subbasin planners followed guidelines presented in the NWPPC Technical Guide for Subbasin Planners (NWPCC 2001). It was developed in accordance with the Council vision, scientific principles, and biological objectives for the Columbia River Basin, as described in the 2000 Fish and Wildlife Program. Additionally, the John Day subbasin planners worked closely with the Oregon Subbasin Planning Coordinating Group (OCG) and their Technical Outreach and Assistance Team (TOAST). The resulting John Day Subbasin Plan follows the outline developed by the OCG in their Oregon Specific Guidance document.

Stakeholder Involvement

Public outreach played an integral role in the development of this plan. The coordination team made a concerted effort to reach out to other stakeholders in the subbasin throughout the planning process. Initial presentations were given to numerous community groups in late 2003. A preliminary draft plan was distributed at public meetings held in Canyon City and Condon in May 2004. Comments on the draft were solicited through May 21, 2004.

Public involvement was also encouraged during development of the revised plan. The coordination team met frequently between August 2004 and March 2005 to further develop and revise the assessment and management portions of the original plan. These meetings were well publicized. Team members stated that their respective boards of directors and local stakeholders were kept informed. Meetings were held at Spray, Fossil, Monument, and John Day. Additionally, the board of directors of CBMRC&D was kept up-to-date regarding the plan's revision process. All meetings were open to the public and meeting notes were sent directly to watershed councils, soil and water conservation districts and involved state and federal agencies. The NWPCC will receive additional oral and written comments on the revised draft at a public meeting before it is adopted.

Vision for the John Day Subbasin

In many ways, the vision is the centerpiece of the subbasin plan. It describes a desired future condition for the subbasin that reflects its unique conditions, values, and priorities. The coordination team developed the following vision for the John Day Subbasin:

> *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.*

This vision reflects the team's belief that watershed management in the John Day Subbasin is necessary to improve and maintain watershed health. It recognizes the important role that local stakeholders, including individual landowners, play in meeting these needs.

Assessment

Information gained during the assessment formed the foundation for development of the subbasin biological objectives, priorities, and strategies. Subbasin planners conducted the assessment using analytical models to compare historic and current conditions for selected focal fish and wildlife species. They worked with the coordination team to make several key decisions that focused the scope and breadth of the planning effort. These decisions led to the selection of focal fish and wildlife species and the use of several analytical models to assess conditions.

Focal Species. Five aquatic species and 11 terrestrial species in the John Day Subbasin were selected as the focal species for the subbasin plan. Criteria used in selecting the focal species include a) designation as a federal threatened or endangered species, b) cultural significance, c) local significance, and d) ecological significance, or ability to serve as an indicator of environmental health for other aquatic or wildlife species.

The five aquatic focal species include: summer steelhead, spring chinook, bull trout, redband trout, and westslope cutthroat trout. The John Day Subbasin is considered one of the most important subbasins in the Columbia River system, as it supports two of the last remaining intact wild anadromous fish populations in the Columbia River Basin. An additional determining factor specific to the selection of aquatic focal species was the availability of information on population status, life history, and habitat requirements.

The eleven terrestrial focal species include: pileated woodpecker, white-headed woodpecker, red-naped sapsucker, ferruginous hawk, grasshopper sparrow, California bighorn sheep, sage sparrow, Columbia spotted frog, yellow warbler, American beaver, and great blue heron. These species were chosen because they are locally significant as components of terrestrial wildlife diversity in the John Day Subbasin.

Assessment Tools. Several tools were used to assess subbasin characteristics and their relationship with focal species productivity. The Ecosystem Diagnosis and Treatment model (EDT) was used to produce quantitative measures of the potential impacts of environmental factors on the abundance and productivity of the anadromous focal species in the John Day Subbasin. It was also used to examine a Properly Functioning Condition (PFC) scenario and its potential impact on populations. PFC represents an approximation of the "best" possible state of the environment with respect to the local economic, social, and political constraints on the environment (at approximately 70% of the historic, undisturbed habitat conditions). To complete the EDT analysis, the streams in the John Day Subbasin were broken into 1,264 individual reaches, 1,158 of which were used in the EDT model for the analysis of spring chinook and summer steelhead. The 106 reaches not rated using EDT is habitat currently available only to resident species, usually above natural and human-made barriers.

The Qualitative Habitat Assessment (QHA) modeling tool was used to assess bull trout habitat in the John Day Subbasin. For QHA modeling, a reach system consisting of 61 reaches was developed by the John Day fisheries technical team. The reach system encompassed all streams that bull trout presently inhabit, or are believed to formerly inhabit. The QHA model determined which attributes are most important in each geographic area in terms of limiting bull trout productions. The QHA for bull trout provided a ranking of stream reaches for both habitat protection and habitat restoration.

Information from the Northwest Habitat Institute's Interactive Biological Information System (IBIS) was used to assess conditions for the terrestrial focal species. Historic and current habitats from IBIS were examined and compared to identify focal habitats and to assess habitat changes that have occurred in the subbasin.

Inventory

The inventory identifies fish and wildlife projects undertaken in the John Day Subbasin. This extensive inventory database identifies and describes fish and wildlife programs. It also identifies existing natural resource laws, regulations, and management plans in the subbasin. The inventory summarizes 339 specific projects that have been undertaken in the subbasin to improve conditions for fish and wildlife. The high number of projects identified in the inventory illustrates a strong commitment by local landowners and citizens in the John Day Subbasin to provide sound stewardship of natural resources.

The inventory was placed in a database that provides the ability to query for project information in a multitude of ways. This capability is useful for evaluating project effectiveness relative to the biological objectives and strategies of the plan. The final section of the inventory is a gap assessment identifying the gaps between existing protections, plans, programs, and projects and the respective needs for each.

Management Plan

The management plan describes desired direction for the subbasin. It begins with the vision, which takes into account socio-economic factors in the subbasin, then outlines biological objectives and restoration strategies to achieve the objectives. It also 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 nine focal habitats used by the 11 terrestrial focal species.

Socio-economic Factors. The John Day Subbasin includes human factors unique to the subbasin which require consideration as aquatic and wildlife plans are implemented. These factors include the involvement of two Indian tribes (Warm Springs and Umatilla), a strong reliance on natural resources for the economic base, the high percentage of economically-distressed communities, and the high percentage and ecological significance of privately owned land in the subbasin. The success of the strategic projects proposed in this management plan depends on acknowledging these human factors and locating funding sources to help offset any economic loss to private landowners.

Biological Objectives and Strategies for Aquatic Focal Species. Based on the results of the assessment and inventory, teams of resource managers, technical experts, and stakeholders throughout the subbasin developed biological objectives, habitat objectives, restoration strategies, and restoration priorities for aquatic focal species in the John Day Subbasin. These objectives, strategies, and priorities can be found in Sections 5.2.2.2, 5.2.2.3, and 5.2.2.4.

Biological objectives describe, in quantitative terms, the focal species performance needed to achieve the subbasin vision. They also define the environmental conditions needed to provide those biological responses. Because the aquatic focal species are all salmonids and have distributions with substantial overlap, they all use and respond to changes in the same environment. Following are the objectives developed for summer steelhead and spring chinook populations at 25 years and 50 years. Objectives for the other species can be found in Section 5.2.

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. Support annual fisheries on all populations.
7. Reestablish connected environments between existing populations to allow metapopulation interactions.
8. Some populations should be expanding beyond their baseline distributions.

Restoration Strategies. 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, aquatic habitats in the John Day are affected by a variety of local historic and ongoing influences instead of by a single dam or other large structure, as is the case in many other subbasins. Consequently, successful aquatic habitat restoration in the John Day Subbasin will require widespread efforts to implement a range of project types.

The management plan defines 10 broad restoration strategies to achieve the biological objectives for the aquatic focal species and 42 specific types of actions that make up these strategies. These strategies and actions, which were identified by the coordination team, are described in detail in Section 5.2.2.4.

The 10 restoration strategies are:

Strategy A: Improve fish passage
Strategy B: Install fish screens on water diversions
Strategy C: Flow restoration
Strategy D: In-stream activities
Strategy E: Riparian habitat improvements
Strategy F: Control pollution sources
Strategy G: Protect existing high quality habitat areas
Strategy H: Upland improvement projects
Strategy I: Education/outreach
Strategy J: Manage recreational/tribal fisheries

Priority Rankings. The plan identifies restoration priorities within three geographic areas of the John Day Subbasin:

- Lower and Middle Mainstem John Day River (below Kimberly)
- Middle Fork and North Fork John Day River
- Upper Mainstem and South Fork John Day River

During the planning process, technical teams within the three geographic areas set priorities within each fifth field watershed (HUC5) for restoration strategies and established a restoration priority ranking between the HUC5s. EDT restoration and protection priority rankings provided the basis for prioritization between the HUC5s. The technical teams then revised the rankings based on professional opinion. The largest general difference they found was that EDT gave high priorities to HUC5s that contain 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 the HUC5s with large tributaries as high priorities for restoration. Also, HUC5s ranked highly for protection by EDT tend to be limited in their restoration opportunities by their relatively intact habitat.

John Day Subbasin planners 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.

The restoration priority rankings established by the local technical teams were reviewed by the coordination team and presented to watershed councils and soil and water conservation districts for comment at regularly scheduled meetings. Following is a brief summary of the established priorities for each of the geographic areas:

- Lower and Middle Mainstem John Day River (below Kimberly) Priorities:
  - First priority – Protection of existing habitat
  - Second priority – Passage
  - Third priority – Flow restoration
  - Fourth priority – Riparian habitat improvements
- Middle Fork and North Fork John Day River Priorities:
  - First priority – Protection of existing habitat
  - Second priority – Passage and riparian habitat improvements
  - Third priority – Fish screens
  - Fourth priority – Instream habitat improvements, upland restoration, and flow restoration.
- Mainstem and South Fork John Day River Priorities:
  - First priority – Protection of existing habitat
  - Second priority – Passage
  - Third priority – Flow restoration
  - Fourth priority – Riparian habitat improvements

Prioritization Framework. The plan includes a prioritization framework to help ensure that proposed projects promote widespread restoration efforts and are done in the most efficient manner. The John Day Subbasin is a large watershed with widespread fish habitat and diverse stressors. The wide dispersal of focal species throughout the area and the need to address widespread changes in habitat make prioritizing specific actions challenging. 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.

Biological Objectives and Strategies for Terrestrial Focal Species. Biological objectives and strategies were also developed for each of the nine focal habitats used by the 11 terrestrial focal species (see Section 5.2.3 for these objectives and strategies). In addition, the following general objective covers all nine focal habitats:

- 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.

Associated strategies with this terrestrial objective include:

- Identify the location, size, and spatial distribution of each of the focal habitat types existing in the subbasin.
- 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.
- Refine and update data currently available on the protected status of each focal habitat.
- Identify areas not currently supporting focal habitats, which, if converted to the focal habitat, would enlarge remnant size or provide connectivity between two or more extant remnants.
- Identify areas not proximate with extant remnants of focal habitat that could be rehabilitated to provide new reservoir habitats for selected focal species and other obligate species.
- Use data obtained by the above strategies to create GIS overlays with areas prioritized for protection, enhancement, or restoration for each focal habitat type.

Although the general terrestrial 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 objectives for each focal habitat type. It should be noted that action on strategies associated with habitat-specific terrestrial objectives should not wait until the completion of this general objective because much can be done with the current state of knowledge.

<u>Research, Monitoring, and Evaluation</u>

In the future, the management plan will be updated periodically through an adaptive management process that includes research, monitoring, and evaluation (RME). Research and monitoring results will be used to update the scientific foundation so that the knowledge base for actions remains current and incorporates the best technical knowledge. Research, monitoring, and evaluation will be necessary to assure implemented projects are effective and that priorities are in keeping with this plan. Monitoring will be done consistent with protocol established for the entire Columbia River Basin to the extent feasible. A representative sample of project types will be monitored to help evaluate project effectiveness and lend feedback for improvements to the plan.

A detailed gap assessment is discussed in Section 4.5. The RME discussed in Section 5.4 addresses the issues identified in the gap assessment.

Acknowledgement

The development of this plan took an incredible amount of time and effort on the part of the coordination team and its consultants. Without their perseverance throughout the entire process the completion of this plan would not have been possible. The coordination team and their consultants are to be commended for their hard work and dedication to the completion of this plan.

2. Introduction

2.1 Description of Planning Entity

The John Day Subbasin Plan was prepared as part of the Northwest Power and Conservation Council's (NWPCC) Fish and Wildlife Program in order to guide the investment of fish and wildlife restoration funds by the Bonneville Power Administration (BPA). The NWPCC's 2000 Fish and Wildlife Program required the NWPCC to adopt subbasin plans in each major subbasin of the Columbia River Basin between 2002 and 2004.

The purpose of subbasin plans is to direct BPA funding to projects that enhance, mitigate and protect fish and wildlife populations that have been adversely impacted by the operation and maintenance of the Columbia River hydroelectric power system. Such mitigation is mandated by the Northwest Power Planning Act of 1980. The NWPCC, BPA, the U.S. Bureau of Reclamation (USBR), the National Oceanic and Atmospheric Administration - Fisheries (NOAA Fisheries) and the U.S. Fish and Wildlife Service (USFWS) also intend to use adopted subbasin plans to help meet requirements of the 2000 Federal Columbia River Power System Biological Opinion (NMFS 2000), which details conditions that the agencies are to meet in order to avoid jeopardizing the existence of endangered and threatened species. Further, NOAA Fisheries and the USFWS intend to use subbasin plans as building blocks in the development of Endangered Species Act (ESA)-mandated recovery plans for threatened and endangered species. The Oregon Watershed Enhancement Board (OWEB) will also consider adopting the plan's recommendations for watershed restoration in the John Day Subbasin under ORS 541.371(1)(c).

This John Day Subbasin Plan has been developed under the guidance of the John Day Subbasin Coordination Team. The coordination team includes representatives from 17 stakeholder organizations in the subbasin who are all party to a Memorandum of Agreement (MOA) for subbasin planning. The MOA established the processes that were used by cooperating local stakeholders; private citizens; public organizations; and local, tribal, state and federal governments to develop this subbasin plan. Appendix A contains the memorandum. The members of the coordination team are listed in Section 2.2.

The involvement of stakeholders in the John Day Subbasin planning process was initiated in September 2002. At that time, no local stakeholder was able to assume the lead entity role to direct the subbasin planning process. At the first actual meeting of the stakeholders on February 4, 2003, the stakeholders requested that the Columbia-Blue Mountain Resource Conservation & Development Area (CBMRC&D) take on the lead role responsibility.

The MOA was distributed to the stakeholders for signature on March 21, 2003. Nearly all the stakeholders had signed the agreement by August, thus formally creating the John Day Subbasin Coordination Team. The coordination team was responsible for developing the MOA, informing stakeholders, setting procedures for decision-making, developing a work plan, determining technical and local input needs, establishing subcontracting procedures, reviewing subcontract applications and recommending the subcontractors to develop the plan. The formalized coordination team first met to start plan development on September 3, 2003.

2.2 List of Participants

The John Day Subbasin Coordination Team consists of the following organizations:

- Sherman County
- Grant Soil and Water Conservation District (SWCD)
- Gilliam County SWCD
- Monument SWCD
- Wheeler SWCD
- Wasco County SWCD
- Sherman County SWCD
- North Fork John Day Watershed Council
- Mid John Day Watershed Council
- Gilliam-East John Day Watershed Council
- Bridge Creek Watershed Council
- Paleo Project
- Oregon Department of Fish and Wildlife
- Oregon Water Resources Department
- Oregon Department of Environmental Quality
- U.S. Bureau of Reclamation
- U.S. Bureau of Land Management

The CBMRC&D served as the administrative organization under contract with the Northwest Power and Conservation Council NWPCC to facilitate the development of the John Day Subbasin Plan. The work plan authorizing NWPCC to release funds was signed on May 6, 2003. The contract between CBMRC&D and the NWPCC was signed on August 27, 2003. Funding from the NWPCC to pay for subbasin plan expenses was first received later that autumn, 2003.

Administrative oversight was provided directly by Karl Niederwerfer, Natural Resources Conservation Service Coordinator for CBMRC&D. CBMRC&D was the lead entity for development of this plan, serving as facilitator for the coordination team and as fiscal agent, managing the contract with the NWPCC and contracting for other services as required in preparing the subbasin plan.

The contractors which assisted in the development of this plan are:

Barnes & Associates, Inc., a natural resources consulting firm based in Roseburg, Oregon, was placed under contract to perform project management and technical writing for the plan. Rick Barnes was the project manager and Jay Walters was the technical writer.

Provisions, a consulting firm in Fossil, Oregon, was placed under contract to carry out community outreach in development of the plan. Lyn Craig provided this service.

Canyon Mountain Technical Services was placed under contract to provide assistance with assigning attributes for the aquatic habitat modeling process. Errol Claire with Canyon

Mountain Technical Services (and retired District Fish Biologist from Oregon Department of Fish and Wildlife at Canyon City) assisted Tim Unterwegner, District Fish Biologist with Oregon Department of Fish and Wildlife at Canyon City, with the aquatic habitat assessment.

The Confederated Tribes of the Warm Springs Reservation (CTWSRO) was placed under contract to assist with data input for the assessment phase of the plan. Michelle Newman provided this service and assisted Tim Unterwegner and Errol Claire with assigning attributes for the habitat modeling process.

Kathy Ferge was contracted to assist the project manager with various portions of the plan during the last few months of the planning process.

2.3 Stakeholder Involvement Process

Public outreach was an integral part of this plan. The coordination team was comprised of 17 key stakeholders in the subbasin, representing soil and water conservation districts, watershed councils, local and regional government and the private sector across the many counties that the subbasin reaches. Coordination team meetings were held at Fossil, Monument, John Day and Condon during the course of this project. Technical staff from a number of stakeholders, including the CTWSRO, Confederated Tribes of Umatilla Indian Reservation (CTUIR), U.S. Forest Service (USFS), NOAA Fisheries and USFWS assisted the coordination team with plan development.

The coordination team made a concerted effort to reach out to other stakeholders in the subbasin. Presentations were given to numerous community groups during the planning process, including members of area soil and water conservation districts, watershed councils, commodity groups, counties and natural resource organizations. These community members were urged to provide input and participate in the planning process.

Due to the geographic size of the John Day Subbasin, presentations about the subbasin plan were given to board members of soil and water conservation districts and watershed councils in Grant, Sherman and Wheeler counties at their regular monthly meetings in October, November and December 2003. Presentations were given at regular meetings of these groups so that the greatest number of people would hear about the initial planning process. All were kept apprised of the subbasin plan development through ongoing email correspondence throughout the planning process.

Informational presentations were also given by the outreach coordinator and members of the John Day Subbasin Coordination Team to all county boards of commissioners in Sherman, Gilliam, Wheeler and Grant Counties. Wasco, Umatilla and Morrow counties were kept informed through correspondence about the John Day Subbasin Plan and were served in person by team members from the Umatilla and Wasco subbasins planning teams.

Additionally, John Day Subbasin Plan newsletters distributed in January, March and May of 2004 provided further outreach to keep the public and stakeholders informed. The newsletters were printed by the regional North Central Education Service District at a significant discount because the district considers itself a collaborator in the outreach process. Newsletters were distributed to natural resource agency offices, courthouses, city halls and public libraries throughout the subbasin. They were also distributed through mailings to all subbasin coordination team members and key stakeholder individuals and groups. The newsletters were also mailed to state and federal agencies based in Oregon and Washington that expressed interest in the planning process. See Appendix B for copies of these newsletters.

In February of 2004 the John Day Subbasin website – www.johndaysubbasin.org – was registered. The website was designed to enhance communication to the general public about the plan and to facilitate discussion and review of the plan and planning process among all interested parties and stakeholders. The site was formally launched in April of 2004 and is updated periodically.

In April of 2004 the project development and coordination teams gave a presentation on the planning process and plan development to commodity group members in Grant County as requested by the county judge (chair of the Grant County Board of Commissioners), who had asked that commodity groups be directly informed at a special meeting before open public meetings were held in the region. Nearly two dozen organizations – ranging from cattlemen's associations to outdoor recreational clubs to timber industry interests – were invited. The meeting included a lengthy question and answer period.

The draft plan was presented at public meetings on May 10, 2004 at Canyon City and on May 11, 2004 at Condon as part of a concerted effort to take the plan "on the road" to maximize outreach. At each of these meetings, various media were used to communicate key elements of the plan and the planning process: handouts, a PowerPoint presentation and newsletters. Oversized maps of the John Day Subbasin were provided gratis by the Gilliam County Soil and Water Conservation District. Attendees were informed about the public comment period to follow submission of the draft plan.

The following are the stakeholders identified for the John Day Subbasin Plan:

- Private landowners within the John Day Subbasin.
- Tribes
    - Confederated Tribes of the Warm Springs Reservation of Oregon
    - Confederated Tribes of the Umatilla Indian Reservation
    - Columbia River Intertribal Fish Commission
- Soil and Water Conservation Districts
    - Grant SWCD
    - Sherman County SWCD
    - Gilliam County SWCD
    - Wheeler SWCD
    - Monument SWCD
    - Wasco County SWCD
    - Morrow SWCD
    - Umatilla County SWCD

- Watershed Councils
  - Pinehollow/Jackknife Watershed Council
  - North Fork John Day Watershed Council
  - South Fork John Day Watershed Council
  - Mid John Day Watershed Council
  - Gilliam East John Day Watershed Council
  - Grass Valley Canyon Watershed Council
  - North Sherman County Watershed Council
  - Bridge Creek Watershed Council
- Municipalities (incorporated cities)
  - City of Canyon City
  - City of Condon
  - City of Dayville
  - City of Fossil
  - City of Grass Valley
  - City of John Day
  - City of Lonerock
  - City of Long Creek
  - City of Mitchell
  - City of Monument
  - City of Moro
  - City of Mount Vernon
  - City of Prairie City
  - City of Spray
  - City of Ukiah
  - City of Wasco
- Counties
  - Lower John Day Partnership (representing Sherman, Gilliam, Wheeler and Wasco counties)
  - Grant County
  - Umatilla County
  - Morrow County
- State Agencies
  - Oregon Department of Fish and Wildlife
  - Oregon Department of Agriculture
  - Oregon Department of Environmental Quality
  - Oregon Water Resources Department
  - Oregon Department of Parks and Recreation
  - Oregon Department of Forestry
  - Oregon Division of State Lands
  - Oregon State Police
  - Oregon State University Extension
  - Oregon Department of Transportation
  - Oregon Watershed Enhancement Board

- Federal Management Agencies
    - U.S. Bureau of Reclamation
    - U.S. Forest Service
    - U.S. Fish & Wildlife Service
    - U.S. Bureau of Land Management
    - National Park Service
    - USDA Natural Resources Conservation Service
    - USDA-Agriculture Research Service
    - National Oceanic and Atmospheric Administration - Fisheries
    - U.S. Army Corps of Engineers
- Other
    - Eastern Oregon Miner's Association
    - Paleo Project

2.4 Overall Approach to the Planning Activity

The John Day Subbasin Plan identifies the goals for watershed restoration, establishes the strategies to meet the goals and defines objectives to measure progress toward the goals. It was drafted in accordance with the Technical Guide for Subbasin Planning (NWPPC 2001a) and the Oregon Specific Guidance document (OSPCG 2003) and has been submitted to the NWPCC for adoption as a subbasin plan under the NWPCC's Fish and Wildlife Program.

The plan consists of three main parts: an assessment of biological potential and opportunities for restoration, an inventory of existing programs and projects and a management plan. The management plan includes a vision statement, biological objectives and strategies for implementation. The coordination team has followed guidance provided by the NWPCC for the subbasin planning process.

The approach followed these general steps:

1. The general resources in the subbasin – physical (location/size, climate and hydrologic), socioeconomic (land use/ownership, population and economic) and fish/wildlife – were described and assessed.

2. Aquatic and terrestrial focal species and their habitats were selected, characterized and assessed.

3. A comprehensive inventory of the existing laws/regulatory programs, existing plans and existing management programs was assembled. These laws, plans and programs establish many of the constraints in which natural resources are managed in the John Day Subbasin.

4. An inventory of 339 completed restoration and conservation projects across the subbasin was presented in a relational database. A sample of the fields in this database includes: project focus (fisheries vs. wildlife), project type, beginning and ending dates, fifth field

watershed, steelhead population area, organizations involved and contact person. Any of these fields may be queried for analysis and reporting purposes.

5. The Ecosystem Diagnostic and Treatment model (EDT) was used to produce quantitative measures of the potential impact of environmental factors on the abundance and productivity of the anadromous focal species in the John Day Subbasin. The EDT process involved rating fish-bearing stream reaches for hydrologic characteristics, stream corridor structure, water quality, and biological community. The EDT model essentially provides a working hypothesis for a watershed and fish population. In theory, EDT can predict the performance of a population subject to current, historic, or hypothetical environmental conditions. For a complete description of EDT, see www.mobrand.com/MBI/edt.html.

   To complete the EDT analysis the streams in the John Day Subbasin were broken into 1,264 individual reaches; 1,158 of which were used in the EDT model for the analysis of spring chinook and summer steelhead. The 106 reaches not rated using EDT provide habitat currently available only to resident species, usually above natural and human-made barriers.

   EDT was also used to examine a Properly Functioning Condition scenario (PFC) and its potential impact on populations. PFCs represent the "best" possible state of the environment with respect to the local economic, social and political constraints on the environment at approximately 70% of the historic, undisturbed habitat conditions.

6. The Qualitative Habitat Assessment (QHA) model was utilized to identify limiting factors and potential protection/restoration measures for bull trout. A total of 61 reaches providing present or historic habitat for bull trout were rated for 11 factors (riparian condition, channel stability, habitat diversity, fine sediment, high and low flow, oxygen, high and low temperature, pollutants, and obstructions), while habitat usage was rated for four bull trout life stages (spawning and incubation, summer rearing, winter rearing, and migration). The bull trout stream reach system was set up at a workshop on October 19 and 20, 2004. The reaches and habitat usage were rated at that workshop along with an additional workshop on November 12, 2004. TOAST did the data analysis, with the assistance of John Day personnel.

7. A synthesis was done by melding information from the assessment and project inventory to help with identifiying biological objectives and set restoration and protection priorities. The Columbia River Intertribal Fish Commission (CRITFC), under the leadership of Phil Roger, was contracted to conduct the vast majority of assessment and synthesis for the revised draft subbasin plan.

8. Biological objectives, habitat objectives and restoration strategies were established by the John Day Subbasin Coordination Team. This group synthesized information from the assessment and inventory to develop the key components of the management plan. Habitat objectives were established for 12 different limiting factors. The group also developed 10 different restoration strategies.

9. A technical team was established for each of three geographic regions of the John Day Subbasin:
    - Lower and Middle Mainstem John Day (below Kimberly)
    - North Fork John Day and Middle Fork John Day
    - South Fork John Day and Upper Mainstem John Day.

   Each technical team included stakeholders from the local area and at least one fisheries biologist with local expertise. These technical teams developed and prioritized management strategies for each of 43 fifth field watersheds in the subbasin. Once the technical teams completed their work, the priorities and strategies were reviewed by the coordination team for approval. This analysis was completed for the fifth field watersheds rather than the 256 sixth field watersheds in the subbasin due to time and budget constraints. The coordination team made the determination early on in the planning process that it was not feasible to do the analysis, synthesis, and management strategy-setting at this fine of a scale given time and budget constraints.

2.5 Process and Schedule for Revising/Updating the Plan

The subbasin plan was developed within the timeline and budget available for the planning process, utilizing the best information available. The plan will be reviewed and revised as necessary with more complete and better information as it becomes available. Plan revisions will incorporate the current and future needs of the subbasin. Specifically, the coordination team recommends the following:

1. Revise the subbasin plan as necessary to ensure consistency with current ESA listings and recovery plans as well as all other applicable laws and regulations.

2. Maintain a feedback loop from research, monitoring, and evaluation efforts in the subbasin to ensure this dynamic plan is updated with the best available science at the time.

3. Review the subbasin plan every five years and update the subbasin plan at least every 15 years, which is the designed life span for this plan.

3. Subbasin Assessment

3.1 Subbasin Overview

3.1.1 General Description

Location

The John Day Subbasin is located in northeastern Oregon in the southern section of the Columbia Plateau Ecological Province. Its over five million-acre (approximately 5,067,500 acres, or 8000 mi^2) drainage area is bound by the Columbia River (Lake Umatilla) to the north, the Blue Mountains to the east, the Aldrich Mountains and Strawberry Range to the south, and the Ochoco Mountains to the west. The John Day Subbasin incorporates portions of Grant, Wheeler, Gilliam, Sherman, Wasco, Jefferson, Umatilla, Morrow, Crook, Harney, Baker and Union counties. The towns within the subbasin with the largest populations include John Day, Prairie City and Condon. Populations of these and the other incorporated towns in the subbasin are listed in Table 2. See Figure 1 for a general overview map of the subbasin.

The John Day River flows generally northwest for 284 miles from its origin in the Blue Mountains and joins the Columbia River at river mile (RM) 217 upstream from the town of Rufus. The mainstem portion of the John Day River begins in the Strawberry Mountains in the Malheur National Forest and flows west through the town of John Day (RM 247) and then north from Dayville (RM 212). Major rivers flowing into the mainstem are the North Fork, Middle Fork, and South Fork John Day rivers.

The largest tributary to the John Day River is the North Fork, which originates in the Wallowa-Whitman National Forest in the Blue Mountains at elevations near 8000 feet. The North Fork John Day River flows westerly for 112 miles and joins the mainstem near Kimberly (RM 185), 15 miles below the town of Monument. The Middle Fork John Day River originates south of the North Fork in the Blue Mountains of the Malheur National Forest, flows westerly for 75 miles, and merges with the North Fork about 18 miles above Monument. The South Fork John Day River originates in the southwest portion of the Malheur National Forest and flows 60 miles north until it merges with the mainstem near Dayville.

Upon merging into the mainstem at Kimberly, the John Day River travels through deep canyon country on its way to the Columbia River. Important tributaries on the lower section of the John Day mainstem include Bridge Creek, Butte Creek, Thirtymile Creek, Hay Creek and Rock Creek.

Size

The John Day Subbasin drains a large portion of northeast Oregon (approximately 8000 mi^2), flowing 284 miles from its source in the Strawberry Mountains (9000-foot elevation), to its mouth at RM 217 (200-foot elevation) on the Columbia River. The John Day system contains over 500 river miles and is the second largest undammed tributary in the western United States. Only the Yellowstone River is larger.

The John Day River Subbasin is comprised of four major watersheds (fourth field watersheds, or HUC4s): North Fork John Day, Middle Fork John Day, Upper John Day, and Lower John Day. The Upper John Day watershed includes the upper mainstem and the South Fork John Day River. The Lower John Day watershed includes the mid- and lower mainstem.

North Fork. The North Fork John Day watershed drains approximately 1800 mi^2, with a perimeter of 306 miles. Elevations range from 1830 feet near the mouth of the North Fork to over 8300 feet in the headwater areas.

Middle Fork. The Middle Fork John Day watershed drains 806 mi^2 with a perimeter of 158 miles. Watershed elevations range from 2200 feet near the mouth of the Middle Fork to over 8200 feet in the headwater areas. The North and Middle Forks of the John Day River start in the mineral-rich Blue Mountains.

Upper John Day. The Upper John Day watershed drains approximately 2135 mi^2 above Picture Gorge (RM 205, near the confluence of Mountain Creek), including the South Fork John Day sub-watershed. The watershed perimeter is 304 miles. The South Fork John Day sub-watershed drains approximately 600 mi^2 and ranges in elevation from 2300 feet to 7400 feet.

Lower John Day. The Lower John Day watershed includes the middle and lower sections of the John Day River and drains the areas downstream of the confluence of the mainstem and North Fork John Day rivers at Kimberly (RM 185). The area encompasses 3148 mi^2 with a perimeter of 301 miles. The highest elevation in this fourth field watershed is Mount Pisgah at 6816 feet, while the lowest elevation is at the mouth of the John Day River at 265 feet.

Geology

The John Day Subbasin is characterized by diverse landforms ranging from loess-covered plateaus in the lower sections to alpine peaks in the headwaters. Rock assemblages within the John Day Subbasin include masses of oceanic crust, marine sediments, volcanic materials, ancient river and lake deposits, and recent river and landslide deposits. Major geologic events shaping the subbasin include volcanic eruptions, uplifting, faulting and erosion.

Volcanic activity in the form of lava flows, mudflows and ash fall formed and stratified three key formations in the subbasin over the course of approximately 37 to 54 million years – the Clarno Formation, John Day Formation, and the Columbia River Basalt Group. The Columbia River Basalt Group, a less-erodible formation, resulted from a series of basalt floods 12 to 19 million years ago. Columbia River basalts are the dominant rocks at elevations below 4000 feet. Igneous rocks are exposed in the higher reaches of the subbasin, while the lower subbasin exposures are primarily extrusive rocks, ash and wind-blown loess.

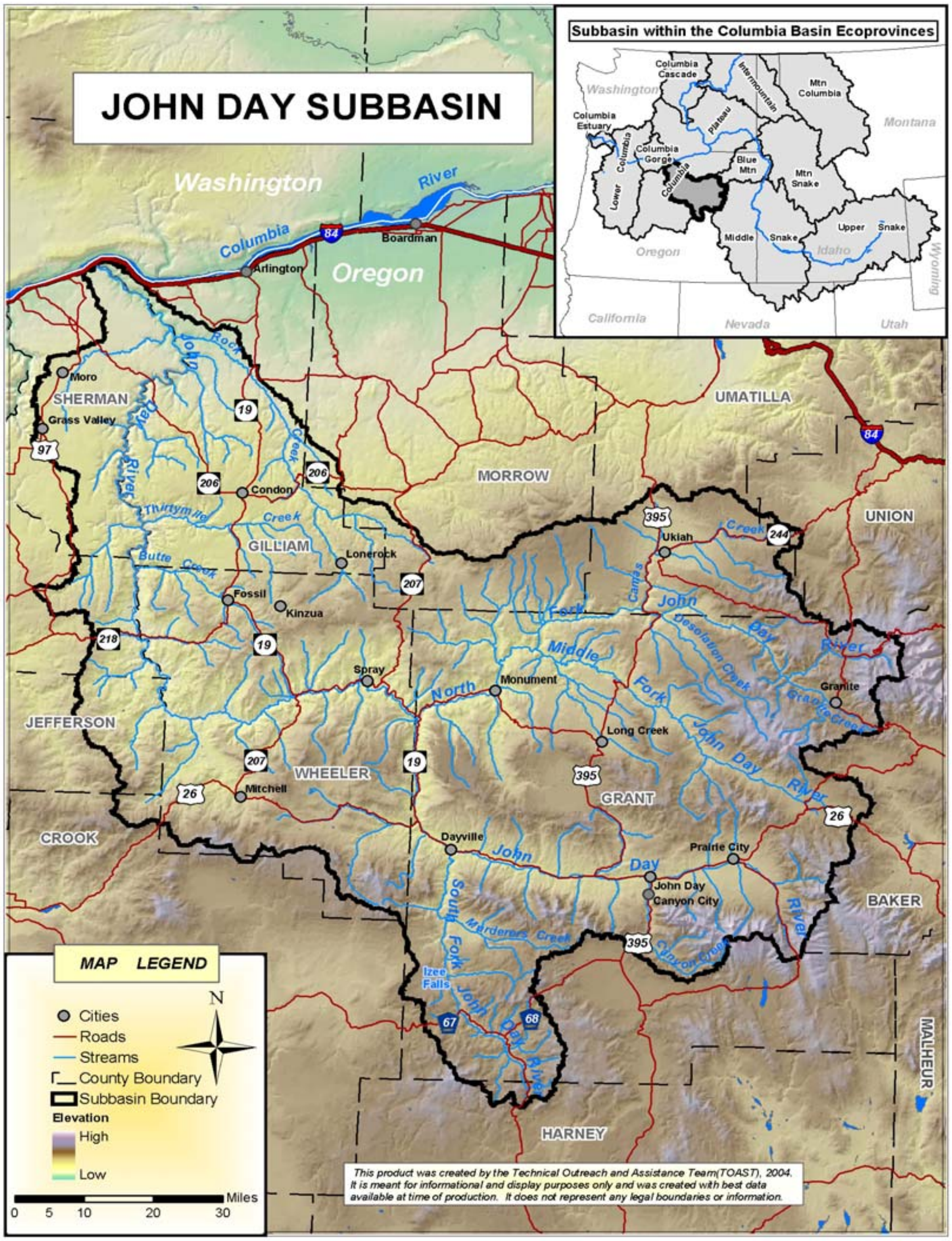

Figure 1. Overview of the John Day Subbasin.

After volcanic activity ceased 10 million years ago, erosion and faulting continued to alter the landscape. The Mascall Formation resulted from waterlaid fine volcanic sediments. The Rattlesnake Formation, a thick sequence of sand and gravel, was deposited in the ancestral John Day Valley. A final layer of predominantly unconsolidated silt, sand, and gravel comprises the Quaternary Alluvium.

Climate and Weather

The John Day Subbasin has a continental climate characterized by low winter and high summer temperatures, low average annual precipitation and dry summers. Climate in the subbasin ranges from sub-humid in the upper subbasin to semi-arid in the lower subbasin. Most precipitation falls between November and March. Less than 10% of the annual precipitation falls as rain during July and August, usually from sporadic thunderstorms. The upper elevations receive up to 50 inches of precipitation annually, mostly in the form of snow; lower elevations receive 12 inches or less of precipitation. The John Day Subbasin receives less precipitation than most portions of the Columbia Basin. See Figure 2 for a precipitation map of the subbasin.

Mean annual temperatures vary inversely with elevation. Mean annual temperature is 38° F in the upper subbasin and 58° F in the lower subbasin. Throughout the subbasin, actual temperatures vary from sub-zero during winter months to over 100° F during the summer. Inflows of moist Pacific air moderate extreme winter temperatures. The average frost-free period is 50 days in the upper subbasin and 200 days in the lower subbasin.

The John Day Subbasin portion of the Deschutes-Umatilla Plateau experiences cold winters and hot summers, with moderated night temperatures. Most precipitation is discharged over the Coast Range and Cascade Mountains before reaching the plateau; therefore, precipitation is low over this physiographic province. The Blue Mountains exhibit a great range of climates because of the diversity of the region. Physical features of the area create microclimates that deviate from the general pattern of warmer lower elevations and colder higher elevations. Eastern Oregon’s precipitation is highly influenced by elevation.

Land Cover

The subbasin’s vegetation ranges from coniferous forest at higher elevations to perennial grassland at middle elevations to desert shrub-steppe at lower elevations. Riparian habitats are often found along the subbasin’s waterways. Irrigated agriculture is undertaken on many floodplain meadows throughout the subbasin, and dryland farming is present to varying degrees (large wheat farms in the lower subbasin and dryland hay in scattered areas throughout the subbasin).

Classifiable plant communities (ecological sites) in the John Day Subbasin are categorized into four basic divisions, according to the topographic position which they occupy: riparian, terrace, upland, and forest-woodland. Grass, shrub, and juniper communities dominate the valley; ponderosa pine, lodgepole pine, Douglas fir and white fir communities dominate higher elevations. Soil diversity also contributes to the variety of vegetation types.

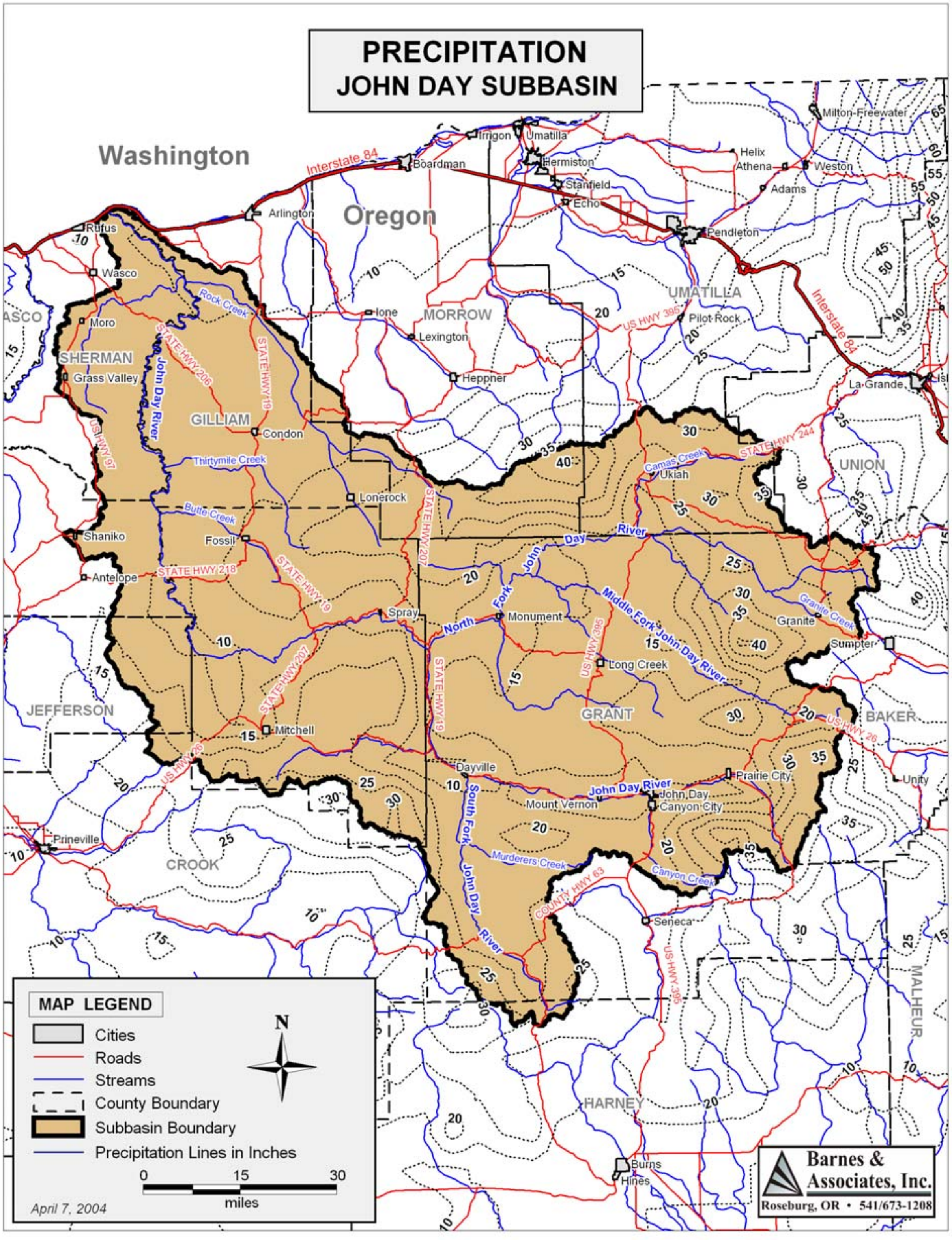

Figure 2. Precipitation map for the John Day Subbasin.

Riparian. Riparian areas are the green corridors of vegetation along perennial streams and around springs and seeps. Riparian zones are comprised of areas of undeveloped soils and developed, well-drained soils. Remnant natural hardwoods include alder, mountain ash, red-osier dogwood, willow, and cottonwood. Kentucky bluegrass and reed canary grass are non-native riparian species.

Riverine Terrace. The riverine terrace zone is formed from abandoned floodplains where soils are drained and subsurface water is diminished. This zone is a transition between riparian and upland vegetation. Primary, secondary and even tertiary terraces are ascribed according to their river proximity. Vegetation is comprised of xeric and non-native plants, including shrub-steppe vegetation.

Upland. The upland zone is characterized by steep slopes with shallow soils on ridges, south and west-facing slopes; and deeper, well-drained soils on north and east-facing slopes. The upper soil layer is sometimes bound by a biological soil crust consisting of algae, fungi, mosses, and lichens. Sagebrush-steppe covers much of the uplands; the various species found (big, low, stiff) is dependent on soil type. Widespread native grasses include: bluebunch wheatgrass and Idaho fescue on north slopes with relatively deep soils, basin wildrye on bottomlands, and sandberg bluegrass on relatively shallow soils.

Forest and Woodland. The John Day Subbasin encompasses about 1.8 million acres of forested lands; half of the subbasin's uplands are forested. The forest and woodland zone is found in higher elevation sites (above 4000 feet) with greater precipitation and cooler temperatures. Soils are generally deeper in this zone, allowing for growth of larger trees. Ponderosa pine is the principal forest cover, dominating south slopes. Moister areas favor Douglas-fir, white fir, grand fir, western larch, lodgepole pine and western white pine. At higher elevations (above 6000 feet), lodgepole pine, Engelmann spruce and subalpine fir are present.

Numerous rare plants are found in the John Day Subbasin. These plants are listed either through the Oregon Natural Heritage Program or under state or federal listings. Non-native plants are an increasing problem in the subbasin.

<u>Land Use, Population and Ownership</u>

Historically, the John Day Subbasin was used by Native Americans, fur trappers and homesteaders. The CTWSRO and the CTUIR have used the subbasin for centuries for gathering and harvesting fish, wildlife and other food stuffs. After the Indian treaties of 1855, homesteads and ranches were established on the river corridor where fertile bottomlands could be farmed and water was available for irrigation and livestock. Gold mining fueled settlement of the upper subbasin starting in the late 1850s, and continued as a significant activity into the early 20th century. Early land uses included wheat farming in the lower subbasin, ranching and associated irrigated hay meadows throughout, and logging in the forests of the subbasin's upper elevations. Small communities were established along the river to provide goods and services for mines, homesteads, and ranches.

Today, the John Day Subbasin is an overwhelmingly rural area with relatively low populations. The population trends for the subbasin can best be characterized by three counties which have a high proportion of their land area and most of their primary towns within the subbasin. These three counties are Grant, Wheeler and Gilliam. These counties' recent population figures according to the U.S. Census Bureau, 1990 and 2000 Census, are shown in Table 1.

Table 1. County populations according to U.S. Census Bureau (USCB 2004).

County	1990 Population	2000 Population	Pop. Change	% Change
Grant	7853	7935	82	1.0%
Gilliam	1717	1915	198	11.5%
Wheeler	1396	1547	151	10.8%
Total	10,966	11,397	431	3.9%

This population is spread between the scattered ranches, farms and homesites of outlying areas; small towns of 100 to 500 people built around a few small service businesses, a post office and perhaps a school (including the towns of Dayville, Fossil, Grass Valley, Long Creek, Mitchell, Monument, Moro, Spray and Ukiah); and the larger towns of 500 to 1821 (including John Day, Prairie City and Condon) which generally serve as county seats, and are home to government offices and numerous service-oriented businesses. Many of these towns were historically sawmill towns. Large mills remain today in John Day and Prairie City. Populations for the towns within the subbasin are shown in Table 2.

Table 2. City populations according to U.S. Census Bureau (USCB 2004).

Town	1990 Population	2000 Population	Pop. Change	% Change
John Day	1836	1821	-15	-0.8%
Prairie City	1147	1080	-67	-5.8%
Condon	635	759	124	19.5%
Canyon City	685	669	-16	-2.3%
Mount Vernon	454	595	141	31.1%
Fossil	416	469	53	12.7%
Moro	284	337	53	18.7%
Ukiah	237	255	18	7.6%
Long Creek	244	228	-16	-6.6%
Grass Valley	181	171	-10	-5.5%
Mitchell	145	170	25	17.2%
Monument	145	151	6	4.1%
Spray	137	140	3	2.2%
Dayville	164	138	-26	-15.9%
Shaniko	37	26	-11	-29.7%
Granite	0	24	24	NA
Lonerock	6	24	18	300.0%
Greenhorn	0	0	0	NA
Total	6753	7057	304	4.5%

The subbasin's population may continue to grow, perhaps at an accelerated rate, if the subbasin's attempts at economic diversification continue to be successful (see the next section on the economy of the subbasin). Increasing human population will result in greater demands for electricity, water, and buildable land as well as an increase in the need for transportation, communication, and other infrastructure. These economic and population demands may affect habitat features such as water quality and quantity, which are important to the survival and recovery of listed species and the health of populations of other non-listed species. Careful planning, management, and mitigation will be required to assure that future development is compatible with the need to maintain and enhance the area's value as fish and wildlife habitat.

Over 95% of the lands within the subbasin are zoned for agriculture and forestry. Private and federal lands are used mainly for livestock grazing and forage production. Urban lands comprise only 0.3% of the land base.

According to data from the Oregon Geospatial Data Clearinghouse (OGDC 2004), the ownership makeup of the John Day Subbasin is 59% private, 31% USFS, 9% BLM/miscellaneous federal and 1% state. Private ownership is focused primarily in the lower subbasin. The ownership makeup of the subbasin has been relatively static for the last decade or more, even though some federal-private exchanges have occurred. See Figure 3 for an ownership map of the subbasin.

The USDA Forest Service manages much of the higher elevations in the subbasin. The Umatilla, Wallowa-Whitman, Malheur and Ochoco National Forest together make up 31% of the subbasin's total area. These forests are managed according to a multiple use philosophy. Wilderness areas, designated roadless areas, and special use zones like riparian conservation areas (RCA) and large game range are managed with the primary emphasis on fish and wildlife values. Wilderness areas include the North Fork John Day Wilderness, Strawberry Wilderness, Black Canyon Wilderness and Bridge Creek Wilderness. Other areas of the forest are managed for multiple uses including grazing, recreation and timber production (though the latter has been much reduced over the last 15 years due to a combination of many factors).

Private forestlands are concentrated in pine and lower elevation mixed-conifer stands. They consist of a mix of large forest industry holdings (though many of these have been sold off in recent years), smaller private woodlots managed for timber and forage production, and recreational properties managed for aesthetics and hunting uses. Clearcutting is rare on private lands, and past logging on private lands in the region has generally resulted in low-to-moderate density stands of younger trees.

Mid-elevation grasslands and shrub-steppe plant communities are primarily in private ownership. Grazing of livestock is the predominant land use, though dryland farming occurs in places, primarily in the lower subbasin, but also in scattered small fields used for hay production on higher elevation ranches in the upper subbasin. Wheat is the primary crop. Recreation is an increasingly important use of these private lands.

In the river corridor and associated floodplains, irrigated agriculture is widespread. A mix of grass, alfalfa and grain hay is the primary product from irrigated lands. Some areas are managed as irrigated pasture; scattered small areas are managed for orchard and specialty crops. The vast majority of the irrigation is from surface waters of the John Day and its tributaries. Riparian areas are typically managed as part of larger agricultural operations, and many have been altered from their natural state by water diversions, channelization, vegetation changes and the like. An increasing number of riparian areas are being managed with an emphasis on protecting fish and wildlife values and water quality through a combination of individual landowner initiatives and contractual agreements associated with incentive programs such as USDA's Conservation Reserve Enhancement Program (CREP) and Conservation Reserve Program (CRP) programs, the riparian fencing programs run by ODFW, the CTWSRO and the CTUIR using BPA funding.

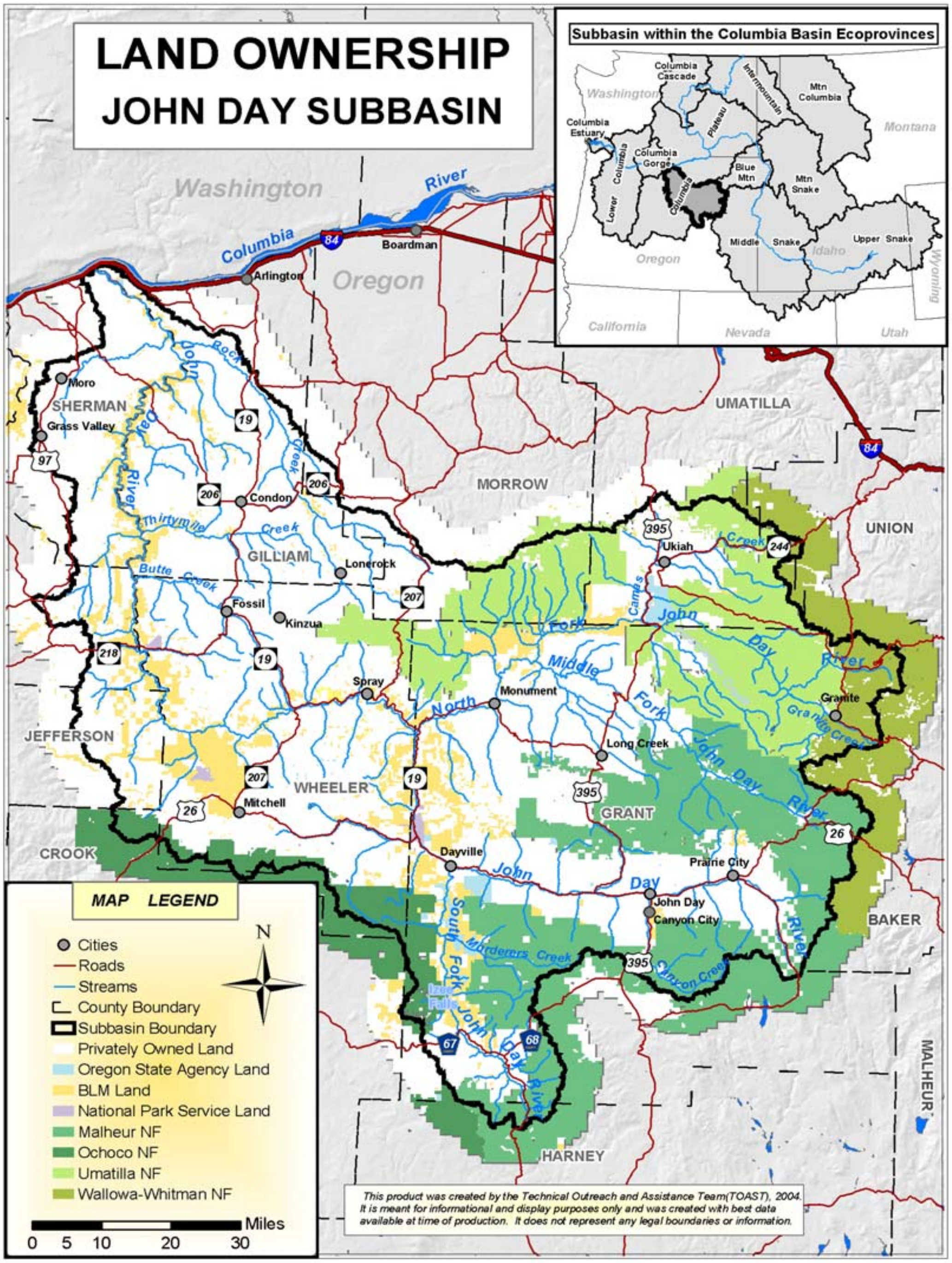

Figure 3. Ownership map for the John Day Subbasin as of June, 2003.

Large portions of the river corridor of the lower mainstem, and portions of the South Fork and the North Fork are managed by the Bureau of Land Management, which also manages scattered upland parcels throughout the subbasin. A recent land exchange program – including the Northeastern Oregon Assembled Land Exchange of 1998 and the changes resulting from the Oregon Land Exchange Act of 2000 - has provided some consolidation of BLM-administered lands in the upper part of the subbasin. The river corridor managed by the BLM is primarily made up of steep, lower elevation canyon country. Primary uses of BLM lands are grazing and recreation - particularly fishing and boating in the river corridors. BLM's management of the river corridor is guided by the 2001 John Day River Management Plan.

Urban lands comprise only a small portion of the land base; residential land use is scattered throughout the private lands of the middle and lower elevations. Residental development is governed by county land use plans and zoning. There is an increasing trend towards fragmentation of large private land holdings and associated rural development ranging from hunting cabins to small subdivisions. Such development has significant long-term ramifications for both terrestrial and aquatic habitat and wildlife. In a few instances conservation easements are being used to keep larger holdings intact and promote conservation goals on private lands.

State-owned lands are mostly wildlife management areas. These include the Bridge Creek Wildlife Area near Ukiah, the Phillip W. Schneider Wildlife Area south of Dayville and the Moon Creek Wildlife Area west of Mt. Vernon. The Bureau of Indian Affairs (U.S. Dept. of Interior) manages about 20 off-reservation trust lands for the CTWSRO, located throughout the subbasin. The CTWSRO either owns or manages approximately 35,000 acres throughout the subbasin. These include the Pine Creek, Oxbow and Forrest Ranches, all acquired by the tribes using BPA funding, and all managed with an emphasis on fish and wildlife conservation.

Three segments of the John Day River system were designated as Federal Wild and Scenic Rivers by the Omnibus Oregon Wild and Scenic Rivers Act of 1988 (Public Law 100-558). Most of the federally-designated Wild and Scenic Rivers in the John Day Subbasin are managed by the BLM according to its 2001 John Day River Management Plan.

The three John Day segments designated as Wild and Scenic are:

- Lower John Day River mainstem from Tumwater Falls upstream to Service Creek, classified as "Recreational" and managed by the BLM.
- North Fork John Day River from Camas Creek upstream to the head waters. One portion of this segment is classified as "Wild," two portions are classified as "Scenic," and two are classified as "Recreational." These segments are primarily managed by the Umatilla and Wallowa-Whitman national forests.
- South Fork John Day River from Smokey Creek upstream to the Malheur National Forest Boundary, classified as "Recreational" and primarily managed by the BLM.

These Wild and Scenic segments total approximately 249 miles.

Four segments of the John Day River system are designated as State Scenic Waterways by the State of Oregon, which restricts development and other activities in the scenic corridor. The program is administered by the Oregon Parks and Recreation Department.

The Oregon Scenic Waterways System was created by a ballot initiative in 1970. The system of rivers was expanded by another ballot initiative in 1988. The four John Day segments designated as State Scenic Waterways include:

- John Day River mainstem from Tumwater Falls upstream to Parrish Creek.
- North Fork John Day River from near Monument upstream to the North Fork John Day Wilderness boundary.
- Middle Fork John Day River from its confluence with the North Fork John Day River upstream to the Crawford Creek Bridge
- South Fork John Day River from the north boundary of the Phillip W. Schneider Wildlife Management Area to County Road 63.

The National Park Service manages the 14,000-acre John Day Fossil Beds National Monument within the John Day Subbasin. This monument, noted for its cultural and paleontologic resources, includes three separate units: Sheep Rock (northwest of Dayville), Painted Hills (northwest of Mitchell), and Clarno (southwest of Clarno).

See Figure 4 for a map showing the aforementioned "reserve areas" in the John Day Subbasin.

Economy

Gold mining fueled settlement of the upper subbasin starting in the late 1850s, and continued as a significant activity well into the early 20^{th} century. The modern economy developed around wheat farming in the lower subbasin, ranching and associated irrigated hay meadows throughout, and logging in the forests of the subbasin's upper elevations. Today the economy is heavily based on government, lumber and wood products manufacturing, retail, agriculture and forestry, telecommunications and tourism. The timber industry is most important in the forested upper portions of the subbasin. Livestock and agriculture are important throughout the subbasin, comprised mostly of cattle and sheep ranching and associated hay crops. Predominant irrigated crops are grass and alfalfa hay. Dry-land production of grain crops is the major economic activity on the plateaus of the lower subbasin. Mining is limited today compared to its historic role, but continues in the form of gravel pits, a bentonite mine near Clarno, and small scale, largely speculative and/or recreational gold mines in the historic mining districts of the upper headwaters. In addition, two of Oregon's three thunderegg mines are located in the subbasin.

Tourism has long been promoted as a growth industry, and many small businesses cater to visitors. Over the past decade, substantial numbers of traditional ranches in the subbasin have become fee hunting preserves, with many offering lodging and guide services to their clients. In Wheeler County alone, more than half of the county's ranches now serve the tourism industry (Don Cossitt, Wheeler County Assessor, personal communication, March 2003). Hunting, fishing, boating, camping, wildlife observation, photography, hiking, swimming and scenic viewing are among the most common recreational activities, but tourism remains limited compared to nearby regions like the Deschutes Subbasin.

The vast majority of the John Day Subbasin – including the counties of Grant, Gilliam, Wheeler, Sherman, Crook, Harney, Jefferson and Morrow - is economically distressed according to the latest data (March 2002) from the Oregon Economic & Community Development Department (OECDD 2004). Many communities have been hard hit by sawmill closures and the decline in forestry jobs over the last thirty years. The historically-large contribution of timber to the subbasin economy has declined in the last decade due to a number of factors including lack of raw materials, environmental litigation (which has contributed to the lack of raw materials), inconsistent domestic lumber markets, and increased domestic imports. Few new industrial opportunities have come along to replace these lost jobs. Expansion of the economy is limited by the small population, isolation from major cities, and limited transportation facilities.

The economic conditions contribute to a larger demographic shift. Many local residents have been forced to leave the area due to lack of economic opportunity, while at the same time retirees and other new emigrants in search of rural living move into the area. The flight of young families combined with the influx of older newcomers is resulting in an increase in the average age, and significant declines in school enrollments in many of the subbasin's towns. Smaller communities struggle to provide public services given limited income bases and high costs per resident. Land values are increasing far faster than commodity prices, limiting the opportunity in many areas of the subbasin for the expansion and/or generational transfer of existing agricultural operations. In addition, consolidation of agricultural operations is reducing overall agricultural employment. An increasing portion of the private land is owned by absentee landowners interested in recreation, land speculation, and retirement.

Despite the economic hardships, the subbasin remains home to vibrant communities with a strong connection to the places they call home. Area communities and residents are pursuing new economic opportunities at the same time that they continue to actively support the agricultural and forest industries around which their communities were founded. Areas of interest include tourism and recreation, small scale manufacturing of easily transportable products (examples include a bowstring manufacturer with a growing business in John Day), value-added agricultural products (including branded beef), value-added forest products (such as the new dowel mill in Seneca and several efforts to promote juniper products), telecommuting (by new immigrants and via efforts like the telemarketing center in John Day and excellent telecom infrastructure as compared to many other parts of rural Oregon). A new golf course and recreational area have recently opened at Arlington (just outside the subbasin on the Columbia River east of the mouth of the John Day River). Wheeler County's first industrial park has already attracted interest from potential occupants. The area's rugged sparsely-settled country continues to provide a wealth of both challenges and opportunities for those that call it home.

Figure 4. Reserved areas of the John Day Subbasin.

Human Disturbances to the Aquatic and Terrestrial Environments

Historically, the John Day River was one of the most significant anadromous fish producing rivers in the Columbia River Basin (CRITFC 1995). The John Day Subbasin is widely held as home to the strongest native runs of spring chinook salmon and summer steelhead in the Columbia Basin. The lower reaches of the John Day River are also home to a relic run of fall chinook. In addition, the entire system supports an unknown number of anadromous Pacific lamprey. Other fish species accorded high interest are resident populations of westslope cutthroat, interior redband and bull trout. Summer steelhead and bull trout have garnered particular interest, as both are federally-listed as threatened under the ESA. Current harvest of anadromous fish is limited within the John Day Subbasin to a small tribal subsistence fishery for spring chinook, but salmon and steelhead produced here contribute to fisheries in the ocean and the lower Columbia River.

Changes in the watershed such as elevated water temperatures, decreased flow and alteration of the hydrograph have in many cases favored introduced (smallmouth bass, channel catfish and carp) or non-salmonid species (northern pikeminnow, chiselmouth and redside shiner) in places that historically were dominated by salmonids. Introduced species – smallmouth bass and channel catfish in particular – have provided a very popular fishery in areas once occupied by salmonids. Some people argue that these introduced species have contributed to declines in salmonids, but ODFW stomach content data suggest that predation by smallmouth bass is not significant (Tim Unterwegner, ODFW, personal communication, April 8, 2004).

Some past and current land use practices have degraded the aquatic resource. Water withdrawals have reduced streamflows, especially during summer, and contributed to higher water temperatures; poorly-managed grazing, mining, timber harvesting, and maintenance of pushup dams have reduced riparian vegetation and shade, also contributing to higher water temperatures and reducing habitat diversity; pushup dams and reduced flows have created physical and thermal obstacles to fish movement. Riparian road construction and use, agricultural and residential development, and recreational use of riparian areas have also contributed to compromised fish habitat.

The John Day Subbasin, particularly along the upper mainstem and South Fork John Day rivers, experienced considerable amounts of intensive stream channelization, flow modifications and drainage (including some tiling of drainage ditches) projects between 1943 and 1951. These projects were encouraged and supported by various agencies to improve crop production. This work was accomplished as “a conservation priority and was considered the stream science at the time” (ODA 2002).

Much of the Columbia Plateau, including much of the lower John Day Subbasin, was once a shrub-steppe environment. This shrub-steppe habitat included bunch grasses, shrubs and numerous wildlife species. Today, much of this area has been converted to dryland wheat. Many of the diverse plant and wildlife communities have been replaced by cropland in a wheat/fallow rotation. Since 1985, there have been an estimated 150,000 acres of farm ground permanently converted to non-native grass cover by way of the USDA’s Conservation Reserve

Program (CRP). This program is supported by the Oregon Department of Fish & Wildlife and has provided improved habitat for many game and non-game species.

Noxious weeds and uncontrolled growth of some native species (e.g., juniper) are an intensifying problem within the subbasin. The rapidly-expanding invasion of noxious weeds represents the single greatest threat to native rangeland biodiversity and recovery of less-than-healthy watersheds. The initiation and spread of noxious plants have been furthered by human disturbances such as recreational use, unmanaged grazing and fire suppression. Although many weeds occupy lands in the John Day Subbasin, those causing most concern are diffuse, spotted, and Russian knapweeds; Dalmatian toadflax; yellow starthistle; Scotch thistle; purple loosestrife; rush skeletonweed; leafy spurge; poison hemlock; and, medusahead rye. Native bunchgrasses have been replaced in many areas by western juniper (*Juniperus occidentalis*), sagebrush (*Artemesia sp*.) and exotic annual grasses (e.g., cheatgrass).

In spite of all the disturbances summarized in this section, the aquatic habitat in the John Day Subbasin is healthier than in many other Columbia Basin tributaries due to the absence of large dams and the presence of quality habitat in some federally-owned headwater areas and elsewhere. Further, landowners and others within the subbasin have increased awareness of the negative impacts of some land management practices. Current practices have been, and continue to be improved to minimize these impacts while at the same time furthering the long-term interests of natural resource industries in the subbasin.

The cooperative nature of current programs and coordinating agencies and entities, and the variety of innovative, effective projects on the ground are an asset to the subbasin in implementing recovery and restoration efforts. Improving and expanding on existing, successful efforts – including habitat enhancement, passage improvement, research and monitoring and evaluation activities – are key to meeting restoration goals within the subbasin.

3.1.2 Subbasin Existing Water Resources

The bulk of this discussion on existing water resources was taken from the John Day Subbasin Summary (NWPPC 2001).

Watershed Hydrography

The John Day River Subbasin consists of four U.S. Geological Survey (USGS) fourth field (HUC4) watersheds: the Upper John Day River (USGS cataloging unit 17070201), the North Fork John Day River (USGS cataloging unit 17070202), the Middle Fork John Day River (USGS cataloging unit 17070203), and the Lower John Day River (USGS cataloging unit 17070204). These HUC4 watersheds are further divided into sub-watersheds (fifth field, or HUC5 watersheds) totaling 43 throughout the entire subbasin. See Figure 5 for a map of the fourth and fifth field watersheds in the subbasin.

Hydrologic Regime

Most water in the John Day Subbasin is derived from the upper watershed, primarily in the form of melting snow. Discharge from the free-flowing (no large-scale dams) John Day River is highly variable from peak to low flows.

Flow data in the John Day River Subbasin is currently being collected from 18 stations located on the river and various tributaries. The OWRD operates and maintains 11 streamflow gaging stations, the USGS runs six and the BLM has assumed operation of the last station. Historic gaging station streamflow data for all current stations as well as “real time” streamflows for some stations are available for download as average daily flows from the OWRD website (www.wrd.state.or.us). The USGS also publishes data from some of the stations in its annual report on streamflows in Oregon.

Streamflows in the mainstem John Day River are currently monitored at five locations: McDonald Ferry (RM 21), Service Creek (RM 157), Picture Gorge (RM 205), John Day (RM 253) and Blue Mountain Hot Springs (RM 275). Flows from the North Fork are monitored at a station near Monument (RM 16). Streamflows in the Middle Fork are recorded near Ritter (RM 15). Two stations are active on the South Fork: one near Dayville (RM 7) and the other near Izee (RM 34). Other streams currently being monitored include: Mountain Creek, Lone Rock Creek, Butte Creek, Murderer’s Creek, Deer Creek, Canyon Creek, Strawberry Creek, Camas Creek and Bridge Creek.

The USGS-maintained gage at McDonald Ferry, Oregon (gage # 14048000), the oldest gage in the subbasin, has been in operation since December 1904. The discharge measured at this station represents 7580 square miles, or approximately 96% of the entire subbasin. Other long-standing gages in the subbasin include John Day River near John Day (#14038530), North Fork John Day River at Monument (#14046000), and John Day River at Service Creek (#14046500). These gaging stations, as well as the McDonald Ferry station, are shown with their locations and periods of record in Table 3.

Based on the record from the McDonald Ferry station, the John Day River’s mean annual discharge into the Columbia River is slightly more than 2000 cubic feet per second (cfs). The average annual discharge ranges from a high of 4818 cfs in 1984 to the low of 603 in 1934.

Table 3. USGS gaging station summary, John Day Subbasin, Oregon.

Gage No.	Gage Name	Lat.	Long.	Area (mi^2)	Elev. (ft)	Period of Record
14048000	McDonald Ferry	45°35'16"	120°24'30"	7580	392	1904-pres.
14038530	John Day	44°5’07”	118°54’19”	386	3130	1968-1994, 1996-pres.
14046000	Monument	44°48'50"	119°25'50"	2520	1959	1925-pres.
14046500	Service Creek	44°7'38"	120°00'20"	5090	1632	1925-1926, 1929-pres.

Peak streamflows in the John Day River usually occur from March through May while the seasonal low flows typically occur from August through October. The highest recorded discharge of the John Day River was 42,800 cfs on December 24, 1964, caused by warm rain melting large amounts of snow. The lowest recorded discharge from the McDonald Ferry station was zero cfs for part of September 2, 1966, August 15 to September 16, 1973, and August 13, 14 and 19 to 25, 1977. Mean annual and mean monthly flows are shown in Figures 6 and 7, respectively. Peak flow at the McDonald Ferry gaging station is typically over 100 times greater than the lowest flows of the same year. From year to year, peak flows can vary as much as 300 to 700%.

The hydrologic curve has shifted from historic times, with peak flows greater than in the past and late season flows more diminished. It is suspected that these effects are due to greatly reduced rates of soil infiltration, reduced capacity for ground water / riparian storage, and diminished in-channel storage in beaver ponds (NWPPC 2001).

Figure 5. Fourth and fifth field watersheds in the John Day Subbasin.

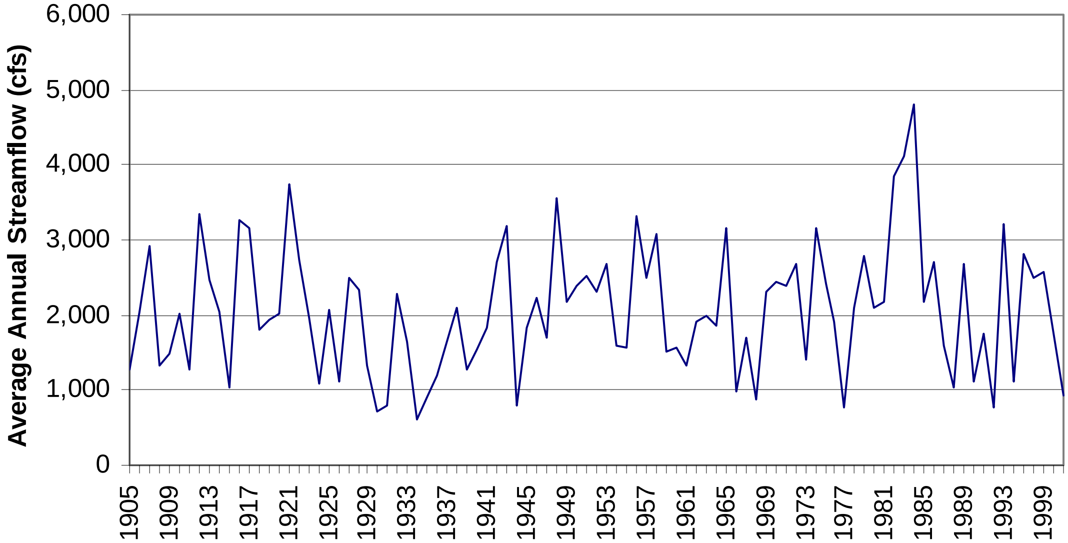

Figure 6. Mean annual flows in the John Day Subbasin (McDonald Ferry gage #14048000).

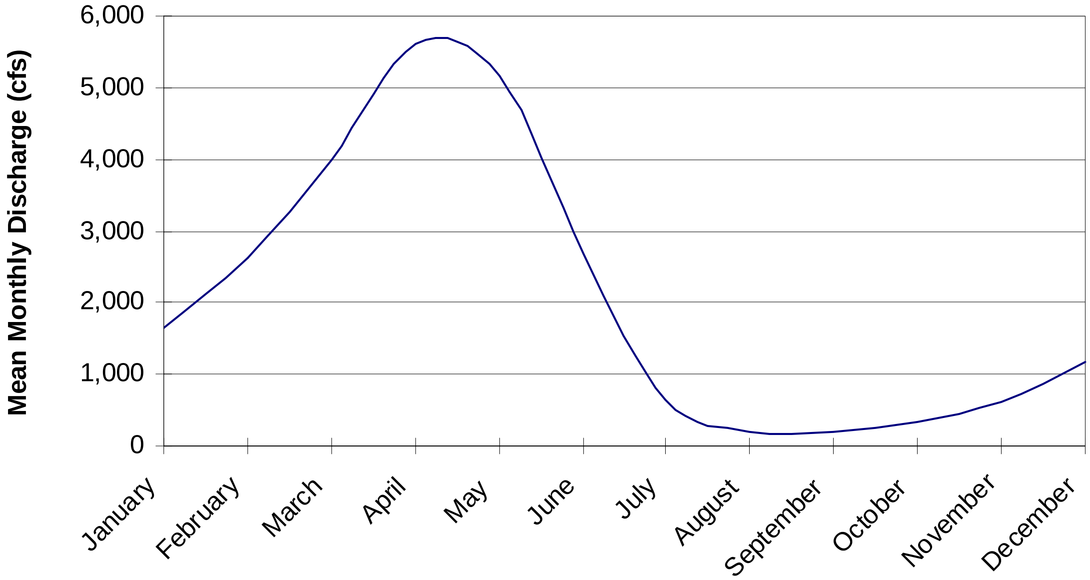

Figure 7. Mean monthly discharge from 1904 to 2002 (McDonald Ferry gage #14048000).

Four types of aquifers comprise each of the four watersheds, as shown in Table 4. The Columbia Plateau aquifer system and the Miocene basaltic-rock aquifer are the two most common. Approximately 31% of the total area has no principal aquifer.

Table 4. Principal aquifers in John Day Subbasin watersheds.

Aquifer Type	Total Miles[2]	Rock Type	Percent Composition			
			NF	MF	U	L
Columbia Plateau aquifer system	3115	Basalt, volcanic rock	32.3	12.9	0.9	53.9
Volcanic and Sedimentary Rock aquifers	508	Basalt, volcanic rock	42.7	0.6	24.8	31.9
Miocene basaltic-rock aquifers	1391	Basalt, volcanic rock	5.8	10.6	66.5	17.1
Pacific Northwest basin-fill aquifers	483	Unconsolidated sand, gravel	15.3	0.0	57.3	27.3
No Principal Aquifer	2425	N/A	19.4	9.7	32.6	38.4

NF = North Fork John Day, MF = Middle Fork John Day, U = Upper John Day, L = Lower John Day.

Water Quality

Water quality standards are benchmarks established to assess whether river and lake quality is adequate to protect fish and other aquatic life, recreation, drinking, agriculture, industry and other uses. Water quality standards are also regulatory tools used by the Oregon Department of Environmental Quality (ODEQ) and the US Environmental Protection Agency (EPA) to prevent water pollution. States are required to adopt water quality standards by the federal Clean Water Act. Standards are subject to approval by EPA.

The Clean Water Act also requires states to maintain a list of stream segments that do not meet water quality standards. This list is called the 303(d) list because of the section of the Clean Water Act that makes the requirement. The Clean Water Act requires states to develop water quality goals (called Total Maximum Daily Loads or TMDLs) along with an implementation plan and schedule to achieve water quality goals for 303(d) listed water bodies**.** TMDLs for the John Day Subbasin are scheduled for completion in 2006 (http://www.deq.state.or.us/wq/303dlist/TMDLTargestMap.htm).

TMDL monitoring was initiated in 2002 in the North and Middle Fork watersheds and will be contined through the summer of 2004 and possible later. The US Environmental Protection Agency approved Oregon's 2002 303(d) list on March 24, 2003 (http://www.deq.state.or.us/wq/303dlist/303dpage.htm).

The ODEQ has identified some streams in the John Day Subbasin as water quality limited. Many of these streams are habitat areas for spring chinook salmon and summer steelhead. Water quality limited means in-stream water quality fails to meet established standards for certain parameters for all or a portion of the year. Water quality parameters (and standards) of temperature (64° F/55° F, rearing/spawning) and dissolved oxygen (98% saturation) relate to the beneficial use for fish life. Other standards include bacteria (fecal coliform) and pH. Many segments of streams throughout the John Day Subbasin are listed on ODEQ's 303(d) list of affected waters for temperature. Most water quality problems in the John Day Subbasin stem from vegetation disturbance, stream straightening / relocation, year-round livestock grazing, cumulative effects of timber harvest and road building, water withdrawals for irrigation and historical mining and dredging. In the lower subbasin, some dry-land agricultural practices, such as summer fallow, can affect water quality by modifying subbasin hydrology, potentially affecting sediment delivery as well as peak and late season flows (NWPPC 2001).

North Fork John Day. The North Fork has the best chemical, physical, and biological water quality in the John Day Subbasin as compared to ODEQ water quality standards (USDI 2000). Most of the streams in this subbasin are considered in relatively good condition, with the exception of elevated late summer water temperatures that do not meet ODEQ standards. It is recognized that water quality standard thresholds default to natural conditions where the latter prevail. An assessment of potential more-natural conditions is being conducted through the TMDL process, scheduled for completion in 2006. Temperature is the primary water quality limitations for the North Fork (Table 5). The North Fork does not meet PACFISH pool frequency management objectives (USDA and USDI 1994). (Pools serve as cold water refugia for salmon and steelhead when streams become warm.) Because the North Fork (including its primary tributary, Middle Fork) contributes 60% of the flow to the mainstem John Day (OWRD 1986), the influence of the North Fork on temperature is significant, which relates directly to fisheries. Other water quality problems in the North Fork include leaching of toxic mine waste in specific locations and a high degree of stream sedimentation from highly erodable soils. Hot geothermal springs also exist, but their effects on water quality are not fully known.

Table 5. North Fork John Day River watershed 303(d) listed stream segments and water quality parameters of concern (ODEQ 2002).

Waterbody Name	Parameter	Waterbody Name	Parameter
Alder Creek	Sedimentation	Hidaway Creek	Temperature
Baldy Creek	Sedimentation	Hog Creek	Sedimentation
Bear Wallow Creek	Temperature	Indian Creek	Temperature
Beaver Creek	Temperature	Lane Creek	Temperature
Big Creek	Temperature	Mallory Creek	Temperature
Big Wall Creek	Temperature, Sedimentation	Meadow Creek	Temperature
Bowman Creek	Temperature	North Fork Cable Creek	Temperature
Bridge Creek	Temperature	North Fork John Day River	Temperature
Buck Creek	Temperature	Onion Creek	Temperature
Bull Run Creek	Temperature	Owens Creek	Temperature
Cable Creek	Temperature	Porter Creek	Sedimentation
Camas Creek	Temperature	Potamus Creek	Temperature
Clear Creek	Temperature	Rancheria Creek	Temperature
Cottonwood Creek	Biological Criteria	Skookum Creek	Temperature
Crane Creek	Temperature	South Fork Cable Creek	Temperature
Desolation Creek	Temperature	South Trail Creek	Temperature
Ditch Creek	Temperature	Sponge Creek	Temperature
East Fork Cottonwood Creek	Biological Criteria	Stalder Creek	Temperature
Fivemile Creek	Temperature	Swale Creek	Temperature, Sedimentation
Frazier Creek	Temperature	Trail Creek	Temperature
Granite Creek	Temperature, Sedimentation	Wilson Creek	Temperature, Sedimentation

Middle Fork John Day. Water quality in the Middle Fork John Day Subbasin generally exhibits satisfactory chemical, physical, and biological quality as compared to ODEQ water quality standards (USDI 2000). The Middle Fork usually has worse water quality problems than its tributaries, with the most serious water quality problem being elevated summer temperatures (Table 6). Sedimentation from streambank erosion is not a serious problem in the Middle Fork. Season-long cattle grazing contributes to elevated fecal coliform counts during summer. However, agricultural runoff presents a low level of potential impact to water quality. (NWPPC 2001)

Table 6. Middle Fork John Day River watershed 303(d) listed stream segments and parameters of concern (ODEQ 2002).

Waterbody Name	Parameter	Waterbody Name	Parameter
Badger Creek	Temperature	Grub Creek	Temperature
Battle Creek	Temperature	Indian Creek	Temperature
Bear Creek	Temperature	Little Pine Creek	Temperature
Canyon Creek	Temperature	McClellan Creek	Temperature
Corral Creek	Biological Criteria	Mountain Creek	Temperature
Cottonwood Creek	Temperature	Murderers Creek	Temperature
Dads Creek	Temperature	North Fork Deer Creek	Temperature
Dans Creek	Temperature	Pine Creek	Temperature
Deardorff Creek	Temperature	Rail Creek	Temperature
Deer Creek	Temperature	Reynolds Creek	Temperature
Dog Creek	Temperature	Reynolds Creek	Temperature
East Fork Canyon Creek	Temperature	Rock Creek	Temperature
Ennis Creek	Temperature	Slyfe Creek	Temperature
Ennis Creek	Temperature	South Fork John Day River	Temperature
Fields Creek	Temperature	Strawberry Creek	Temperature
Fields Creek	Temperature	Sunflower Creek	Temperature
Flat Creek	Temperature	Tex Creek	Temperature
Flat Creek	Temperature	Tex Creek	Temperature
Grasshopper Creek	Temperature	Tinker Creek	Temperature
Grasshopper Creek	Temperature	Utley Creek	Biological Criteria
		Utley Creek	Dissolved Oxygen

Upper John Day (upstream of Dayville, but including South Fork). Water quality is fair in the upper watershed during most of the year as compared to ODEQ water quality standards (USDI 2000). Low summer flows on the mainstem John Day River above Dayville contribute to elevated temperatures (Table 7); higher streamflows during the winter/spring and streambank erosion contribute to turbidity. Problematic eutrophication (the process whereby excessive growth of algae and aquatic plants increases organic matter in the water, resulting in elevated pH levels and decreased dissolved oxygen, all of which are harmful to aquatic life) in the South Fork and mainstem John Day rivers are a partial result of irrigation return flow (non-point source) and possibly cattle feedlots (point source) (NWPPC 2001).

Table 7. Upper John Day River watershed 303(d) listed stream segments and parameters of concern (ODEQ 2002).

Waterbody Name	Parameter	Waterbody Name	Parameter
Badger Creek	Temperature	Grub Creek	Temperature
Battle Creek	Temperature	Indian Creek	Temperature
Bear Creek	Temperature	Little Pine Creek	Temperature
Canyon Creek	Temperature	McClellan Creek	Temperature
Corral Creek	Biological Criteria	Mountain Creek	Temperature
Cottonwood Creek	Temperature	Murderers Creek	Temperature
Dads Creek	Temperature	North Fork Deer Creek	Temperature
Dans Creek	Temperature	Pine Creek	Temperature
Deardorff Creek	Temperature	Rail Creek	Temperature
Deer Creek	Temperature	Reynolds Creek	Temperature
Dog Creek	Temperature	Reynolds Creek	Temperature
East Fork Canyon Creek	Temperature	Rock Creek	Temperature
Ennis Creek	Temperature	Slyfe Creek	Temperature
Ennis Creek	Temperature	South Fork John Day River	Temperature
Fields Creek	Temperature	Strawberry Creek	Temperature
Fields Creek	Temperature	Sunflower Creek	Temperature
Flat Creek	Temperature	Tex Creek	Temperature
Flat Creek	Temperature	Tex Creek	Temperature
Grasshopper Creek	Temperature	Tinker Creek	Temperature
Grasshopper Creek	Temperature	Utley Creek	Biological Criteria
		Utley Creek	Dissolved Oxygen

Lower John Day (downstream of Dayville). During the summer months from July to September, groundwater provides much of the base flow to the Lower John Day River. Although ODEQ has listed the lower river as water quality limited for temperature, other water quality constituents such as total phosphates, biochemical oxygen demand, and fecal coliform can also limit water quality during late summer when flows are the lowest and water temperatures are the greatest (Table 8). Severe streambank erosion and sedimentation exists in some tributaries to the mainstem. Eutrophication is also active during the low-flow summer months when water temperatures are high. (NWPPC 2001) Total Maximum Daily Loads (TMDLs) are expected to be developed for this portion of the subbasin in 2006.

Table 8. Lower John Day River watershed 303(d) listed stream segments and parameters of concern (ODEQ 2002).

Waterbody Name	Parameter	Waterbody Name	Parameter
Bear Creek	Temperature	John Day River	Temperature
Bridge Creek	Temperature	John Day River	Temperature
Gable Creek	Temperature	John Day River	Fecal Coliform
Grass Valley Canyon	Temperature	John Day River	Dissolved Oxygen
Henry Creek	Temperature	Nelson Creek	Temperature
John Day River	Fecal Coliform	Pine Creek	Biological Criteria
John Day River	pH	Sorefoot Creek	Temperature
John Day River	Temperature	Stahl Canyon	Temperature
John Day River	Temperature	Thirtymile Creek	Temperature
		Thirtymile Creek	Temperature

The Agricultural Water Quality Management Act (Senate Bill 1010) was passed in 1993 to formally organize agricultural efforts to address water pollution in watersheds across the state. Senate Bill 1010 directed ODA to develop watershed-based plans that outline strategies to prevent and control water pollution from agricultural activities and soil erosion.

The Senate Bill 1010 process is triggered in an area when a water quality management plan is required by state or federal law. Area plans identify local water quality problems associated with agricultural lands, conditions in the watershed that need to be addressed to meet water quality standards, and ways to correct those problems. Area rules are established to address those parameters identified in the 303(d) list.

The four Agricultural Water Quality Management Area Plans (AgWQMAP) developed for the John Day Subbasin include:

1. North and Middle Forks John Day AgWQMAP
2. Upper and South Fork John Day AgWQMAP
3. Middle John Day AgWQMAP
4. Lower John Day AgWQMAP

Riparian Resources

The riparian zone is the area that normally receives some degree of inundation (or saturated soil conditions) during the growing season. In most of the John Day Subbasin, the majority of the riparian zone is flooded during part of the growing season and dry during mid to late summer. Several riparian ecological sites have distinct potential plant communities. Some of these sites have the potential for dense riparian plant communities. In areas where the soils are not developed enough to moderate the annual wet-dry cycle, vegetation is either lacking completely or restricted above the normal high water line to plants such as service berry, hackberry, mock orange and various annual and perennial grasses and forbs. The areas where soils are developed and well-drained have more shrubs that are traditionally considered riparian, such as willow and alder. Where water flow is slow or where saturated soil conditions last longer into the growing season, sedges and rushes occupy more of the plant composition.

An ecological site is a particular or unique kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation. Along the John Day River itself there are several ecological sites that have distinct potential plant communities. Some of these sites have potential for riparian plant communities and others do not.

On the lower mainstem John Day River system, seven draft riparian ecological sites have been described which support distinct potential plant communities. The sites vary greatly in their ability to support riparian vegetation (USDI 2000).

Basalt Cliff /Ledge. This site consists of basalt cliffs and ledges. It is generally devoid of soil. Occasionally very sparse vegetation will exist in fractures and crevices.

Colluvium. This site consists of rubble deposited by colluvial means. Fluvial forces have little to do with this landform. Boulders that have rolled into the stream are present adjacent to the site and are evident at low flow levels. Vegetation varies depending on how much fine soil material has accumulated and distance from average water flows. Hackberry is the dominant woody vegetation with mock orange present in wetter sites. Willows are present at all but a few sites. Bunchgrass is typically not present below the mean high water mark. Reed canary grass is common. Some emergent species tend to follow the water level as flows recede in the growing season.

Cobble/Gravel Bar. This site consists of gravel and cobble bars, including mid-channeland point bars. Bar material is highly mobile. Vegetation, when present, is typically emergent and tends to follow the waters edge as it recedes during the growing season. As a result of substrate mobility and the associated shearing action, woody species are seldom found. Some mid-channel bars have willow communities that are becoming established. These bars are in locations relative to channel shape that allow energy and shearing actions to stay in a defined pattern and allow for woody species to become better established.

Terrace Edge. The formation of this site is the result of lateral stream migration into an older terrace landform. The older terrace is a remnant of the holocene period prior to the John Day adjusting to its current elevation. The top or flat part of the terrace contains upland species. This site is variable due to slope of the terrace edge, either vertical or sloping or slumping, and due to parent material of the terrace, either fine textured or coarse or a mixture of both. The substrate material composition is a factor in erosion rate (active cutbank, stable vertical bank, slumping recovering bank) which is a function of spatial location with respect to channel migration. Vegetation varies due mainly to soil texture and flow level fluctuations. Herbaceous and emergent vegetation follows water levels as it recedes during the growing season. Woody species are seldom found.

Non-Riparian Terrace Edge. This site consists of shallow soil terrace underlain by coarse fluvial substrate, typically gravel or cobble. This site is a specific subunit of the previously described terrace edge site. At low flow levels this site typically grades into gravel bars. Vegetation is limited by the lack of fine soil material and by low water holding capacity especially when water levels recede. As a result of substrate mobility and the associated shearing action, woody species are seldom found.

Alluvial Fan. This site forms a confluence with tributaries and canyon features. It is highly variable and groundwater relations are a key component. Coarse materials are deposited from the tributary into the main channel. Some of the coarse material is sheared from the front edge and deposited immediately downstream. Fine materials are deposited from the main channel both upstream and downstream of the coarse fan. The areas of fine soils material are subirrigated by the tributary creating a more stable water regime for plant communities. Vegetation is diverse with both herbaceous and woody vegetation present.

Hillslope. This site consists of shallow stony colluvium. What little fine soil that is included is loamy in texture. Fluvial forces have little to do with this landform and this site is very stable. Boulders that have rolled into the stream are present adjacent to the site and are evident at low flow levels. Vegetation varies depending on how much fine soil material has accumulated and elevation from average water flows. Hackberry is the dominant woody vegetation with mock orange present in wetter sites. Willows have only been found at very few sites. Bunchgrass is typically not present below the mean high water mark. Reed canary grass occurs on some areas. Some emergent species tend to follow the water level as flows recede in the growing season.

Wetland Resources

The John Day Subbasin has numerous wetlands. However, most of these wetlands are small. Many of these wetlands are in complex with stream systems and thus are linear in nature. (Roger Borine, USDA Natural Resources Conservation Service, April 1, 2004).

The U.S. Fish and Wildlife Service's National Wetlands Inventory covers the John Day Subbasin. However, the maps of this inventory are not yet available in electronic format. There have been no Local Wetlands Inventories conducted in the subbasin. These local inventories are typically conducted by municipalities prior to land development efforts (Kevin Herkamp, Oregon Division of State Lands, March 30, 2004).

3.1.3 Hydrologic and Ecologic Trends in the Subbasin

Watershed conditions in the John Day Subbasin have changed significantly over the past 150 years. Water and land use practices contributing to these changes include placer and dredge mining, livestock grazing, timber harvest, certain intensive agricultural practices, road construction, flood events (such as the 1964 and 1996 floods) and stream channelization. These watershed disturbances have caused risks to ecological integrity by reducing biodiversity and threatening riparian-associated species (ICBEMP 2000). Terrestrial habitat areas were irrevocably changed with the introduction of livestock grazing and intensive agricultural conversion. Fire suppression for the past 100 or more years has also changed the structure and composition of forest stands in the subbasin. Nonetheless, habitat conditions on some private lands, in particular those involved in cooperative restoration programs, are generally considered to be improving. In addition, habitat conditions on federally-administered lands are on an upward trend (Federal Caucus 2000).

Historical descriptions of the John Day Subbasin indicate that the John Day River was once a relatively stable river with good summer streamflows and water quality, and heavy riparian cover. Streambanks were covered with dense growths of aspen, poplar, and willow; cottonwood galleries were thick and wide; and beaver were very abundant (Wissmar *et al*. 1994). Large spring and fall chinook salmon migrations and numerous beaver sightings indicated that John Day River waters contained a high degree of in-stream habitat diversity. Terrestrial habitat was noted to have been dominated by native bunchgrasses and sagebrush.

Historic, recent and current land use practices may have altered the hydrologic cycle (the storage, movement and character of the water resource over entire areas of the John Day Subbasin and its tributary system). Changes in the hydrologic cycle are demonstrated by increased runoff, altered peak flow regimes, reduced ground water recharge and soil moisture storage, and low late-season flow. Historic and current land uses, in combination with hydrologic changes, may have resulted in some portions of the John Day Subbasin reflecting marked stream channel instability (i.e., channel widening, downcutting, vertical cut banks, and excessive gully development).

Although riparian habitat has been largely degraded as compared to historic conditions, riparian habitat quality is improving in some areas receiving enhancement and protection. Photo-monitoring and other assessments by BLM show condition variations, but where riparian-oriented management has been implemented, vegetative structure, density, and diversity have increased (USDI 2000). In general, riparian areas in the lower and middle mainstem portion are "functional-at-risk," indicating a functional condition but susceptibility to degradation (USDI 2000). Overall, a moderate level of wetland has been lost. Conversion of the river-bottom areas to agricultural development has effectively reduced the natural meadow habitat historically associated with riverine habitats.

Both the quantity and quality of natural wildlife habitat in the John Day Subbasin have declined since the mid-1800s (USDI 2000). Habitats for wildlife have become increasingly fragmented, simplified in structure, and infringed on or dominated by non-native plants (ICBEMP 2000). The most obvious disturbance in the subbasin is cattle grazing (OWRD 1986). The subbasin is sensitive to overgrazing by cattle because the native grassland vegetation evolved in the absence of large herbivores (Li *et al*. 1994). Historic sheep grazing also played a role in habitat disturbance.

Major habitat changes have also resulted from a century of fire suppression activities/fire exclusion from the forest ecosystem. This practice has resulted in forest stand densities outside the historic range of natural conditions. The resulting dense stands of trees are more susceptible to insect infestation and disease infection. These dense stands are also more likely to experience catastrophic stand replacement fires and their substantial impacts on certain forest habitats, including riparian areas. Fire suppression has also resulted in juniper encroachment into native grasslands. These juniper forests increase water usage through increased evapo-transpiration, thus leading to reduced streamflows.

Past logging activities, inundation of lower river habitat from Columbia River hydropower development, human development, irrigated and dry-land agricultural conversion, drought, recreational activities, road densities and noxious weed encroachment have also affected the natural wildlife habitats in the subbasin (USDI 1998). Habitat quality is variable depending on the degree to which habitats have been converted into other land uses, impacted by human activities or invaded by noxious weeds. Although agricultural development has altered native habitat areas, non-native habitat has increased for adaptable species.

Restoration of certain aspects of watershed function in the John Day Subbasin began long before any species were listed under the ESA. Soil erosion, stream channel instability, and riparian function-oriented projects have been underway in the subbasin in different land use sectors for many years by way of a combination of federal, state, tribal, local, and privately-led efforts. Movement toward conservation tillage in the agricultural sector, improvements in grazing management, and improved timber management practices, while oriented toward their particular sector, also achieve value for salmon in the long run. Improvements in the scientific understanding of species distribution and needs, watershed management, and techniques for watershed restoration are expected to enhance these on-going efforts for additional benefit to fish and wildlife resources.

3.1.4 Regional Context

Relation to Other Geographic Units in the Columbia River Basin

The John Day Subbasin is one of 62 subbasins within the United States portion of the Columbia River Basin. Located in northeastern Oregon in the southern section of the Columbia Plateau Ecological Province, it is one of 11 ecological provinces within the Columbia River Basin (U.S. portion). The John Day Subbasin is bound on two sides by other subbasins within the Columbia Plateau Ecological Province: on the west by the Deschutes Subbasin and on the north by the Lower Middle Columbia (western portion) and the Umatilla (eastern portion) subbasins. Subbasins from the Blue Mountain and Middle Snake ecological provinces bound the John Day Subbasin on the east. The John Day Subbasin contains over five million acres (5,067,500 acres), making it the fourth largest subbasin in Oregon. See Figure 8 for a map of the subbasins and ecological provinces within the Columbia River Basin.

The John Day River is unique – it is the second longest free-flowing river in the continental United States, and its spring chinook salmon and summer steelhead populations are two of the last remaining intact wild populations of anadromous fish in the Columbia River Basin. The John Day River has also been kept relatively free of hatchery influences. Many segments of the John Day River have been designated under the federal Wild Scenic Rivers Act and Oregon's State Scenic Waterways Act. Among other things, these designations recognize the John Day's significant fish and wildlife values.

NOAA Fisheries Evolutionarily Significant Units

NOAA Fisheries has identified more than 50 different Evolutionarily Significant Units (ESUs) of west coast salmon and steelhead in Washington, Oregon, California, and Idaho. An ESU is a geographic delineation of fish used to distinguish individual populations of salmon and steelhead that share common genetic, ecological, and life history traits, but differ in important ways from fish in other ESUs. Within an ESU there may be multiple populations of demographically independent groups of fish that spawn during specific seasons and within specific waterbodies, but do not interbreed with fish from another group.

The interior Columbia River Basin is currently home to 12 different anadromous salmonid ESUs belonging to three different species: chinook salmon (*Oncorhynchus tshawytscha*), sockeye salmon (*O. nerka*), and steelhead trout (*O. mykiss*). Since 1991, seven of these 12 ESUs have been listed as threatened under the ESA because of dramatic declines in abundance and loss of habitat.

The John Day Subbasin is located within the Mid-Columbia River (MCR) steelhead ESU. Other subbasins within the MCR steelhead ESU are the Yakima, Klickitat, Deschutes, Walla-Walla and the Umatilla. See the insert map in Figure 9 for a map of the MCR steelhead ESU and its neighboring ESUs.

The National Marine Fisheries Service's (NMFS) recent Biological Opinion (NMFS 2000) on the federal Columbia River hydropower system recognizes the importance of the John Day Subbasin to fish and wildlife restoration efforts. NMFS – now called NOAA Fisheries – specifically identified the Upper John Day as a priority watershed that will receive immediate attention for habitat and species recovery for the MCR steelhead ESU. NMFS assigned priority status to the Upper John Day watershed because the watershed has significant potential for improvement in productive capacity, contains significant amounts of quality habitat on federal lands to anchor restoration efforts, and has significant numbers of water diversions where immediate and significant gains could be secured by addressing flow, passage and screening problems.

The MCR steelhead was listed as threatened on March 25, 1999 (64 FR 14517); critical habitat was designated on February 16, 2000 (65 FR 7764); and protective regulations were adopted on July 10, 2000 (65 FR 42422). However, On April 30, 2002, the United States District Court for the District of Columbia adopted a consent decree resolving the claims in the National Association of Homebuilders, *et al.* v. Evans, Civil Action No. 00-2799 (D. D.C., April 30, 2002). Pursuant to that consent decree, the court issued an order vacating critical habitat designations for a number of listed salmonid species.

USFWS Designated Bull Trout Planning Units

The U.S. Fish and Wildlife Service has identified five populations of bull trout as Distinct Population Segments (DPSs) for recovery purposes (i.e., the U.S. Fish and Wildlife Service has concluded that these populations meet the requirements of the joint policy with the National Marine Fisheries Service regarding the recognition of distinct vertebrate populations (61 FR 4722)). Bull trout present in the John Day Subbasin are part of the Columbia River DPS, encompassing parts of Oregon, Washington, Idaho and Montana. Other DPSs identified by the USFWS include: Klamath River, Jarbidge River, Coastal-Puget Sound and St. Mary-Belly River populations.

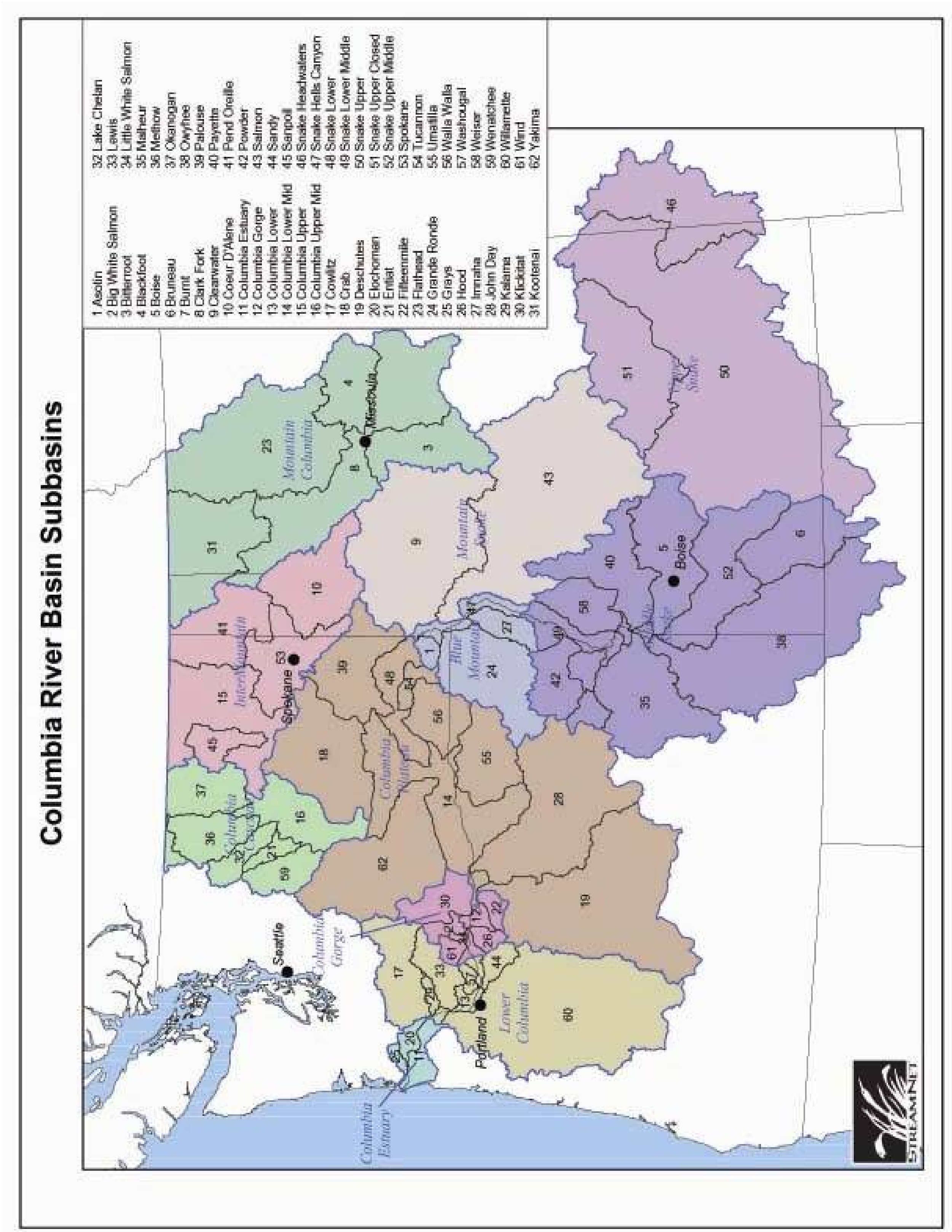

Figure 8. Columbia Basin Ecological Provinces and Subbasins.

The U.S. Fish and Wildlife Service has identified the John Day Subbasin as one of 22 recovery units within the Columbia River Distinct Population Segment (USFWS 2003). Recovery units were identified based on three factors: (1) recognition of jurisdictional boundaries, (2) biological and genetic factors common to bull trout within a specific geographic area, and (3) logistical concerns for coordination, development, and implementation of the recovery plan. The John Day Recovery Unit includes bull trout from three watersheds: the North Fork John Day River, the Middle Fork John Day River and a portion of the Upper Mainstem John Day River. Each of these areas corresponds to a core area for recovery purposes. See the insert map in Figure 20 for a map of the Columbia River DPS and its 22 recovery units.

The U.S. Fish and Wildlife Service issued a final rule listing the Columbia River and Klamath River populations of bull trout (*Salvelinus confluentus*) as a threatened species under the Endangered Species Act on June 10, 1998 (63 FR 31647). The other four populations were listed as threatened later in 1998 and in 1999, resulting in all bull trout in the coterminous United States being listed as threatened.

3.2 Focal Species Characterization and Status

3.2.1 Native/Non-native Wildlife, Plant and Resident/Anadromous Fish of Ecological Importance

<u>Species Designated as Threatened or Endangered</u>

Terrestrial Wildlife. Five wildlife species found in the John Day Subbasin are currently listed as threatened or endangered by Oregon and/or the federal government (Table 9). In addition, three wildlife species found in the John Day Subbasin are federal candidate species, meaning that there is sufficient information on the biological vulnerability of and threats to these species to support proposals to list them as endangered or threatened (Table 10). A similar category at the state level is Oregon's classification of critical sensitive species, which includes species whose listing as threatened or endangered is pending, or for which immediate conservation actions are needed to prevent their listing. The John Day Subbasin has 19 species found on Oregon's critical sensitive species list (Table 11).

In addition to the critical category, Oregon also recognizes sensitive wildlife species that are vulnerable, peripheral or naturally rare, or have an undetermined status. Vulnerable sensitive species are species whose listing as threatened or endangered is not imminent and may be avoided by continued or expanded use of adequate protective measures and monitoring. Peripheral or naturally rare species are sensitive because they are species whose Oregon populations are at the edge of their range, or because they have had historically low population numbers in Oregon because of naturally limiting factors. Species with an undetermined status may also be susceptible to population decline, but need more study to determine their status. The 40 species that fall into one or more of these three categories are also shown in Table 11.

Table 9. Wildlife species of the John Day Subbasin listed as threatened or endangered at the state or federal level (ODFW 2003, USFWS 2003).

Common Name	Scientific Name	Status
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

Table 10. Wildlife species of the John Day Subbasin that are candidates for federal listing (USFWS 2003).

Common Name	Scientific Name
Columbia spotted frog	*Rana luteiventris*
Washington ground squirrel	*Spermophilus washingtoni*
yellow-billed cuckoo	*Coccyzus americanus*

Table 11. Sensitive wildlife species of the John Day Subbasin that fall into one of four categories: critical, vulnerable, peripheral or naturally rare, or of undetermined status (ODFW 1997)

Common Name	Scientific Name	Oregon Sensitive Status
Birds:		
black-backed woodpecker	*Picoides arcticus*	Critical
burrowing owl	*Athene cunicularia*	Critical
common nighthawk	*Chordeiles minor*	Critical
ferruginous hawk	*Buteo regalis*	Critical
flammulated owl	*Otus flammeolus*	Critical
Lewis's woodpecker	*Melanerpes lewis*	Critical
northern goshawk	*Accipiter gentiles*	Critical
northern pygmy-owl	*Glaucidium gnoma*	Critical
red-necked grebe	*Podiceps grisegena*	Critical
sage sparrow	*Amphispiza belli*	Critical
three-toed woodpecker	*Picoides tridactylus*	Critical
upland sandpiper	*Bartramia longicauda*	Critical
vesper sparrow	*Pooecetes gramineus*	Critical
white-headed woodpecker	*Picoides albolarvatus*	Critical
yellow-billed cuckoo	*Coccyzus americanus*	Critical
yellow-breasted chat	*Icteria virens*	Critical
American white pelican	*Pelecanus erythrorhynchos*	Vulnerable
bobolink	*Dolichonyx oryzivorus*	Vulnerable
grasshopper sparrow	*Ammodramus savannarum*	Vulnerable
great gray owl	*Strix nebulosa*	Vulnerable
loggerhead shrike	*Lanius ludovicianus*	Vulnerable
long-billed curlew	*Numenius americanus*	Vulnerable
olive-sided flycatcher	*Contopus cooperi*	Vulnerable
pileated woodpecker	*Dryocopus pileatus*	Vulnerable
pygmy nuthatch	*Sitta pygmaea*	Vulnerable
sage grouse	*Centrocercus urophasianus*	Vulnerable
sandhill crane	*Grus canadensis*	Vulnerable
Swainson's hawk	*Buteo swainsoni*	Vulnerable

western bluebird	*Sialia mexicana*	Vulnerable
willow flycatcher	*Empidonax traillii*	Vulnerable/Undetermined Status
bank swallow	*Riparia riparia*	Undetermined Status
Barrow's goldeneye	*Bucephala islandica*	Undetermined Status
bufflehead	*Bucephala albeola*	Undetermined Status
harlequin duck	*Histrionicus histrionicus*	Undetermined Status
mountain quail	*Oreortyx pictus*	Undetermined Status
spruce grouse	*Falcipennis canadensis*	Undetermined Status
Williamson's sapsucker	*Sphyrapicus thyroideus*	Undetermined Status
black swift	*Cypseloides niger*	Peripheral or Naturally Rare
black-throated sparrow	*Amphispiza bilineata*	Peripheral or Naturally Rare
horned grebe	*Podiceps auritus*	Peripheral or Naturally Rare
tricolored blackbird	*Agelaius tricolor*	Peripheral or Naturally Rare
Mammals:		
Townsend's big-eared bat	*Corynorhinus townsendii*	Critical
fringed Myotis	*Myotis thysanodes*	Vulnerable
American marten	*Martes americana*	Vulnerable
pallid bat	*Antrozous pallidus*	Vulnerable
long-eared Myotis	*Myotis evotis*	Undetermined Status
long-legged Myotis	*Myotis volans*	Undetermined Status
silver-haired bat	*Lasionycteris noctivagans*	Undetermined Status
western small-footed Myotis	*Myotis ciliolabrum*	Undetermined Status
white-tailed jackrabbit	*Lepus townsendii*	Undetermined Status
Amphibians:		
northern leopard frog	*Rana pipiens*	Critical
tailed frog	*Ascaphus truei*	Vulnerable
western toad	*Bufo boreas*	Vulnerable
Columbia spotted frog	*Rana luteiventris*	Undetermined Status
Woodhouse's toad	*Bufo woodhousii*	Peripheral or Naturally Rare
Reptiles:		
painted turtle	*Chrysemys picta*	Critical
sagebrush lizard	*Sceloporus graciosus*	Vulnerable
western rattlesnake	*Crotalus viridis*	Vulnerable
long-nosed leopard lizard	*Gambelia wislizenii*	Undetermined Status

Plants. Table 12 displays threatened, endangered and sensitive plant species with documented or suspected occurrence in the John Day Subbasin as of April 12, 2004. All species on this list are also on the USFS Regional Forester's Sensitive Species list. Any species without a status listing in the status fields (last three columns of table) is on only the USFS Regional Forester's Sensitive Species list.

Table 12. Threatened, endangered and sensitive plant species documented or suspected to occur in the John Day Subbasin (Source: USFS 1999).

Species Name	Common Name	U.S.F.W.S. Status	Oregon Status	BLM Special Status List
Achnatherum hendersonii	Henderson's ricegrass		C	Sens
Achnatherum wallowaensis	Wallowa Ricegrass			Sens
Artemisia ludoviciana ssp. estesii	Este's artemisia	SoC		Sens
Astragalus diaphanus var. diurnus	South Fork John Day (Wats.) Barn milk-vetch	SoC	LT	
Astragalus peckii	Peck's milk-vetch	SoC	LT	
Astragalus tegetarioides	Bastard milk-vetch	SoC	C	Sens
Botrychium ascendens	Upward-lobed moonwort	SoC	C	Sens
Botrychium campestre	Prairie moonwort			
Botrychium crenulatum	Crenulate moonwort	SoC	C	Sens
Botrychium fenestratum	Windowleaf moonwort			
Botrychium lanceolatum	Lance-leaf grapefern			
Botrychium lineare	Skinny moonwort			
Botrychium lunaria	Moonwort grapefern			
Botrychium minganense	Mingan grapefern			
Botrychium montanum	Mountain grapefern			
Botrychium paradoxum	Two-spiked moonwort	SoC	C	
Botrychium pedunculosum	Stalked moonwort	SoC	C	
Botrychium pinnatum	Pinnate grapefern			
Calochortus longebarbatus var. longebarbatus	Longbearded Mariposa lily	SoC		
Calochortus longebarbatus var. peckii	Peck's lily	SoC	C	Sens
Calochortus macrocarpus var. maculosus	Nez Perce Mariposa lily			
Calochortus nitidus	Broad-fruit Mariposa lily	SoC		
Camissonia pygmaea	Dwarf evening primrose		C	Sens
Carex backii	Back's sedge			
Carex crawfordii	Crawford's sedge			
Carex hystericina	Porcupine sedge			
Carex interior	Inland sedge			
Carex nardina	Spikenard sedge			
Carex parryana ssp. idahoa	Idaho sedge			
Carex stenophylla (C. eleocharis)	Narrowleaf/needleleaf sedge			
Cypripedium fasciculatum	Clustered lady slipper	SoC	C	
Cypripedium parviflorum	Yellow lady's slipper			
Erigeron disparipilus	Snake River daisy			

Kobresia bellardii (K. myosuroides)	Bellard's kobresia			
Kobresia simpliciuscula	Simple kobresia			
Leptodactylon pungens ssp. hazeliae	Granite phlox/Prickly phlox	SoC	C	
Listera borealis	Northern twayblade			
Lomatium erythrocarpum	Red-fruit lomatium	SoC	LE	
Lomatium ochocense	Ochoco lomatium			Sens
Lomatium ravenii	Raven's lomatium			
Lomatium salmoniflorum	Salmon River lomatium			
Luina serpentina	Colonial luina	SoC		Sens
Lycopodium complanatum	Ground cedar			
Mimulus clivicola	Bank monkeyflower			
Mimulus evanescens	Dissppearing monkeyflower		C	Sens
Mimulus jungermannioides	Heptic monkeyflower			Sens
Myosurus sessilis	Sessile mousetail			Sens
Pellaea bridgesii	Bridge's cliffbrake			
Penstemon peckii	Peck's penstemon	SoC		Sens
Phacelia minutissima	Dwarf phacelia	SoC	C	Sens
Phlox multiflora	Many flowered phlox			
Pleuropogon oregonus	Oregon Semaphore grass	SoC	LT	
Rorippa columbiae	Columbia cress	SoC	C	Sens
Salix farriae	Farr willow			
Silene spaldingii	Spalding's campion	SoC	LE	
Suksdorfia violacea	Violet suksdorfia			
Thelypodium eucosmum	Arrow-leaf thelypody	SoC	LT	
Thelypodium howellii ssp. howellii	Howell's thelypody			
Trifolium douglasii	Douglas cloves			

Key:
SoC = species of concern, LT = listed as threatened, LE = listed as endangered, C = concern, Sens = BLM sensitive.

Fish. Bull trout were listed as threatened by the U.S. Fish and Wildlife Service (USFWS) in 1998; Mid-Columbia River steelhead were listed as threatened in 1999 by the National Marine Fisheries Service (both listings under the federal Endangered Species Act).

The status of westslope cutthroat trout, interior redband trout, and chinook salmon have all been reviewed by the appropriate regulatory agencies (USFWS for both trout species and NOAA Fisheries for chinook). The agencies have determined none of these species are warranted for listing under the ESA.

Westslope cutthroat and inland redband trout are listed as a sensitive species by the State of Oregon. Designation as sensitive indicates that the species is vulnerable, peripheral or naturally rare, or have undetermined status.

Species Recognized as Rare or Significant to the Local Area

Terrestrial Wildlife. In addition to the above threatened, endangered and sensitive species, there are several other species that are locally significant as components of terrestrial wildlife diversity in the John Day Subbasin. These species include re-established populations of California bighorn sheep from extirpated status, significant strongholds of shrub-steppe obligates and a relatively large representation of landbirds.

Along with the Umatilla/Willow Subbasin, the John Day Subbasin has a high proportion of shrub-steppe habitat, and therefore serves as a stronghold for many species dependent on this high quality shrub-steppe habitat. These shrub-steppe obligates include the long-billed curlew, loggerhead shrike, sage sparrow, grasshopper sparrow, burrowing owl, ferruginous hawk, Swainson's hawk, black-throated sparrow, sagebrush lizard and Washington ground squirrel.

Landbirds are also significant in the local area because they account for a significant portion of the vertebrate biological diversity in the John Day Subbasin. Approximately 207 species of landbirds occur in the subbasin, making up about 69% of the terrestrial vertebrate species in the subbasin. The distribution and abundance of many of these birds have been affected by fire suppression, timber management and resulting changes in the structure and distribution of plant communities (Marcot *et al*. 1997). Landbirds found in the John Day Subbasin that have declined in abundance regionally are shown in Table 13.

Table 13. Landbird species with declining population trends inhabiting the John Day Subbasin.

Species	Primary Habitat for Breeding
American kestrel[1]	coniferous forest, grassland
mourning dove[1]	coniferous forest, riparian
Vaux's swift[1]	coniferous forest, riparian
rufous hummingbird[1]	coniferous forest, riparian
belted kingfisher[1]	riparian
Lewis's woodpecker[2]	coniferous forest, riparian
Williamson's sapsucker[1]	coniferous forest, riparian
olive-sided flycatcher[1,2]	coniferous forest
western wood-pewee[1]	coniferous forest, riparian
violet-green swallow[1]	coniferous forest, riparian
barn swallow[1]	riparian
rock wren[1]	grassland, cliff, rock, talus
Swainson's thrush[1]	coniferous forest, riparian
varied thrush[1]	coniferous forest
orange-crowned warbler[1]	riparian
Wilson's warbler[1]	riparian
western tanager[1]	coniferous forest, riparian
chipping sparrow[1]	coniferous forest
white-crowned sparrow[1]	riparian
dark-eyed junco[1]	coniferous forest, riparian
western meadow lark[1,2]	grassland

pine siskin[2]	coniferous forest
American goldfinch[1]	riparian

[1]Species identified as having a significant declining population trend by Andleman and Stock 1994
[2]Species identified as a high concern to management by Saab and Rich 1997

Plants. Sensitive plant species are shown in Table 12 above.

Fish. Westlope cutthroat trout in Oregon are found only in the John Day River Subbasin (Shepard 2002). Historically, westslope cutthroat trout were limited to the Upper John Day River and select tributaries. Today, however, they are found in the North Fork John Day River watershed as well (See Figure 32 for current distribution.). Westslope cutthroat were introduced into Clear and Desolation creeks (North Fork John Day River tributaries) from Deardorff Creek (Upper Mainstem John Day River tributary) in the early 1960s in an effort to re-establish a fishery after extensive spruce budworm spraying eliminated aquatic life in portions of those streams.

Interior redband trout were petitioned for listing by a consortium of several environmental groups in 1995. USFWS determined they were not warranted for listing because they could not demonstrate the petitioned population was distinct from other redband populations, including those in the John Day River Subbasin. Where redband trout and steelhead distributions overlap, they are externally indistinguishable from each other until steelhead undergo smoltification at approximately six inches. Recent studies (Kostow 2003) indicate the different life history patterns of steelhead and redband are not reproductively isolated. Therefore, there is probably no justification for treating them as separate Evolutionarily Significant Units (ESUs). In this subbasin plan, it is assumed that measures for protecting and enhancing steelhead will also benefit redband trout.

The predominant life history strategy for bull trout within the subbasin is currently the resident form, particularly in the Middle Fork. Historically, bull trout exhibited more diverse life history patterns than at present. Larger historic populations of chinook salmon, steelhead, cutthroat and redband would have provided a large forage base for bull trout. A larger forage base would have favored the highly predatory, migratory (fluvial) form, which can grow as large as 20 to 25 inches in length. These larger, fluvial fish were highly regarded as a food source by Native Americans (Buchanan, 1997). Another unique feature of bull trout is their tolerance for and growth rates in cold water. Optimum growth of bull trout fry occurs at 39 to 40° F.

The spring chinook and summer steelhead populations in the John Day River have local as well as regional significance because they are not supplemented with hatchery fish. The John Day River is managed exclusively for wild fish production and may be the only large Columbia River tributary that has no hatchery stocking program for anadromous fish.

Species with Special Ecological Importance to the Subbasin

Terrestrial Wildlife. Several groups of wildlife species have special ecological importance to the John Day Subbasin, including: 1) functional specialists, 2) critical functional link species, 3) species with an association with salmonids, 4) Partners in Flight (PIF) species, 5) managed game species, and 6) species identified in the Habitat Evaluation Procedure (HEP) loss assessment. Each group is discussed briefly below.

Functional Specialists. Functional specialists are those wildlife species that perform very few and very specific ecological roles (IBIS 2003). As such, the persistence of these species depends on the continued existence of the required habitat or resource. One example of a functional specialist in the John Day Subbasin is the turkey vulture, which has the functional role of carrion feeding and little else. Accordingly, a decrease in the availability of carrion will negatively impact this species. Vertebrate species occurring in the John Day Subbasin that have been identified as functional specialists by IBIS are listed in Table 14.

Table 14. Functional specialists occurring in the John Day Subbasin (IBIS 2003).

Common Name	Scientific Name
Birds:	
black swift	*Cypseloides niger*
boreal owl	*Aegolius funereus*
common nighthawk	*Chordeiles minor*
gyrfalcon	*Falco rusticolus*
harlequin duck	*Histrionicus histrionicus*
merlin	*Falco columbarius*
northern pygmy-owl	*Glaucidium gnoma*
peregrine falcon	*Falco peregrinus*
snowy owl	*Nyctea scandiaca*
turkey vulture	*Cathartes aura*
Mammals:	
Canadian lynx	*Lynx canadensis*
wolverine	*Gulo gulo*
Reptiles:	
common kingsnake	*Lampropeltis getula*
ringneck snake	*Diadophis punctatus*

Critical Functional Link Species. A terrestrial species is characterized as a critical functional link species if it is the only species, or one of just a few species, in a particular wildlife habitat type that performs a particular key ecological function (IBIS 2003). The loss of these species may mean the loss of this function in the wildlife habitat type.

Critical functional link species identified by IBIS that occur in the John Day Subbasin are listed in Table 15. One example of a critical functional link species in the John Day Subbasin is the American beaver, which plays a unique role in every habitat in which it occurs by impounding water to create diversions or dams. Several species play multiple unique roles. For example, the black bear eats the bark, cambium, and bole of trees, excavates cavities in snags or live trees, and physically fragments standing wood (IBIS 2003).

Table 15. List of critical functional link terrestrial wildlife species in the John Day Subbasin (IBIS 2003).

Common Name	Scientific Name
Birds:	
black-chinned hummingbird	*Archilochus alexandri*
brown-headed cowbird	*Molothrus ater*
Canada goose	*Branta canadensis*
double-crested cormorant	*Phalacrocorax auritus*
great blue heron	*Ardea herodias*
great horned owl	*Bubo virginianus*
greater scaup	*Aythya marila*
red-breasted sapsucker	*Sphyrapicus ruber*
redhead	*Aythya americana*
rufous hummingbird	*Selasphorus rufus*
Williamson's sapsucker	*Sphyrapicus thyroideus*
Mammals:	
American beaver	*Castor canadensis*
black bear	*Ursus americanus*
bushy-tailed woodrat	*Neotoma cinerea*
common porcupine	*Erethizon dorsatum*
deer mouse	*Peromyscus maniculatus*
dusky-footed woodrat	*Neotoma fuscipes*
fisher	*Martes pennanti*
golden-mantled ground squirrel	*Spermophilus lateralis*
mink	*Mustela vison*
mountain lion	*Puma concolor*
northern pocket gopher	*Thomomys talpoides*
Nuttall's (mountain) cottontail	*Sylvilagus nuttallii*
red squirrel	*Tamiasciurus hudsonicus*
Rocky Mountain elk	*Cervus elaphus nelsoni*
snowshoe hare	*Lepus americanus*
Amphibians:	
Great Basin spadefoot	*Scaphiopus intermontanus*
long-toed salamander	*Ambystoma macrodactylum*

Species Associated with Salmonids. The John Day Subbasin also has numerous species which are linked, in some manner, to salmonids. The wildlife species of the subbasin that have been identified by IBIS as species that eat salmonid eggs, fry, fingerlings, parr, smolts, adults, or carcasses are listed in Table 16.

Table 16. List of wildlife species in the John Day Subbasin that eat different stages of salmonids (IBIS 2003).

Common Name		
Birds:	**Birds:**	**Birds:**
American crow	great egret	varied thrush
American dipper	greater scaup	violet-green swallow
American robin	greater yellowlegs	western grebe
American white pelican	green heron	willow flycatcher
bald eagle	green-winged teal	winter wren
bank swallow	harlequin duck	**Mammals:**
barn swallow	herring gull	American marten
Barrow's goldeneye	hooded merganser	black bear

belted kingfisher	horned grebe	bobcat
black-billed magpie	killdeer	coyote
black-crowned night-heron	mallard	deer mouse
California gull	northern rough-winged swallow	long-tailed weasel
canvasback	osprey	mink
Caspian tern	peregrine falcon	mountain lion
Clark's grebe	pied-billed grebe	northern flying squirrel
cliff swallow	red-breasted merganser	northern river otter
common goldeneye	red-necked grebe	raccoon
common loon	red-tailed hawk	red fox
common merganser	ring-billed gull	striped skunk
common raven	snowy owl	vagrant shrew
common tern	song sparrow	Virginia opossum
double-crested cormorant	spotted sandpiper	water shrew
Forster's tern	spotted towhee	western spotted skunk
golden eagle	tree swallow	white-tailed deer
gray jay	trumpeter swan	**Reptiles:**
great blue heron	turkey vulture	common garter snake

PIF Species. Other species with special ecological importance to the subbasin are Partners in Flight species. Partners in Flight (PIF) is "a cooperative effort involving partnerships among federal, state and local government agencies, philanthropic foundations, professional organizations, conservation groups, industry, the academic community, and private individuals" (PIF 2002). Founded in 1990, the original purpose of PIF was to aid neotropical migratory birds that breed in the Nearctic and winter in the Neotropics. However, the organization now works to conserve most landbirds. PIF produces both national and state lists of species they believe should be considered in land use plans, project planning, impact assessments, research, monitoring, outreach and other activities. A total of 78 species found in the John Day Subbasin are on the Oregon PIF list (Table 17).

Table 17. Common names of the 78 John Day Subbasin bird species on the Oregon PIF list (IBIS 2003).

Common Name		
American dipper	gray flycatcher	sharp-tailed grouse
American kestrel	great gray owl	short-eared owl
American pipit	green-tailed towhee	Swainson's hawk
ash-throated flycatcher	Hammond's flycatcher	Swainson's thrush
band-tailed pigeon	hermit thrush	Townsend's solitaire
bank swallow	horned lark	Townsend's warbler
black swift	house wren	varied thrush
black-backed woodpecker	Hutton's vireo	Vaux's swift
black-headed grosbeak	lark sparrow	veery
black-throated gray warbler	Lewis's woodpecker	vesper sparrow
black-throated sparrow	Lincoln's sparrow	warbling vireo
Brewer's sparrow	loggerhead shrike	western bluebird
brown creeper	Macgillivray's warbler	western meadowlark
Bullock's oriole	Nashville warbler	western tanager
burrowing owl	northern harrier	western wood-pewee
bushtit	olive-sided flycatcher	white-breasted nuthatch
Calliope hummingbird	orange-crowned warbler	white-headed woodpecker
chipping sparrow	pileated woodpecker	white-throated swift

Clark's nutcracker	purple finch	Williamson's sapsucker
common poorwill	red crossbill	willow flycatcher
downy woodpecker	red-breasted sapsucker	Wilson's warbler
dusky flycatcher	red-eyed vireo	winter wren
ferruginous hawk	red-naped sapsucker	yellow warbler
flammulated owl	rufous hummingbird	yellow-billed cuckoo
fox sparrow	sage sparrow	yellow-breasted chat
grasshopper sparrow	sage thrasher	yellow-rumped warbler

Managed Game Species. The John Day Subbasin is also home to many game species. A total of 58 species in the subbasin are classified as managed game species or fur-bearing mammals in Oregon (Table 18). In addition to the species listed in Table 18, other hunted or trapped species in the subbasin include badger, coyote, striped and spotted skunk, long-tailed weasel and ermine. Several ODFW management plans provide guidance for managing game species in the subbasin, including *Oregon's Elk Management Plan, February 2003; Oregon's Bighorn Sheep and Rocky Mountain Goat Management Plan, December 2003; Oregon's Mule Deer Management Plan, February 2003; Oregon's Black Bear Management Plan, 1993 to 1998;* and *Oregon's Cougar Management Plan, 1993 to 1998.*

Table 18. Managed game species and fur-bearing mammals in the John Day Subbasin.

Common Name	Scientific Name
Birds:	
American coot	*Fulica americana*
American crow	*Corvus brachyrhynchos*
American wigeon	*Anas americana*
Barrow's goldeneye	*Bucephala islandica*
blue grouse	*Dendragapus obscurus*
blue-winged teal	*Anas discors*
bufflehead	*Bucephala albeola*
California quail	*Callipepla californica*
Canada goose	*Branta canadensis*
canvasback	*Aythya valisineria*
chukar partridge	*Alectoris chukar*
cinnamon teal	*Anas cyanoptera*
common goldeneye	*Bucephala clangula*
common merganser	*Mergus merganser*
common snipe	*Gallinago gallinago*
Eurasian wigeon	*Anas penelope*
gadwall	*Anas strepera*
gray partridge	*Perdix perdix*
greater scaup	*Aythya marila*
greater white-fronted goose	*Anser albifrons*
green-winged teal	*Anas crecca*
harlequin duck	*Histrionicus histrionicus*
hooded merganser	*Lophodytes cucullatus*
lesser scaup	*Aythya affinis*
mallard	*Anas platyrhynchos*
mountain quail	*Oreortyx pictus*
mourning dove	*Zenaida macroura*
northern pintail	*Anas acuta*

northern shoveler	*Anas clypeata*
redhead	*Aythya americana*
ring-necked duck	*Aythya collaris*
ring-necked pheasant	*Phasianus colchicus*
Ross's goose	*Chen rossii*
ruddy duck	*Oxyura jamaicensis*
ruffed grouse	*Bonasa umbellus*
sage grouse	*Centrocercus urophasianus*
snow goose	*Chen caerulescens*
white-winged scoter	*Melanitta fusca*
wild turkey	*Meleagris gallopavo*
wood duck	*Aix sponsa*
Mammals:	
American beaver	*Castor canadensis*
American marten	*Martes americana*
American mink	*Mustela vison*
black bear	*Ursus americanus*
bobcat	*Lynx rufus*
California bighorn sheep	*Ovis canadensis californiana*
fisher	*Martes pennanti*
mountain lion	*Puma concolor*
mule deer	*Odocoileus hemionus hemionus*
muskrat	*Ondatra zibethicus*
northern raccoon	*Procyon lotor*
northern river otter	*Lontra canadensis*
pronghorn	*Antilocapra americana*
red fox	*Vulpes vulpes*
Rocky Mountain elk	*Cervus elaphus nelsoni*
mountain goat	*Oreamnos americanus*
white-tailed deer	*Odocoileus virginianus ochrourus*
Amphibians:	
bullfrog	*Rana catesbeiana*

HEP Species: Certain species in the Columbia River Basin were selected during the USFWS Habitat Evaluation Procedure (HEP) loss assessment process. These species were used to model impacts from adjacent hydro-electric development. HEP species relevant to the John Day Subbasin are those selected for the John Day and McNary dams. These species are listed in Table 19.

Table 19. HEP species selected for the John Day and McNary dams (IBIS 2003).

Common Name	Scientific Name
Birds:	
spotted sandpiper	*Actitis macularia*
mallard	*Anas platyrhynchgos*
great blue heron	*Ardea herodia*
lesser scaup	*Aytha affinis*
Canada goose	*Branta canadensis*
blue grouse	*Dendragapus obscurus*
yellow warbler	*Dendraica petechia*
California quail	*Callipepla californica*
black-capped chickadee	*Parus atricopillus*
downy woodpecker	*Picoides pubescens*
western meadowlark	*Sturnella neglecta*
Mammals:	
mink	*Mustela vison*
mule deer	*Odocoileus hemionus*

Plants. Noxious plants known to occur in the John Day Subbasin are listed in Table 20. This list of weeds is a subset of those on the Oregon Department of Agriculture's noxious weed list (ODA 2004) made specific to the John Day Subbasin by several local botanists and county weed agents.

Table 20. Noxious weeds found in the John Day Subbasin.

Common Name	Scientific Name
Russian knapweed	*Acroptilon repens*
jointed goatgrass	*Aegilops cylindrica*
quackgrass	*Agropyron repens*
camelthorn	*Alhagi pseudalhagi*
ragweed	*Ambrosia artemisiifolia*
whitetop (hoary cress)	*Cardaria draba*
plumeless thistle	*Carduus alanthoides*
musk thistle	*Carduus nutans*
diffuse knapweed	*Centaurea diffusa*
spotted knapweed	*Centaurea maculosa*
yellow starthistle	*Centaurea solstitialis*
squarrose knapweed	*Centaurea virgata*
rush skeltonweed	*Chondrilla juncea*
Canada thistle	*Cirsium arvense*
bull thistle	*Cirsium vulgare*
poison hemlock	*Conium maculatum*
field bindweed	*Convolvulus arvensis*
common crupina	*Crupina vulgaris*
houndstongue	*Cynoglossum officinale*
leafy spurge	*Euphorbia esula*
St. Johnswort (Klamath weed)	*Hypericum perforatum*
perennial pepperweed	*Lepidium latifolium*
dalmation toadflax	*Linaria dalmatica*

Common Name	Scientific Name
yellow toadflax	*Linaria vulgaris*
purple loosestrife	*Lythrum salicaria*
Scotch thistle	*Onopordum acanthium*
Mediterranean sage	*Salvia aethiopis*
tansy ragwort	*Senecio jacobaea*
milkthistle	*Silybum marianum*
Johnsongrass	*Sorghum halepense*
Austrian peaweed	*Sphaerophysa salsula*
medusahead rye	*Taeniatherum caput-medusae*
saltcedar	*Tamarix ramosissima*
puncturevine	*Tribulus terrestris*

Species Recognized by Native Americans as Culturally or Spiritually Significant

Confederated Tribes of the Umatilla Indian Reservation. All species of fish, wildlife, and plants are significant to the culture and tradition of the CTUIR because of their belief that the Creator designed and brought each species into being. As such, each species is believed to fulfill important roles in the ecosystem. Some examples of these roles in Native American tradition and culture are shown in Table 21.

Table 21. Some examples of the importance of animals and plants in the cultural and spiritual lives of CTUIR Native Americans.

Traditional or Cultural Role	Examples of Animals Involved
regalia	eagle feathers and otter, deer, and elk pelts
instruments/music	eagle whistle, deer hide drum, dew claw rattles
subsistence	salmon, whitefish, mule deer, elk, grouse
medicinal	lamprey
spirit/vision quests	bear, cougar, raven
stories/oral histories	coyote, owl
naming	wolf, eagle
tools	elk/deer antler tools, fish bones

Confederated Tribes of the Warm Springs Reservation of Oregon. The John Day Subbasin lies within the ceded territory of the CTWSRO (see Section 4.1.2 for more information on the CTWSRO treaty with the U.S. government). All of the subbasin's natural resources are important to the CTWSRO, including water, native fish, cultural plants and wildlife. Indigenous species are of tremendous cultural significance. The tribes depend on natural resources for subsistence, medicinal remedies, religious ceremonies and for practical uses such as tool making. Cultural resources are coveted by the CTWSRO and they are considered sacred. Due to the sensitive nature of cultural resources, knowledge of their distribution and utilization is not shared with the general public.

Freshwater mussels and Pacific lamprey have special significance to the Confederated Tribes of Warm Springs Reservation of Oregon and the Confederated Tribes of the Umatilla Indian Reservation. Further details of these two species can be found in Appendix C.

3.2.2 Focal Species Selection

List of Species Selected/Methodology for Selection

Terrestrial Wildlife. The John Day Subbasin wildlife focal species and their associated habitats are listed in Table 22.

Large portions of the text in this terrestrial wildlife section originate from a 2004 draft of the *Southeast Washington Subbasin Planning Ecoregion Wildlife Assessment*, and are used with permission to Carl Scheeler from the authors, Paul Ashley and Stacy Stovall. The text has been slightly modified to fit into the context of the John Day Subbasin.

In contrast to the selection of aquatic focal species (discussed below), terrestrial focal species for the John Day Subbasin were selected using a more holistic approach that emphasizes ecosystem management through the use of focal habitat types while including components of single-species, guild, or indicator species assemblages. This approach is more appropriate for terrestrial than aquatic systems, and is based on the assumption that conservation strategies for terrestrial systems that emphasize critical components of the focal habitats are more desirable than those that emphasize individual species.

By combining the “coarse filter” (focal habitats) with the “fine filter” (focal wildlife species assemblage) approach, subbasin planners believe there is a much greater likelihood of maintaining, protecting and/or enhancing key focal habitat attributes and providing functioning ecosystems for terrestrial wildlife. This approach not only identifies priority focal habitats, but also describes the most important habitat conditions and attributes needed to sustain obligate wildlife populations within these focal habitats. Although conservation and management is directed towards focal species, establishment of conditions favorable to focal species will also benefit other species with similar habitat requirements.

The rationale for using focal species is to draw immediate attention to habitat features and conditions most in need of conservation or most important in a properly functioning ecosystem. These focal species can serve as “representative” species for a given habitat type, helping stakeholders and the public to better relate to the somewhat abstract notion that habitats, not species, are often the primary target of management actions.

John Day Subbasin planners selected 11 focal species (Table 22) from a list of focal candidates that met one or more of the categories indicating ecological importance, as presented in Section 3.2.1. Species accounts for these 11 terrestrial focal species are included in Appendix D. Planners selected species that have life requirements representative of habitat conditions or features that are important within the properly functioning focal habitat types identified in the IBIS database. These habitat types and their relationship to the terrestrial focal species are described in Appendix E. Planners also looked for species to provide a focus for describing desired habitat conditions, attributes and needed management strategies and/or actions. While consideration was given to the value of using focal species for monitoring and evaluation of management strategies, this was not an obligatory consideration, as monitoring and evaluation is likely to be tiered to a more regionally consistent strategy.

Aquatic. The John Day Subbasin aquatic focal species include: summer steelhead, chinook salmon, bull trout, westslope cutthroat trout and redband trout.

Aquatic focal species were selected based upon their importance economically, ecologically and culturally. Another determining factor is that there is more information available regarding population status, life history and habitat requirements for these five species relative to non-focal species.

Prior to steelhead being listed as threatened under the ESA, the John Day River supported a robust sport fishery, with up to 4700 wild fish caught by anglers (ODFW 2001) and harvest rates averaging about 12% of escapement. Since 1996, consumptive catch has been limited to marked, hatchery fish straying into the John Day River from other Columbia River tributaries. However, a catch-and-release fishery for wild fish has been permitted since 1996.

There has been no sport harvest of spring chinook allowed in the John Day River Subbasin since 1976. However, there is a limited tribal subsistence harvest authorized by the Confederated Tribes of the Umatilla Indian Reservation. The tribal harvest is limited to no more than 5% of the estimated number of spring chinook returning to the subbasin. In recent years, that harvest has been restricted to the North Fork John Day River and one of its tributaries, Granite Creek. Prior to authorizing a sport fishery or additional tribal fisheries, an escapement goal of 7000 spring chinook returning to the mouth of the John Day River, as agreed to in U.S. vs. Oregon, must be reached (ODFW 1998).

Redband and westslope cutthroat trout are the two resident salmonid fishes of interest to sport anglers. The three areas with the highest angling effort for resident trout species are the Middle and South forks and the upper portions of the mainstem John Day. The upper mainstem reaches are also occupied by bull trout. However, harvest of bull trout is prohibited because of their listing as “threatened” under the ESA. Very little information regarding harvest rates of resident trout species is available. Catch of westslope cutthroat and redband is limited by Oregon Department of Fish and Wildlife angling regulations.

Similar to terrestrial species, the aquatic focal species can be used as indicators of aquatic ecosystem health. Oregon Department of Environmental Quality uses water temperatures as an indicator of water quality. The water temperature standards used to determine water quality impairment were developed based on needs of native salmonid species. Each species has slightly different habitat needs. For instance, bull trout thrive with cold water temperatures and have optimum fry growth at 39 to 40° Fahrenheit (Buchanan 1997). In contrast, redband trout have adapted to relatively warmer water temperatures, with optimum growth at 55 to 64° Fahrenheit. Different life stages of each species also require different habitat types.

Table 22. Terrestrial focal species selected for the John Day Subbasin.

Common Name	Focal Habitat	Status[1]		Critically Linked	Functional Specialist	Salmon Associated	HEP	PIF	Managed Game Species
		Federal	OR						
pileated woodpecker	montane & eastside mixed conifer forest	n/a	SS-V	No	No	No	No	Yes	No
white-headed woodpecker	ponderosa pine	n/a	SS-C	No	No	No	No	Yes	No
red-naped sapsucker	aspen forest component of eastside interior riparian forest	n/a	n/a	No	No	No	No	Yes	No
ferruginous hawk	western juniper & mountain mahogany woodlands	n/a	SS-C	No	No	No	No	Yes	No
grasshopper sparrow	eastside interior grasslands	n/a	SS-V/PNR	No	No	No	No	Yes	No
California bighorn sheep	interior canyon shrublands	n/a	n/a	No	No	No	No	No	Yes
sage sparrow	shrub-steppe	n/a	SS-C	No	No	No	No	Yes	No
Columbia spotted frog	herbaceous wetlands	C	SS-U	No	No	No	No	No	No
yellow warbler	eastside interior riparian-wetlands	n/a	n/a	No	No	No	Yes	Yes	No
American beaver	eastside interior riparian-wetlands	n/a	n/a	No	No	Yes	No	No	Yes
great blue heron	eastside interior riparian-wetlands	n/a	n/a	Yes	No	Yes	Yes	No	No

[1] Status: C=candidate species; SS-C=sensitive species-critical; SS-V=sensitive species-vulnerable; SS-V/PNR=sensitive species-vulnerable/peripheral or naturally rare; SS-U=sensitive species-undetermined

3.2.3 Model Methods – EDT and QHA

This section discusses the methods and models used to assess the impacts of the John Day Subbasin's aquatic habitat and other environmental factors on populations of the subbasin's fisheries. The Ecosystem Diagnosis and Treatment (EDT) model was used to assess the summer steelhead and spring chinook. The QHA modeling tool was used to assess bull trout habitat in the subbasin. Quantitative assessments were not conducted for the redband and westslope cutthroat trouts.

<u>EDT Methods</u>

The EDT model was used to produce quantitative measures of the potential impact of environmental factors on the abundance and productivity of the anadromous focal species in the John Day Subbasin. The EDT model uses reach-based ratings determined by subbasin planners to identify population limiting factors, restoration and preservation priority areas, and the potential impact of restoration scenarios on abundance and productivity for each focal species population. The EDT model requires that the stream network be parsed into "reaches," or physically similar sections of stream. Reaches can then be rated by subbasin planners for up to 46 different attributes to characterize each reach in both its current and template (historic/reference) status with respect to fish habitat quality and environmental condition. See Appendix F for a description of these 46 attributes. Real measurements and professional estimates/judgements are used to rate each attribute of each reach. Based on these environmental attributes, the EDT model compares estimates of historical abundance and productivity to current estimates and then defines which environmental factors are specifically limiting to current populations. The 46 environmental attributes are rolled up and presented to the EDT model user as 16 "survival" or "limiting" factors (listed below) and are ranked as having high (or large), medium, low, or no impact on focal species survival.

1. Flow
2. Channel stability
3. Habitat diversity
4. Key habitat quantity
5. Obstructions
6. Withdrawals
7. Sediment load
8. Oxygen
9. Chemical toxins
10. Temperature
11. Food
12. Competition (with hatchery fish)
13. Competition (with other species)
14. Predation
15. Pathogens
16. Harrassment/poaching

Additional information regarding the EDT model and its applications can be found at http://www.mobrand.com/MBI/edt.html.

The EDT model relies on a set of biological rules derived from the technical literature to establish the link between a species and its habitat. Each anadromous population within the John Day Subbasin was analyzed individually using the EDT model. Separate runs were completed for summer steelhead for the North Fork, Middle Fork, South Fork, Upper Mainstem, and Lower John Day populations. Delineation between the Upper and Lower population boundaries differ according to the agency defining the populations. NOAA Fisheries makes the break between the two populations at the confluence of the South Fork John Day River. ODFW marks the break for the two populations at the confluence of the North Fork John Day River, approximately 27 miles downriver from the NOAA boundary. The NOAA boundary was used for this analysis in order to maintain consistency with the ESA listing for summer steelhead in the John Day Subbasin. Four separate spring chinook salmon populations were analyzed using the EDT model: North Fork, Middle Fork, Granite Creek, and Upper Mainstem.

The EDT model produces several products for each population run through the model. A baseline report is produced that estimates the capacity, abundance, productivity, and life history diversity of both adults and juveniles in the population. Abundance is commonly measured over an entire generation and is expressed as a calculated effective population size. It is a measure of the number of individual organisms in a population. The productivity of a population is a measure of its ability to sustain itself or its ability to rebound from low numbers. The EDT productivity parameter is one of the parameters in the Beverton Holt production function. It represents a rate of increase at extremely small population levels. Diversity is important for the long-term persistence of salmonid populations, whether it be genetic or phenotypic. EDT outputs a diversity index rating for each population run through the model based on life history trajectories.

A second major product of EDT is the diagnostic report, which defines the habitat limitations that are producing the results in the baseline report on capacity, productivity, and diversity. The diagnostic reports also produce suggestions of which areas (reach or geographical) of the watershed should be considered for restoration and protection value.

The streams in the John Day Subbasin were broken into 1,264 individual reaches; 1,158 of which were used in the EDT model for spring chinook and summer steelhead analysis. See Appendix G for maps showing the stream reach delineations by population area for EDT modeling of summer steelhead. Also see Appendix H for a list of these reaches. The remaining 106 reaches delineate habitat currently available to only resident species, usually above natural and human-made passage barriers. To simplify reporting, the reaches were then rolled up into geographic areas (GA). For the John Day Subbasin, the GAs correspond to the 43 HUC5s currently recognized in the subbasin. EDT model results include priority listings for restoration potential and protection value for each GA for each population. GAs designated with a high restoration potential value may produce the greatest increase in productivity and abundance with restoration, as identified by the EDT model. GAs designated with a high protection value would produce the largest loss of current productivity should habitat conditions deteriorate. The model can also be used to examine the potential impact on focal species according to different restoration scenarios, which could be an important tool to estimate the benefits of specific restoration and protection strategies.

Additionally, the EDT model was used to examine a Properly Functioning Condition (PFC) scenario and its potential impact on populations. PFCs represent the "best" possible state of the environment with respect to the local economic, social, and political constraints on the environment at approximately 70% of the historic, undisturbed habitat conditions.

The large number of reaches delineated in the John Day Subbasin and the unique behavior of the spring chinook salmon in the subbasin proved a challenge to the EDT model. Following is a chronology of the problems and fixes employed to produce the results in this report.

Spring of 2004. Due to the tight timeframe for completing this plan by the May 2004 deadline, the technical team focused efforts on anadromous fish (summer steelhead and spring chinook). Accordingly, approximately 70% (889 reaches) of the 1264 total stream reaches in the John Day Subbasin were initially rated for habitat quality for use with the EDT model. Within this context, 24 of 46 environmental/ecological attributes were routinely rated (Appendix H), yielding a total of approximately 160,000 data entries.

The technical team made the decision to continue assigning reach attributes until February 20, 2004, before submitting the data for analysis. This timeline was set to allow the use of the EDT model to process various scenarios and develop a management plan. Results were expected in early March 2004, but acceptable EDT baseline information was not received until April 19, 2004, and final baseline results were not received until May 3, 2004. This left the team with less than one month to complete the assessment and management plan before the May 28, 2004, plan deadline set forth by the NWPCC.

Approximately 30% of the reaches originally delineated by the technical team were not initially rated due to time constraints and the large number of reaches. Several problems with steelhead and chinook salmon results and initial population numbers from the baseline reports (EDT model runs) were unrealistic. These problems were addressed with several corrections and adjustments to the EDT attribute ratings (for steelhead and chinook) and encoding for holding patterns of steelhead. Mobrand Biometrics Inc. found several data entry problems that were corrected and suggested a reduction of temperature ratings for some of the reaches. See Appendix I for a letter of explanation of the problems.

To reflect observed summer steelhead behavior, the model rules were adjusted to hold steelhead in the Columbia River until spawning, instead of placing them within the John Day Subbasin during prespawning. While this change produced some positive results, steelhead population numbers were still unsatisfactory and it was assumed that the un-rated reaches were a large influence (most of the un-rated reaches were steelhead habitat).

Initial EDT runs were reporting that the run sizes for spring chinook salmon were approximately 1,000 for North Fork, 20 for Granite Creek, and 0 for the other two populations. The adjustments to temperature increased the chinook numbers, but still did not reflect observed numbers; it was assumed that the problem lay in the model structure and how it modeled behavior of juvenile spring chinook rearing.

Most of the spring of 2004 was spent rating reaches and little time was left for checking and correcting model problems. The May 28th deadline did not allow the John Day Subbasin planners time to address the problems of the EDT runs, which were still producing unsatisfactory population results for both steelhead and spring chinook. The assumption by the planners that some of the fault was a result of the incomplete ratings of the 1264 reaches in the John Day (30% had not been rated at all) and that the EDT model was unable to adequately reflect spring chinook salmon use of tributary rearing habitat in the John Day system could not be tested at the time.

Summer of 2004. Several corrections in the EDT model for John Day Subbasin steelhead occurred during the summer of 2004. One of the largest problems discovered by Mobrand Biometrics, Inc. was that the EDT model was characterizing the John Day Subbasin with a historic (template) baseline condition for steelhead at restored levels in the Columbia River, i.e. the model was assuming that all downstream dams had been removed. The original intention of the model was to treat conditions outside of the subbasin as identical between template and current condition, with Columbia River mainstem dams in place. This allowed for a comparison of in-subbasin habitat effects only. Model runs with the error produced very large historical potential abundance in the John Day Subbasin. With the dams in place on the Columbia River, the incorrect historical numbers from EDT in the spring of 2004 dropped by 75% to 79% to more accurately describe recent populations within the subbasin.

Fall of 2004. To address the problems of the EDT model that were discovered and insufficiently answered in previous work, a second effort to properly assess the aquatic focal species with further adjustments and fine-tuning was completed during the response process in the fall and winter of 2004. To accomplish these adjustments, four major goals were assigned to the technical group. They included:

1. Examine the EDT data (889 reaches) for inconsistencies which, if changed, would more closely represent observed fish numbers currently seen in the John Day Subbasin.
2. Examine rule changes for spring chinook salmon that would allow the juveniles to use the cooler, non-natal tributaries for rearing instead of the warmer John Day mainstem.
3. Rate more of the reaches (~390) that were not rated in the spring of 2004.
4. Complete a QHA assessment for bull trout.

The first and second goals were assigned to Larry Lestelle of Mobrand Biometrics, Inc. Mr. Lestelle examined the John Day EDT model patterns and ratings for problems and to address the spring chinook life history patterns in the John Day Subbasin. He concluded that errors in some of the patterns of channel width and flow were causing an underestimation in quantity of habitat. Corrections to the patterns were completed. See Appendix J for an explanation of the corrections.

Concerns about the EDT model's treatment of the spring chinook salmon life history pattern were also examined. It was believed that the model was not capturing the observed movement of juveniles into cooler, non-natal tributaries for rearing. This is the dominant life history pattern for spring chinook in the John Day Subbasin. The approach taken to correct this problem was similar to the way in which the EDT model was designed to handle coho salmon: the existing off-channel attribute was used as a surrogate for non-natal tributary rearing. See Appendix K for a letter explaining the recommended correction.

An additional 280 reaches were rated to satisfy the third goal. This was accomplished by choosing representative reaches that had already been rated during the spring of 2004 and applying the same attribute ratings to associated sets of un-rated reaches. Essentially, unrated reaches with similar characteristics to already rated reaches were assigned similar ratings. The one-to-many application of ratings from a representative reach to a set of unrated reaches was primarily based on local knowledge of similar habitat and the direction of the north or south slope face of the stream. This method was chosen, again, due to time and budget constraints. Two weeks of work were required to assign the ratings and patterns to 280 reaches. The remaining 106 unrated reaches are unavailable to anadromous species due to natural or human-made passage barriers.

After several attempts to complete and refine EDT work in the John Day Subbasin, there are still several issues that will need to be addressed if this model is to continue as a tool for assessment in the John Day Subbasin. Those issues are:

1. Any future EDT analysis in the John Day Subbasin that would include barrier removal scenarios would require that the 106 obstruction and upstream reaches be rated.
2. The 280 reaches that were assigned surrogate ratings in the fall of 2004 should be re-rated with individual inspection of their actual habitat data.
3. Since several attempts to correct spring chinook numbers in the populations have failed to completely correct the problems, it is clear that the past solutions of adjusting the ratings of creating surrogate habitat are just patches and the real solution may lie in the creation of EDT model rules specific to the behavior of spring chinook in the John Day Subbasin, or replacement of EDT with a more appropriate model.
4. Currently the model has created an unrealistic pattern of pre-spawning mortality for spring chinook populations. This causes inaccurate patterns of distribution and low EDT abundance numbers. At this time it is unclear why the model has created this situation. It will require more time and analysis from Mobrand Biometrics to respond to this problem.
5. The large number of reaches delineated in the John Day Subbasin has proved to challenge the capability of the web-based EDT model interface (and possibly the software/hardware). Report requests continually returned errors and greatly slowed the model processing. Mobrand Biometrics, Inc. needed to provide direct assistance to the technical team to furnish John Day Subbasin EDT reports

At the time of this analysis, methodologies appropriate for the John Day Subbasin had not been developed for using the EDT model with non-anadromous species, such as bull trout. A simpler model, the Qualitative Habitat Assessment (QHA), was used instead of EDT to determine limiting factors and priority reaches for bull trout. The QHA assessment for bull trout was completed during the Fall of 2004, in response to the fourth goal outlined above.

QHA Methods

The QHA modeling tool was used to assess bull trout habitat in the John Day Subbasin. A detailed user's manual of QHA can be found at ftp://ftp.streamnet.org/toast/tools/QHA/. The QHA tool requires the user to rate 11 attributes (riparian condition, channel stability, habitat diversity, fine sediment, high and low flow, oxygen, high and low temperature, pollutants, and obstructions) in both the current and reference conditions in each stream reach designated as historic or current bull trout habitat. The user must then develop a hypothesis relating the importance of these attributes to a focal species on a reach-by-reach basis for each of four life stages (spawning/incubation, summer rearing, winter rearing, migration). QHA produces a series of tables that describe the physical habitat and identify where restoration and/or protection activities may be the most productive.

The QHA was designed to minimize the limitations associated with unstructured qualitative assessments. QHA is a "structured qualitative assessment." In other words, it is a systematic and objective assessment of species habitat relationships that relies principally on existing local professional knowledge and judgment. It "structures" the process by: (1) following a logical and replicable sequence, (2) using the best available quantitative data as the basis for decisions, (3) generating a product that is similar in form to products resulting from other more quantifiable approaches, and (4) documenting the decision process.

QHA relies on the same conceptual framework as the more technically sophisticated EDT technique. There are, however, several significant differences. While each of the habitat characteristics used in QHA is also used in EDT, EDT considers many more habitat factors and seeks to link these directly to measurable data. QHA, by contrast, relies on the judgment of knowledgeable professionals to draw this link. EDT uses a series of life history trajectories to model the movement of fish through its environment over several life stages. QHA collapses life history into fewer stages and treats each stream reach or small watershed as a static unit. Again, QHA relies on the knowledge of experts to assess these life history dynamics.

John Day QHA Model Development. For QHA modeling of bull trout habitat, a reach system consisting of 61 reaches (Appendices L and M) was developed by the John Day fisheries technical team and is structured differently from the reaches developed for the EDT model. This reach system encompasses all streams that bull trout presently inhabit, or are believed to formerly inhabit. Reach lengths ranged from 0.6 miles (Salmon Creek in the North Fork) to a 167.6 mile reach in the lower John Day River. The median reach length was 10.6 miles with 73% of the reaches less than 15 miles in length. GIS was used to map these reaches and assess land ownership patterns and how these patterns were related to bull trout habitat use.

The reaches were rated for each of the 11 environmental attributes (Appendix N) under current and reference conditions (Appendices O and P, respectively). These reaches were rated on a scale of 0 to 4 where 4 is "normative" and the other ratings are a percentage of normative (3=75%, 2=50%, 1=25%, 0=0%).

A QHA "species hypothesis" worksheet was filled out (Appendix Q). This worksheet provided the technical team with the opportunity to apply their understanding of biological systems to make decisions regarding the relative importance of each life stage to fish productivity and sustainability. Life stages were rated according to overall importance in the subbasin. QHA required users to rate four life stages: spawning, summer rearing, winter rearing, and migration.

The QHA model determines which attributes are most important in each geographic area in terms of limiting bull trout production. The QHA for bull trout provided a ranking of stream reaches for both habitat protection and habitat restoration. Stream reaches are ranked high for protection where significant loss of bull trout production could occur if the habitat were degraded. Stream reaches ranked high for restoration are reaches where significant gains in fish production could be achieved by restoring habitat to historic conditions. However, it is not assumed nor necessarily intended that habitats will be restored to historic conditions. The QHA methodology simply provides a tool for prioritizing future efforts geographically to restore and protect fish habitat.

To provide more consistency with EDT results for steelhead and chinook, priority reaches (those defined as being in the top quartile for restoration as determined by QHA) were pooled by geographic area (HUC5s).

3.2.4 Aquatic Focal Species Population Delineation and Characterization

Each fish species will be addressed separately in the following order: summer steelhead, spring chinook salmon, bull trout, redband trout and westslope cutthroat trout.

Summer Steelhead *(Oncorhynchus mykiss)*

Steelhead can be divided into two basic run types based on their level of sexual maturity at the time they enter fresh water and the duration of the spawning migration (Burgner et. al. 1992). The *stream-maturing* type, or summer steelhead, enters fresh water in a sexually immature condition and requires several months in fresh water to mature and spawn. The *ocean-maturing* type, or winter steelhead, enters fresh water with well-developed gonads and spawns shortly thereafter (Barnhart 1986). Only summer steelhead are present in the John Day Subbasin. In subbasins with both summer and winter steelhead runs, it appears that the summer run occurs where habitat is not fully utilized by the winter run or a seasonal hydrologic barrier, such as a waterfall, separates them. Summer steelhead usually spawn farther upstream than winter steelhead (Roelofs 1983, Behnke 1992). Coastal streams are dominated by winter steelhead, whereas inland steelhead of the Columbia River Basin are almost exclusively summer steelhead

In the Pacific Northwest, summer steelhead enter fresh water between May and October (Busby *et al.* 1996, Nickelson *et al.* 1992). During summer and fall, before spawning, they hold in cool, deep pools (Nickelson *et al*. 1992). They migrate inland toward spawning areas, overwinter in the larger rivers, resume migration to natal streams in early spring, and then spawn (Meehan and Bjornn 1991, Nickelson *et al*. 1992).

Unlike Pacific salmon, steelhead are capable of spawning more than once before death. However, it is rare for steelhead to spawn more than twice before dying, and most that do spawn more than once are females (Nickelson *et al.* 1992). Steelhead spawn in cool, clear streams with suitable gravel size, depth and current velocity. Intermittent streams may also be used for spawning (Barnhart 1986, Everest 1973). Steelhead enter streams and arrive at spawning grounds weeks or even months before they spawn and are vulnerable to disturbance and predation during that time.

Depending on water temperature, steelhead eggs may incubate for one and a half to four months before hatching. Juveniles rear in fresh water from one to four years, and then migrate to the ocean as smolts. Summer rearing takes place primarily in the faster parts of pools, although young-of-the-year are abundant in glides and riffles. Some older juveniles move downstream to rear in larger tributaries and mainstem rivers (Nickelson *et al.* 1992). Productive steelhead habitat is characterized by complexity, primarily in the form of large and small wood.

Steelhead smolts migrate to the ocean in the spring and summer and typically reside in marine waters for one or two winters before returning to their natal stream to spawn at four or five years of age. Populations in Oregon and California have higher frequencies of age-1-ocean steelhead than populations to the north (Busby *et al.* 1996). For more information on steelhead life histories, see Busby *et al.* (1996).

The species *Oncorhynchus mykiss* in the John Day Subbasin is represented not only by steelhead, but also by redband trout. Redband trout are described in detail elsewhere in this assessment, but the principal difference between redband and steelhead is that redband do not migrate to the ocean. Recent studies (Kostow 2003) indicate the different life history patterns of steelhead and redband are not reproductively isolated. Therefore, there is probably no justification for treating them as separate ESUs. In this assessment, we did not do a separate assessment for redband and will assume that measures for protecting and enhancing steelhead will also benefit redband. Steelhead and redband trout are sympatric (occupying the same range without loss of identity from interbreeding) in all subbasins that contain steelhead. Sympatric populations with different life histories form different populations due to assortative mating, but are not reproductively isolated from each other (Currens 1987). Each morphology appears to be able to produce offspring of the other type. Redband males have been observed to pair with steelhead females, particularly when steelhead populations are small. Redband trout populations also occur above barriers to steelhead.

Middle Columbia Steelhead ESU

Steelhead in the Mid-Columbia River ESU were listed as a threatened species on March 25, 1999. The ESU includes all naturally spawned populations of steelhead in streams from above the Wind River in Washington, and above the Hood River in Oregon (exclusive), upstream to and including the Yakima River in Washington. Excluded are steelhead from the Snake River Subbasin.

A population with adequate spatial structure will include more than one spawning aggregate and will allow the expression of natural patterns of gene flow and life history characteristics.

Steelhead are widely distributed throughout most of the subbasin (Figure 9). The only exceptions are in the South Fork drainage above Izee Falls – an impassible barrier – and in the Lower John Day area where high temperatures and low flows are widespread, restricting the current distribution.

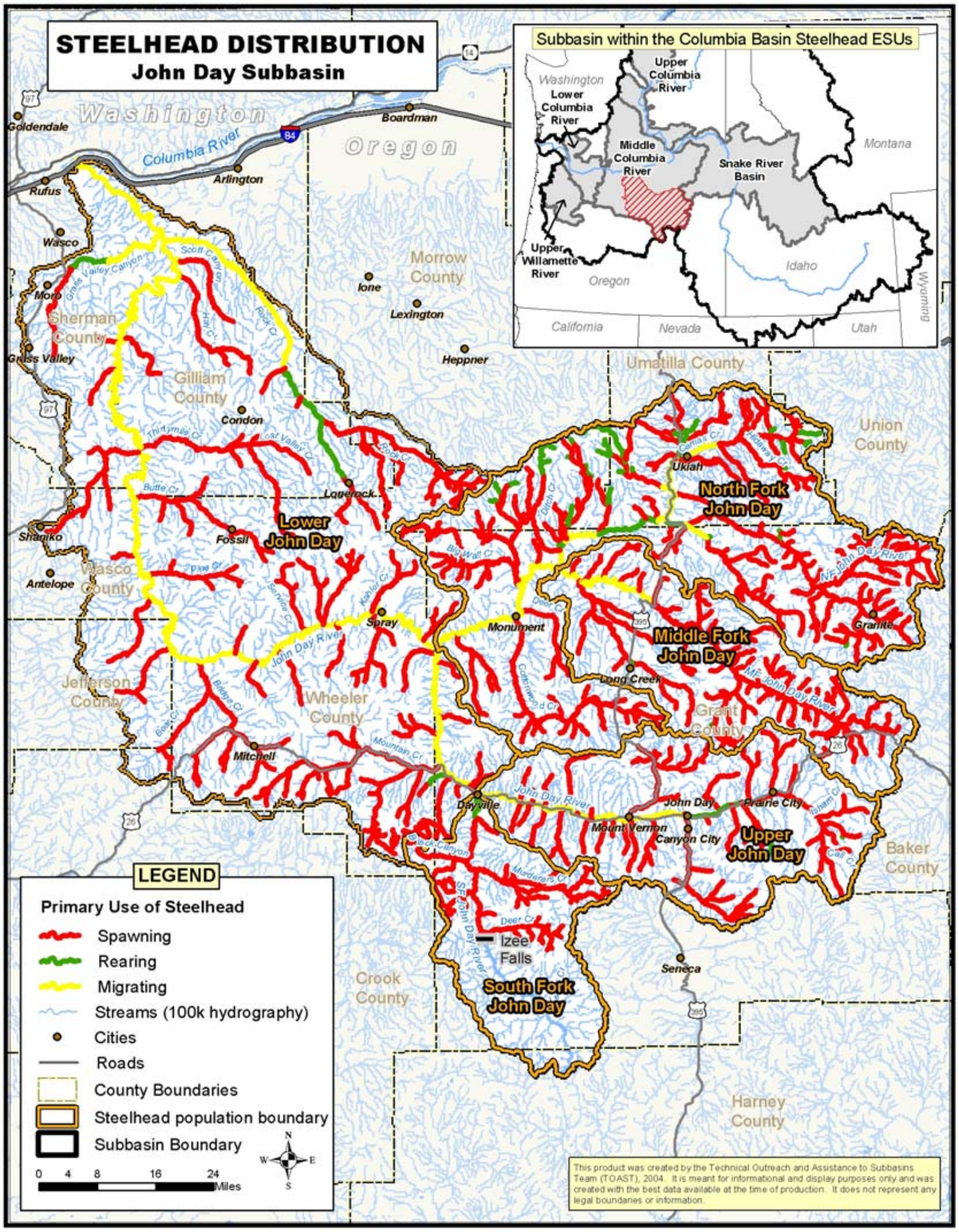

Figure 9. Distribution of summer steelhead in the John Day Subbasin.

Independent Populations of Mid-Columbia Steelhead within the John Day Subbasin

The Interior Columbia Basin Technical Recovery Team (TRT) defined the John Day River as a major grouping based primarily on subbasin topography and distance from other spawning aggregates (NOAA Fisheries 2003b). This subbasin is one of the few remaining summer steelhead streams in the interior Columbia Basin that have had little influence from introduced hatchery fish and that have more recently been classified as strong or healthy (Lee *et al.* 1997, Huntington *et al.* 1994). Within this major grouping the TRT defined five populations on the basis of genetic information, demographic correlations, and habitat/ecoregion data. Spawning areas are widely distributed across tributary and mainstem habitats but are not well-documented. The five major groupings are:

- **Lower John Day:** This population includes steelhead-supporting tributaries to the John Day downstream of the South Fork John Day River, including Pine Creek, Bologna Creek and Grass Valley Canyon. This widespread population is the most differentiated ecologically from other populations, occupying the lower, drier, Columbia Plateau ecoregion. This habitat divergence was the primary factor in delineating this population.

- **North Fork John Day:** The TRT defined this population on the basis of habitat characteristics, subbasin topography and demographic patterns. The North Fork occupies the highest elevation, wettest area in the John Day Subbasin. In addition, it encompasses sufficient habitat to support an independent population. Finally, Chilcote (2001) investigated population trajectories in the John Day (and other Oregon rivers). He found that the upper North Fork index count was the most divergent of the John Day stocks. This combination of factors supports this population delineation. It includes the mainstem North Fork John Day River and its tributaries.

- **Middle Fork John Day:** Spawning areas in the Middle Fork John Day River are well-separated from all other spawning areas with the exception of the North Fork John Day. This distance, coupled with habitat differences between this population and the North Fork population, and general subbasin topography led to independent population designation for this area. The population includes the Middle Fork John Day and all its tributaries.

- **South Fork John Day:** Genetic data indicate that *O. mykiss* samples from the South Fork John Day River that may include the anadromous form are differentiated from those in other parts of the John Day (Currens *et al.* 1985). The TRT delineated this as an independent population on the basis of this genetic information as well as subbasin topography. The species assemblage in the South Fork is also unique.

- **Upper John Day:** The Upper Mainstem John Day River population includes the mainstem John Day River and tributaries upstream from the South Fork. It is separated from the lower mainstem on the basis of habitat differences and from the South Fork on the basis of topography.

Although the lower reaches of spawning areas in these populations are in close proximity, the TRT generally felt that separate population status was warranted due to the distribution of fish within each branch of the John Day (with relatively small proportions of available spawning habitat present at the lower reaches), the size of each subbasin (large enough to support independent populations) and the river branching patterns. The extent to which these populations inter-breed is unknown.

ODFW empirical survey data in Table 23 confirm that there are significant populations of steelhead in all five of the steelhead population areas in the John Day Subbasin. Resource managers will manage for and maintain all five John Day steelhead populations.

<u>Abundance</u>

Abundance is a measure of the number of individual organisms in a population. Abundance is commonly measured over an entire generation and is expressed as a calculated effective population size.

With some exceptions, the recent five-year average (geometric mean) abundance for natural steelhead within this ESU was higher than levels reported in the 1999 status review. Returns to the Yakima River, Deschutes River, and sections of the John Day River system are up substantially in comparison to 1992 to 1997. Recent five-year geometric mean annual returns to the John Day Subbasin are generally below the corresponding mean returns reported in previous status reviews. Despite episodic increases in abundance, the total population has been trending downward since 1958 (Figure 10).

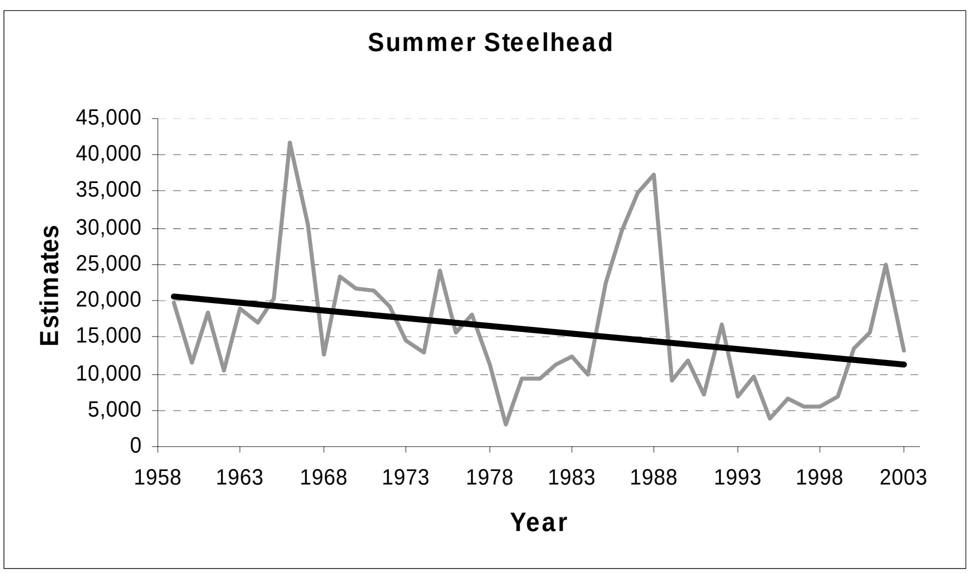

Figure 10. Estimates of total John Day adult summer steelhead numbers with trend line (ODFW estimates).

Table 23. Estimated catch of wild and hatchery steelhead in the John Day Subbasin as reported on steelhead punch cards (ODFW 2001).

Zone	Year	Wild	Hatchery	Total Catch	% Hatchery
1	1996	108	184	292	63.0%
	1997	171	682	853	80.0%
	1998	154	546	700	78.0%
2	1996	3	0	3	0.0%
	1997	80	70	150	46.7%
	1998	6	4	10	40.0%
3	1988	2996	1510	4506	33.5%
	1989	2596	2324	4920	47.2%
	1990	601	1390	1991	69.8%
	1991	1798	1352	3150	42.9%
	1992	399	487	886	55.0%
	1993	302	557	859	64.8%
	1994	176	761	937	81.2%
	1995	428	778	1206	64.5%
	1996	223	529	752	70.3%
	1997	234	610	844	72.3%
	1998	11	40	51	78.4%
North	1988	16	12	28	42.9%
Fork	1989	55	0	55	0.0%
	1990	23	23	46	50.0%
	1991	242	163	405	40.2%
	1992	0	0	0	n/a
	1993	52	20	72	27.8%
	1994	33	7	40	17.5%
	1995	22	38	60	63.3%
	1996	79	54	133	40.6%
	1997	161	84	245	34.3%
	1998	0	0	0	n/a
Middle	1988	37	12	49	24.5%
Fork	1989	20	24	44	54.5%
	1990	26	36	62	58.1%
	1991	115	16	131	12.2%
	1992	0	4	4	100.0%
	1993	42	0	42	0.0%
	1994	30	3	33	9.1%
	1995	6	3	9	33.3%
	1996	48	6	54	11.1%
	1997	110	n/a	110	n/a
	1998	0	0	0	n/a

NOAA Fisheries (2003a) reports the median annual rate of change in abundance since 1990 to be +2.5%, with individual trend estimates ranging from -7.9% to +11%. The same basic pattern is also reflected in population growth rate estimates for the production areas. The median short-term (1990 to 2001) annual population growth rate estimate was 1.045, assuming that hatchery fish on the spawning grounds did not contribute to natural production. The median short-term growth rate under the assumption of equal hatchery/natural origin spawner effectiveness was 0.967. The John Day is the only subbasin of substantial size in which production is clearly driven by natural spawners.

Steelhead Harvest in the Subbasin

Direct commercial harvest of steelhead in non-Indian fisheries was eliminated by legislation in the early 1970s. A fishery on wild steelhead has been limited to catch and release since 1996.

Stray hatchery steelhead have been observed during incidental and statistical creel programs since 1986. All hatchery-produced steelhead in the Columbia Basin have the adipose fin removed prior to release. Stray hatchery steelhead are removed during open fishing periods (Table 24) to minimize the potential for negative interactions between out-of-subbasin strays and wild fish. Most hatchery strays are removed by sport fishermen in the mainstem John Day (Table 23, Zones 1-3). However, significant numbers of hatchery fish migrate into some tributaries (Table 23, North Fork and Middle Fork catches) and may interbreed with wild populations. The impact of this potential inter-breeding is unknown and constitutes a critical uncertainty in management of John Day steelhead populations.

Prior to 1996, harvest of wild fish was allowed, with a two fish per day bag limit. Since then retention of non-clipped fish has been prohibited. The Umatilla Tribes conduct a small subsistence fishery in the North Fork. (USBR 2003)

Table 24. Description of Time Periods in which Fisheries Occur within the John Day Subbasin (USBR 2003).

Fishery Location	Time Period	Comments
Zone 1 - Mouth of John Day to Cottonwood Bridge (RM 38)	Year Round	Catch and release of all unmarked steelhead
Zone 2 - Cottonwood Bridge (RM 38) to Kimberly (RM 185)	Year Round	Catch and release of all unmarked steelhead
Zone 3 - Kimberly (RM 185) to Mouth of Indian Creek (RM 257)	Sept. 1 – April 15	Catch and release of all unmarked steelhead
North Fork - Mouth of North Fork to RM 60 at Hwy 395 Bridge	Sept. 1 – April 15	Catch and release of all unmarked steelhead
Middle Fork - Mouth of Middle Fork to RM 24.2 at Hwy 395 Bridge	Sept. 1 – April 15	Catch and release of all unmarked steelhead
South Fork John Day River		Closed to adult steelhead fishing
All Other Tributaries		Closed to adult steelhead fishing

Assessment Results

Population Status

EDT baseline reports indicate that 45% of steelhead escapement in the John Day Subbasin is to the North Fork (Table 25, Figure 11). This is greater than the 29% estimated by fishery managers for the 1992 to 1997 baseline period (Table 25, Figure 12), although the estimated subbasin-wide escapement for EDT is similar to that estimated by fishery managers (10,568 vs. 10,293). The North Fork and South Fork populations are estimated to have the highest productivity, while the Lower John Day has the lowest productivity (Table 25). All populations are below the EDT estimate of present capacity.

Comparing these baseline abundances to the 1992 to 1997 averages, the total abundance is very similar, while the distribution differs. EDT estimates a higher population in the North Fork, South Fork, and Upper John Day, but a much lower population in the lower John Day. The total baseline abundance exceeds the NOAA Fisheries interim target, though the Lower John Day and Upper John Day are both at lower abundances than the target abundances. The EDT estimate of historic abundance potential is much lower than that estimated by fishery managers (Table 25).

Table 25. Summer steelhead population averages historic abundance potential, baseline abundance and baseline capacity based on EDT results, observed averages, and interim targets.

Population Area	EDT Historic Abundance Potential	EDT Baseline Abundance (no harvest)	EDT Baseline Productivity (no harvest)	EDT Baseline Capacity (no harvest)	Empirical 1992-1997 Average	Empirical 1999-2003 Average	NOAA Fisheries Interim Targets	Professional Judgment Estimated Historic
Lower JD	10,108	1,292	2.8	2,028	3,355	6139	3200	17,738
North Fk JD	14,698	4,870	4.7	6,202	3,345	6120	2700	25,578
Middle Fk JD	5,930	1,448	3.6	2,010	1,534	2806	1300	10,934
South Fk JD	2,941	1,221	4.7	1,553	690	1262	600	5,586
Upper JD	5,912	1,737	4.2	2,283	1,369	2505	2000	10,164
Total	39,589	10,568		14,076	10,293	18,832	9800	70,000

Empirical data per ODFW, NOAA interim targets per NMFS 2002.

NOAA Fisheries cites interim abundance targets (eight-year, or approximately two generations, geometric mean of annual natural spawners) for each of the five population groupings in the John Day River (Table 25). Also shown in this table are the empirical averages for 1992 through 1997 and for 1999 through 2003 for each of the steelhead population areas based on ODFW survey information. A review of this data illustrates that steelhead abundance was 83% greater in 1999 to 2003 than in the earlier years of 1992 to 1997. For the most recent period the recovery targets were met in all five independent population areas. In 1992 to 1997 the interim targets were met in all of the population areas except the Upper John Day.

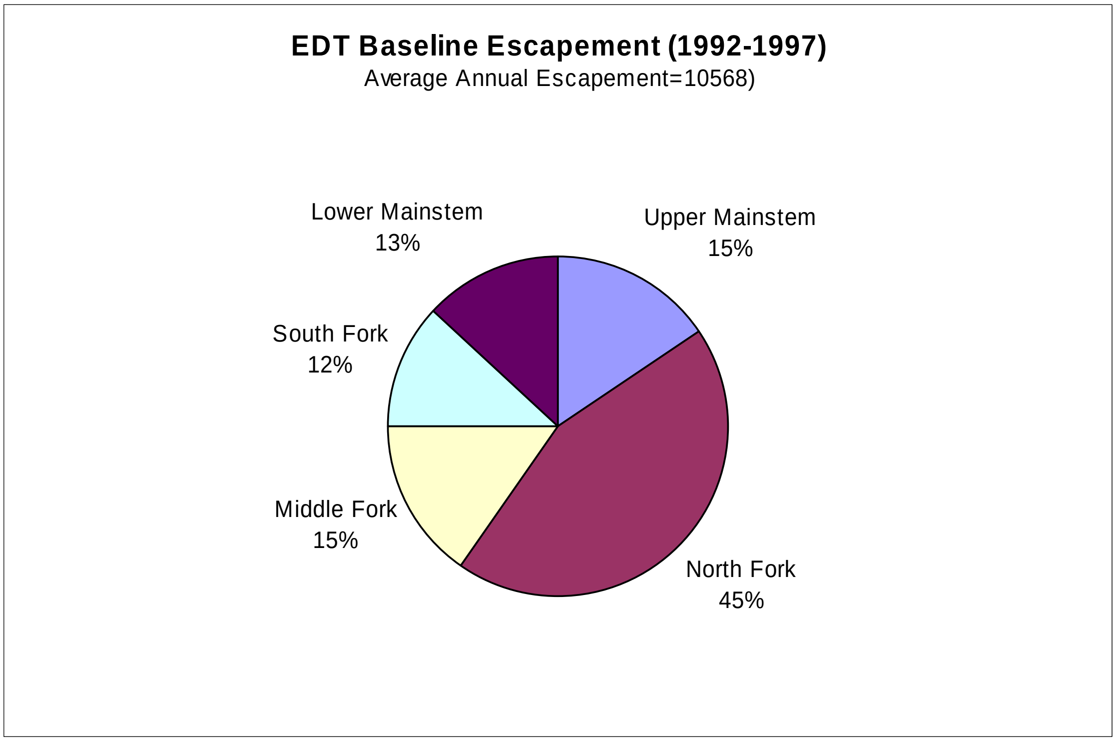

Figure 11. Distribution of John Day steelhead populations as estimated by EDT for the years 1992-1997.

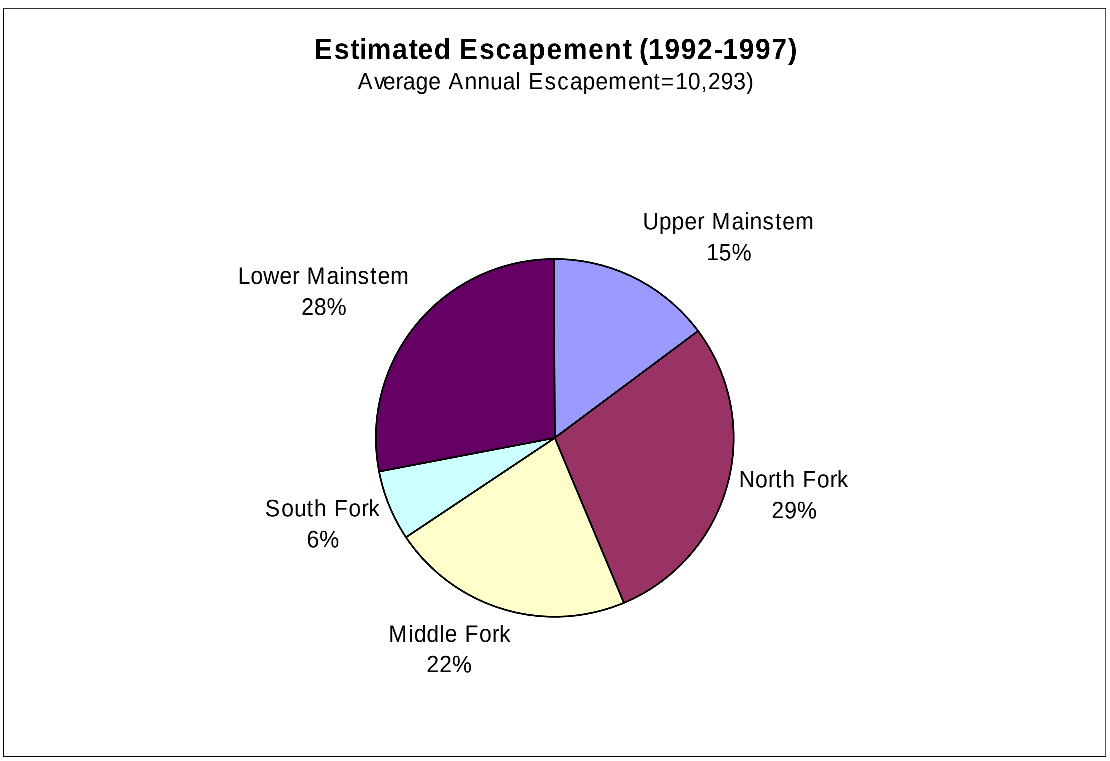

Figure 12. Distribution of John Day steelhead populations as estimated by fish managers for the years 1992-1997.

It is important to note that the ODFW empirical data used here were collected for the purpose of identifying trends. They were not collected for the purpose of determining statistically sound abundance figures. The true abundance of steelhead may vary significantly. ODFW assimilated this information using boundaries for the population areas that vary slightly from the steelhead population areas used by NOAA Fisheries. NOAA Fisheries makes the break between the Lower John Day and Upper John Day at the confluence of the South Fork John Day. ODFW assumes the break is at the confluence of the North Fork John Day River.

Juvenile Productivity

The productivity of a population is a measure of its ability to sustain itself or its ability to rebound from low numbers. The EDT baseline productivity values are shown in Table 25. The EDT productivity parameter is one of the parameters in the Beverton Holt production function. It represents a rate of increase at extremely small population levels. It does not represent the rate of population growth of the present steelhead populations. To sustain a population it is essential that the productivity numbers exceed 1.0.

The EDT values for the John Day suggest that no population is in immediate danger of decline. Compared to historic levels, however, current populations are substantially less productive than formerly. This can be summarized in the spawner/recruit curves generated by EDT (Figure 13). These curves indicate that the stocks currently are very close to, or just above, replacement level when compared to the historic conditions. The distance between the current curve and the replacement line at a given level of spawners is the surplus available for harvest. The only populations that could support minimal harvests at the NOAA Fisheries interim population targets are the South Fork and North Fork.

The EDT results suggest that productivity is highest in the South Fork John Day and the North Fork John Day and the lowest in the Lower John Day. Historically, according to EDT, the Lower John Day was also the least productive steelhead population. However, the John Day technical team disagreed with this conclusion, and felt that the Lower John Day summer steelhead had higher productivity than the other populations. The technical team also was skeptical that the South Fork summer steelhead population is currently the most productive population in the John Day Subbasin. The relative productivity of the five populations, both currently and historically, are gaps in knowledge that should be addressed in the future.

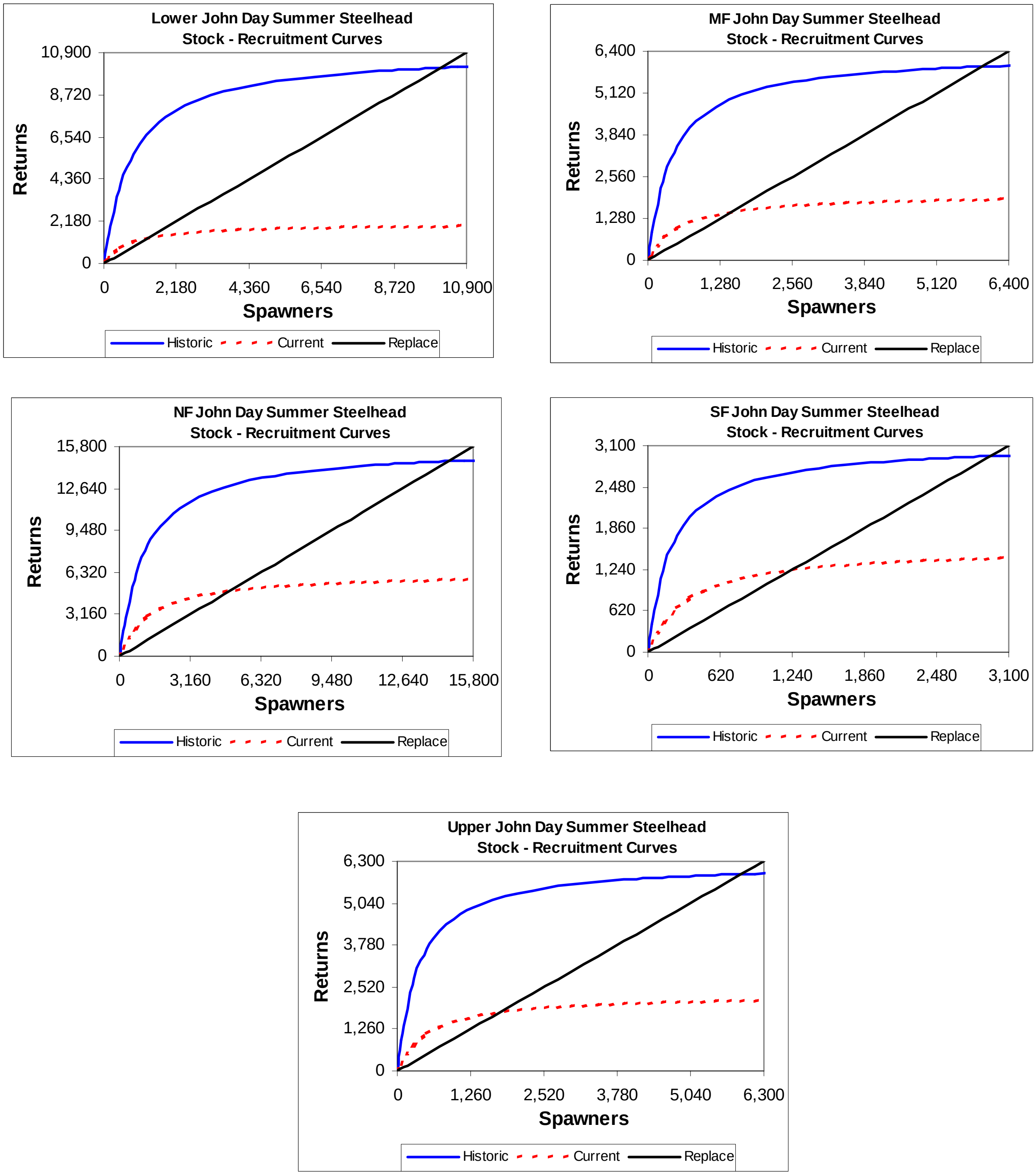

Figure 13. Stock recruitment curves produced by EDT baseline report for the five steelhead populations of the John Day Subbasin.

Diversity

Diversity is important for the long-term persistence of salmonid populations, whether it be genetic or phenotypic. This index expresses the diversity as a percent of the historic potential (Note: historic diversity is, by definition, 100%). The diversity indices for summer steelhead in the John Day Subbasin are as follows:

- Lower John Day – 18%
- North Fork John Day – 53%
- Middle Fork John Day – 57%
- South Fork John Day – 72%
- Upper John Day – 39%

The EDT model estimates that the South Fork population has retained 72% of its historic diversity of life history patterns. The remaining four populations have been seriously impacted, however, having lost from 43 percentage points (Middle Fork John Day) to 82 percentage points (Lower John Day) of their original life history patterns. The John Day Subbasin is one of the few areas where hatchery fish have not been directly introduced into the river system. For a complete set of EDT model baseline steelhead results for the five populations, see Appendix R.

Identification of Limiting Factors

Environmental Relationships by Population

One of the EDT model outputs is a list of potential protection and restoration areas and their ranks. For the John Day Subbasin, the planners chose HUC5s, of which there are 43, as the geographic areas for summarizing EDT diagnostic results. Those highest ranked HUC5s may produce the greatest increase in productivity and abundance with restoration. Those designated with a high protection value are most important to preserve current habitat and environmental conditions. The protection and restoration ranking for each HUC5, as well as the restoration value of each attribute (high, medium, or low) within that HUC5, are presented in Appendix S. Priority HUC5s were those ranked within the top quartile of all HUC5s used by each population. Priority attributes are those rated as having a "high" or "medium" impact on production. In this section, only the top quartile protection and restoration HUC5s will be listed along with those attributes within each top priority restoration HUC5 that are high or medium priority. See Appendix S for a complete set of EDT Diagnostic Reports for summer steelhead.

Lower John Day

Steelhead spawning in the Lower John Day population area is in tributary streams connected by the John Day River. Table 26 presents the top quartile of the 18 HUC5s denoted by EDT as important to this population for restoration and protection. One HUC5 (JDR Johnson Creek) is in the top quartile for both protection and restoration. Common to all four top priority HUC5s for restoration is key habitat quantity, temperature, sediment load, and habitat diversity. Upon reviewing the restoration attributes by geographic area, the technical team thought that flow restoration was also important for Bridge Creek, though probably not as important for Johnson Creek.

A set of maps displaying the EDT quartile for each HUC5 for protection and restoration for summer steelhead and spring chinook in the John Day Subbasin can be found in Appendix V.

Table 26. Top quartile protection and restoration geographic areas with important restoration attributes as estimated by EDT (black), with additional attributes listed by the subbasin planners (gray) for Lower John Day summer steelhead.

Lower John Day Summer Steelhead										
Geographic area priority			Attribute for Restoration							
Geographic area	Protection benefit	Restoration benefit	Channel stability/landsc.1/	Flow	Habitat diversity	Obstructions	Sediment load	Temperature	Key habitat quantity
Bridge Creek		X		▒	■	■	■	■	■
JDR Johnson Creek	X	X		■	■		■	■	■
Lower JDR Kahler Creek		X		■	■	■	■	■	■
Lower JDR Muddy Creek	X								
Mountain Creek		X	■		■		■	■	■
Rock Creek	X								
Upper Middle JDR	X								

The Lower JDR MacDonald Ferry HUC5 was designated by EDT as a top HUC5 for protection. This HUC5 contains portions of the John Day Reservoir and was also selected as an important HUC5 for other John Day steelhead populations. In all cases, key habitat quantity was a relatively high ranking attribute for protection. This suggests that the increase in volume resulting from the John Day Reservoir was treated as favorable habitat by the EDT model. This unexpected result shows the importance of conditioning EDT model results with professional expertise. This reach was excluded from the list of top quartile HUC5s for both Lower John Day and Upper John Day steelhead populations.

North Fork

Among the 17 HUC5s denoted by EDT as important to the North Fork population, all six HUC5s in the top restoration and protection quartiles are within the North Fork watershed (Table 27). Three of the geographic areas (NF JDR Big Creek, and the upper North Fork) are listed as high priority for both protection and restoration, signifying that all three should be protected from further degradation and that restoration on any of the limiting factors listed would have the potential to increase productivity and abundance for the population. Common to all four top priority HUC5s for restoration is key habitat quantity while sediment load is a top priority for three HUC5s.

Table 27. Top quartile protection and restoration geographic areas with important restoration attributes as estimated by EDT for North Fork John Day summer steelhead.

NF John Day Summer Steelhead								
Geographic area priority			Attribute for Restoration					
Geographic area	Protection benefit	Restoration benefit	*Flow*	*Habitat diversity*	*Obstructions*	*Sediment load*	*Temperature*	*Key habitat quantity*
Cottonwood Creek		X	■	■		■	■	■
Desolation Creek	X							
NF JDR Big Creek	X	X			■			■
NF JDR Potamus Creek		X		■		■	■	■
Upper Camas Creek	X							
Upper NF JDR	X	X				■		■

Middle Fork

Among the 14 HUC5s denoted by EDT as important to the Middle Fork John Day steelhead population, all five HUC5s in the top restoration and protection quartiles are within the Middle Fork watershed (Table 28). Three of the geographic areas (Big Creek, Camp Creek, and Long Creek) are listed as high priority for both protection and restoration, signifying that all three should be protected from further degradation and that restoration on any of the limiting factors listed would have the potential to increase productivity and abundance for the population. Common attributes to all five top priority HUC5s for restoration is key habitat quantity and sediment load. Upon review, the John Day technical team thought that habitat diversity and temperature were important attributes for restoration for Camp Creek. The John Day technical team was dubious of the protection value for Long Creek.

Table 28. Top quartile protection and restoration geographic areas with important restoration attributes as estimated by EDT (black), with additional attributes listed by the subbasin planners (gray) for Middle Fork John Day summer steelhead.

MF John Day Summer Steelhead							
Geographic area priority			Attribute for Restoration				
Geographic area	Protection benefit	Restoration benefit	*Flow*	*Habitat diversity*	*Sediment load*	*Temperature*	*Key habitat quantity*
Big Creek	X	X			■		■
Camp Creek	X	X		░	■	░	■
Long Creek	X	X	■	■	■		■
Lower MF JDR		X		■	■	■	■
Upper MF JDR	X				■		■

South Fork John Day

Steelhead habitat in the South Fork John Day River is limited to that area downstream of Izee Falls (Figure 1). Among the 13 HUC5s denoted by EDT as important to this population, one priority HUC5 is in the Lower John Day watershed (Table 29) with JDR Johnson Creek being ranked as having a high priority for restoration.

Table 29. Top quartile protection and restoration geographic areas with important restoration attributes as estimated by EDT (black), with additional attributes listed by the subbasin planners (gray) for South Fork John Day summer steelhead.

SF John Day Summer Steelhead					
Geographic area priority			Attribute for Restoration		
Geographic area	Protection benefit	Restoration benefit	*Sediment load*	*Temperature*	*Key habitat quantity*
JDR Johnson Creek		X			black
Lower SF JDR	X	X	black	black	black
Middle SF JDR	X		black	gray	black
Murderers Creek	X	X	black	gray	black

Among the high priority HUC5s, two (Lower South Fork and Murderers Creek) are listed for both protection and restoration, signifying that both should be protected from further degradation and that restoration on any of the limiting factors listed would have the potential to increase productivity and abundance for the population. Common to all four top priority HUC5s is key habitat quantity, with three of the HUC5s also having sediment load as a priority. Upon review, the John Day technical team thought that temperature should be added as an attribute for restoration for Middle SF JDR and Murderers Creek.

Upper John Day

Among the 15 HUC5s denoted by EDT as important to the Upper John Day River steelhead population, all of the top restoration and protection quartiles are in the Upper John Day portion of the subbasin (Table 30).

Table 30. Top quartile protection and restoration geographic areas with important restoration attributes as estimated by EDT for Upper John Day summer steelhead.

Upper John Day Summer Steelhead								
Geographic area priority			Attribute for Restoration					
Geographic area	Protection benefit	Restoration benefit	*Flow*	*Habitat diversity*	*Obstructions*	*Sediment load*	*Temperature*	*Key habitat quantity*
Beech Creek		X	■	■	■	■	■	■
Canyon Creek	X							
Fields Creek		X		■		■		■
Laycock Creek		X		■	■	■		■
Strawberry Creek	X	X		■		■	■	■
Upper JDR	X							

Among the high priority HUC5s in the Middle Fork drainage, one (Strawberry Creek) is listed for both protection and restoration, signifying the importance of this HUC5 to steelhead. Common to all five top priority HUC5s for restoration is key habitat quantity, sediment load, and habitat diversity.

Identification of Restoration Priorities

Table 31 summarizes the EDT outputs from each steelhead population area as presented above. Complete EDT outputs, including all HUC5s relevant to each population, are presented in Appendix S.

EDT model results were used along with consideration of other factors such as landowner cooperation, potential for successful restoration, and synergies with existing restoration efforts. The methods used to establish restoration priorities are presented in Section 5.2.2.4, Restoration Strategies and Priorities.

Table 31. First quartile geographic areas with the high and moderate ranked restoration attributes as estimated by EDT.

John Day Summer Steelhead Restoration Priorities											
Geographic area priority					Attribute for Restoration						
Geographic area	Lower and Middle Mainstem	North Fork	Middle Fork	Upper Mainstem and South Fork	*Channel stability*	*Flow*	*Habitat diversity*	*Obstructions*	*Sediment load*	*Temperature*	*Key habitat quantity*
Bridge Creek	X						■	■	■	■	■
JDR Johnson Creek	X					■	■		■	■	■
Lower JDR Kahler Creek	X					■	■	■	■	■	■
Mountain Creek	X				■		■		■	■	■
Cottonwood Creek		X				■	■		■	■	■
NF JDR Big Creek		X						■			■
NF JDR Potamus Creek		X					■		■	■	■
Upper NF JDR		X							■		■
Big Creek			X						■		■
Camp Creek			X						■		■
Long Creek			X			■	■		■		■
Lower MF JDR			X				■		■	■	■
JDR Johnson Creek				X							■
Lower SF JDR				X					■	■	■
Murderers Creek				X					■		■
Beech Creek				X		■	■	■	■	■	■
Fields Creek				X			■		■		■
Laycock Creek				X			■	■	■		■
Strawberry Creek				X			■		■	■	■

Analysis of Limiting Factors

Several limiting factors have already been presented for the top quartile HUC5s of each steelhead population. Another perspective on limiting factors was completed for all the HUC5s used by steelhead. The percentage of geographic areas (HUC5s) with attribute classes of high or medium priority for restoration was compared (Figure 14). Geographic areas utilized exclusively by out-of-area populations for migration were excluded from this analysis to avoid these areas being over weighted in the analysis. (For example, Lower JDR McDonald Ferry is used by all five populations. To prevent this reach by being weighted by a factor of five, it only entered into the analysis for Lower John Day summer steelhead.) Key habitat quantity is a limiting factor for 100% of the geographic areas, while sediment load is a limiting factor in over 80% of geographic areas. Habitat diversity, temperature, and flow are the other significant limiting factors.

The John Day technical team questioned the ranking of some of the limiting factors. They thought that, subbasin-wide, temperature was as much, if not more, of a limiting factor than sediment load. They also thought that flow should be as much of a limiting factor as temperature. (Note that in earlier EDT runs, flow was felt to be too much of a limiting factor and thus the ratings for current flow were upgraded to reduce the impact of flow as a limiting factor.)

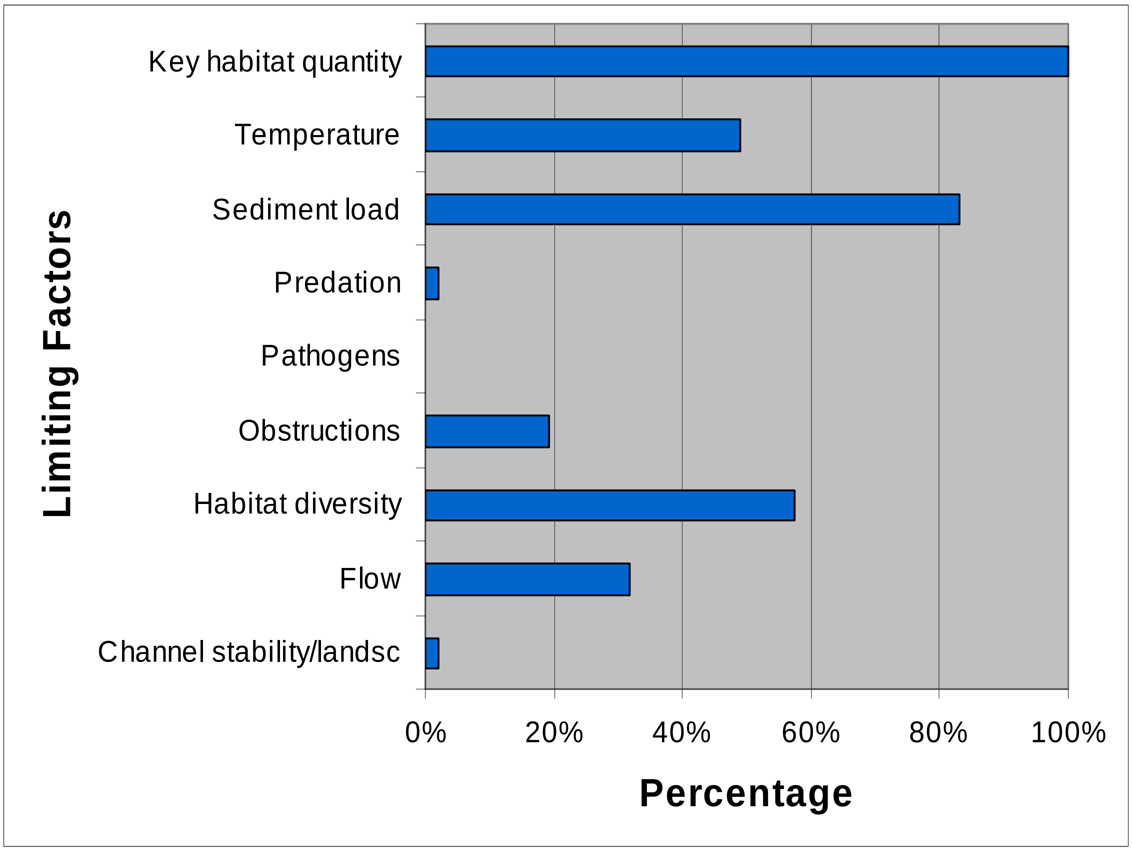

Figure 14. Limiting factors for summer steelhead by percentage of geographic areas (John Day Subbasin HUC5s).

3.2.4 Aquatic Focal Species Population Delineation and Characterization

Spring Chinook Salmon *(Oncorhynchus tshawytscha)*

Some chinook salmon populations were among the first salmon populations to become extinct in Oregon, due to their preferred status in the harvest (Hume 1893) and to extensive, early habitat degradation in eastern Oregon (Thompson and Haas 1960). The range of chinook salmon in Oregon historically included all Columbia and Snake River subbasins and all coastal streams below natural barriers. Where adequate habitat was available historically, adult chinook entered rivers most of the year with peaks that formed separate breeding populations (ODFW 1995).

The species is extinct in the Snake River above the Hells Canyon dam complex, in the Deschutes River above the Pelton/Round Butte dam complex, in the Oregon portion of the upper Klamath Basin, above dams in the Sandy, Willamette, Umpqua and Rogue rivers, and in the Umatilla and Walla Walla rivers. Populations have been lost from other basins including an early fall-run population in the lower Grande Ronde River, the fall-run population in the John Day River and the spring-run population in the upper Hood River. Winter-run populations may have been lost in the Sandy River and in Tillamook Bay. Irrigation diversions, hydroelectric dams, and other habitat problems that decreased flows, caused blockages, and increased summer and fall water temperatures caused many of the early extinctions (Thompson and Haas 1960, Fulton 1968). (ODFW 1995)

The chinook salmon is an anadromous species that rears in the Pacific Ocean for most of its life and spawns in freshwater streams in North America from Kotzebue Sound, Alaska, through central California. The majority of mature chinook salmon enter Oregon coastal rivers from about April through December, although a few fish are probably entering some rivers during every month of the year. Spring chinook begin entering the Columbia River in February. Entry into most Oregon rivers reaches a low point in summer. Different populations of chinook salmon in a basin can be distinguished by the season of the year during which they return to fresh water since fish with different run timings tend to spawn in different parts of the basin and thus maintain some reproductive isolation. Such populations in Oregon rivers are usually called either spring or fall chinook, although several populations could legitimately be described as summer or winter chinook. Spawning generally occurs from August to early November for spring chinook and from October to early march for fall chinook. All adults die within two weeks after spawning. (ODFW 1995)

The populations in the Mid-Columbia subbasins cluster loosely with each other, but are clearly a distinct group compared to all other chinook populations in Oregon (Schreck *et al*. 1986, Utter *et al*. 1989, and Marshall 1993).

The spring run of chinook salmon in the John Day is grouped into the Mid-Columbia River ESU. This ESU includes all naturally-spawned populations of spring-run chinook salmon in Columbia River tributaries from the Klickitat River upstream to and including the Yakima River (excluding the Snake River Basin).

In February, the adult spring chinook from the John Day Subbasin enter the Columbia River from the Pacific Ocean and migrate 217 miles up river, passing three dams to reach the confluence of the John Day and Columbia rivers. Spring chinook distribution within the John Day Subbasin is presented in Figure 15. Adult spring chinook salmon migrate upstream into and within the subbasin during April, May, and June. Most spring chinook return as 4-year-olds (75%), with 3-year-old (2.5%) and 5-year-old (22.5%) returns comprising the remainder (Lindsay *et al*. 1985). (USBR 2003)

Spring chinook salmon are regularly found in 38 streams in the subbasin (Table 32, Figure 15). Spring chinook salmon spawn in the Mainstem above Prairie City, in the Middle Fork above Armstrong Creek, and in the North Fork above Camas Creek including Granite Creek and its tributaries Clear and Bull Run creeks (Lindsay *et al*. 1986). Spawning habitat is primarily limited to the mainstem and major tributaries of the North Fork, such as Granite, Clear, and Bull Run creeks. (USBR 2003) In some years, small numbers of adults return to the South Fork John Day River, Camas Creek, Desolation Creek, and Canyon Creek.

They arrive at holding and spawning areas in the Upper John Day, Middle Fork John Day, North Fork John Day, and Granite Creek (a tributary to the North Fork) by early July (USBR 2003). Adults are consistently found in pools with a depth greater than 4.9 feet and with escape cover such as undercut banks, fallen trees or other debris, boulders, or vegetation (Lindsay *et al.* 1985). The adult holding locations are cold-water refugia and are well known to the biologist of the John Day watershed. While the daytime temperatures of the John Day are warm, night time temperature cool sufficiently to allow the adults to move within the system to the next cool water holding area. The adults are found in these locations until they spawn in late August through late September (USBR 2003).

Emergence of fry commences in March and April following high water (USBR 2003). Distribution extends downstream after emergence, then as water temperatures increase and flows decrease juveniles move into cooler tributaries and mainstem areas. By late September and early October, a shift back downstream usually takes place concurrent with decreasing water temperatures and increasing flows (Lindsay *et al*. 1985). Juveniles reside in rearing areas for approximately 12 months before migrating downstream the following spring, with migration peaking past Spray (RM 170) on the mainstem during the second week in April (Lindsay *et al*. 1985).

Rearing habitats are both on the mainstem reaches and the lower reaches of significant tributaries. (USBR 2003) The majority of rearing is in the lower portions of the cooler water tributaries, and not in the mainstem rivers where spawning occurs. Recapture data in the Columbia River indicate that smolts from the John Day River enter the Columbia from April through May and enter the Columbia River estuary in May and June (Lindsay *et al*. 1985).

Spring chinook spawning surveys have been conducted in index areas of Granite Creek, Clear Creek, Bull Run Creek, North Fork John Day River, Middle Fork John Day River and Upper John Day River since 1978. A few of these index areas have been surveyed since 1959.

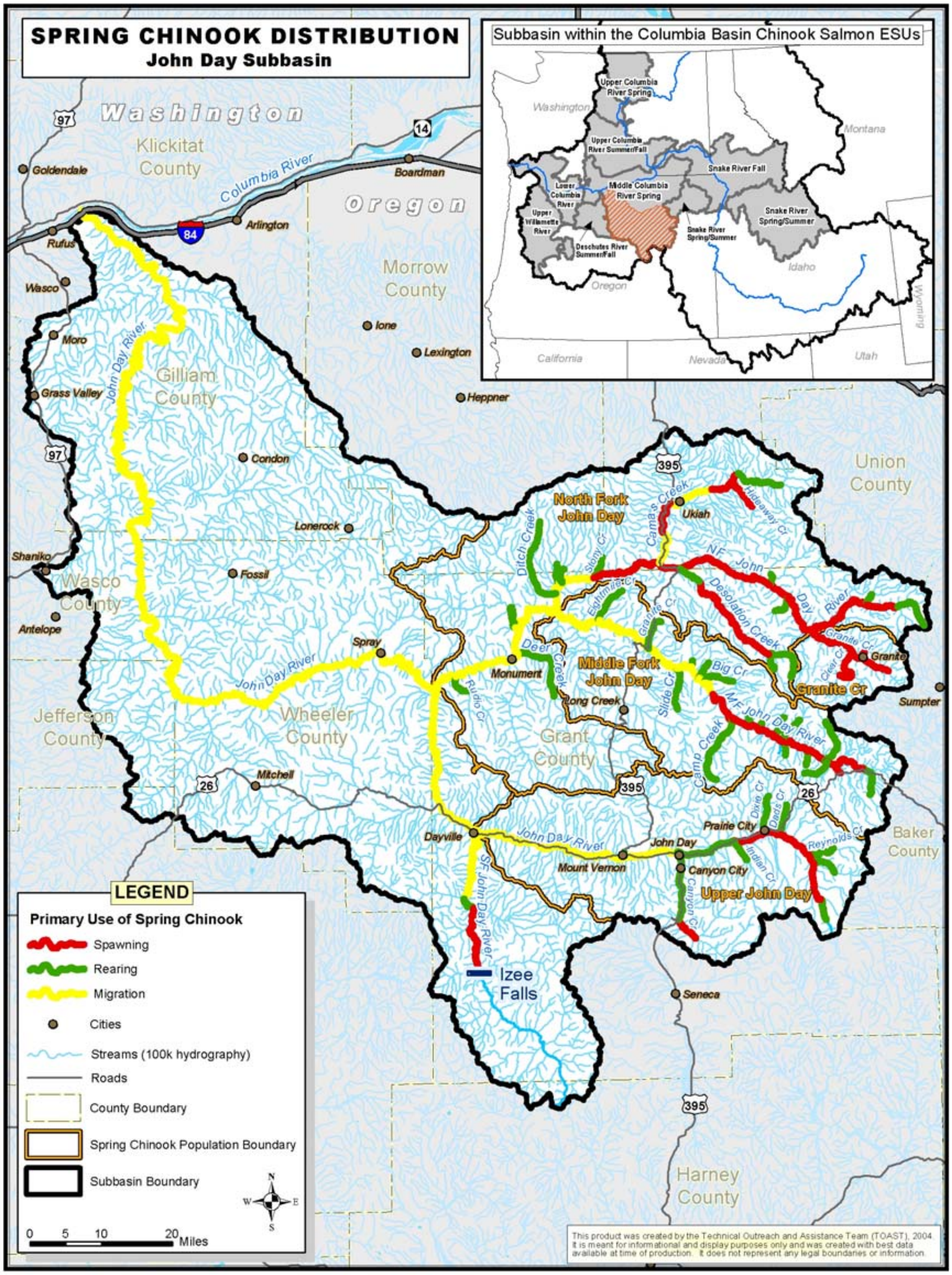

Figure 15. Spring chinook distribution in the John Day Subbasin.

The trend in estimated numbers returning to the subbasin for spring chinook salmon in the John Day River appears be slightly increasing for the period of record (Figure 16). However, the pattern of returning adult salmon is very different between the first 20 years and the second 20 years of the period. The reasons for strong variability in returns and the extreme differences between the peaks and valleys of this curve since about 1984 are unknown and deserve further attention. Recent increases have been attributed to improvements in fish habitat in the mainstem John Day River above the town of John Day and in the Middle Fork John Day River above the town of Galena (approximately mid-way between State Highways 7 and 395) and to improve ocean conditions.

Table 32. Distribution of spring chinook salmon (including juveniles) in John Day Subbasin streams. (Source: StreamNet)

Tributary Stream	Main Stream	Miles of Tributary	Miles Used	% Used
John Day River	Columbia River	277.6	181.8	65%
Bull Run Creek	Granite Creek	9.3	3.1	33%
Clear Creek	Granite Creek	8.0	2.3	29%
Indian Creek	John Day River	11.8	3.4	29%
North Fork	John Day River	111.0	59.6	54%
Beaver Creek	John Day River	4.10	0.8	20%
Beech Creek	John Day River	18.7	1.7	9%
Canyon Creek	John Day River	27.5	10.4	38%
Dads Creek	John Day River	8.6	4.2	49%
Deardorff Creek	John Day River	9.6	1.0	10%
Dixie Creek	John Day River	11.4	1.3	11%
Reynolds Creek	John Day River	9.3	1.4	15%
South Fork	John Day River	57.3	27.6	48%
Big Boulder Creek	Middle Fork	6.5	2.1	32%
Big Creek	Middle Fork	11.6	1.0	9%
Butte Creek	Middle Fork	4.9	2.2	45%
Camp Creek	Middle Fork	15.6	11.3	72%
Clear Creek	Middle Fork	12.7	3.9	31%
Coyote Creek	Middle Fork	2.5	0.6	24%
Deerhorn Creek	Middle Fork	3.4	1.5	44%
Eightmile Creek	Middle Fork	8.9	0.7	8%
Granite Boulder	Middle Fork	8.1	4.0	49%
Granite Creek	Middle Fork	5.9	1.3	22%
Huckleberry Creek	Middle Fork	6.4	0.5	8%
Indian Creek	Middle Fork	13.6	1.7	13%
Slide Creek	Middle Fork	10.2	0.3	3%
Squaw Creek	Middle Fork	9.4	2.8	30%
Big Wall Creek	North Fork	21.3	2.3	11%
Camas Creek	North Fork	36.7	15.5	42%
Deer Creek	North Fork	11.1	2.5	23%
Desolation Creek	North Fork	21.1	5.0	24%
Ditch Creek	North Fork	19.5	1.9	10%
Granite Creek	North Fork	16.2	10.0	62%
Mallory Creek	North Fork	14.3	4.0	28%
Middle Fork	North Fork	71.0	40.3	57%
Potamus Creek	North Fork	18.4	0.6	3%
Rudio Creek	North Fork	16.8	3.4	20%
Stony Creek	North Fork	6.8	3.0	44%

The estimates for the population in the Granite Creek system show a decreasing trend, while the other three spring chinook populations in the John Day Subbasin appear to be on the increase (Figure 17). Granite Creek is a tributary of the upper North Fork. The reasons for the Granite Creek population's declining trend, in light of the increase in North Fork populations, are not clear. However, the decline appears to correlate with recent intensive forest management activities and degradation from historic mining (USBR 2003). Like the North Fork population, the Middle Fork and Upper John Day spring chinook populations also show a positive trend.

In 2000, record numbers of spring chinook salmon spawned in the index areas of the John Day River. According to unpublished data from the ODFW, a total of 477 redds were counted in the North Fork John Day that year, when in 1995 only 27 redds were tallied. In the declining Granite Creek system, 241 redds were counted, more than double the 20-year average. Spawning populations in both the mainstem and Middle Fork John Day rivers were the highest

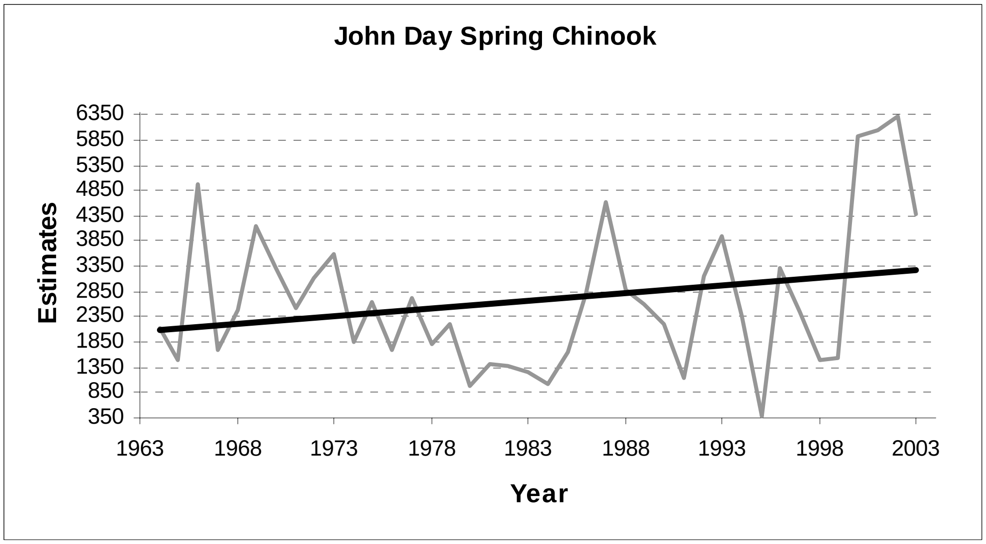

Figure 16. Estimates of total spring chinook escapement in the John Day Subbasin, 1964 to 2000 (estimate data per ODFW).

recorded since 1959. Contributing factors probably include improved ocean conditions, success in habitat restoration (screened diversions, improved adult and juvenile fish passage, efficient irrigation, riparian cover) and improved management practices. (USBR 2003)

<u>Description of Chinook's Aquatic Introductions, Artificial Production and Captive Breeding Programs</u>

Although no releases of hatchery chinook salmon have been made into the rivers of the John Day Subbasin, a small number of stray hatchery adults have been recovered during spawning surveys in the fall (Wilson *et al*. 2000). This small number (less than 1% of the total adult return) is thought to present little risk to the genetic integrity of the population. (USBR 2003)

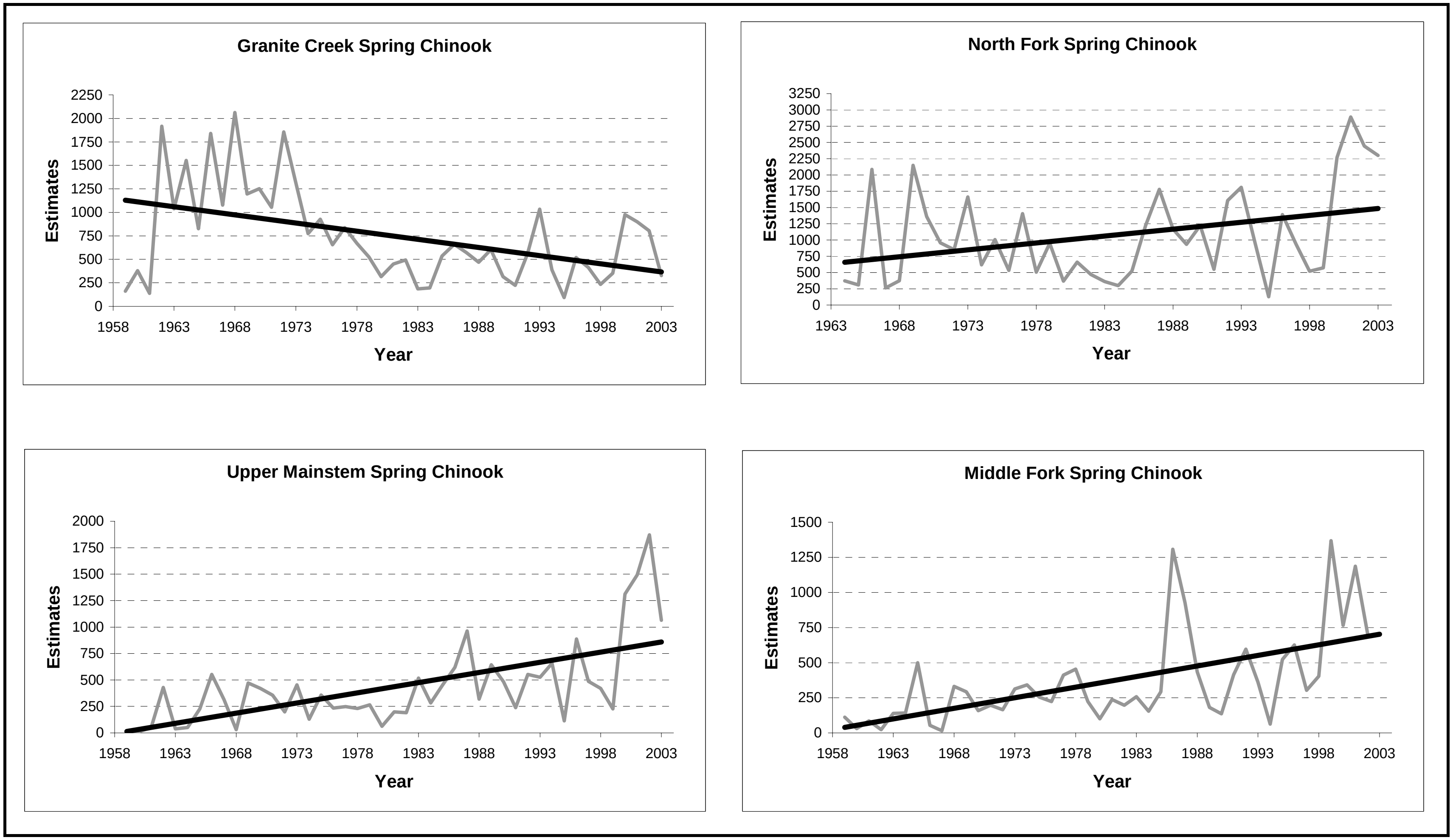

Figure 17. Estimates of adult spring chinook escapement for each John Day population, with trend lines. (estimate data per ODFW)

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Chinook Harvest in the Subbasin

All angling for salmon in the John Day Subbasin has been prohibited since 1976. The CTUIR have a limited subsistence fishery on Granite Creek and on the North Fork between Highway 395 and Big Creek (excluding tributaries). This tribal fishery has been conducted in the last decade with a variable annual quota of 100 fish or less (ODFW 1995). Oregon State Police (OSP) provide priority enforcement presence in chinook holding and spawning areas. Harassment and poaching problems seem to be decreasing as a result (ODFW 1995). The escapement target that would allow a sport fishery to resume is 7000 fish to the mouth of the John Day River for three to four consecutive years, but this target has not yet been met. Escapement to the spawning areas during 2000 and 2001 was about 6000 spawners. The Tribes, OSP and ODFW closely monitor the quota for this tribal fishery and the fishery itself. (USBR 2003)

Environmental Conditions for Chinook

Reduced streamflows, especially during summer, have contributed to higher water temperatures. Further, reduced streamflows have created physical and thermal obstacles to fish movement. Reduced riparian vegetation and shade have contributed to higher water temperatures and reducing habitat diversity. Yet, the aquatic habitat is healthier than in many other Columbia Basin tributaries due to the absence of large dams and the presence of quality habitat in some federally-owned headwater areas. (USBR 2003)

Downstream-migrating juvenile fish are susceptible to entrapment in water diversions that are either inadequately screened or not screened at all. Fish become impinged on inadequate screens, or are drawn into the diversion system without an escape route back to the main stream. Trapped fish eventually die as they run out of water, or are exposed to other lethal conditions (such as high water temperatures, lack of dissolved oxygen, or physical contact with pumps and sprinklers) in the irrigation channel or agricultural field. (USBR 2003)

During critical low water years, some fish may encounter passage and spawning difficulties in some upper subbasin streams. Flows necessary for migration are available most years. However, juveniles moving out of unfavorably high stream temperatures in some mainstem reaches to cooler water in tributaries are blocked from some streams because of low flows, passage barriers, irrigation demands or a combination of the three. Research studies in the John Day Subbasin revealed that when mean daily stream temperatures exceed 68° F, young chinook disappear from the mainstem habitat either by escaping to cooler tributaries where available or are lost to mortality. (ODFW 1990)

Overal, the quality of the habitat used by spring chinook in the Upper John Day drainage has been stable to improving, except in the area used by the Granite Creek population. Part of the spring chinook habitat in the North Fork is protected by scenic waterway and wilderness designations. Habitat outside of these protected areas has been impacted by certain logging, road construction, mining and grazing activities. Logging activity, including road construction and clearcuts, have been more extensive in the Granite Creek watershed than elsewhere in the John Day Subbasin**.** Habitat impacts affecting the Granite Creek population include heavy mining activity since the mid-1970s. Several blowouts of acid mine waste ponds in the subbasin have affected water quality. (ODFW 1995) Habitat in the upper mainstem has been improving due to riparian fencing, improved water management and other habitat improvement projects on private lands.

<u>EDT Assessment Results</u>

Abundance. Abundance is a measure of the number of individuals in a population. For the John Day spring chinook, adult fish numbers have been estimated over the last five decades. Figure 17 shows the estimates of adult numbers for each of the four populations of the system. Except for the Granite Creek population, most of the populations appear to have a positive trend. The early years of 2000s have been tremendous years for return of several salmonids species within the Columbia Basin, including the spring chinook of the John Day River. Recent ocean conditions have been very positive for salmonid survival during these years.

The EDT model runs are based on population trends and environmental conditions of the period from 1992 to 1997. During this period, ocean conditions were not positive for survival and the populations show fluctuations during this time, but appear to remain at a stable state. Several measures of abundance are shown below in Table 33. See Appendix T for a complete set of EDT baseline reports for spring chinook. These are compared to the observed averages for each period. The empirical data shown in Table 33 illustrates that there has been significant increases in all John Day Subbasin populations in recent years.

The EDT baseline abundance total is similar to the 1992 to 1997 average. However, most of the fish are produced in the North Fork. Granite Creek, Middle Fork, and Upper John Day EDT numbers are approximately half of the observed numbers. Attempts were made in the EDT model of the John Day to adequately reflect how spring chinook utilize rearing habitat; in particular, habitat in the significant tributaries in the vicinity of the mainstem river spawning beds. While the numbers for each population were elevated from the spring 2004 results and the total number of spring chinook is closer to reality, the model appears to need further work if it is to be used for subbasin scenario work. The model is still not reflecting the observed proportions of fish from each population, as it is overestimating the North Fork population and underestimating the other three populations. This is the case for both the current abundance and the historic potential. The work to correct for this issue is discussed under “EDT Methods” in Section 3.2.3.

Table 33. Spring chinook adult population averages.

Population Area	EDT Historic Abundance Potential	EDT Baseline Abundance (no harvest)	EDT Baseline Productivity[1] (no harvest)	EDT Baseline Capacity (no harvest)	Empirical 1992-1997 Average	Empirical 2000-2004 Average	Professional Judgement Estimated Historic
North Fk JD	6,252	1,731	5.2	2,145	1,139	2,554	22,280
Granite Cr	1,059	85	2.2	157	501	667	3,760
Middle Fk JD	2,152	177	2.2	328	431	942	7,680
Upper JD	1,767	217	2.7	345	538	1,353	6,280
Total	11,230	2,210		2,975	2,609	5,516	40,000

Observed data per ODFW.
[1] smolts per spawner

Further EDT data provided in Table 33 shows that severe losses occurred in productivity and abundance for all populations when a comparison is made between present status and the historic (template) condition. The North Fork population has lost 66% of productivity and 72% of its abundance, compared to historic conditions. The remaining three populations have been more severely impacted, losing between 92% and 88% of each of these indices. The actual losses in productivity and abundance are probably somewhat greater for the North Fork spring chinook and somewhat less for the other populations, given the inaccuracies in EDT estimates of present abundance. The relative impacts to each population are probably similar to that shown, however.

The risk of further decline, based upon observed abundance and productivity, is greatest for the Granite Creek, Middle Fork and Upper John Day spring chinook salmon populations. This is also reflected in the EDT stock recruitment results (Figure 18). These three populations are at low abundance (≤ 500) and are near replacement level of productivity. During any future periods of adverse environmental conditions, these populations of spring chinook salmon may not be able to maintain themselves.

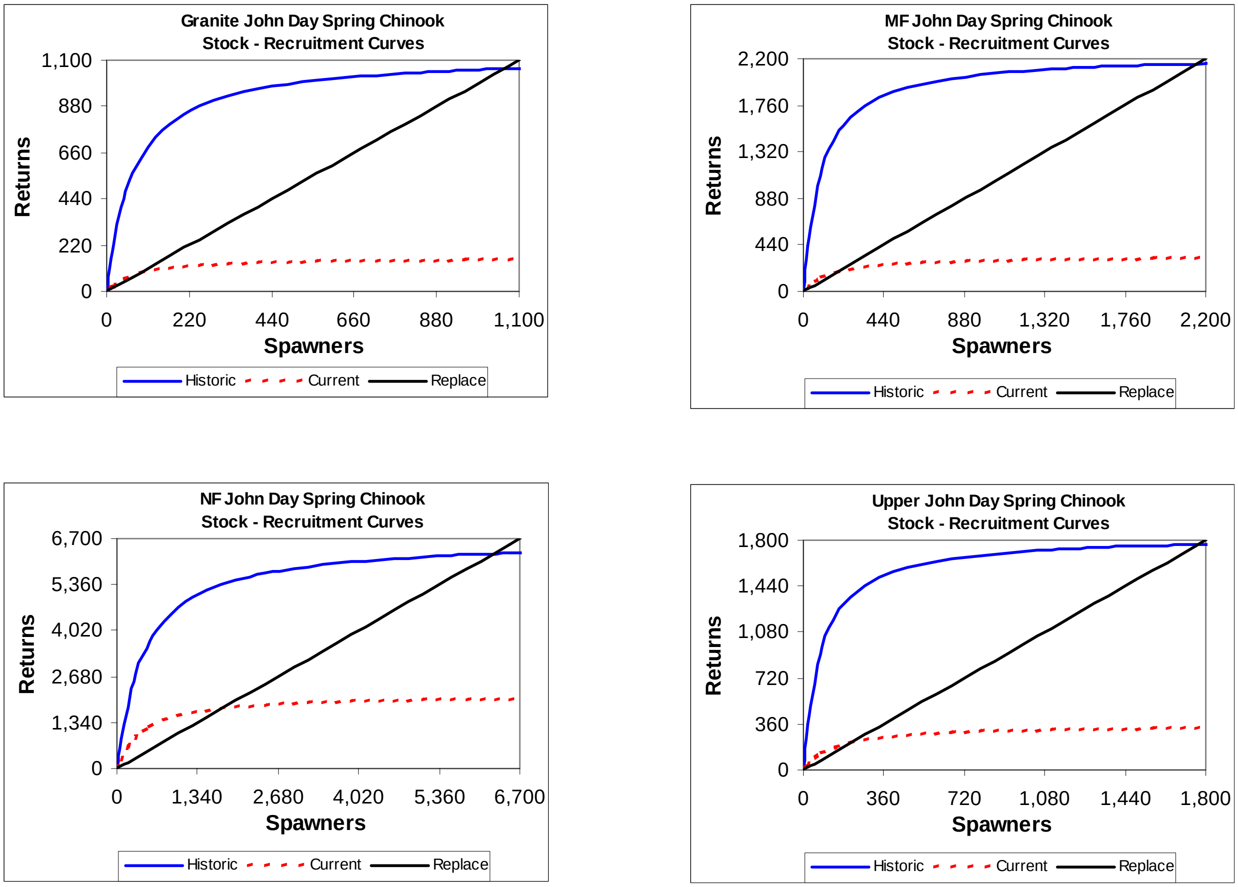


Figure 18. Stock recruitment curves produced by EDT baseline report for the four populations of the John Day Subbasin.

Juvenile Productivity. Changes made to the model and the rating of additional reaches have increased the productivity levels for all spring chinook populations from those first reported in the spring 2004 subbasin plan. All populations now exceed 2.0, while past numbers exceeded 2.0 only for the North Fork population.

There have been several efforts to determine the smolt production in the John Day Subbasin.

1. ODFW 1988 smolt production estimates were 306,400 smolts. This was determined utilizing the 1987 estimated escapement of 4,596 adults (ODFW 1990).
2. Five-year average estimated production from spawning ground surveys = 240,000 smolts (ODFW 1990).
3. United States vs. Oregon subbasin reports estimate 279,000 current smolts and project the future number of smolts to be 356,250 (ODFW 1998).

The U.S. vs. Oregon data shown in #3 above is believed to be the best estimate available.

The data shown in Table 34 illustrates that the smolt production estimated by EDT (61,953) is far smaller compared to estimates determined from a variety of sources listed above. Smolt productivity (smolts/spawner) does not vary as much as other indicators between populations in the adult baseline report. Values range from 76 smolts/spawner (Granite Creek) to 110 smolts/spawner (North Fork). EDT current (based on 1992-97enviromental conditions) smolt production is greatest for the North Fork population (42,130) and ranges between 3,800 and 8,600 for the remaining populations. Smolt production in the Middle Fork and the upper mainstem should be similar to the numbers coming out of the North Fork and the recent ODFW research has placed smolt estimates for the entire John Day at:

- 2001 – 92,900
- 2002 – 103,100
- 2003 – 83,950
- 2004 – 91,400

Table 34. Spring chinook juvenile population averages from EDT.

Population Area	EDT Historic Abundance Potential	EDT Baseline Abundance (no harvest)	EDT Baseline Productivity[1] (no harvest)	EDT Baseline Capacity (no harvest)
North Fk JD	127427	42130	110	54078
Granite Cr	22682	3806	76	9252
Middle Fk JD	43025	7416	81	15376
Upper JD	38570	8601	98	14426
Total	231704	61953		93132

[1] smolts per spawner

The two most likely reasons that EDT is underestimating present smolt production are the problems with the reach ratings and/or the rearing "patch" which may not adequately account for all tributary production. In either case this discrepancy and subsequent estimates of survival rates are felt to be too unreliable for use at this time. However EDT results are useful for analyzing the causes for decline from template conditions, but should be used cautiously when estimating the amount of decline or present productivity.

See Appendix T for more detailed results of adult and juvenile spring chinook populations modeling in EDT.

Diversity. The EDT model produces an index that expresses the diversity as a percent of the historic potential (Note: historic diversity is, by definition, 100%). Corrections to the spring 2004 model runs have increased diversity for all the populations and benefited the Middle Fork and the Upper John Day the most. Work in the spring of 2004 indicated that the North Fork had the greatest diversity and the Upper John Day had the lowest diversity at 5%. The most recent runs of the EDT model for the four population of spring chinook salmon in the John Day Subbasin results without harvest are as follows:

- North Fork John Day – 81%
- Granite Creek – 41%
- Middle Fork John Day – 71%
- Upper John Day – 89%

The diversity index changed the least from historic to present conditions compared to productivity and abundance. Losses ranged from 59 percentage points for the Granite Creek population to 11 percentage points for the Upper John Day population.

Identification of Limiting Factors

Environmental Relationships by Population. One of the EDT model outputs is a list of potential protection and restoration areas and their ranks. For the John Day Subbasin the planners chose HUC5 watersheds, of which the John Day Subbasin has 43, as the Geographic Areas for summarizing EDT diagnostic results. High restoration potential ranking HUC5s may produce the greatest increase in productivity and abundance with restoration. Those designated with a “high” protection value are most important to preserve current habitat and environmental conditions. The limiting factors are also presented with each HUC5 and are ranked as having “high” (or large), “medium,” “low,” or “no” impact on focal species survival. Only “high” and “medium” priority attributes are listed with the top quartile of HUC5s for restoration. Priority HUC5s were those ranked within the top quartile of all HUC5s used by a single population. Priority attributes are those rated as having “high” or “medium” impact on production. Only the top quartile results for each population of spring chinook salmon that was analyzed are presented here. See Appendix U for complete results on the ranking of restoration and protection HUC5s for spring chinook salmon.

Granite Creek. The Granite Creek spring chinook population spawns only in the Granite Creek HUC5. All other HUC5s that are important to this population are similar habitat that is occupied by the North Fork population and the common migration corridor of the Lower John Day River. Table 35 lists only the top quartile HUC5s from 11 HUC5s assigned by EDT as important for this population.

Table 35. Top quartile protection and restoration geographic areas with important restoration attributes as estimated by EDT (black), with additional attributes listed by the subbasin planners (gray) for Granite Creek spring chinook.

Granite John Day Spring Chinook					
Geographic area priority			**Attribute for Restoration**		
Geographic area	**Protection benefit**	**Restoration benefit**	***Habitat diversity***	***Sediment load***	***Key habitat quantity***
Granite Creek	X	X	■	■	■
NF JDR Big Creek	X	X	▒		■
NF JDR Potamus Creek	X	X	■		■

All three HUC5s in the top quartile are listed for both protection and restoration, which signifies that all three should be protected from any further degradation and that restoration on any of the limiting factors listed would have the potential to increase productivity and abundance for the population. The NF JDR Big Creek and NF JDR Potamus Creek HUC5s are located immediately downstream of Granite Creek. Common to all three HUC5s is key habitat diversity, which was given priority by EDT for focal species survival. Habitat diversity is a priority for Granite Creek and is understood by the technical team to be very important for NF JDR Big Creek even though EDT did not identify it as a priority.

Middle Fork. The Middle Fork spring chinook population spawns in the HUC5s of Big and Camp creeks and Upper MF JDR. Other HUC5s that are important to this population (defined by EDT) are the remaining areas of the Middle Fork John Day River and habitat that is occupied by the North Fork population below the confluence of the Middle Fork and the common migration corridor of the Lower John Day River. Table 36 lists only the top quartile HUC5s from 13 HUC5s assigned by EDT as important to this population.

Table 36. Top quartile protection and restoration geographic areas with important restoration attributes as estimated by EDT (black), with additional attributes listed by the subbasin planners (gray) for Middle Fork John Day spring chinook.

MF John Day Spring Chinook							
Geographic area priority			Attribute for Restoration				
Geographic area	Protection benefit	Restoration benefit	*Flow*	*Habitat diversity*	*Sediment load*	*Temperature*	*Key habitat quantity*
Big Creek	X	X					
Camp Creek	X	X					
Upper MF JDR	X	X					

All three of the HUC5s in the top quartile are listed for both protection and restoration; these three are the spawning habitat of the Middle Fork population. EDT is indicating that these HUC5s should be protected from further degradation and that restoration on the listed limiting factors should increase productivity and abundance for the population. Among the top areas listed, EDT indicates that Camp Creek is in need of restoration on the most habitat attributes. The attributes of temperature and key habitat quantity for Camp Creek were ranked as the greatest priority for species survival. Spawning for this population covers the entire length of the Middle Fork John Day River in the Camp Creek HUC5. Spawning in Big Creek and Upper MF JDR HUC5s are approximately a third of the length in Camp Creek HUC5. In addition, the technical team believes that flow should be a greater priority for increasing chinook productivity and abundance in Camp Creek and Upper MF JDR HUC5s than suggested by the EDT results. Temperature is also of concern in the Upper MF JDR area. The technical team would elevate its priority, whereas EDT places it in a low priority.

North Fork. The North Fork spring chinook population spawns in several HUC5s in the watersheds of Camas and Desolation creeks, and Middle and Upper NF John Day rivers. Other HUC5s that are defined by EDT as important to this population are common areas of the migration corridor in the Lower John Day River. Table 37 lists only the top quartile HUC5s from 14 HUC5s EDT assigned to this population.

Table 37. Top quartile protection and restoration geographic areas with important restoration attributes as estimated by EDT for North Fork John Day spring chinook.

NF John Day Spring Chinook					
Geographic area priority			Attribute for Restoration		
Geographic area	Protection benefit	Restoration benefit	*Habitat diversity*	*Temperature*	*Key habitat quantity*
Desolation Creek	X				
Lower Camas Creek		X	■	■	■
NF JDR Big Creek	X	X	■	■	■
NF JDR Potamus Creek	X	X	■	■	■
Upper NF JDR	X				

For this population, EDT lists only two of the spawning areas as needing both protection from additional habitat degradation and restoration of habitat attributes with limiting factors. These two HUC5s are also shared as priority areas with the Granite Creek population. The technical team did not have any further addition to these EDT results.

Upper John Day. The upper mainstem spring chinook population spawns in several HUC5s. Most of the spawning occurs in the Upper JDR and Strawberry Creek HUC5s. A small area is used for spawning in the Canyon Creek watershed and, on rare occasions, spawning occurs in the Lower South Fork of the John Day River (since spawning in the SF is rare for this population, it was not included in the EDT analyses). Other HUC5s that are defined by EDT as important to this population are middle areas of the mainstem above the NF and the common areas of the migration corridor in the Lower John Day River. Table 38 lists only the top quartile HUC5s from 13 HUC5s assigned by EDT to this population.

For this population, EDT lists only two of the spawning areas as needing both protection from additional habitat degradation and restoration of habitat attributes with limiting factors. Canyon Creek, a spawning area, was not listed. However, Laycock Creek, a HUC5 immediately downriver of all three spawning areas, is listed for both protection and restoration. EDT rated key habitat quantity as high priority for all of the HUC5s listed.

The technical team questions several of the EDT ratings for spring chinook in this geographic area. While temperature rated as a high priority for the Upper JDR, the team feels that the Laycock Creek HUC5 was not rated high enough for this attribute. Also, while EDT rated flow as of little importance for Strawberry and Laycock creeks, the team would place greater importance on this attribute for these three HUC5s.

Table 38**.** Top quartile protection and restoration geographic areas with important restoration attributes as estimated by EDT (black), with additional attributes listed by the subbasin planners (gray) for Upper John Day spring chinook.

Upper John Day Spring Chinook							
Geographic area priority			**Attribute for Restoration**				
Geographic area	**Protection benefit**	**Restoration benefit**	***Flow***	***Habitat diversity***	***Temperature***	***Key habitat quantity***	
Laycock Creek	X	X	(gray)	(black)	(gray)	(black)	
Strawberry Creek	X	X	(gray)	(black)	(black)	(black)	
Upper JDR	X	X	(gray)	(black)	(black)	(black)	

Further, while the HUC5s listed above for the four populations of spring chinook are of great importance, the technical team feels that restoration work in steelhead-based tributary streams will be the most cost-effective strategy to achieve improvements for all species. Therefore, the team tended to rank HUC5s with large tributaries as higher priorities for restoration based on the steelhead outputs from EDT with the assumption that what is good for steelhead will also benefit tributary rearing spring chinook salmon.

Analysis of Limiting Factors

Several limiting factors have already been presented for the top quartile HUC5s of each spring chinook salmon population. Another limiting factors breakdown of EDT output was completed on all the HUC5s used by spring chinook. Here the percentage of geographic areas (HUC5s) with attribute classes of “high” or “medium” priority for restoration was compared (Figure 19). Since the main use of the Lower John Day Subbasin by the populations of spring chinook salmon is as a migration corridor, the mean scores (from four populations) of each HUC5 were used in this common area.

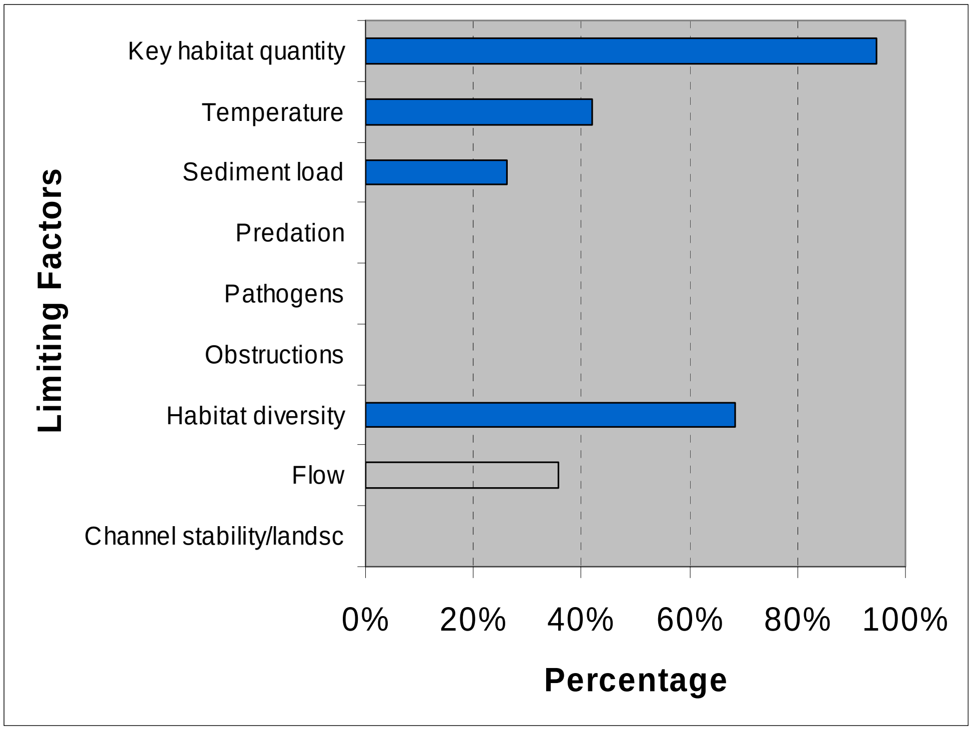


Figure 19. Limiting factors for spring chinook by percentage of geographic areas (HUC5s of the John Day Subbasin).

Key habitat quantity is a limiting factor for approximately 95% of the geographic areas. This is a very similar result to that found for summer steelhead. Key habitat quantity refers to the key habitat type required of each life stage for each species; the physical area of each of these habitats is accumulated across all life stages. Channelization of streams and rivers can affect almost all the key habitats over the range of life stages. Further, a major loss of a few habitat types for some of the life stages (for example, the loss of 60% of pool habitat between current and historic conditions) would produce a limiting factor from key habitat. Habitat diversity showed up in almost 70% of the geographic areas of spring chinook, very similar to the finding for steelhead. Temperature as a limiting factor was again similar between spring chinook and summer steelhead as a limiting factor in 40 to 50% of the geographical areas for each species. For spring chinook, sediment load was a limiting factor for approximately 30% of the areas, while steelhead had more than twice as many areas with this limiting factor. Although flow was a limiting factor for summer steelhead it did not show up in the spring chinook EDT results. However, the technical team believes that flow should also be included as a limiting factor for spring chinook for several of the HUC5s representing almost 40% of the top priority areas.

Relationship to Delisting Criteria

Spring chinook salmon in the Mid Columbia ESU are not proposed for listing at this time. Hence, no interim or final delisting criteria have been proposed. However, three chinook populations are presently in what could be termed a borderline status and could be candidates for listing if they were to decline significantly during periods of poor environmental conditions.

The abundance of Granite Creek, Middle Fork and Upper John Day populations are all near 500 fish. Populations below this level may increase the risk of negative demographic impacts from environmental variation and of unwanted genetic change in small populations. Though the Middle Fork and Upper John Day populations have been increasing recently, their productivity is relatively low, indicating they would be more vulnerable to decline during periods of adverse environmental conditions. The Granite Creek population has been relatively stable during the last several years, but should receive particular attention for restoration actions because it exhibits a long-term declining trend.

3.2.4 Aquatic Focal Species Population Delineation and Characterization

Bull Trout *(Salvelinus confluentus)*

Much of this bull trout section was taken from the U.S. Fish and Wildlife Service's 2003 draft recovery plan for the John Day River Recovery unit (USFWS 2003).

Bull Trout Population Data and Status

The U.S. Fish and Wildlife Service issued a final rule listing the Columbia River and Klamath River populations of bull trout (*Salvelinus confluentus*) as a threatened species under the Endangered Species Act on June 10, 1998 (63 FR 31647). An emergency rule listing the Jarbidge River population as endangered due to road construction activities was published on August 11, 1998 (63 FR 42757), and the population was subsequently listed as threatened on April 8, 1999 (64 FR 17110), when the emergency rule expired. The Coastal-Puget Sound and St. Mary-Belly River populations were listed as threatened on November 1, 1999, (64 FR 58910), which resulted in all bull trout in the coterminous United States being listed as threatened. The five populations discussed above are listed as distinct population segments, *i.e.*, the U.S. Fish and Wildlife Service has concluded that they meet the requirements of the joint policy with the National Marine Fisheries Service regarding the recognition of distinct vertebrate populations (61 FR 4722).

Bull trout present in the John Day Subbasin are part of the Columbia River Distinct Population Segment (DPS) encompassing parts of Oregon, Washington, Idaho and Montana. Historically, bull trout are estimated to have occupied about 60% of the Columbia River Basin. Presently bull trout occur in 45% of their estimated historical range (Quigley and Arbelbide 1997). The U.S. Fish and Wildlife Service identified the John Day Subbasin as one of 22 recovery units within the Columbia River Distinct Population Segment (USFWS 2003).

The John Day Recovery Unit includes bull trout from three watersheds: the North Fork John Day River, the Middle Fork John Day River, and a portion of the Upper Mainstem John Day River. Each of these areas corresponds to a core area for recovery purposes (Figure 20). Inclusions of other areas within the John Day River Recovery Unit (e.g., the mainstem John Day River below the town of Spray) have been identified as research needs. Research needs apply to areas where the recovery unit team feels more information is needed to accurately plan and implement recovery actions.

After considering information that is currently available, including that in Ratliff and Howell (1992), and Buchanan *et al.* (1997), eleven existing, local populations (or stocks) of bull trout within the John Day Subbasin were identified. A local population is considered to be fish of a given species which spawn in a particular lake or stream(s) at a particular season, and which to a substantial degree do not interbreed with any group spawning in a different place, or in the same place at a different season.

Although bull trout historically occurred throughout the John Day Subbasin, they were probably never as abundant as other salmonids in the subbasin. It is certain that they were more abundant and more widely distributed than they are today. The local populations of the North Fork John Day River Core Area were described as a special concern in the early 1990s, indicating the possibility that extinction could occur (Ratliff and Howell 1992). Because of further reduced numbers since that time, these populations have been downgraded to having a moderate risk of extinction (Buchanan *et al.* 1997). Relative to extinction, the Middle Fork John Day River Core Area holds local populations at high risk of extinction since they are only found in tributaries, and are thought to be extinct in the Middle Fork John Day River itself (Ratliff and Howell 1992). Populations in the Upper Mainstem John Day Core Area are thought to be at moderate risk of extinction (Ratliff and Howell 1992).

North Fork John Day. According to the U.S. Fish and Wildlife Service, there are no **r**eliable estimates of populations for North Fork John Day streams (Paul Bridges, USFWS, personal communication, March 25, 2004).

Middle Fork John Day. Bull trout in the Middle Fork John Day River persist at low abundance levels. In 1999, population surveys were conducted in Clear Creek, Big Creek, Deadwood Creek and Granite Boulder Creek to estimate abundance. Total numbers of bull trout, consisting primarily of juvenile and subadult fish, were estimated to be 1950 individuals in Big Creek, 640 individuals in Clear Creek and 368 individuals in Granite Boulder Creek (Hemmingsen 1999). Additional surveys were conducted during the summer of 2000 in Vinegar Creek and part of Davis Creek. A single bull trout was found in Vinegar Creek and none were found in Davis Creek.

Upper Mainstem John Day River. The Oregon Department of Fish and Wildlife estimated from 1990 surveys that the Upper Mainstem John Day River, Call Creek, and Rail Creek may have more than 300 total spawning adults (ODFW 1995).

Bull trout typically have more specific habitat requirements than other salmonids.
As a result, bull trout are more sensitive to changes in habitat and less able to persist and thrive when habitat conditions are altered or degraded (Rothschild and DiNardo 1987). Channel and hydrologic stability, substrate, cover, temperature, and the presence of migration corridors consistently appear to influence bull trout distribution or abundance (Ziller 1992).

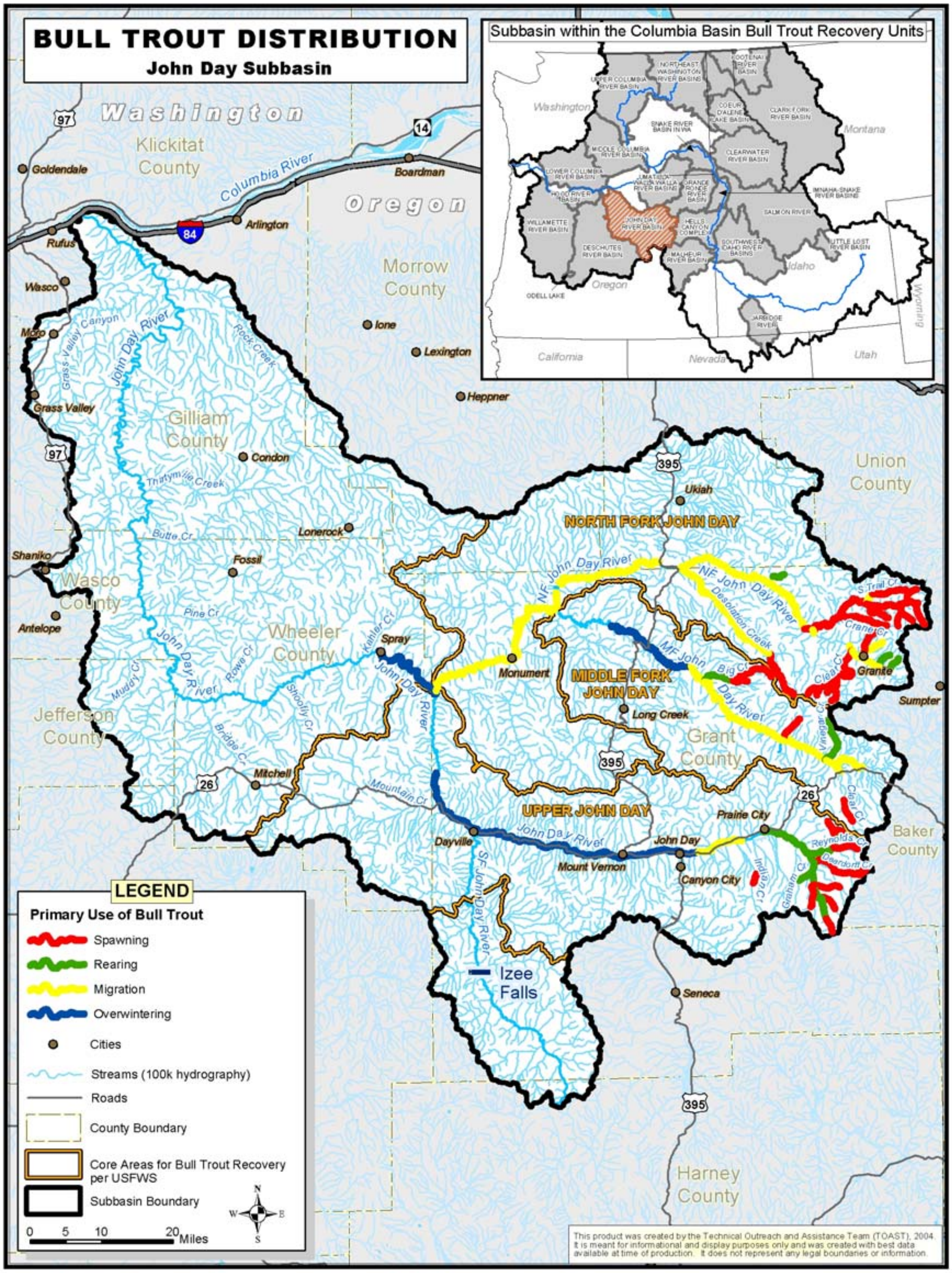


Figure 20. Bull trout distribution and Recovery Unit core areas in the John Day Subbasin.

Adults usually spawn from August through November in the coldest headwater tributaries of a river system, and require water temperatures less than 50° F for spawning, incubation and rearing (Weaver and White 1985). Although migratory bull trout (fluvial and adfluvial) may use much of a river basin through their life cycle, rearing and resident fish often live only in smaller watersheds or their tributaries (second to fourth order streams) (Ziller 1992).

Juvenile bull trout are closely associated with stream channel substrates, often using interstitial (space between substrate) spaces for cover (Fraley and Shepard 1989). A close association with channel substrates appears more important for bull trout than for other species. This specific rearing habitat requirement suggests that highly variable streamflows, bed movements, and channel instability will influence the survival of young bull trout, especially since embryos and alevins incubate in substrate during winter and spring (Rieman and McIntyre 1993).

A study to determine bull trout life history in the John Day River above Prairie City is currently underway (*Bull Trout Life History Project* by Oregon Department of Fish and Wildlife). Preliminary results from that study indicate that a remnant fluvial population persists and that movement is highly correlated to water temperatures and time of spawning. Adult bull trout migrate upstream in the John Day River toward spawning areas as early as July and commence spawning in early September. Spawning is usually complete by early November, at which time the adults immediately move downstream. It is assumed that bull trout in the Middle Fork and North Fork watersheds exhibit a similar migration pattern.

Information on carrying capacity is not currently available. However, the USFWS bull trout recovery team believes that, in a recovered condition, the subbasin will support about 5000 adult spawners, with perhaps 1500 each for the upper mainstem and Middle Fork core areas and 2000 for the North Fork core area. (Ron Rhew, USFWS, personal communication, April 20, 2004).

Bull trout have very low levels of genetic variation within populations (such as the John Day, Umatilla and Grande Ronde subbasin populations) but are highly differentiated between populations (Spruell and Allendorf 1997). The John Day and Grande Ronde bull trout populations tend to be similar genetically. However a unique allele frequency was found in seven of 10 John Day populations which was not present in any of the 11 Grande Ronde populations (Spruell and Allendorf 1997). The Oregon Department of Fish and Wildlife has collected enough data on bull trout in the John Day Subbasin to believe that there is genetic interchange between the population within the subbasin (Tim Unterwegner, ODFW, personal communication, April 13, 2004). Radio tagging and trapping efforts lead ODFW to believe that bull trout are migrating fairly extensively throughout the John Day River and its major tributaries above the town of Spray (Tim Unterwegner, ODFW, personal communication, April 13, 2004).

Bull Trout Distribution

Bull trout are indigenous to the John Day Subbasin and historically had a wider distribution within the subbasin than at present. The current distribution of bull trout is clearly fragmented (Howell and Buchanan 1992). The John Day watershed presently contains three bull trout subpopulations: one in the Upper John Day River, a second in the Middle Fork John Day River and a third in the North Fork John Day River. Bull trout distribution is limited primarily to headwaters of the Upper Mainstem, North Fork and Middle Fork John Day River tributaries, with seasonal use of the entire North Fork John Day River. In the winter of 2004, ODFW documented subadult bull trout movement in the mainstem John Day River down to the National Park Service Interpretive Center at RM 203 and in the Middle Fork down to the hot springs at Ritter (RM 15). Two individuals were caught in a downstream migrant screw trap on the mainstem and one individual was caught in another screw trap on the Middle Fork (Tim Unterwegner, ODFW, personal communication, April 8, 2004). See Figure 20 for distribution of bull trout within the John Day Subbasin.

Upper Mainstem John Day River. Based on distribution information contained in Buchanan *et al.* (1997), and professional judgment of the John Day River Recovery Unit Team, the USFWS identified two bull trout local populations in the Upper Mainstem John Day River. The first is the Upper John Day River local population (includes a portion of the mainstem John Day River, Deardorff Creek, Reynolds Creek, Rail Creek, Roberts Creek, and Call Creek) and the second is the Indian Creek local population above the flow barrier (Buchanan *et al.* 1997).

Historical records indicate the presence of bull trout in Dads Creek, Dixie Creek, Pine Creek, Canyon Creek, Laycock Creek, and Beech Creek (Buchanan *et al.* 1997). Resident (summer distribution) bull trout currently occupy approximately 48 miles of stream in the Upper Mainstem John Day River (MNF 1998a and 1999a). These areas that possess habitat that would be suitable for bull trout have been identified as potential local populations. The existing and potential local populations for the Upper Mainstem John Day River are displayed in Table 39 and Figure 21.

Table 39. List of current and potential local bull trout populations in the Upper John Day River subwatershed.

Population Number	Local Population	Existing Local Population	Potential Local Population	Life History Forms Present
1	Upper John Day River (includes mainstem John Day River, and Call, Reynolds, Deardorff, and Rail Creeks)	X		Resident and Fluvial
2	Indian Creek above flow barrier	X		Resident
3	Pine Creek		X	
4	Canyon Creek		X	
5	Strawberry Creek		X	

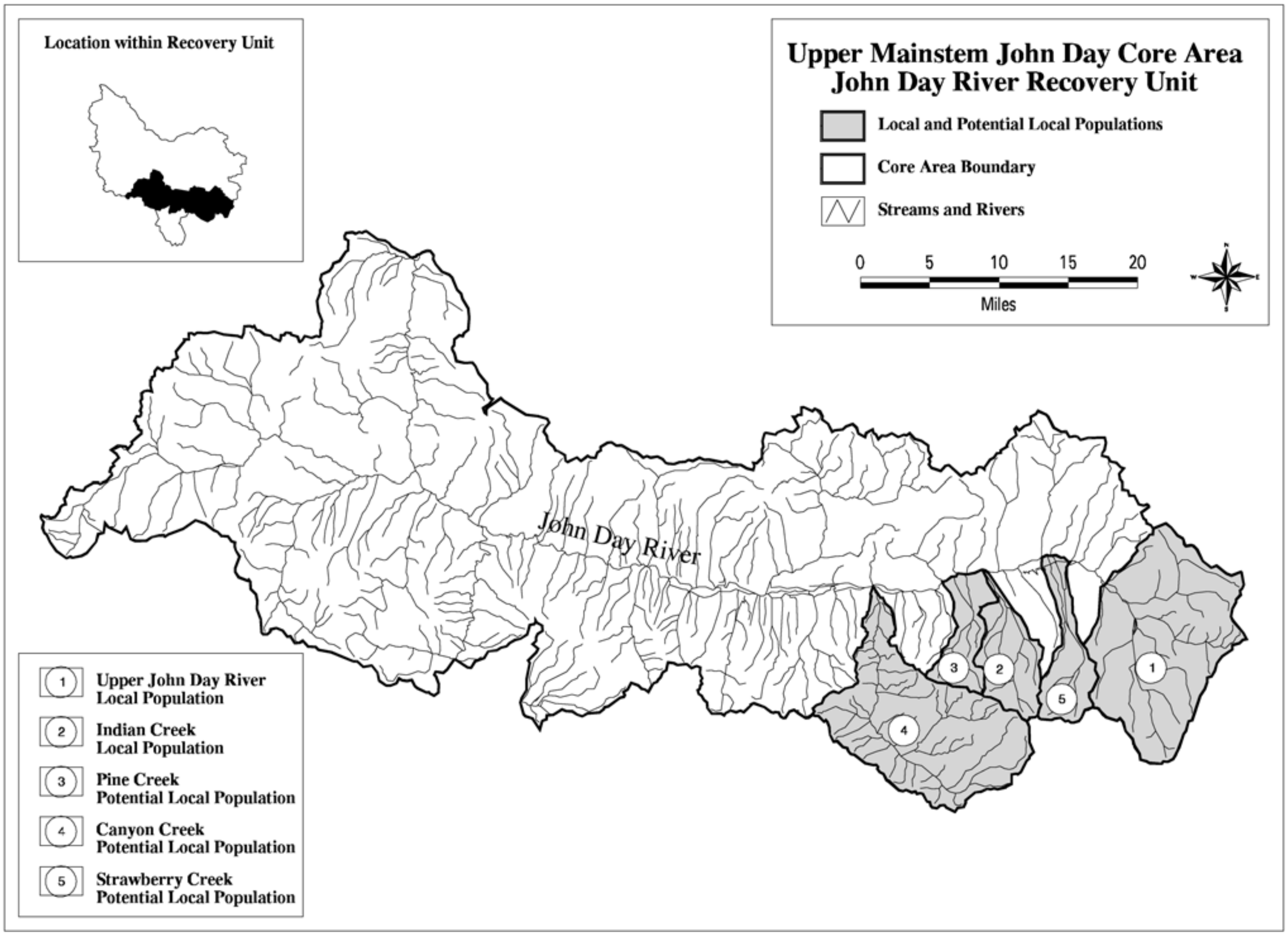


Figure 21. Bull trout local populations within the Upper Mainstem John Day Core Area.

Middle Fork John Day River. Distribution information for the Middle Fork John Day River indicates that three local populations currently exist within this drainage: Big Creek, Clear Creek and Granite Boulder Creek (Buchanan *et al.* 1997). The Malheur National Forest has identified an additional five areas as potential habitat for bull trout local populations (potential local populations) (1998a), including Big Boulder Creek, Butte Creek, Davis Creek, Upper Middle Fork John Day River, and Vinegar Creek. Isolated sightings of bull trout have been confirmed in Vinegar Creek. These existing and potential local bull trout populations for the Middle Fork John Day watershed are shown in Table 40 and Figure 22.

Current distribution in the Middle Fork John Day River is based on isolated sightings with the primary distribution restricted to tributaries and limited to 22% of stream miles previously known to support bull trout (Claire and Gray 1993, Buchanan *et al.* 1997). Data from the 1990 and 1992 Oregon Department of Fish and Wildlife Aquatic Inventory Project indicates that bull trout occupy approximately 16 miles of stream in the Middle Fork John Day River watershed, including 5.5 miles in Big Creek, 2.5 miles in Deadwood Creek (a tributary to Big Creek), 4 miles in Granite Boulder Creek; and 4 miles in Clear Creek.

Table 40. List of current and potential local bull trout populations in the Middle Fork John Day River subwatershed.

Population Number	Local Population	Existing Population	Potential Population	Life History Forms Present
1	Big Creek and tributaries	X		Resident and Fluvial
2	Clear Creek	X		Resident
3	Granite Boulder Creek	X		Resident and Fluvial
4	Big Boulder Creek		X	
5	Butte Creek		X	
6	Davis Creek		X	
7	Upper Middle Fork John Day River (mainstem and tributaries above Clear Creek)		X	
8	Vinegar Creek		X*	

***Confirmed isolated sightings of bull trout.

Bull trout migration from these tributary streams during the summer is highly unlikely due to high water temperatures and habitat modifications in the mainstem. Aquatic inventory surveys conducted by the Oregon Department of Fish and Wildlife in 1990 and 1991 detected 60 bull trout in the Middle Fork John Day River watershed; two fish were measured at 10 inches and 14 inches, all others were less than eight inches in length (Buchanan *et al.* 1997). In the 1999 and 2000 surveys of Clear Creek, eight redds were observed each year (MNF 2001).

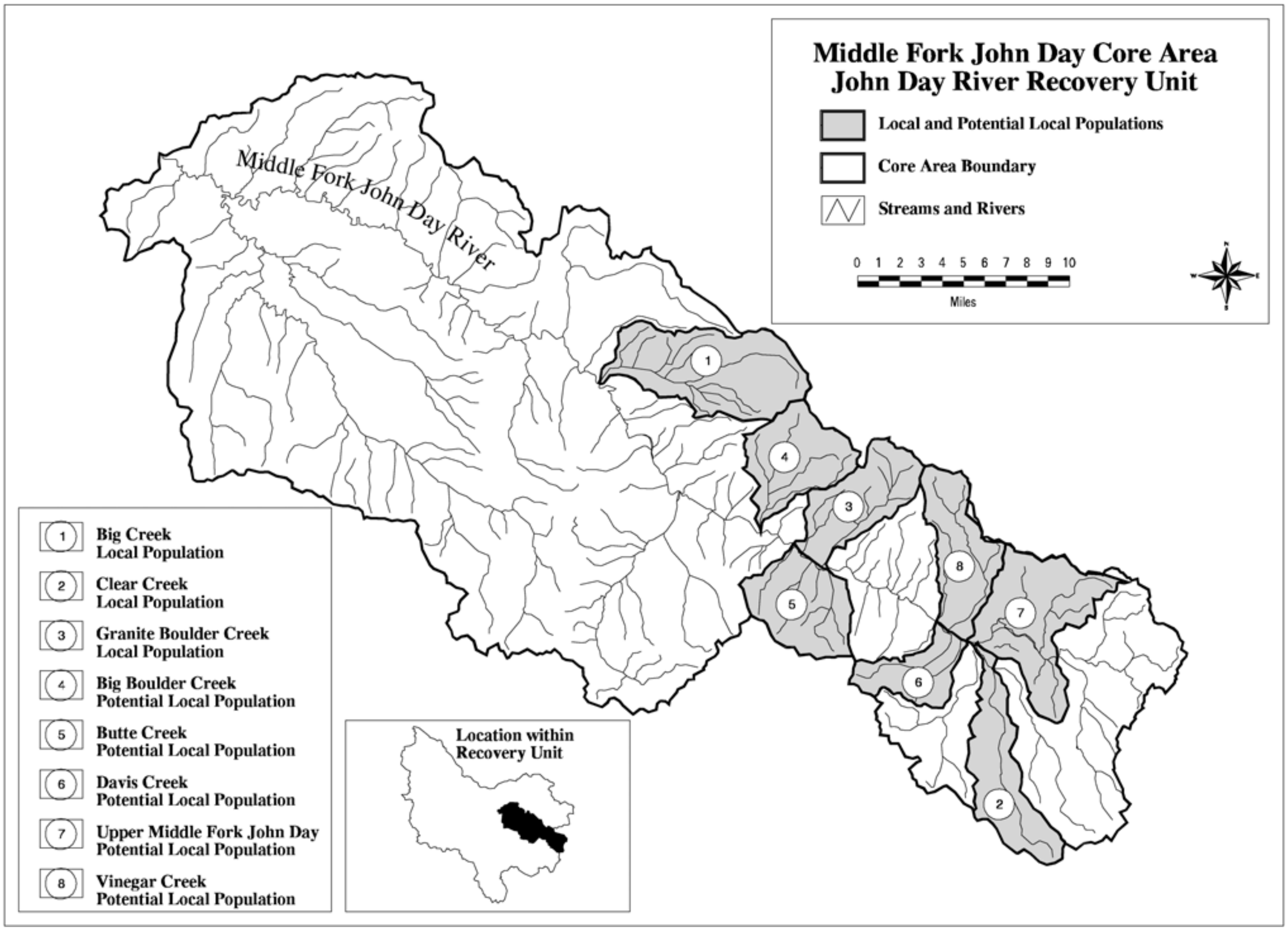


Figure 22. Bull trout local populations within the Middle Fork John Day Core Area.

North Fork John Day River. Based on distribution information contained in Buchanan *et al.* (1997), and professional judgment of the John Day River Recovery Unit Team, six local populations have been identified in the North Fork John Day River subbasin: Desolation Creek (includes South Fork Desolation Creek below the falls and North Fork Desolation Creek); Lower Clear Creek below the Pete Mann ditch (including Lightning Creek below the ditch); upper Clear/Lightning Creek including Salmon Creek, upper Granite Creek including Bull Run, Deep, Boulder, and Boundary creeks and the upper mainstem Granite Creek); upper North Fork John Day River (Crawfish, Baldy, Cunningham, Trail, Onion, and Crane creeks as well as the North Fork John Day River upstream of Granite Creek; and upper South Fork Desolation Creek above the falls. Based upon inventories conducted in 1992, bull trout distribution in the North Fork John Day River and tributaries is limited to 18% of the previously known range (Claire and Gray 1993).

The existing populations for the North Fork John Day Core Area are displayed in Table 41 and Figure 23 below. No potential populations were identified.

Table 41. List of current local bull trout populations in the North Fork John Day River subwatershed.

Population Number	Local Population	Existing Population	Life History Forms Present
1	Desolation Creek (includes South Fork Desolation Creek below waterfall, North Fork Desolation, and West Fork Meadowbrook creeks)	X	Fluvial and Resident
2	Lower Clear Creek below the ditch (includes Lightning Creek below ditch)	X	Resident
3	Upper Clear/Lightning creeks above the ditch (includes Salmon Creek)	X	Resident
4	Upper Granite (includes Bull Run, Deep and Boundary , Boulder Creeks and upper mainstem Granite Creek)	X	Fluvial and Resident
5	Upper North Fork John Day River (includes Crawfish, Baldy, Cunningham, Trail, Onion and Crane creeks, as well as mainstem North Fork John Day River upstream of Granite Creek)	X	Fluvial and Resident
6	Upper South Fork Desolation Creek above waterfall	X	Resident

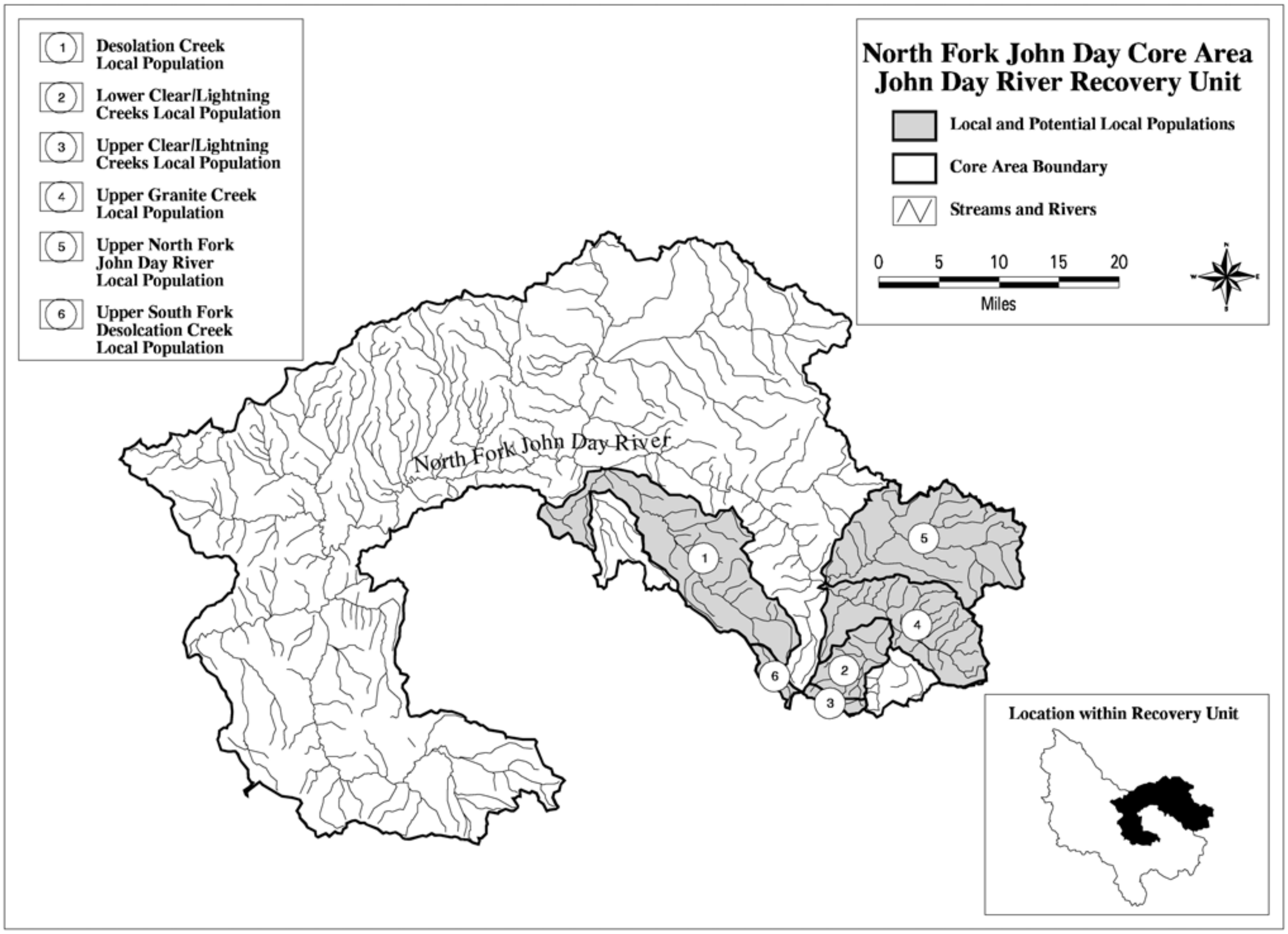


Figure 23. Bull trout local populations within the North Fork John Day Core Area.

Mainstem John Day River. Recent survey work by the Oregon Department of Fish and Wildlife (Hemmingsen *et al.* 2001) detected bull trout in the mainstem John Day River at river mile 170 near the town of Spray, downstream of the confluence with the North Fork John Day River (river mile 183). Two bull trout were radio tagged and tracked upstream during the summer. One bull trout was tracked to river mile 66 of the North Fork John Day River. It had traveled about 112 miles upstream during a period of 77 days. The second bull trout traveled about 137 miles upstream to river mile 3.8 in Granite Creek, a tributary to the North Fork John Day River (Hemmingsen *et al.* 2001). Presence of bull trout below the confluence of the two tributaries is an indication the local bull trout populations of the North Fork and Middle Fork John Day rivers may be connected via seasonal migration between these two subbasins and that the mainstem may serve as bull trout over-wintering and migration habitat.

In 2000, the Oregon Department of Fish and Wildlife captured eleven bull trout in the mainstem John Day River near the town of Spray, Oregon, while seining for juvenile chinook salmon. Two of the fish were implanted with radios and both were subsequently tracked into the North Fork John Day River. One was tracked upstream to Granite Creek, and the second was tracked as far as Texas Bar Creek, although it may not have gone that far on its own. The radio tag was found at the base of a tree containing an osprey nest. One of the fish tagged was 9.2 inches and the other was 9.7 inches long (Hemmingsen *et al.* 2001).

Although the role of the lower mainstem of the John Day River is not well understood at this time, it may be an important link between bull trout populations within the John Day Subbasin and the Columbia River. The recovery team has not identified this portion of the John Day River as essential for recovery at this time. But as further information becomes available, it may be appropriate to recognize the importance of the lower mainstem John Day River from its confluence with the North Fork John Day to its confluence with the Columbia River.

Within the John Day Subbasin, historic bull trout distribution likely included seasonal use of the entire mainstem and larger tributaries. Bull trout from the John Day Subbasin were known to migrate to and from the Columbia River (Buchanan *et al.* 1997). Historical records indicate presence of bull trout in Dads Creek, Dixie Creek, Pine Creek, Canyon Creek, Laycock Creek, and Beech Creek (Buchanan *et al.* 1997).

Elevated water temperature and reduced streamflow due to water diversions in the mainstem river and larger tributaries typically act as thermal barriers to migration during summer and early fall, isolating the local populations (Buchanan *et al.* 1997). Thermal barriers to migration exist in many reaches of stream where irrigation of agricultural lands take place. These barriers also exist in some forested reaches, particularly where channel alterations have occurred, or riparian vegetation has been altered or reduced by livestock grazing, logging, road building or mining.

<u>Description of Aquatic Introductions, Artificial Production and Captive Breeding Programs</u>

Bull trout recovery could be enhanced by the reintroduction of bull trout to areas in streams above many natural and man-made barriers (e.g., Cunningham Creek, Lightning Creek, both in the North Fork Core Area). For example, Bridge Creek is adjacent to Clear Creek (currently inhabited) and could provide about 11 miles of high quality habitat with good water quality that could be recolonized by bull trout (ODFW *in litt*. 2000). Access to Bridge Creek was blocked by a 15-foot dam (ODFW *in litt*. 2000), but passage was provided and steelhead have been entering the stream since 2001. Bull trout may now be entering Bridge Creek as well (USFWS 2003).

Although the USFWS draft recovery plan identifies opportunities for expansion above barriers (such as Cunningham Creek and Winom Creek), the recovery team did not feel that the likelihood of a separate potential population would be great, but that these would simply be expansions of current populations. The best example is Cunningham Creek, where the team proposed reintroduction of bull trout above the gradient barrier, using bull trout stock from below the barrier (Paul Bridges, USFWS, personal communication, March 25, 2004).

<u>Environmental Conditions for Bull Trout</u>

Historic land use activities that have impacted local bull trout populations include construction and operation of roads (including culverts that pose as fish passage barriers), forestry practices, agricultural development, livestock grazing, and mining. Some historic practices, such as pushup dam construction, that resulted in passage barriers may have significantly reduced important fluvial bull trout populations. Lasting effects from some of these early land use activities still limit bull trout distribution and abundance in the John Day River Recovery Unit.

Existing land use activities that contribute to compromised bull trout and other fish habitat include the formation of pushup dams for irrigation, riparian road construction and use, riparian grazing, agricultural development, residential developments, recreational use of riparian areas, mining and competition with non-native species.

Dams. There are no major hydropower dams located in the John Day Subbasin (ODA 2001). Anadromous fish access to the John Day Subbasin is constrained by passage through three mainstem Columbia River Dams: Bonneville, The Dalles, and John Day. Any limitation on the production of anadromous fish in the John Day Subbasin has a negative effect on stream productivity due to the loss of nutrients imported by the anadromous fish. This resource loss affects native fish, including bull trout in the John Day Subbasin, by the direct loss of potential prey as well as limiting the productive capacity of area streams for other fish and invertebrate prey species.

Forest Management Practices. Fire suppression policies and other forest management practices have affected both the composition and structure of forest stands in the subbasin (MNF 1998a and 1999b). Intensive fire suppression, a top priority for resource managers since the early 1900s, has reduced the frequency of "low intensity" fires. Without periodic low or moderate intensity fires or other disturbance, stand densities tend to increase and tree species composition shifts to favor shade-tolerant trees (UNF 1997).

In places, historic forest management practices have shifted forest composition from lodgepole pine to white fir as the dominant overstory in some areas of the forest and from ponderosa pine to Douglas fir in other areas (ODFW *in litt*. 2000). The removal of large diameter, fire-tolerant trees and the subsequent management of the faster-growing fir tree species have resulted in dense stands of trees that are more susceptible to larger fires and less conducive to more frequent low intensity fires (UNF 1997, MNF 1998a). The increase in large fires can be attributed to both weather conditions that followed the start of a fire and the type of fuels (MNF 1999b). Resulting fires impacted bull trout habitat, indirectly increasing sedimentation and water temperatures by loss of ground covering vegetation (Buchanan *et al.* 1997).

Upper Mainstem John Day River. Use of ground-based logging equipment on steep (greater than 30%) slopes and high road densities can contribute sediment to bull trout spawning and rearing areas (ODFW *in litt.* 2000). Increased stream temperatures, increased sediment delivery, and loss of large pools, in part from inappropriate forest management practices, are the main factors limiting bull trout productivity in this area.

Middle Fork John Day River. With the exception of Clear and Lunch creeks, the amount of large wood in streams and stream pool depths have been reduced in many reaches due to past harvest, railroad, and road building activities (MNF 1998a).

North Fork John Day River. Fish habitat has been affected through high water temperatures due to a lack of streamside shade, increased amounts of fine sediments, altered hydrologic patterns, lost pool habitat, and low amounts of in-stream woody structure (UNF and WWNF 1997a and 1997b).

Livestock Grazing. Livestock management practices that result in high intensity riparian grazing, and/or season-long use of riparian areas, have the potential to raise stream temperatures by reducing shade, increasing the width-to-depth ratio of the channel (resulting from trampled banks), and collapsing undercut banks. Degradation of aquatic habitat parameters may occur from grazing, causing significant disruption of normal behavioral patterns in bull trout. These disruptions may include avoidance of habitat adjacent to certain activities (all life stages) and failure or delay of normal spawning activities (adult stages). Mortality from redd failure and nest collapse (egg, alevin, and juvenile stages) is possible due to the presence of livestock in the streams.

Grazing pressure from domestic livestock has been reduced in recent years on federal lands within the John Day Subbasin. Full implementation of and compliance with PACFISH and INFISH standards for livestock grazing will be a key for bull trout recovery.

Upper Mainstem John Day River. The Deardorff, Hot Springs, Rail Creek and Reynolds Creek livestock grazing allotments contain streams inhabited by bull trout in the Upper John Day River (MNF 1999a). The negative impacts, if any, of these grazing allotments on bull trout habitat are unknown.

Middle Fork John Day River. Several areas of the Middle Fork John Day River lack adequate riparian vegetation and shrubs necessary to prevent bank erosion and heating of water (ODFW *in litt*. 2000). The absence of shrubs and deciduous trees in meadows along the upper reaches of the Middle Fork John Day River has been attributed to summer long grazing (ODFW *in litt*. 2000).

North Fork John Day River. Historically, more intense livestock (cattle, horses and sheep) grazing, as compared to the present, over much of the North Fork John Day River drainage contributed to aquatic habitat degradation (UNF *in litt.* 2000). Some damaged riparian areas have been attributed to livestock grazing on private land in the lower North Fork John Day River tributaries and along Camas Creek, a tributary to the upper North Fork John Day River (ODFW 1990) (BLM *in litt.* 2003). Current grazing on National Forest land is much lighter than in the past, but localized areas may experience concentrations of livestock and/or wild ungulates sufficient to damage stream banks and degrade habitat quality (UNF *in litt.* 2000). Grazing on private land varies widely, but lower Camas and Owens creeks show ongoing stream bank damage from livestock (UNF *in litt.* 2000).

Agriculture Practices. Some agricultural practices have changed hydrology, contributing to degraded stream and riparian conditions throughout the subbasin. Draining and conversion of wetlands to pastures, diking and channelization of streams, and removal of extensive beaver colonies and large trees in riparian corridors have all reduced the connectivity between rivers and their floodplains (ODFW *in litt*. 2000).

Cumulatively, warm irrigation return flow combined with decreased in-stream flow has significantly altered the temperature regime of area streams and rivers (ODFW *in litt*. 2000). Recent work to cool these waters through subsurface return looks promising. The recently-adopted Upper John Day and South Fork Agricultural Water Quality Management Plan discusses this in detail (USFWS 2003, OWRB *in litt*. 2003). Attempts to armor riverbanks to prevent erosion have also simplified the river channel and reduced habitat diversity (ODFW *in litt*. 2000).

A high number of pushup dams are used for irrigation within migratory bull trout habitat (NWPPC 2001). Some of these temporary dams result in intermittent passage and interrelated impacts such as sedimentation, reduced flows, channel alteration and associated water quality impacts (NWPPC 2001). Although participation in the fish screening program for irrigation works is extensive, there still remain many legal diversions which are unscreened and existing screens that do not meet current screen criteria (NWPPC 2001).

Upper Mainstem John Day River. Streams currently occupied, historically occupied, or that are potential habitat for bull trout are affected by irrigation activities in the upper mainstem. Indian Creek has virtually no flow during part of each summer, which seasonally isolates a local bull trout population (ODFW *in litt*. 2000). Irrigation withdrawals completely dry Pine Creek, a historic bull trout stream, for several miles each summer (ODFW *in litt*. 2000). Strawberry Creek, which contains core bull trout habitat, has passage problems attributable to multiple diversions with inadequate jump pools or the presence of concrete aprons (ODFW *in litt*. 2000). This stream is inadequately screened and has multiple channels once it leaves National Forest land. One of the diversions intercepts the main channel blocking all upstream passage (ODFW *in litt*. 2000). Two wooden plank dams have been recently reported on Reynolds Creek within a mile or so of the John Day River, that are likely barriers to migratory fish due to inadequate jump pools and minimal spill (USFWS 2003).

Middle Fork John Day River. The Oregon Department of Environmental Quality (1998) identified all streams inhabited by bull trout in the middle fork system (Middle Fork John Day River, Big Creek, Granite Boulder Creek and Clear Creek) as water quality limited, primarily for high summer temperatures, but also flow modification of the Middle Fork John Day River. High water temperatures in the Middle Fork John Day River are a factor contributing to isolating bull trout local populations in the Middle Fork John Day Core Area (ODFW *in litt*. 2000). Potential habitat is also limited by irrigation structures.

North Fork John Day River. The Pete Mann Ditch diverts most of the West Fork Clear Creek and virtually all of Salmon and Lightning creeks before continuing on to the North Fork Burnt River. The Pete Mann Ditch also partially dewaters East Fork Clear Creek, Dry Creek, Spring Creek, and Lightning Creek, all of which contain bull trout (ODFW *in litt*. 2000, UNF *in litt*. 2000). Although most of the water right is for mining use, the portion that is delivered to the Burnt River watershed is used to irrigate agricultural crops, primarily hay (ODFW *in litt*. 2000).

Transportation Network. As with many stream systems throughout the Pacific Northwest and the country, extensive road networks may parallel existing stream channels imposing a variety of impacts.

Roads have the potential to not only facilitate excessive inputs of fine sediment and possible habitat degradation in streams, but also increase human access which may induce angling mortality and introductions of nonnative fishes and increase the potential for water pollution through accidental spills.

Upper Mainstem John Day River. A paved county and Forest Service road follows the upper mainstem with several crossings and placement that constrains the flood plain (ODFW *in litt*. 2000). Improved roads also make bull trout spawning and rearing areas more accessible to the public and increase susceptibility to over harvest, poaching and harassment (ODFW *in litt*. 2000). Road densities and riparian road mileage are expected to be comparable to that reported for the north and middle forks.

Middle Fork John Day River. According to the Oregon Department of Fish and Wildlife (*in litt*. 2000), Highways 26 and 7 cross or follow parts of the Middle Fork John Day River, and culverts on Clear Creek and the middle fork could be either replaced with bridges, or with culverts that are more fish passage friendly. Road densities in roaded areas within the subwatersheds supporting bull trout range from 2.4 to 5.7 miles per square mile, with approximately 20% of roads occurring in the riparian habitat conservation areas, or RHCAs (MNF 1999a and 1999b).

North Fork John Day River. In the North Fork John Day River watershed, where roads were present in the non-wilderness portion of the subwatersheds (seven out of nine subwatersheds), road densities ranged from 3.0 to 6.7 miles per square mile. Miles of road within the riparian habitat conservation area range from zero to 13, and in some cases occur in 71% of the riparian habitat conservation areas adjacent to fish bearing streams, with up to 61 stream crossings (UNF and WWNF 1997a). Data from the Granite drainage indicate that road-related problems are likely more extensive than elsewhere in the North Fork watershed, with non-wilderness road densities ranging from 0.4 to 7.09 miles per square mile. In some watersheds the total length of road in riparian habitat conservation areas are over double the total length of fish bearing streams, (UNF and WWNF 1997b).

Mining. Dredge tailings can create deposits that are attractive to spawning fish because of the looseness and suitable particle size of gravels. However, dredge tailing areas tend to be less stable than natural spawning grounds. Since bull trout spawn after the suction dredging season, bull trout redds established in unstable gravels would be at high risk for loss when higher winter flows redistribute gravels. Therefore, embryo survival may be reduced in areas of dredge tailings, especially if high flows scour the tailings and destroy redds (Harvey *et al*. 1998).

Another threat exists to bull trout from lode operations, which may expose materials with a potential to leach metals or produce acid mine drainage (e.g., pH<6-6.5). Bull trout may be adversely affected where lode operations and/or settling ponds encounter or contain toxic or contaminated materials and occur within riparian habitat conservation areas or in uplands located upstream or adjacent to occupied bull trout spawning, rearing and resident areas (USFWS 2003).

Upper Mainstem John Day River. Mining activity in the Upper Mainstem John Day River was extensive in the past, and included large scale dredging of the Upper John Day River and lode mines in the Canyon Creek watershed and above Prairie City (OWRD 1986). Although active claims exist in a number of tributaries, the majority of current activity consists of small scale placer mining along area streams, such as Canyon Creek (OWRD 1986). According to the Malheur National Forest (1999a) there are no active mining operations in the upper mainstem, and recreational mining has not been observed for the last five years.

Middle Fork John Day River. Many parts of the mainstem Middle Fork were dredge mined (particularly near Galena at RM 45 and near the mouth of Granite Boulder Cr at RM 57) and several tributaries (such as Davis, Vincent, Vinegar, Ruby, Ragged and Butte creeks, among others) were placer mined (Tim Unterwegner, ODFW, personal communication, April 8, 2004). In the Granite Boulder subwatershed, hand-dredging streams involved lifting and washing stream rocks by hand and stacking them in the adjacent floodplain or terraces, removing the majority of the larger stream substrate from the channels in Elk, Deep, Big, Placer Gulch, Davis, Vinegar and Vincent creeks (MNF 1999b).

North Fork John Day River. Boulder Creek, a tributary inhabited by bull trout in the Granite Creek watershed, has a dewatered section resulting from past mining activities (John Day River Recovery Unit Team *in litt*. 2001). Lightning and Salmon creeks, in the Granite Creek watershed, are negatively affected by the Pete Mann mining ditch. The ditch diverts water from Granite Creek to the Burnt River watershed, and impedes bull trout movement upstream (UNF and WWNF 1997b, ODFW *in litt*. 2000).

Residential Development. Stream channel alteration has occurred within populated areas. Areas of the mainstem John Day River have been channelized and armored to keep flows within a designated course. However, residential development is, in a relative sense, not an appreciable factor in bull trout decline.

Recreation. Potential impacts to bull trout habitat from recreational activities include increased sediment delivery to streams from road and trail use, disturbed streambeds and banks from vegetation removal at camp sites and other localized recreation use, introduction of noxious weeds from tires from off-road and other vehicles and feed for stock animals, increased opportunity for poaching and potential introduction of non-native fishes.

Upper Mainstem John Day River. The main recreational impacts in this area are associated with the Strawberry Mountain Wilderness Area where there is a significant amount of camping and traveling near bull trout-inhabited streams. These streams are used by residential bull trout and as seasonal migratory corridors for spawning and dispersal. The primary impact outside of the Strawberry Mountain Wilderness Area is camping in designated campgrounds along the mainstem and tributaries (Larry Bright, Malheur National Forest, personal communication, March 30, 2004).

Middle Fork John Day River. The main recreational impacts in this area are camping and all-terrain vehicle use. There are fewer designated campgrounds in this area than in other areas of the subbasin, but there is a higher percentage of camping in undeveloped / undesignated campsites. Measures to mitigate these impacts – including signing, pole fencing and road closures – are showing some promise by reducing all-terrain vehicle use and camping in undeveloped camping areas (Larry Bright, Malheur National Forest, personal communication, March 30, 2004).

North Fork John Day River. Wilderness trails follow the North Fork John Day River and do not appear to adversely affect stream habitat. However, the potential for unlawful harvest of bull trout exists, especially during the fall spawning season, due to the proximity of these trails to the North Fork John Day River and Baldy Creek (UNF and WWNF 1997a). In September of 1999, the remains of a large female bull trout were found in Baldy Creek, immediately adjacent to the existing trail (John Day River Recovery Unit Team *in litt*. 2001). The U.S. Forest Service was unable to determine who had poached the fish (John Day River Recovery Unit Team *in litt*. 2001).

Fisheries Management. The use of rotenone pesticide to kill undesirable fish species in headwater lakes and streams was historically common. Treatments were typically conducted at times and locations such that it is very unlikely that bull trout were killed. However, rotenone projects may have locally reduced the forage base for migratory bull trout (ODFW *in litt*. 2000).

Major treatment projects were completed on the North Fork in 1966, 1969, 1971, 1973 and 1982; on the Middle Fork in 1966, 1974 and 1982; on the South Fork in 1965 and 1978; and on the mainstem in 1962, 1967, 1970 and 1979. Smaller projects were completed on Camas and Long creeks after 1957 and in several standing water bodies since that time (including Aldrich Ponds in 1983) (USFWS 2003).

Upper Mainstem John Day River. Brook trout inhabit the upper mainstem drainage including Slide and Little Slide lakes in the Strawberry Creek drainage (ODFW *in litt*. 2000). Historically, brook trout and hatchery rainbow trout stocking occurred on a limited basis in the upper subbasin (ODFW 1990). A few specialized put-and-take fisheries continue to be implemented in ponds and lakes (*e.g.* Trout Farm Pond and Magone Lake), but angling effort in areas inhabited by bull trout is described as low (ODFW *in litt*. 2000).

Middle Fork John Day River. At present, there are no brook trout known to inhabit the Middle Fork or its tributaries, and no bull trout/brook trout hybrids have been reported (Claire and Gray 1993). Angling effort in Middle Fork areas inhabited by bull trout is described as very low, attributable to the discontinued stocking of legal sized and fingerling trout (ODFW *in litt*. 2000).

North Fork John Day River. Brook trout inhabit the North Fork drainage, including Crawfish and Baldy lakes (ODFW *in litt*. 2000). Most of the lakes are in drainages where bull trout are currently or were historically found. Bull trout/brook trout hybrids have been found at several locations in the North Fork John Day Core Area (Claire and Gray 1993), including Winom Creek. Historic angling included targeting bull trout in the North Fork John Day Core Area, but has since markedly diminished (ODFW *in litt*. 2000). Some poaching may occur, especially during the hunting season (John Day River Recovery Unit Team *in litt*. 2001).

Isolation and Habitat Fragmentation. The major isolating mechanism affecting local bull trout populations in the John Day Subbasin is seasonally inadequate water quality and quantity in the mainstem river and tributaries, a result of degraded riparian and stream habitat conditions.

Other barriers include low head dams, diversions, and natural waterfalls (Claire and Gray 1993, ODFW *in litt*. 2000).

Upper Mainstem John Day River. Local populations in the upper mainstem are seasonally isolated due to high water temperatures and reduced flows in the connecting mainstems. Multiple agricultural diversions in the core habitat on Strawberry Creek prevent all upstream fish passage (ODFW *in litt*. 2000). A section of Indian Creek is virtually dewatered during the summer, isolating the small local bull trout population (ODFW *in litt*. 2000).

Middle Fork John Day River. Populations within the Middle Fork drainage are at greatest risk from isolation due to habitat fragmentation, seasonally high water temperatures and reduced flows in the connecting mainstems (ODFW *in litt*. 2000). Bull trout are found in only three Middle Fork tributaries that are geographically distant. Population estimates for two of the tributaries are below 800 total fish of all ages, and existing data show no evidence of interchange between the local populations (ODFW *in litt*. 2000). There is a 15-foot dam on Bridge Creek that prevents access to approximately 11 miles of good habitat, but the passage barrier has been removed by installation of a fish ladder. (ODFW *in litt*. 2000). There is also a natural waterfall on Granite Boulder Creek that is a fish barrier. No fish have been found above it (Claire and Gray 1993).

North Fork John Day River. Natural waterfalls on South Fork Desolation, East Meadowbrook, and Big creeks potentially isolate bull trout into separate local populations (Claire and Gray 1993). Seasonally high water temperatures and reduced streamflow in many connecting streams prevent migration and seasonally isolate local populations. The Pete Mann Ditch on Clear Creek impedes upstream movement of bull trout from Lightning and Salmon creeks (ODFW *in litt*. 2000).

A comparison of the significance of threats for each core area follows in Tables 42, 43, and 44.

Table 42. Significance of past (last 100 years) and present threats to bull trout within the Upper Mainstem John Day Core Area of the John Day River Recovery Unit.

Threat or Activity	Low		Moderate		High	
	Past	Present	Past	Present	Past	Present
Dams	X	X				
Forest Management Practices				X	X	
Livestock Grazing				X	X	
Agricultural Practices		X			X	
Transportation Network				X	X	
Mining				X	X	
Residential Development	X			X		
Recreation	X	X				
*Fisheries Management				X	X	
**Isolation & Habitat Fragmentation					X	X

*Includes influence of non-natives (e.g. brook trout).
**Includes influence of fish passage problems (culverts, unscreened diversions, etc.).

Table 43. Significance of past (last 100 years) and present threats to bull trout within the Middle Fork John Day Core Area of the John Day River Recovery Unit.

Threat or Activity	Low		Moderate		High	
	Past	Present	Past	Present	Past	Present
Dams	X	X				
Forest Management Practices				X	X	
Livestock Grazing				X	X	
Agricultural Practices		X			X	
Transportation Network				X	X	
Mining				X	X	
Residential Development	X			X		
Recreation	X	X				
*Fisheries Management		X			X	
**Isolation & Habitat Fragmentation					X	X

Table 44. Significance of past (last 100 years) and present threats to bull trout within the North Fork John Day Core Area of the John Day River Recovery Unit.

Threat or Activity	Low		Moderate		High	
	Past	Present	Past	Present	Past	Present
Dams	X	X				
Forest Management Practices				X	X	
Livestock Grazing		X			X	
Agricultural Practices		X			X	
Transportation Network				X	X	
Mining					X	X
Residential Development	X			X		
Recreation	X	X				
*Fisheries Management				X	X	
**Isolation & Habitat Fragmentation					X	X

Tables 43 and 44: *Includes influence of non-natives (e.g. brook trout).
**Includes influence of fish passage problems (culverts, unscreened diversions, etc.).

In the John Day River Recovery Unit, some local populations are relatively strong, but the majority are at relatively low numbers. Degradation and fragmentation of bull trout habitat have resulted in populations that are at high risk. Ultimately, these threats must be addressed in the near future for recovery to be achieved. PACFISH/INFISH has greatly helped the bull trout. The change in perspective of the action agencies and the public has made the difference. However, direct action to restore connectivity and habitat is key to the bull trout's survival, let alone its recovery. (Paul Bridges, USFWS, personal communication, March 25, 2004).

Harvest in the Subbasin. Bull trout are aggressive by nature and readily take lures or bait, making them very susceptible to angling. Historically, a few anglers selectively angled for and caught bull trout. Creel survey information for the John Day River drainage indicates a reduction in the percentage of bull trout taken versus other trout species from approximately 22% during the period from 1961 to 1970 to 4.5% from 1981 to 1992 (Claire and Gray 1993).

Harvest of bull trout has been prohibited in the John Day Subbasin since 1994. Prior to the prohibition, legal harvest was higher in the North Fork drainage than the Middle Fork or upper mainstem. Since the prohibition, efforts toward angler education and enforcement have been increased. Stocking of catchable rainbow trout was discontinued in the Middle Fork John Day and Desolation Creek to prevent incidental catch of bull trout.

Modeling Results

John Day Subbasin bull trout habitat has declined 35.4% - from 698.4 miles to 451.5 miles – from historic to current times (Table 45).

Table 45. Total historic and current John Day Subbasin bull trout habitat by land ownership category.

Land Ownership	Historic Habitat (miles)	Current Habitat (miles)	Miles Habitat Lost	% of Habitat Lost
Private	295.8	204.2	91.7	31.0%
U.S. Forest Service	349.6	204.1	145.6	41.6%
Bureau of Land Management	38.2	33.8	4.4	11.4%
Federal Energy Regulatory Commission	1.1	1.1	0.0	0.0%
National Park Service	4.8	4.8	0.0	0.0%
Oregon Division of State Lands	8.9	3.5	5.3	60.2%
Total	698.4	451.5	246.9	35.4%
% Publicly Owned	57.6%	54.8%	62.9%	

The Upper John Day has lost the most habitat (49%), while the North Fork has lost the least (23.2%) (Tables 46 to 48). Among ownership categories with more than 10 miles of habitat, the most habitat has been lost on land owned by the U.S. Forest Service in the Upper John Day and Middle Fork and on private land on the North Fork. Over the entire subbasin, 41.6% of habitat on Forest Service lands has been lost compared to 31% on privately owned lands and 11.4% on BLM land. The state and federal government own 72.5% of the historic habitat, and 77.4% of the current habitat in the North Fork John Day drainage (Table 46). In the Middle Fork drainage, the federal government owns the majority (58%) of historic habitat, but the majority (56.8%) of current habitat is in private ownership. In the Upper John Day drainage the federal government owns 42.2% of historic habitat and 28.1% of current habitat.

Table 46. Total historic and current North Fork John Day Drainage bull trout habitat by land ownership category.

Land Ownership	Historic Habitat (miles)	Current Habitat (miles)	Miles Habitat Lost	% of Habitat Lost
Private	75.3	48.1	27.2	36.1%
Bureau of Land Management	30.6	27.4	3.2	10.6%
U.S. Forest Service	158.9	133.4	25.5	16.0%
Oregon Division of State Lands	8.9	3.5	5.3	60.2%
Federal Energy Regulatory Commission	0.6	0.6	0.0	0.0%
Total	274.3	213.0	61.3	22.3%
% Publicly Owned	72.5%	77.4%	55.6%	

Table 47. Total historic and current Upper John Day Drainage bull trout habitat by land ownership category.

Land Ownership	Historic Habitat (miles)	Current Habitat (miles)	Miles Habitat Lost	% of Habitat Lost
Private	155.2	98.4	56.8	36.6%
U.S. Forest Service	104.0	30.3	73.7	70.8%
Bureau of Land Management	4.0	2.8	1.1	28.6%
Federal Energy Regulatory Commission	0.5	0.5	0.0	0.0%
National Park Service	4.8	4.8	0.0	0.0%
Total	268.5	136.9	131.6	49.0%
% Publicly Owned	42.2%	28.1%	56.8%	

Table 48. Total historic and current Middle Fork John Day Drainage bull trout habitat by land ownership category.

Land Ownership	Historic Habitat (miles)	Current Habitat (miles)	Miles Habitat Lost	% of Habitat Lost
Private	65.3	57.6	7.7	11.7%
U.S. Forest Service	86.7	40.3	46.4	53.5%
Bureau of Land Management	3.6	3.6	0.0	0.0%
Total	155.6	101.5	54.1	34.8%
% Publicly Owned	58.0%	43.2%	85.8%	

A current assessment of conditions in the John Day Subbasin, as specified using QHA, can be found in Appendix O and the associated maps in Appendix W. Comparing the mean current habitat attribute rating to the mean reference habitat attribute rating for each attribute provides a measure of which habitat attributes have changed the most from reference. By this measurement, riparian condition, habitat diversity, fine sediment, high temperature and channel stability are the habitat attributes with the greatest decline (Table 49). The QHA ratings suggest that there has been little change in the pollutants, obstructions, and oxygen attributes when comparing current to reference conditions.

Table 49. Mean QHA attribute values over all reaches under reference and current conditions and the percent reduction of that attribute for bull trout in the John Day Subbasin.

Attribute	Reference Mean	Current Mean	Percent Reduction
Riparian Condition	4.0	2.7	32%
Habitat Diversity	3.9	2.8	30%
Fine sediment	4.0	2.8	28%
High Temperature	3.9	2.9	27%
Channel stability	4.0	3.0	25%

High Flow	4.0	3.2	19%
Low Flow	4.0	3.3	18%
Low Temperature	4.0	3.5	13%
Oxygen	4.0	3.8	6%
Obstructions	4.0	3.8	4%
Pollutants	4.0	3.9	3%

Protection and restoration reach rankings produced by QHA (Tables 50 and 51) were evenly divided into quartiles with the first quartile being of greatest value to bull trout and the last (fourth) quartile having the least. Thus a reach in the first protection quartile would be among a set of reaches that are the most important for the protection of bull trout, while a reach in the first restoration quartile would be among a set of reaches that have the highest restoration potential for bull trout if fully restored to reference conditions All reaches where bull trout do not presently occur (but did occur in the reference condition) were placed in the fourth (bottom) protection quartile. This categorization was then reviewed by the John Day technical team and adjustments made to the four groups. One reach (Clear Cr (MF)) was upgraded from the second quartile into the top priority group for protection, while seven had their restoration ranking raised from a lower priority. Final groupings are listed under the priority groupings column of Tables 50 and 51.

The grouping of reaches into four categories based on their protection value and restoration potential is displayed in Figures 24 and 25. The top priority group of reaches for both protection and restoration is listed in Table 52. The reaches upgraded to this top priority group by the technical team are indicated by underlined reach names. Table 52 also gives the top three ranked attributes for each priority restoration reach for bull trout.

Table 50. Bull Trout QHA habitat protection rankings. Attributes are ranked within each reach and all reaches are ranked as to their protection value. Final groupings, as determined by the John Day technical team are listed under "Priority Grouping."

NPC= Not present currently

Protection Habitat Ranking

Reach Name	Reach Rank	Priority Grouping	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
JD-1	40	3	9	6	8	10	7	5	2	4	11	1	3
JD-2	39	3	8	6	8	11	7	5	2	4	10	1	3
JD-3	33	3	8	7	10	11	9	4	3	5	6	1	2
MF-1	29	2	9	7	8	11	10	4	2	6	5	1	3
MF-2	27	2	10	7	9	11	8	4	2	6	5	1	3
MF-3	30	2	10	7	9	11	8	4	2	5	6	1	3
MF-4	34	3	10	8	9	11	4	5	2	3	7	1	6
INDIAN SYSTEM (MF)	NPC	4											
BIG CR (MF)-1	23	2	8	7	9	11	10	3	1	6	5	1	4
BIG CR (MF)-2	13	1	7	3	9	6	8	5	1	10	4	1	11
BIG BOULDER SYSTEM	NPC	4											
GRANITE BOULDER	3	1	7	4	8	3	9	6	1	10	5	1	11
BUTTE CR	NPC	4											
VINEGAR CR	35	3	6	5	8	7	9	3	1	11	4	1	10
DAVIS CR	NPC	4											
CLEAR CR (MF)	18	1	4	3	9	5	6	7	1	10	8	1	11
NF-1	38	3	11	7	8	10	6	4	2	5	9	1	3
NF-2	37	3	11	6	8	10	7	4	2	5	9	1	3
NF-3	31	3	11	4	8	10	7	5	2	6	9	1	3
CAMAS CR-1	NPC	4											
CAMAS CR-2	NPC	4											
CABLE CR	NPC	4											
CAMAS CR-3	NPC	4											
HIDAWAY CR	NPC	4											
NF-4	24	2	11	5	8	10	7	3	2	6	9	1	4
DESOLATION CR-1	36	3	11	5	9	10	8	3	2	7	6	1	4
DESOLATION CR-2	20	2	6	4	8	5	9	3	1	10	7	1	11
DESOLATION CR-3	5	1	6	5	7	3	4	9	1	8	10	1	11
BIG CR (NF)	60	4											
NF-5	12	1	4	3	8	9	6	5	1	10	7	1	11
GRANITE CR-1	28	2	10	9	8	11	7	4	1	6	5	2	3
GRANITE CR-2	17	2	8	10	9	7	6	3	1	5	4	2	11
CLEAR CR (GRANITE)-1	25	2	11	8	9	10	7	3	1	6	5	2	4
CLEAR CR (GRANITE)-2	9	1	9	8	10	7	6	3	1	5	4	2	11
SALMON CR	11	1	5	6	10	4	3	8	1	7	9	1	11
BULL RUN	22	2	7	6	9	8	11	3	1	10	4	2	5
CRANE CR-1	26	2	8	7	9	11	10	4	1	6	5	1	3
CRANE CR-2	16	1	7	3	9	5	5	4	1	10	8	1	11
NF-6	1	1	7	6	8	5	9	4	1	10	3	1	11
TRAIL CR	19	2	5	6	10	8	7	3	1	9	4	2	11
BALDY DRAINAGE	4	1	7	5	8	3	9	6	1	10	4	1	11
CRAWFISH-CUNNINGHAM	10	1	5	6	9	7	8	4	1	10	3	1	11
JD-4	32	3	8	10	11	9	7	4	2	5	6	1	3
CANYON CR (JD)-1	NPC	4											
VANCE-BERRY	NPC	4											
CANYON CR (JD)-2	NPC	4											
CANYON EF SYSTEM	NPC	4											
CANYON CR MF	NPC	4											
CRAZY CR	NPC	4											
CANYON CR-3	NPC	4											
JD-5	21	2	9	10	11	7	5	4	2	3	6	1	8
PINE CR-1	NPC	4											
PINE CR-2	NPC	4											
INDIAN CR (JD)-1	NPC	4											
INDIAN CR (JD)-2	2	1	6	5	7	3	4	9	1	8	10	1	11
STRAWBERRY SYSTEM	NPC	4											
REYNOLDS CR	15	1	7	6	10	5	3	4	1	8	9	1	11
DEARDORFF CR	8	1	5	4	9	3	6	7	1	10	8	1	11
JD-6	14	1	5	3	9	4	8	7	1	10	6	1	11
RAIL-CALL	6	1	4	5	9	3	6	8	1	10	6	1	11
ROBERTS CR	7	1	5	4	9	3	6	8	1	10	6	1	11

Table 51. Bull trout QHA habitat restoration rankings. Attributes are ranked within each reach and all reaches are ranked as to their protection value. Final groupings are listed under Priority Grouping. Reaches with names shaded had their priority grouping upgraded by the John Day technical team.

Restoration Habitat Ranking													
Reach Name	Reach Rank	Priority Grouping	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
JD-1	28	2	3	6	5	7	9	2	4	10	1	8	11
JD-2	33	3	4	8	5	6	10	2	3	9	1	7	11
JD-3	27	2	6	5	4	7	8	2	3	10	1	8	11
MF-1	42	3	2	7	8	9	6	3	4	5	1	10	11
MF-2	34	3	2	4	5	7	6	3	9	8	1	10	11
MF-3	15	1	1	3	5	2	4	9	7	7	6	10	11
MF-4	19	1	2	1	4	3	5	7	9	8	6	10	10
INDIAN SYSTEM (MF)	13	1	4	7	3	1	6	5	9	8	2	10	10
BIG CR (MF)-1	29	2	5	7	4	1	3	6	9	8	2	9	9
BIG CR (MF)-2	43	3	2	5	4	1	3	7	9	8	6	9	9
BIG BOULDER SYSTEM	41	3	3	2	4	1	6	7	10	8	5	10	9
GRANITE BOULDER	48	4	3	4	7	2	1	6	9	8	5	9	9
BUTTE CR	35	3	3	2	4	1	6	7	9	8	5	9	9
VINEGAR CR	22	2	4	3	2	1	7	6	9	8	5	9	9
DAVIS CR	40	3	3	5	4	1	6	7	9	8	2	9	9
CLEAR CR (MF)	39	2	3	2	4	1	6	7	10	8	5	10	9
NF-1	31	3	3	6	5	8	9	2	4	7	1	10	11
NF-2	32	3	2	9	5	7	8	3	4	6	1	10	10
NF-3	30	2	1	9	4	7	8	3	5	6	2	10	10
CAMAS CR-1	38	3	4	6	5	9	8	2	3	7	1	10	10
CAMAS CR-2	21	2	3	8	5	9	6	2	4	7	1	10	10
CABLE CR	18	1	3	5	8	2	4	7	9	6	1	9	9
CAMAS CR-3	24	2	2	9	6	8	7	3	4	5	1	10	10
HIDAWAY CR	14	1	2	6	8	3	4	5	9	7	1	9	9
NF-4	12	1	1	9	4	3	7	8	6	5	2	10	10
DESOLATION CR-1	17	1	1	7	3	4	6	8	9	5	2	10	10
DESOLATION CR-2	26	2	2	6	3	4	5	8	9	7	1	9	9
DESOLATION CR-3	52	4	1	2	3	4	4	4	4	4	4	4	4
BIG CR (NF)	45	3	4	3	5	1	2	7	8	8	6	8	8
NF-5	37	2	7	7	4	1	5	6	7	3	2	7	7
GRANITE CR-1	4	1	2	1	4	3	6	8	10	9	7	5	11
GRANITE CR-2	3	1	3	1	4	2	5	8	9	10	7	6	11
CLEAR CR (GRANITE)-1	1	1	1	2	4	3	7	10	9	8	6	5	11
CLEAR CR (GRANITE)-2	6	1	4	3	1	2	5	9	10	8	7	6	10
SALMON CR	23	2	4	2	3	1	5	8	9	7	6	9	9
BULL RUN	7	1	4	3	2	1	5	8	11	7	6	9	10
CRANE CR-1	44	3	7	8	3	2	4	6	9	5	1	9	9
CRANE CR-2	25	2	2	5	4	1	6	7	9	8	3	9	9
NF-6	57	4	3	3	3	2	1	3	3	3	3	3	3
TRAIL CR	36	2	6	3	2	1	7	5	10	8	4	9	10
BALDY DRAINAGE	60	4	2	2	2	1	2	2	2	2	2	2	2
CRAWFISH-CUNNINGHAM	55	4	4	3	2	1	4	4	4	4	4	4	4
JD-4	9	1	5	1	2	6	7	3	8	9	4	10	11
CANYON CR (JD)-1	10	1	6	1	2	5	7	4	9	8	3	9	11
VANCE-BERRY	47	4	4	3	2	1	6	7	9	8	5	9	9
CANYON CR (JD)-2	16	2	2	1	3	4	6	8	9	7	5	9	9
CANYON EF SYSTEM	46	3	1	2	4	5	7	6	9	8	3	9	9
CANYON CR MF	49	3	1	2	3	6	5	7	9	8	4	9	9
CRAZY CR	53	4	2	4	3	1	5	7	8	8	6	8	8
CANYON CR-3	58	4	1	5	4	2	5	5	5	5	3	5	5
JD-5	2	1	3	1	2	4	7	5	8	9	6	10	11
PINE CR-1	5	1	4	1	3	6	7	2	8	9	5	11	10
PINE CR-2	61	4	1	1	1	1	1	1	1	1	1	1	1
INDIAN CR (JD)-1	8	1	4	2	3	7	6	1	8	9	5	10	10
INDIAN CR (JD)-2	56	4	2	1	4	3	5	5	5	5	5	5	5
STRAWBERRY SYSTEM	11	1	4	6	2	7	8	1	8	8	3	8	5
REYNOLDS CR	20	2	3	2	4	1	8	7	9	9	5	9	6
DEARDORFF CR	50	4	3	2	5	1	7	6	7	7	4	7	7
JD-6	54	4	2	4	3	1	4	4	4	4	4	4	4
RAIL-CALL	59	4	3	2	3	1	3	3	3	3	3	3	3
ROBERTS CR	51	4	3	2	4	1	7	5	7	7	7	7	6

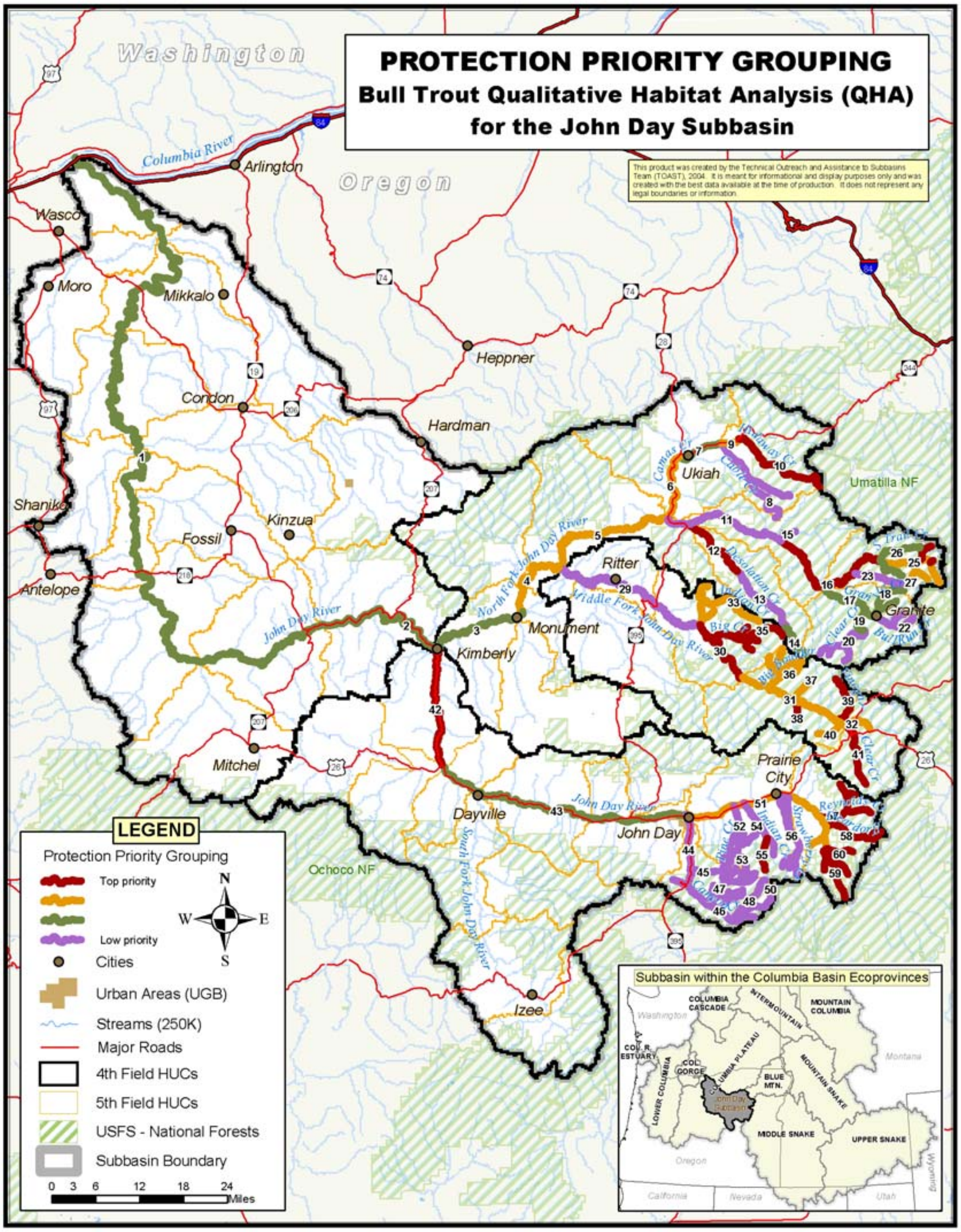


Figure 24. QHA results of protection quartiles by reach for bull trout.

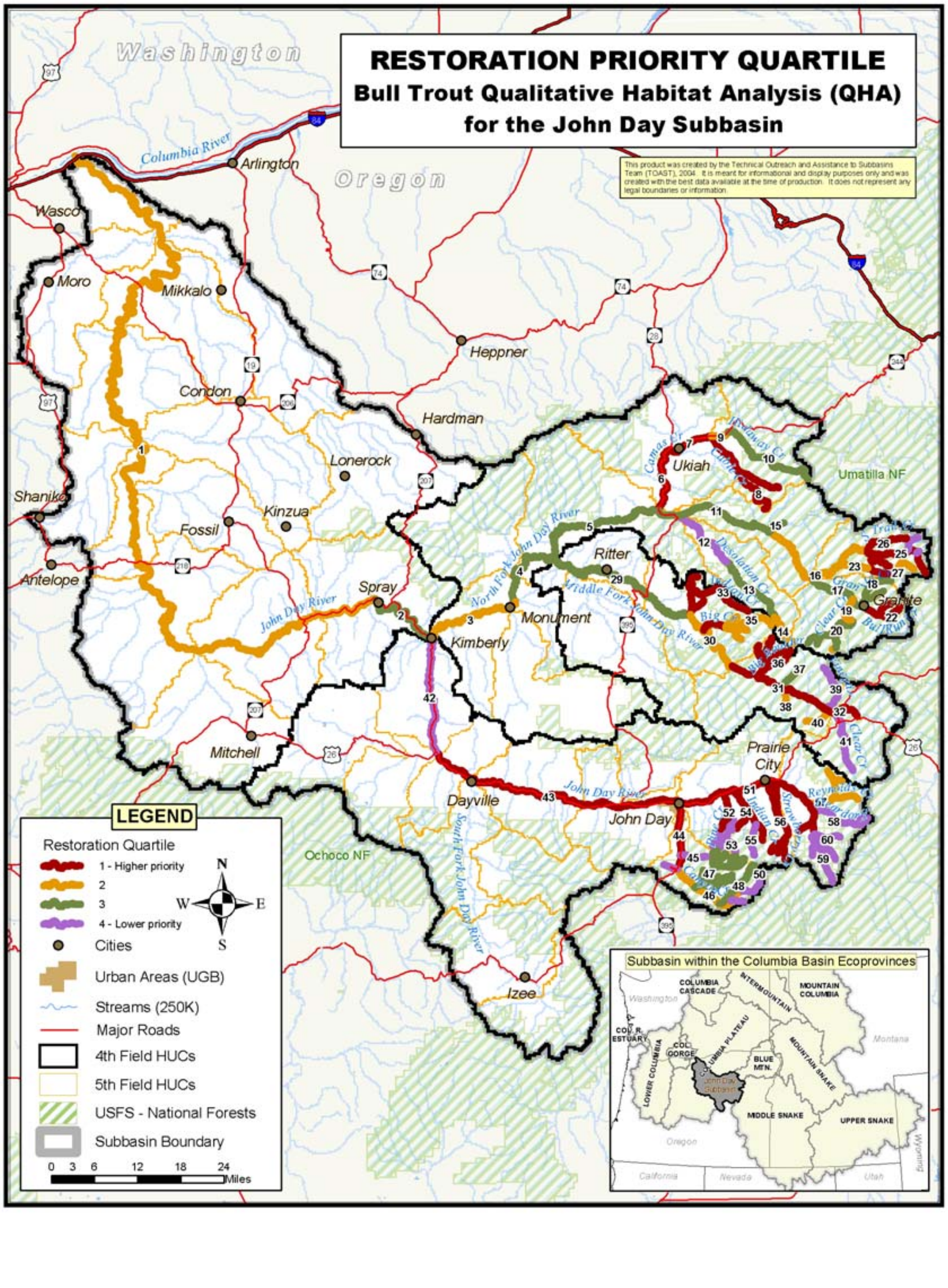


Figure 25. QHA results of restoration quartiles by reach for bull trout.

Table 52. Top priority protection reaches and top restoration reaches as determined from QHA rankings and technical team analysis. Reaches upgraded to this list by the technical team are underlined. The most important attributes for restoration reaches are also listed.

Protection Reaches	Restoration Reaches	Top Restoration Attributes
BALDY DRAINAGE	BULL RUN	Fine Sediment, Habitat Diversity, Channel Stability
BIG CR (MF)-2	CABLE CR	High Temperature, Fine Sediment, Riparian Condition
CLEAR CR (GRANITE)-2	CANYON CR (JD)-1	Channel Stability, Habitat Diversity, High Temperature
CLEAR CR (MF)	CLEAR CR (GRANITE)-1	Riparian Condition, Channel Stability, Fine Sediment
CRANE CR-2	CLEAR CR (GRANITE)-2	Habitat Diversity, Fine Sediment, Channel Stability
CRAWFISH-CUNNINGHAM	DESOLATION CR-1	Riparian Condition, High Temperature, Habitat Diversity
DEARDORFF CR	GRANITE CR-1	Channel Stability, Riparian Condition, Fine Sediment
DESOLATION CR-3	GRANITE CR-2	Channel Stability, Fine Sediment, Riparian Condition
GRANITE BOULDER	HIDAWAY CR	High Temp, Riparian Condition, Fine Sediment
INDIAN CR (JD)-2	INDIAN CR (JD)-1	Low Flow, Channel Stability, Habitat Diversity
JD-6	INDIAN SYSTEM (MF)	Fine Sediment, High Temperature, Habitat Diversity
NF-5	JD-4	Channel Stability, Habitat Diversity, Low Flow
NF-6	JD-5	Channel Stability, Habitat Diversity, Riparian Condition
RAIL-CALL	MF-3	Riparian Condition, Fine Sediment, Channel Stability
REYNOLDS CR	MF-4	Channel Stability, Riparian Condition, Fine Sediment
ROBERTS CR	NF-4	Riparian Condition, High Temperature, Fine Sediment
SALMON CR	PINE CR-1	Channel Stability, Low Flow, Habitat Diversity
	STRAWBERRY SYSTEM	Low Flow, Habitat Diversity, High Temperature

The attributes shown in Table 52, if improved, would provide the greatest restoration of bull trout productivity according to this model. The most common attributes on this list are channel stability, riparian condition, fine sediment, and habitat diversity, although high temperature and low flow are also on this list.

Note that when interpreting restoration rankings, a low ranking means that habitat improvements in that reach will result in little benefit to bull trout. This may mean that, although habitat is in poor condition, improving it would not result in much additional use (e.g. JD-2 in the lower mainstem). It can also mean that the habitat is in such good condition that little improvement is possible (e.g. NF-6 in the North Fork John Day).

The relative importance of the eleven attributes was ranked for each of four assessment areas in the John Day Subbasin (lower-middle, upper, North Fork, and Middle Fork). Values were normalized by dividing the minimum sum of ranks for all attributes in each watershed (lower, upper, North Fork, Middle Fork) by the sum of the ranks for each attribute. The result is a relative value (ranging from 0 to 1) of the importance of each attribute to the focal species of interest in a watershed.

These rankings are presented for each region in Figures 26 to 29. The highest ranked attribute in each assessment area (the attribute having the biggest overall impact on the species in each assessment area) has a value of 1.0. All other attribute impacts are scaled to this highest ranked attribute within each assessment area. Results indicate that high temperature is by far the most important limiting factor in the Lower Mainstem John Day (Figure 26) and also ranks high in the North Fork (Figure 27) and Middle Fork (Figure 28). Fine sediment, channel stability, habitat diversity, and riparian condition all rank high for the bull trout populations in the North Fork, Middle Fork, and Upper John Day (Figure 29) watersheds.

The HUC5s that contain top quartile protection reaches are listed in Table 53. The top four ranking attributes for restoration averaged over those top quartile protection reaches are also listed. Added to the list of priority HUC5s by subbasin planners (though not displayed in Table 53) was the Desolation Creek HUC5 in the North Fork.

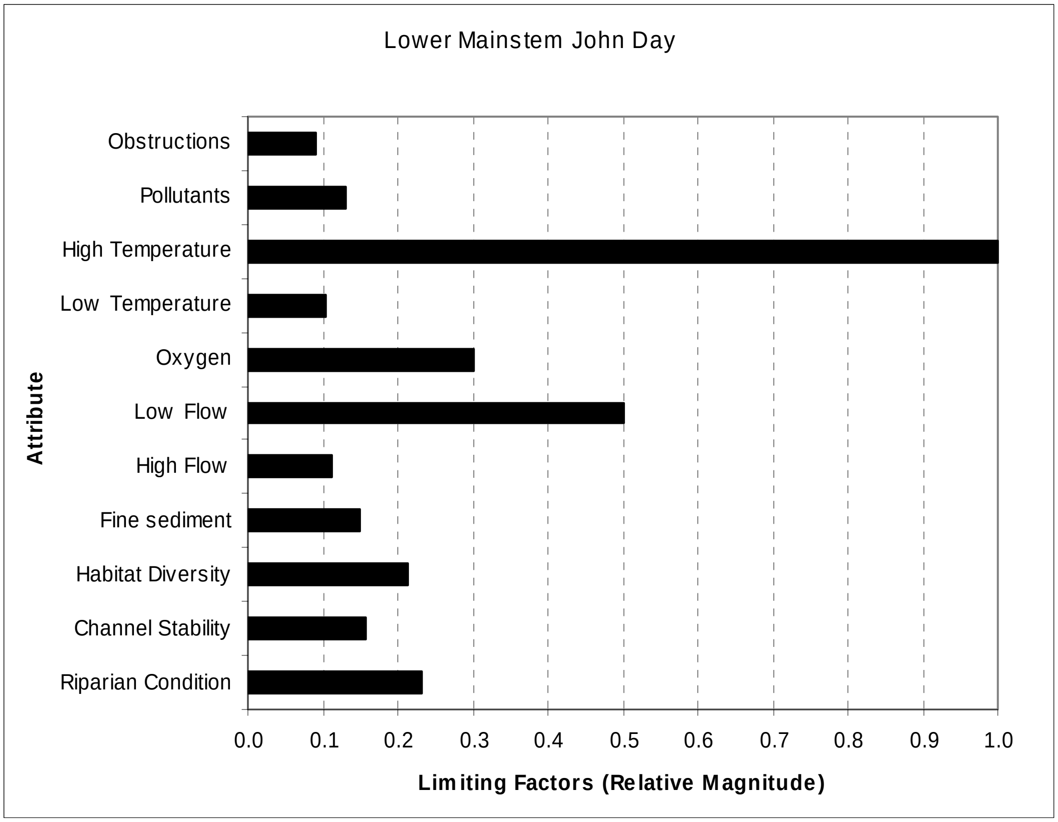


Figure 26. Limiting factors for habitat attributes for lower mainstem John Day.

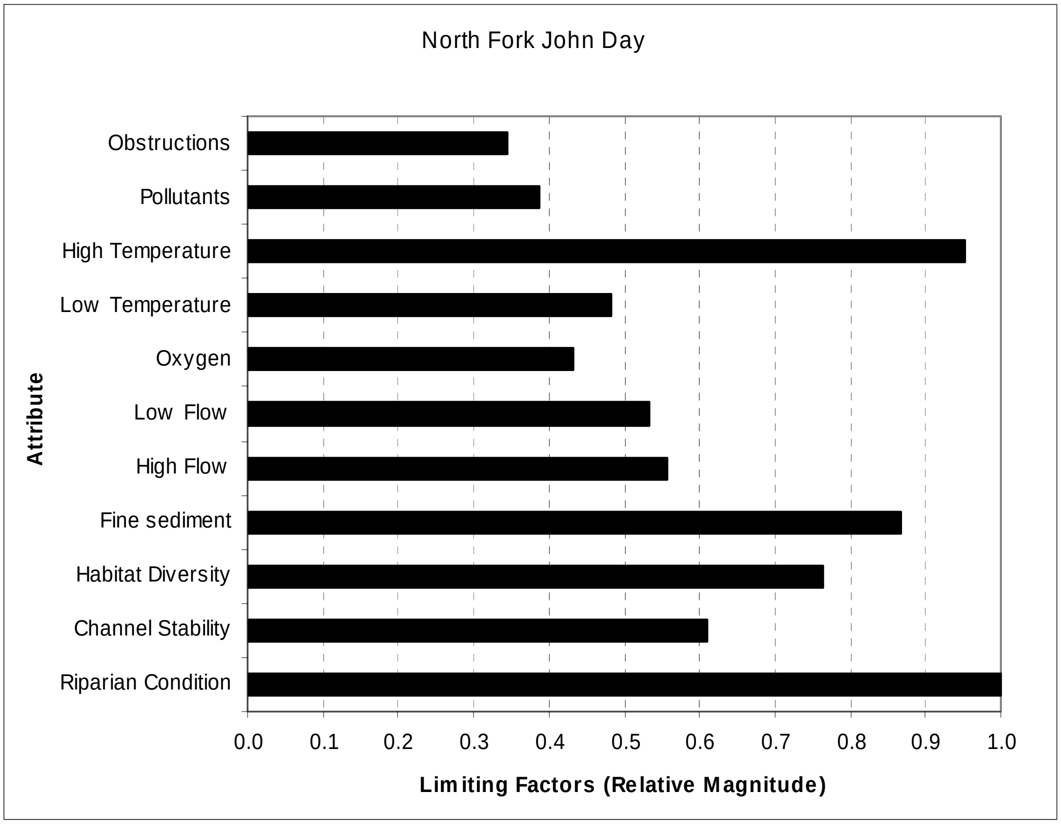


Figure 27. Limiting factors for habitat attributes for the North Fork John Day.

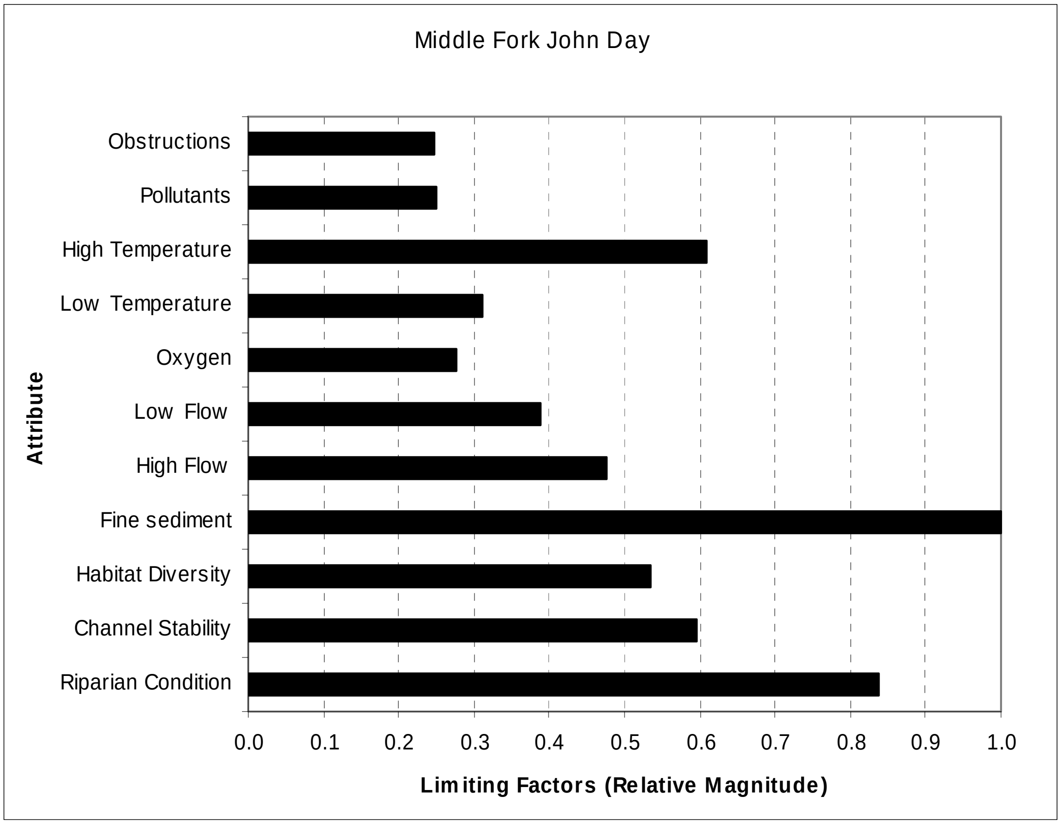


Figure 28. Limiting factors for habitat attributes for the Middle Fork John Day.

Figure 29. Limiting factors for habitat attributes for the Upper John Day.

Table 53. Priority QHA restoration geographic areas and the top four ranked QHA restoration attributes for priority reaches in those geographic areas.

John Day Bull Trout Restoration Priorities										
Geographic area priority				Attribute for Restoration						
Geographic area	North Fork	Middle Fork	Upper Mainstem	*Low Flow*	*High Flow*	*Fine Sediment*	*High Temperature*	*Riparian Condition*	*Channel Form*	*Channel Complexity*
Big Creek		X				■	■	■		■
Camp Creek		X			■	■		■	■	
Canyon Creek			X	■			■		■	■
FieldsCreek			X	■			■		■	■
Granite Creek	X					■		■	■	■
Laycock Creek			X	■			■		■	■
NF JDR Big Creek	X					■	■	■		■
Strawberry Creek			X	■				■	■	■
Upper Camas Creek	X				■	■	■	■		
Upper JDR			X			■		■	■	■
Upper Middle JDR			X	■			■		■	■

<u>Discussion</u>

The assessment areas with the greatest protection and restoration value are the North Fork and Upper John Day. The North Fork contained eight reaches in the top priority group for restoration and nine for protection, out of 26 total reaches. The Upper John Day contained six reaches in the top priority group for restoration and six reaches for the top priority group for protection out of 19 total reaches. The Middle Fork assessment areas had three reaches (out of 13) in the top priority group for protection and three for restoration.

The Lower Mainstem John Day assessment unit was rated low for bull trout protection and restoration value. However, it was the opinion of the John Day technical team that a healthy John Day bull trout population required connectivity with other Columbia River subbasins. Improving connectivity may require improving habitat in the Lower Mainstem John Day. The ranking of the high temperature attribute in the Lower Mainstem John Day (Figure 26) is due to this attribute's presumed impact on bull trout migration. If bull trout migration turns out to occur more often in the winter than during high temperature periods, then high temperature (and possibly low flow) likely does not adversely affect bull trout as much as is indicated in Figure 26. It was suggested by the technical team that the lack of connectivity between populations may be a function of low population sizes, rather than any particular habitat problem. One research need is a better understanding of the importance of connectivity between populations and, if it does turn out to be important, what factors (if any) are currently limiting the ability of bull trout to use the Lower Mainstem John Day River as a migration corridor.

Table 52 provides a list of the most important reaches for protection and restoration. One reach, Clear Cr-2 (Granite) appears on both the protection and restoration lists, indicating that this reach is of particular importance to bull trout. The adjacent reach, Clear Cr-1 (Granite) also ranks high for restoration potential. Other watersheds with reaches on both lists are Desolation Cr and Indian Cr (JD). In both cases, the upper portion of the system has high protection value while the lower portion has high restoration value. In both systems, the highest ranking attributes for restoration are habitat attributes (habitat diversity, riparian condition, habitat diversity) or flow/temperature attributes (high flow, high temperature), suggesting that habitat restoration projects combined with increasing flows where opportunities exist might be particularly effective at increasing bull trout habitat in these systems. The USFWS draft recovery plan for John Day bull trout specifically addresses restoring flow to Indian Creek and assessing connectivity issues in Salmon Creek.

The majority of bull trout habitat in the John Day Subbasin is publicly owned. However, in many cases and particularly in the Upper John Day, passage barrier obstructions, high water temperatures, or low flow in lower reaches where adjacent land ownership is private are preventing bull trout from accessing upstream reaches on public land. Although there is tremendous potential for restoration of bull trout on public land, in many of these cases it will require restoration projects on private land.

3.2.4 Aquatic Focal Species Population Delineation and Characterization

Redband Trout *(Oncorhynchus mykiss gairdneri)*

Redband Trout Population Data and Status

The species *Oncorhynchus mykiss* is one of the most taxonomically complicated groups in Oregon. The species probably consists of multiple subspecies, none of which have been formally recognized. Behnke (1992) proposes three subspecies with ranges extending into Oregon: *O.m. irideus*, or coastal rainbow and steelhead trout; *O.m. gairdneri*, or inland Columbia Basin redband and steelhead trout; and *O.m. newberrii*, or Oregon Basin redband trout. (ODFW 1995)

Currens (1997) suggests that separate groups of redband trout evolved in large river systems, such as the Columbia, Deschutes, Klamath and Sacramento rivers. The subspecies that occurs in the John Day Subbasin is *Oncorhynchus mykiss gairdneri*, which is present in inland drainages of the Pacific Northwest. Since redband trout and steelhead are considered the same subspecies, it is hard to distinguish between the two of them. So in this subbasin plan, redband trout have been broken into two categories: the redband trout that exhibit an anadromous life history (steelhead) are covered in the steelhead section of the plan and the redband trout that exhibit a residential life history will be covered in this section.

Ancestral redband trout probably reached the Sacramento-San Joaquin basin from the south during the second half of the Pleistocene Epoch and penetrated the Columbia, Fraser and

Athabasca river basins between 30,000 and 50,000 years ago (Behnke 1992). All redband trout of the Columbia and Fraser River basins are classified as *O. mykiss gairdneri*. This subspecies is genetically and morphologically differentiated from coastal rainbow trout. Morphological characteristics of distinction include the presence of vestigial basibranchial teeth, larger spots, more elliptical parr marks, fewer pyloric caeca, yellow and orange tints on the body, a trace of a cutthroat mark and light colored tips on dorsal, anal and pelvic fins (Behnke 1992). However, genetic techniques (e.g. protein electrophoresis) provide the only method to correctly identify this subspecies as unique from other salmonids. (Muhlfeld 2004)

Columbia River redband trout exhibit a wide variety of life history strategies. Anadromous stocks of redband (steelhead) trout migrate approximately 217 miles from the mouth of the John Day River down the Columbia River to the Pacific Ocean. Fluvial stocks occupy larger rivers and spawn in smaller tributaries. Resident forms inhabit smaller tributaries and headwater areas for their entire lives.

Redband trout commonly inhabit high elevation streams in arid regions characterized by extreme variation in seasonal water flow, temperature and dissolved oxygen levels (Behnke 1992, Vinson and Levesque 1994, Zoellick *et al*. 1999). However, despite their wide distribution and apparent adaptability to harsh environmental conditions, the redband trout is considered a "species at risk" (Marshall *et al*. 1996) due to the recent decline and disappearance of several populations (Nehlsen *et al*. 1991). At present, the management of redband populations is problematic because the physical and biological factors that limit the distribution and physiological tolerance of these trout are not well understood, and very little is known about the effects of environmental factors on the metabolic performance of wild native salmonids. (Rodnick 2002)

Abundance and distribution of redband trout are not routinely indexed in the John Day Subbasin. Juveniles with trout and steelhead life history types are difficult to differentiate where the two populations coexist, making independent monitoring difficult. At this time, abundance estimates of John Day trout populations are unknown. Summer distribution of redband trout is limited to headwater areas, similar to John Day cutthroat and bull trout, by a variety of land use impacts including stream dewatering from irrigation diversions and temperature barriers caused by stream alterations due to cattle grazing and timber harvest. (ODFW 1995).

Redband are more difficult to monitor than steelhead but appear to be abundant in most headwater areas. Redband populations are probably fragmented and isolated in some headwater areas due to habitat degradation in lower mainstems (ODFW 1995). Historic redband trout (*O.m. gairdneri*) populations probably included fluvial fish, which used the mainstem habitats for rearing (Kostow 2003). Recent length frequency measurements of redband trout demonstrated that over 98% of the fish sampled were less than six inches in length (ODFW 2001), suggesting that the current trout life history in the subbasin is residential. Few redband trout exceed 10 inches in length (ODFW 1996).

Densities of *O.m. gairdneri* greater than or equal to one inch in length have been measured at 43 locations in the three major drainages that produce steelhead in the John Day (the North Fork, Middle Fork and upper mainstem), summarized by subbasin in Table 54. These measurements were intended to target steelhead parr (young salmonids), but also include some unknown number of resident redband trout. According to abundance benchmarks developed by Dambacher and Jones (1995), most one inch and longer redband abundances ranged from moderate (0.06 to 0.19 fish per m^2) to high (>0.2) across the John Day Subbasin and from year-to-year within the same subbasin. These density measurements could be expanded to local abundance measurements if habitat areas were measured, but the necessary information is not currently available. (Kostow 2003)

Table 54. Density of 1+ *O. mykiss* in the John Day Subbasin, based on sampling in 43 locations. Abundance benchmarks for density data: low (< 0.05), moderate (0.06 – 0.19), high (>0.2), according to Dambacher and Jones (1995). (unpublished data, Tim Unterwegner, ODFW). (Kostow 2003)

Year	**North Fork Fish/m²**	**Middle Fork Fish/m²**	**Upper Mainstem Fish/m²**
1990	0.05	0.15	0.19
1991	0.13	0.20	0.22
1992	0.28	NS	NS
1994	0.19	NS	NS
1996	0.23	NS	NS
2000	NS	0.23	NS

The John Day Subbasin contains over 2485 miles of *O. mykiss gairdneri* spawning and rearing habitat, now located primarily in tributaries and the upper portions of the subbasin (Kostow 2003). Redband trout tend to spawn in rivers and streams during the spring months of March, April and May. Cool, clean, well-oxygenated water is necessary for the eggs to survive. Redband trout fry emerge from the gravel in June and July. For the most part, they live near where they were spawned. Redband trout are three years old at maturity, with size varying depending on the productivity of individual waters. Few redband trout exceed 10 inches in length (ODFW 1996).

Redband trout require four basic habitat types to accommodate life history requirements: spawning, rearing, adult and overwintering (Behnke 1992). Redband trout fry emerge from the gravel in June and July. Redband trout eggs typically hatch in four to six weeks and alevins take about three to seven days to absorb the yolk sac before emergence. At a water temperature of 50° F, eggs hatch in approximately 31 days (Leitritz and Lewis 1980). Gravels free of sediments are optimum for spawning since sediment can smother eggs by impeding the free flow of oxygenated water and can trap alevins (Willers 1991). Bjornn and Reiser (1991) documented rainbow trout embryo survival as it related to the proportion of substrate composed of fines less than ¼ inch: 90% embryo survival with fines at 10%, 75% embryo survival with fines at 20%, and 50% embryo survival with fines at 30%. Spawning is adversely affected when substrate fines (< ¼ inch) exceed 25% (Bjornn and Reiser 1991). (Pyzik 2003)

After young trout emerge from the spawning gravel, they often rear in low velocity areas associated with stream margin habitats, high cover areas and interstitial spaces. Adults require habitat for resting and feeding and thus are generally found in areas of abundant cover associated with deep pools, large organic material, undercut stream banks and overhanging vegetation.

Over-winter sites, characterized by low velocity areas with cover, including large woody debris, are important to all age classes (Bjornn and Reiser 1991). (Pyzik 2003)

Redband trout possess a hereditary basis to persist at higher water temperatures than other species of trout (Behnke 1992). Sonski (1985) noted that redband trout raised in a hatchery continued to grow until temperature reached 75°F; his recommended temperatures included a range from 65 to 75°F to keep broodstock in good condition. Behnke (1992) has captured (fly-fishing) live redband in streams with temperatures of 82.9°F. Water temperatures exceeding 84.9°F can be fatal to rainbow trout (Bjornn and Reiser 1991). Recent studies in southeast Oregon streams (Little Blitzen River and Bridge Creek in the Blitzen River Basin and North Fork Twelvemile Creek in the Warner Basin) found that redband trout prefer water temperatures of 55°F. At this temperature, metabolic power and swimming ability were some of the highest reported for wild fish (Rodnick *et al*. in press). Stream shade and proper width-to-depth ratios are the key factors influencing water temperatures within streams of south central Oregon. (Pyzik 2003)

Steelhead and redband trout are sympatric (occupying the same range without loss of identity from interbreeding) in all basins that contain steelhead. Sympatric populations with different life histories form different populations due to assortative mating, but are not reproductively isolated from each other (Currens 1987). Each morphology appears to be able to produce offspring of the other type. Redband males have been observed to pair with steelhead females, particularly when steelhead populations are small. Redband trout populations also occur above barriers to anadromous fish. (ODFW 1995)

<u>Genetic Integrity</u>

Mid-Columbia from Fifteenmile Creek to Walla Walla, except South Fork John Day (described below). This group contains sympatric redband trout and summer steelhead populations in the lower Deschutes, John Day, Umatilla, and Walla Walla rivers, and redband trout and winter steelhead populations from Fifteenmile Creek and adjacent areas. Steelhead and trout in the Umatilla, John Day, and Deschutes have all been studied biochemically in some detail and population have been compared within basins. However, comparisons between the basins have not been analyzed. The populations as a group are clearly different from the populations in Oregon’s Snake River, but differences within the group may also exist (Currens 1987, Currens and Stone 1989). (ODFW 1995)

South Fork John Day. This group includes steelhead and redband trout in the South Fork of the John Day River. The uniqueness of this group has been determined by allozyme and ecosystem comparisons within the John Day Subbasin. No comparisons have been made outside of the John Day Subbasin (Currens and Stone 1989). There is a barrier – Izee Falls – in the upper South Fork. However, the uniqueness of the South Fork group appears to extend below this barrier; thus, the boundary is drawn at the mouth of the South Fork. The uniqueness of the South Fork redband may result from two factors. First, the South Fork environment comprises a desert ecotype that is unique when compared to the rest of the John Day Subbasin. This feature may produce unique selection pressures on the South Fork populations compared to the rest of the John Day Subbasin. Second, Bisson and Bond (1971) detected unique related species assemblages in the South Fork John Day and in the mid-Silvies River in the Malheur Lakes Basin that suggest a recent (within the last 10,000 years) stream exchange between these basins. This exchange appears to have transferred fish in both directions. The uniqueness of the redband trout in this group may be partly explained by an historical event that naturally introduced novel genetic variation into the South Fork John Day from the redband population in the Silvies River. (ODFW 1995)

In response to population declines, resident forms of redband trout are considered a species of special concern by the U.S. Fish and Wildlife Service, American Fisheries Society, and all states throughout their historic range (Idaho, Oregon, Washington, Nevada, California and Montana). Additionally, they are classified as a sensitive species by the U.S. Forest Service and the Bureau of Land Management (BLM). In Oregon, the resident life form of the inland Columbia Basin subspecies, redband trout, is currently listed as a state "sensitive" species effective in 1990 and as a federal Category 2 candidate species (ODFW 1995). Despite their broad distribution, few strong populations exist. Known or predicted secure populations inhabit 17% of the historic range and 24% of the present range (Lee *et al*. 1997). Furthermore, Lee *et al*. (1997) reported that only 30% of the watersheds supporting spawning and rearing populations were classified as strong populations. Consequently, populations in Oregon and California have been petitioned for listing under the ESA. The California petition is currently under review and the 1999 petition to list the Great Basin redband trout in Oregon was deemed unwarranted at this time (Muhlfeld, 2004). USFWS determined they were not warranted for listing because they could not demonstrate the petitioned population was distinct from other redband populations, including those in the John Day River Subbasin. NOAA Fisheries is currently conducting a status review of inland steelhead under the federal Endangered Species Act (ODFW 1995).

<u>Redband Trout Distribution</u>

Currently in the John Day Subbasin, the redband trout inhabit the North Fork, Middle Fork, Mainstem, and South Fork John Day rivers and upper headwater areas. See Figure 30 for a map of redband trout distribution in the John Day Subbasin. Trout distribution has decreased within most basins, including in areas where they are currently sympatric with steelhead, primarily due to losses in mainstem reaches and the withdrawal of trout populations into headwater areas. Trout populations are no longer present in the lower mainstems of major inland basins such as the Yakima, John Day or Umatilla, which were likely highly productive reaches for trout historically. (ODFW 1995)

<u>Description of aquatic introductions, artificial production and captive breeding programs</u>

Most trout hatchery programs use a domesticated coastal rainbow trout that originated from wild rainbow (redband) trout in northern California about 100 years ago. Most trout releases are in high mountain lakes that do not have wild populations, although some have outlets and hatchery fish may stray out of them downstream into wild trout and steelhead populations. Stream releases of legal-sized hatchery rainbow also occur in the upper Deschutes, John Day, Grande Ronde, Pine, Burnt, and Powder subbasins. Non-native trout, including brook and brown trout, have also been released into the inland redband trout range. (ODFW 1995)

Trout hatchery programs, using domestic coastal rainbow stock, are present in tributaries of the John Day River and the mainstem Umatilla River. Stocking of rainbow trout in the mainstem and North Fork John Day River watersheds was first recorded in 1925 and continued until 1997 in rivers and streams and is ongoing in some lakes and ponds (Table 55). The streams where rainbow trout were consistently stocked include Canyon Creek and the John Day River in the upper mainstem watershed; and Camas Creek, Desolation Creek and North Fork John Day River in the North Fork watershed. Other streams with cutthroat trout were stocked once or twice with rainbow trout, most often in the 1920s or 1940s. (Gunckel 2002)

Of the ponds and lakes with stream outlets, Canyon Meadows Reservoir and Magone Lake were consistently stocked from 1964 to 1996 and 1940 to the present, respectively. In the North Fork John Day watershed, Olive lake and Pendland lake were stocked most frequently, from 1925 to 1985 and 1972 to present, respectively. (Gunckel 2002)

Hatchery stocks of rainbow trout planted in the John Day Subbasin were primarily Roaring River, Cape Cod, Willamette and Oak Springs stocks. The Oak Springs stock originally came from Utah in 1923. In 1971, milt (the sperm-containing fluid of a male fish) from a hatchery in Tacoma, Washington was mixed with this stock and the resulting stock was typically used for Eastern Oregon plantings (Kinunen & Moring 1976). Willamette Rainbow stock originated from McKenzie River rainbow. The Cape Cod stock came to Oregon from a commercial hatchery in

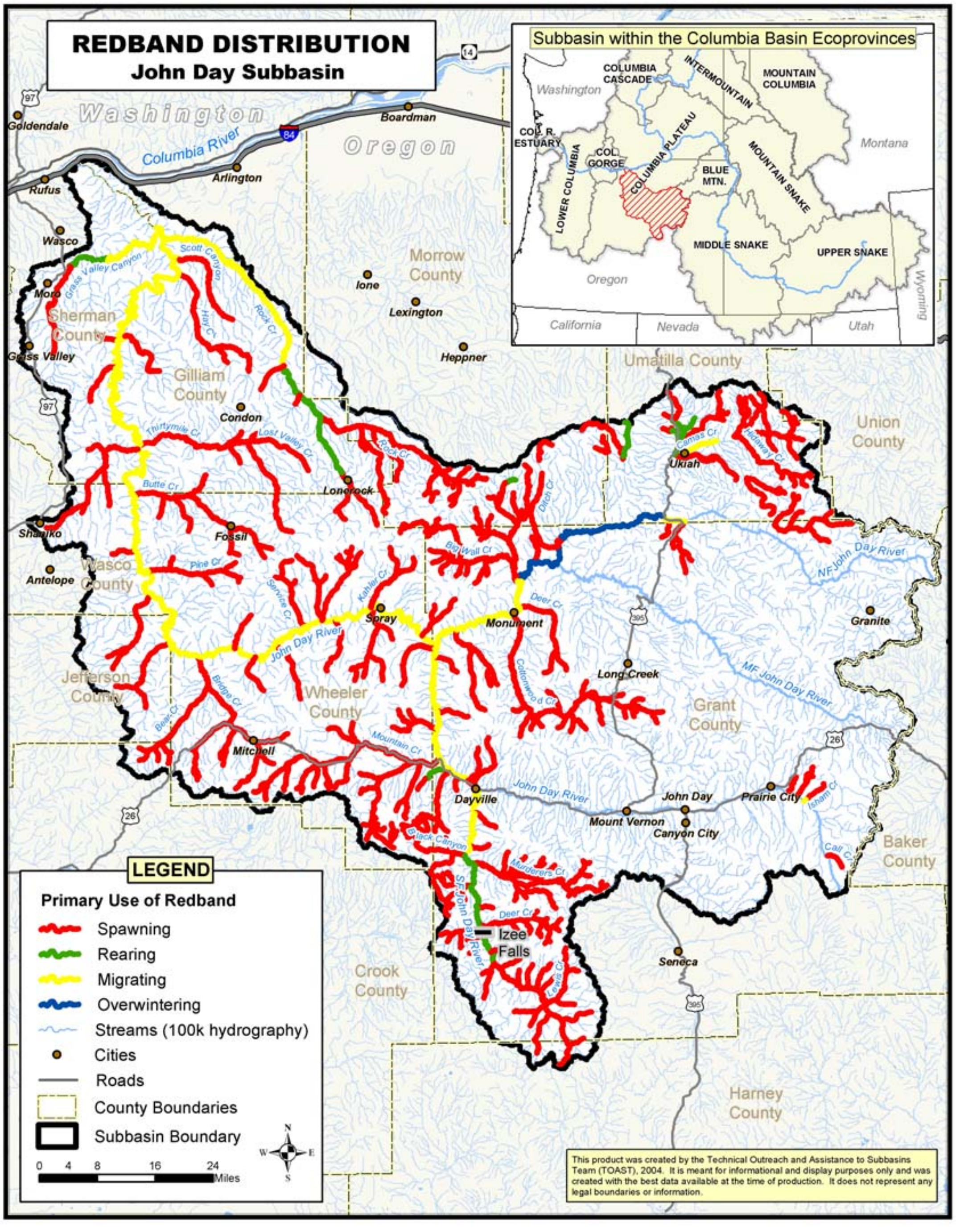


Figure 30. Distribution of redband trout in the John Day Subbasin.

Cape Cod, Massachusetts (Kinunen & Moring 1976). It is believed the Cape Cod hatchery originally obtained their rainbow trout from the McCloud Basin, California (Phil McKee, Fall River Hatchery, personal communication). The Roaring River stock was obtained from the W.S. Meadow trout farm in Idaho in 1937, which originally acquired the parent brood from Utah (Kinunen & Moring 1976). (Gunckel 2002)

Table 55. Total number and pounds of rainbow trout stocked in Upper John Day waterbodies, 1925-2001. n/a = not available; * = ponds and reservoir with a stream outlet. (Gunckel 2002)

Sub-Basin	Water body	Number	Pounds	# of Plantings	Year
North Fork	Big Meadow Creek		40	1	‘41
	Cable Creek	1,840	35	1	‘41
	Camas Creek	247,741	26,929	51	‘25- ‘97
	Crane Creek	20,000	25	2	‘29, ‘54
	Desolation Creek	117,341	29,972	49	‘41- ‘95
	Desolation Creek South Fork,	5,324	450	2	‘41, ‘57
	Fox Creek	6,550	1,600	2	‘41, ‘48
	Frazier Creek	2,831	51	1	‘41
	Hidaway Creek	2,001	36	1	‘41
	John Day River, North Fork	1,116,269	118,297	147	‘25- ‘97
	Lake Creek	21,120	69	1	‘46
	Winom Creek	1,051	20	1	‘41
	Baldy Lake	1,360	40	1	‘48
	Bridge Creek Mgt Area	2,842	40	3	‘81- ‘84
	Bull Prairie Reservoir*	433,677	13,628	44	‘62- ‘01
	Carvendar Reservoir*	9,038	3,209	4	‘98- ‘01
	Jump Off Joe Lake	11,320	17	2	’59, ’62
	Lost Lake	5,971	2,001	6	‘96- ‘01
	Olive Lake	715,421	11,292	31	‘25- ‘85
	Penland Lake	663,514	24,040	39	‘72- ‘01
	Twin Ponds	502	186	1	‘99
	Umatilla Forest Ponds	50,435	6,470	23	‘76- ‘01
Mainstem	Beech Creek	1,001	167	1	‘53
	Canyon Creek	826,448	70,676	113	‘25- ‘97
	Canyon Creek, East Fork	30,000	n/a	1	‘29
	Fields Creek	2,126	400	1	‘41
	John Day River	486,573	63,972	85	‘48- ‘88
	Rail Creek	1,849	360	1	‘41
	Canyon Meadows Reservoir*	211,982	60,114	72	‘64- ‘96
	Carpenter Pond	51,827	14,328	51	‘72- ‘91
	Dale Ponds	2,811	426	3	‘57- ‘58
	Dayville Pond	4,034	1,063	8	‘59- ‘64
	Dove Ponds	9,308	542	8	‘56- ‘59
	Holmberg Pond	9,610	1,526	10	‘58- ‘64
	Lemons Pond	1,952	472	5	‘58- ‘61
	Magone Lake	317,118	8,170	37	‘40- ‘01

	Morris Ponds	40,328	3,516	18	‘56- ‘62
	Mt. Vernon Pond	500	125	1	‘58
	Oliver Ponds	32,417	2,345	14	‘56- ‘62
	Patterson Pond	48,071	9,182	23	‘58- ‘73
	Retherford Pond	6,194	1,433	9	‘58- ‘63
	Seventh Street Pond	22,206	7,274	22	‘92-‘01
	Strawberry Lake	183,825	561	8	‘28-‘48
	Trout Farm Pond*	23,038	7,312	23	‘90- ‘01
	Trowbridge Ponds	17,899	1,129	15	‘56- ‘64
	Velvin Pond	910	156	2	‘57, ‘58

Harvest in the Subbasin

Redband trout have little commercial value, and historically have supported only a small sport fishery. Hence they have attracted little attention from managers, have not been well researched and their status has not been sufficiently documented compared to other salmonids in the Pacific Northwest. (Kostow 2003)

Most trout programs are restricted to lakes or reservoirs where impacts to wild trout are minimized. Angling regulations in these populations target hatchery fish and require the release of all wild steelhead. Since 1998, there have been no releases of hatchery rainbow trout into any streams within the subbasin. Current fishing regulations for the John Day Subbasin are five fish a day, 10 in possession, minimal length eight inches. Lakes are open year round, all streams (exceptions listed below) within the John Day River Subbasin are open for trout angling from the fourth Saturday in May to the end of October. The following streams are closed to all angling: Granite Creek system, Middle Fork John Day River from Highway 7 to Summit Creek.

Environmental Conditions for Redband Trout

Resident redband trout rely on many of the same habitat characteristics as steelhead. Consequently, many of the environmental conditions that arose as limiting factors for steelhead during the EDT analysis would also be limiting for resident redband; including lack of key habitat quality and habitat diversity, and increased sedimentation and seasonal water temperatures. In response to these conditions, and decreased summer flow, many resident redband populations have retreated to headwater areas where they have become fragmented and isolated. (ODFW 1995)

3.2.4 Population Delineation and Characterization

Westslope Cutthroat Trout *(Oncorhynchus clarki lewisi)*

The following information is from "Status of Westslope Cutthroat Trout (*Oncorhynchus clarki lewisi*) in the United States: 2002" (Shepard *et al*. 2003), volume 1 of the Interior Columbia Basin Ecosystem Management Project Draft EIS (ICBEMP 2000), and various other local sources referenced within this section.

Westslope Cutthroat Trout Population Data and Status

The WCT is one of 14 subspecies of cutthroat trout *O. clarki* native to interior regions of western North America (Trotter 1987, Behnke 1992). Cutthroat trout owe their common name to the distinctive red slash that occurs just below both sides of the lower jaw. Adult WCT typically exhibit bright yellow, orange and red colors, especially among males during the spawning season. Characteristics of WCT that distinguish this fish from the other cutthroat subspecies include a pattern of irregularly-shaped spots on a body that has few spots below the lateral line, except near the tail; a unique chromosome complement (2n = 66, versus 64 for other inland subspecies); and other genetic and morphological traits that appear to reflect a distinct, evolutionary lineage (Trotter 1987, Behnke 1992).

Westslope cutthroat trout (WCT) probably never were widely distributed within the Blue Mountains or Columbia Plateau. Productivity has been adequate to sustain localized migratory and isolated populations, resulting in current populations thought to be fairly secure. However, this conclusion must be tempered by uncertainty regarding the genetic integrity of remaining populations. Most current wild populations are depressed. Hybridization, fragmentation and loss of migratory populations have limited healthy populations to a much smaller proportion of their historical range. Further, competition with introduced rainbow and brook trout has impacted the ability of the species to fully occupy its natural niche in the ecosystem.

In the John Day Subbasin, hybridization is not believed to be a major reason for WCT decline. Habitat and water quality alterations are much more ubiquitous problems and have contributed to a decrease in distribution, aggravating any problems caused by hybridization. In other words, changes to habitat and water quality have pushed cutthroat into a smaller and smaller area where they are more likely to hybridize with native redband trout and steelhead (Tim Unterwegner, ODFW, personal communication, April 19, 2004).

Populations of WCT in these mostly isolated stream systems have remained stable in recent years. WCT distribution within the John Day Subbasin is limited primarily to public lands. Because of more restrictive land use regulations on public lands, the risk to WCT habitat is not as great as if it were primarily private lands.

While there hasn't been a planned effort to establish population trends, occasional and sporadic surveys have served to establish presence and productivity data in the John Day Subbasin. However, based on 1990 and 1992 stream survey data, Kostow (1995) reported that almost all John Day drainage WCT stocks have more than 300 spawning adults.

The spatial arrangement of range-wide populations of WCT with abundance deemed at or near capacity were obviously clumped and appeared related to the presence of areas designated as wilderness, roadless, or national parks. In the western states, about 3800 miles classified as "at or near capacity" (39% of all miles in this class) were in wilderness and about 930 miles (10% of all miles in this class) had field data to support this classification. Because assessments of abundance, regardless of data quality, were linked to quality of habitat, it is not surprising that most populations located in wilderness and roadless areas would be designated as being at or near capacity. Except where empirical observations indicated otherwise, nearly all habitats in wilderness areas were presumed to be in pristine condition. While assignment of 54% (2055 miles) of the miles of habitat rated "at or near capacity" within wilderness was based on professional judgment (low data quality), approximately 25% of the miles classified in this category in wilderness was supported by field data.

Appendix E of the 2003 Assessment Report (Shepard *et. al*. 2003) shows a comparison of WCT habitat in the John Day Subbasin that is currently and was historically occupied. Approximately 1229 miles of habitat are currently occupied, while 1393 miles are currently unoccupied (but historically occupied). Cutthroat were introduced into North Fork John Day tributaries in the early 1960s, so that watershed is not listed as historically occupied.

Westslope cutthroat trout usually mature at four or five years of age and spawn entirely in streams, primarily small tributaries. Spawning occurs between March and July, when water temperatures warm to about 50° F (Trotter 1987, Behnke 1992, McIntyre and Rieman 1995). Natal homing, i.e. the return of adult fish to spawning areas where they themselves were produced, is believed to occur in WCT. Individual fish may spawn only in alternate years (Shepard *et al.* 1984, Liknes and Graham 1988). Fertilized eggs are deposited in stream gravels where the developing embryos incubate for several weeks, with the actual time period inversely related to water temperature. Several days after hatching from the egg, WCT fry about one inch long emerge from the gravel and disperse into the stream.

Westslope cutthroat trout fry may grow to maturity in the spawning stream or they may migrate downstream and mature in larger rivers or lakes. Consequently, three WCT life-history types are recognized (Trotter 1987, Liknes and Graham 1988, Behnke 1992, McIntyre and Rieman 1995): *Resident* fish spend their lives entirely in the natal tributaries; *fluvial* fish spawn in small tributaries but their resulting young migrate downstream to larger rivers where they grow and mature; and *adfluvial* fish spawn in streams but their young migrate downstream to mature in lakes. After spawning in tributaries, adult fluvial and adfluvial WCT return to the rivers or lakes (Rieman and Apperson 1989, Behnke 1992). All three life-history types may occur in a single drainage (Bjornn and Liknes 1986, Rieman and Apperson 1989). Whether these life-history types represent opportunistic behaviors or genetically distinct forms of WCT is unknown. However, evidence from Washington State suggests that life-history types represent opportunistic behaviors. Here, numerous self-sustaining stocks of WCT in streams and lakes have established themselves outside the historic range of the subspecies as the result of widespread introductions of hatchery WCT.

Westslope cutthroat trout feed primarily on macroinvertebrates, particularly immature and mature forms of aquatic insects, terrestrial insects and, in lakes, zooplankton (Liknes and Graham 1988). These preferences for macroinvertebrates occur at all ages in both streams and lakes. Westslope cutthroat trout rarely feed on other fishes (Liknes and Graham 1988, Behnke 1992).

Growth of individual WCT, like that of other species of fish, depends largely upon the interaction of food availability and water temperature. Resident WCT usually do not grow longer than twelve inches, presumably because they spend their entire lives in small, coldwater tributaries. In contrast, fluvial and adfluvial WCT often grow longer than twelve inches and attain weights of two to three pounds. Such rapid growth results from the warmer, more-productive environments afforded by large rivers, lakes and reservoirs (Trotter 1987, Behnke 1992).

Spawning habitat for WCT occurs in low-gradient stream reaches that have gravel substrate ranging from 0.8 to three inches in diameter, water depths near 0.7 ft and mean water velocities from 1 to 1.3 feet per second (Liknes 1984, Shepard *et al.* 1984). Proximity to cover (e.g., overhanging stream banks) is an important component of spawning habitat for adult WCT. On the basis of information for other salmonid species, survival of developing WCT embryos is probably inversely related to the amount of fine sediment in the substrate in which the fertilized WCT eggs were deposited (Alabaster and Lloyd 1982). After they emerge from the spawning gravel, WCT fry generally occupy shallow waters near streambanks and other low-velocity areas (e.g., backwaters, side channels) (McIntyre and Rieman 1995). Fry move into main-channel pools as they grow to fingerling size (3 to 5 inches long). Juvenile WCT are most often found in stream pools and runs that have summer water temperatures of 45 to 61° F and a diversity of cover (Fraley and Graham 1981, McIntyre and Rieman 1995). Adult WCT in streams are strongly associated with pools and cover (Shepard *et al.* 1984, Pratt 1984a, Peters 1988, Ireland 1993, McIntyre and Rieman 1995). During winter, adult WCT congregate in pools (Lewynsky 1986, Brown and Mackay 1995, McIntyre and Rieman 1995), while juvenile fish often use cover provided by boulders and other large in-stream structures (Peters 1988, McIntyre and Rieman 1995). During summer in lakes and reservoirs, the primary habitat for rearing and maturation of adfluvial fish, WCT are often found at depths where temperatures are less than 61° F (McIntyre and Rieman 1995).

Genetic integrity. The historic range of WCT occurs both east and west of the Continental Divide in the Missouri, Saskatchewan and Columbia River basins. It is believed that the ancestral WCT moved upstream into the upper Columbia River Basin before geologic events formed impassable waterfalls on the Pend Oreille River near the present-day border between Washington and Idaho (Roscoe 1974, Behnke 1992). In turn, periodic connections between headwater streams allowed WCT from the Columbia River Basin to enter the Missouri and Saskatchewan River basins until soon after the last glacial period (i.e., the Pleistocene Epoch) approximately 7000 to 10,000 years ago (Behnke 1979, 1992, Trotter 1987). As the post-glacial waters receded, however, stocks of WCT east of the Continental Divide became isolated from those in the Columbia River Basin.

The present-day, disjunct WCT stocks in Washington and Oregon may have been deposited there by late-Pleistocene floods (Behnke 1992). Massive floods accompanied periodic bursting of the ice dams that formed glacial Lake Missoula, a large prehistoric lake that was inhabited by WCT and occupied major valleys in present-day western Montana.

Because WCT east of the Continental Divide became reproductively isolated from WCT west of the divide 7000 to 10,000 years ago, it is possible that subsequent evolution has led to genetic differences in WCT between the Missouri and Columbia River basins or among these and other reproductively isolated WCT stocks elsewhere in the historic range of the subspecies. Fish stocks that are reproductively isolated can evolve unique characteristics (i.e., adaptations) that can be important to survival of the stocks (Scudder 1989).

Cutthroat trout of the subspecies that we today recognize as WCT were first described in 1805 by the Lewis and Clark expedition on the basis of specimens caught near the Great Falls of the Missouri River, near the present-day city of Great Falls, Montana (Behnke 1992). However, as recently as the 1970s there was confusion regarding the appropriate taxonomic classification of the WCT (Roscoe 1974). Today, WCT are considered a distinct taxonomic form, distinguishable from the Yellowstone and other subspecies of cutthroat trout on the basis of spotting pattern, karyotype (66 chromosomes), and biochemical characteristics (Behnke 1992). These features separate WCT from the other subspecies of inland cutthroat trout to a substantial degree atypical of fishes representing different taxons within a single species (Allendorf and Leary 1988). The subspecies *Oncorhynchus c. alpestris,* known as the "mountain cutthroat trout," is considered a synonym of WCT. It occurs as disjunct stocks ranging from the John Day River drainage in eastern Oregon into British Columbia (Trotter 1987, Behnke 1992).

Paul Spreull at the University of Montana looked at samples from two populations (Dixie and Roberts creeks) from the Upper John Day and found pure WCT in upstream samples and WCT X rainbow trout hybrids in downstream samples. WCT X rainbow hybrids have also been identified via DNA analysis in Little Indian Creek. Most of the work to-date has been focused on determining species and subspecies purity. While this is a legitimate and important question relevant to genetic and biological conservation, like most biological questions, it is not that simple and a simple answer could be misleading. For example, if we assume WCT are native to the John Day and eastern Washington, they evolved in the presence of native rainbow/steelhead, and some expected background levels of hybridization could occur while still maintaining a more general level of reproductive isolation (e.g., a possibility in Dixie and Roberts creeks). Thus, detection of WCT X rainbow hybrids could be a product of sampling methods, location and size rather than a definitive answer concerning population purity.

Other important considerations regarding WCT in the John Day Subbasin and along the east slope of the Washington Cascades: 1. Rainbow trout and steelhead are native in most drainages where WCT occur, and 2. There is considerable uncertainty about the degree of genetic purity in "native" WCT, particularly in Washington where releases of hatchery WCT have been widespread since the turn of the century. Consequently, WCT X rainbow hybridization may be more of a threat to native rainbow trout populations in areas where WCT have been introduced.

Genetic Risks. Throughout their range, many of the historic habitats of WCT have been extensively colonized by introduced (stocked), nonnative fishes. Among these nonnative species are brook trout, rainbow trout, brown trout and lake trout (*Salvelinus namaycush*). Range-wide, genetic introgression (interbreeding) is considered to be the primary threat to the continued existence of WCT, particularly where they coexist with rainbow trout or Yellowstone cutthroat trout (Liknes and Graham 1988).

However, in the John Day Subbasin, the only introduced species are rainbow trout (from historic stocking, discontinued in 1995 where WCT are present) and brook trout (introduced in the 1930s and now self sustaining). The John Day population has a low threat of genetic introgression. Further, the WCT population is a very small part of the entire WCT distribution (Tim Unterwegner, ODFW, personal communication, April 19, 2004).

Spatial Diversity. In addition to the seasonal movements related to spawning and growth, WCT often move in response to seasonal changes in habitat conditions and habitat requirements. Fluvial and adfluvial WCT have been shown to migrate more than 62 miles in response to habitat needs (Bjornn and Mallet 1964, Liknes 1984). For example, there can be considerable movement to suitable pools used as overwintering habitat (Brown and Mackay 1995). Among resident WCT in tributaries, less extensive, seasonal movements may be made in response to changing habitat requirements and conditions, particularly water temperature. Westslope cutthroat trout may move relatively little in stream reaches that have numerous pools (Peters 1988), whereas movement can be more extensive in stream reaches with few pools (Lewynsky 1986, Peters 1988, McIntyre and Rieman 1995).

During their evolutionary history in the Columbia River Basin, WCT shared habitats with several piscivorous (i.e., fish-eating) fish species, namely northern pikeminnow (*Ptychocheilus oregonensis)*, bull trout, chinook salmon, and rainbow trout and their sea-run form, steelhead. In the Missouri River Basin, where WCT have probably occurred for 7000 to 10,000 years (Behnke 1992), the subspecies formerly coexisted with fewer species of fish, all of them essentially nonpiscivorous (e.g., Arctic grayling {*Thymallus arcticus*} and mountain whitefish {*Prosopium williamsoni*}). In both river basins, WCT also coexisted with sculpins (*Cottus* spp.), suckers (*Catostomus* spp.), and dace (*Rhinichthys* spp.) and other minnows.

<u>Westslope Cutthroat Trout Distribution</u>

Current Distribution. The John Day Subbasin consists of two major watersheds with WCT occupation: the Upper Mainstem John Day and the upper North Fork John Day. Resident WCT are the dominant life history form present; however, recent research has indicated larger, possibly fluvial life forms are present in the mainstem John Day River. Westslope cutthroat trout distribution overlaps with resident redband trout, with WCT generally being found in reaches with higher gradient, cooler temperatures and greater amounts of large woody debris. Westslope cutthroat trout distribution in the John Day Subbasin also overlaps with bull trout, steelhead trout and chinook salmon. Hybridization and introgression between WCT and redband trout has been noted in areas where overlapping distribution occurs. Figure 31 illustrates the regional distribution across the western states. Figure 32 illustrates WCT distribution in the John Day Subbasin.

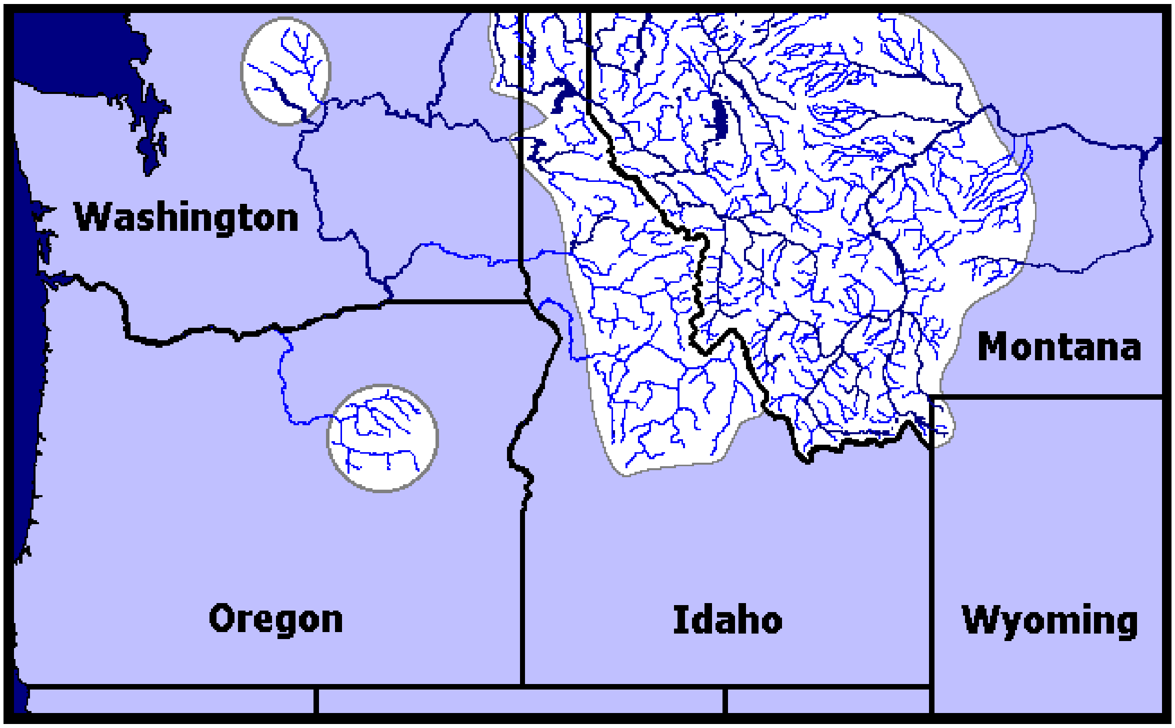


Figure 31. Westslope cutthroat trout distribution across the west.

Upper Mainstem John Day River Watershed. Hemmingsen and Gray (1999 draft) reported WCT distribution in the Upper Mainstem John Day River. The Malheur National Forest provided an updated WCT distribution map that contains additional WCT records, including presumed seasonal habitat distribution. Based on the Malheur distribution map, resident WCT currently occupy: 1) Fields Creek and tributaries, 2) Moon Creek, 3) McClellan Creek, 4) Ingle Creek, 5) Laycock Creek, 6) Canyon Creek and tributaries, 7) Little Pine Creek, 8) Dog Creek, 9) Pine Creek, 10) Indian Creek and tributaries, 11) Strawberry Creek and tributaries, 12) Upper John Day River and tributaries (including major tributaries: Graham, Call, Roberts, Reynolds, Deardorff, and Rail creeks), 13) Dixie Creek and tributary 14) Bear Creek, 15) Beech Creek and tributaries, 16) Birch Creek, and 17) Belshaw Creek. Portions of a total of 64 rivers, streams and tributaries are occupied either year-round (approximately 197 miles) or seasonally (an additional 94 miles) by WCT. Seasonal WCT habitat includes the lower portions of most of these occupied tributaries, an additional tributary without resident WCT (Widows Creek) and the mainstem John Day River downstream to Widows Creek (between the towns of Dayville and Mount Vernon). These "seasonal" zones appear to be habitat for wandering or migratory WCT. Hemmingsen and Gray (1999) conservatively estimate WCT occupying at least 221 miles across 41 streams.

Data generated by the ICBEMP (1996) predicts that 33 HUC5 watersheds occur in the mainstem John Day River within the current range of WCT. Westslope cutthroat trout presence is known within 17 HUC5 watersheds; while 13 HUC5 watersheds are known to not contain WCT. Further, the ICBEMP model predicts an additional two HUC5 watersheds contain WCT and one additional HUC5 watershed does not contain WCT (ICBEMP 1996). All WCT-occupied HUC5 watersheds in the mainstem John Day are predicted or known to have "depressed" WCT populations.

Resident WCT distribution overlaps with resident bull trout habitat in Indian Creek, the Upper Mainstem John Day River and the tributaries to the Upper Mainstem John Day River (Roberts, Call, Rail, Reynolds, and Deardorff creeks) for a total of 47.5 miles. Seasonal WCT distribution overlaps with migratory bull trout habitat throughout the Upper Mainstem John Day River downstream to the town of John Day (approximately 42 additional miles). Cursory analysis indicates bull trout and WCT occur sympatrically in the mainstem John Day River and its tributaries wherever bull trout are found (overlap between these two species, for resident and migratory forms, is approximately 90 miles). Westslope cutthroat trout are substantially more widely distributed than bull trout in the Upper Mainstem John Day River. Table 56 contains occupancy by fish use by land ownership in the Upper John Day River.

Table 56. Mileages of WCT Occupancy, Land Ownership - Upper John Day River.

Fish Use – Ownership	WCT Occupancy
Resident - Private Lands	71 miles
Resident - Public Lands	126 miles
Resident - Total	197 miles
Seasonal - Private Lands	94 miles
Seasonal - Public Lands	0 miles
Seasonal - Total	94 miles
Combined Mileage	291 miles

Resident WCT are the one known life-history form found in the Upper John Day River watershed. Resident fish occur in upper, forested reaches of the above streams. Larger, possibly migratory forms have only been found in the well-connected, upper headwaters area (at the confluence of Call, Rail, Reynolds, Roberts, Deardorff and Graham creeks with the mainstem John Day River), and in mainstem riverine habitats downstream in the broad river valley. Resident forms are often isolated in single streams, separated from other stocks by distance and habitat conditions. However, numerous stocks in the Upper John Day River exhibit occupation of multiple, connected tributary streams that are, as a group, isolated from other, single stream stocks by geographic distance and habitat conditions. This connectivity is important to avoid isolation and protect the interconnected stocks from cumulative watershed effects (Hemmingsen and Gray 1999 draft). No information is available regarding WCT spawning locations in the Upper Mainstem John Day River or its tributaries.

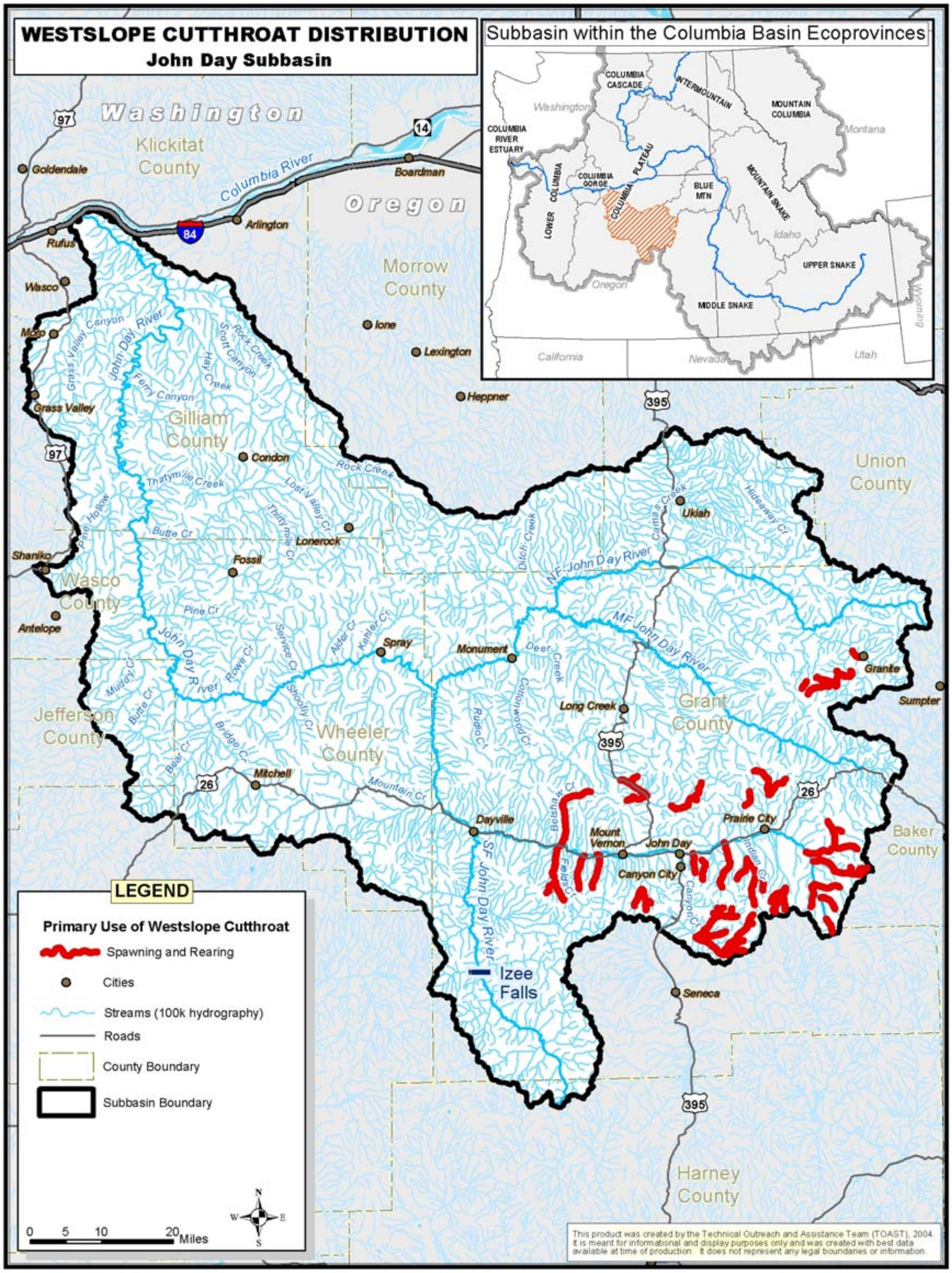


Figure 32. Distribution of westslope cutthroat in the John Day Subbasin.

Malheur National Forest file information indicates that WCT numbers in the Upper John Day, Prairie City and Canyon Creek HUC5 watersheds (Upper Mainstem John Day River; Graham, Roberts, Call, Rail, Reynolds, Deardorff, Strawberry, Indian, Pine, Dog, Little Pine, Canyon, Dixie and Bear creeks) were "relatively strong" (based on subjective field observations), while WCT numbers in the Beech Creek, Mount Vernon and Fields HUC5 watersheds (Fields, Moon, McClellan, Ingle, Laycock, Beech, Birch and Belshaw creeks) were "generally lower." Kostow (1995) reported, based on juvenile fish trap data at irrigation diversions, a recent downward trend in WCT abundance. However, these data may not be an accurate measure of population trends.

Upper North Fork John Day River Watershed. Confusion exists as to the origin of WCT found in the North Fork John Day River watershed. No genetic data are available for these fish. ICBEMP (1996) analysis indicates all North Fork John Day WCT stocks were introduced. Hemmingsen and Gray (1999 draft) indicate at least some of the North Fork John Day WCT stocks may be either introduced WCT or another cutthroat subspecies (Lahontan and Yellowstone cutthroat have been stocked in certain North Fork John Day reservoirs in the past). Jim Hewkin (retired ODFW District Biologist) transplanted 100 WCT from Deardorff Creek (upper mainstem tributary) to Clear Creek (a tributary to Granite Creek) and 100 to South Fork Desolation Creek in 1960. Both Clear Creek and Desolation Creek are in the North Fork John Day watershed. This transplant was documented in the 1960 annual report for the John Day District. Even though these are "introduced" populations, it is believed they are important for reducing risks to the overall population and for WCT recovery efforts overall (Tim Unterwegner, ODFW, personal communication, April 19, 2004). For purposes of this analysis, it is assumed that these fish are WCT.

The Malheur NF also provides a WCT distribution map for the upper North Fork John Day River, based on previous U.S. Forest Service and ODFW stream surveys, indicating WCT occupy South Fork Desolation Creek, Lake Creek and tributary, and Clear Creek and tributaries (portions of eight streams). Hemmingsen and Gray (1999 draft) indicate WCT occupy portions of seven streams. ODFW records indicate that cutthroat trout found in the Olive Lake area (Lake Creek watershed) may have been brought there from outside the state (Kostow 1995 indicated Lahontan cutthroat trout have been stocked in Olive Lake. Hemmingsen and Grey (1999) indicate both Lahontan and Yellowstone cutthroat have previously been stocked in Olive Lake). Within the upper North Fork John Day River, WCT are found almost exclusively on Umatilla National Forest lands. Bull trout overlap with WCT in 13 miles of stream in the North Fork John Day River watershed.

Little summarized information is available for North Fork John Day WCT. Historic distribution data is not available and ICBEMP (1996) analysis indicates all stocks are introduced. Resident fish occur in the above drainages; however, no information was available regarding presence of migratory forms or seasonal distributions of WCT. No information is available regarding WCT spawning locations.

Data generated by ICBEMP (1996) predicts that 10 subwatersheds occur in the North Fork John Day River within the current range of WCT. Westslope cutthroat trout presence is known within 4 subwatersheds, and 6 subwatersheds have no information (ICBEMP 1996). All occupied subwatersheds in the North Fork John Day River watershed are predicted or known to have "depressed" WCT populations.

In summary, WCT occur in about 51 tributaries or stream reaches that collectively encompass 315 linear miles of stream habitat, distributed between 2 watersheds in the John Day River drainage.

Historic Distribution. The historic distribution of WCT (Behnke 1992) in streams and lakes is not known precisely but can be summarized as follows: west of the Continental Divide, the subspecies is native to several major drainages of the Columbia River Basin, including the upper Kootenai River drainage from its headwaters in British Columbia, through northwest Montana, and into northern Idaho; the Clark Fork River drainage of Montana and Idaho downstream to the falls on the Pend Oreille River near the Washington-British Columbia border; the Spokane River above Spokane Falls and into Idaho's Coeur d'Alene and St. Joe River drainages; and the Salmon and Clearwater River drainages of Idaho's Snake River Basin. The historic distribution of WCT also includes disjunct areas draining the east slope of the Cascade Mountains in Washington (Methow River and Lake Chelan drainages), the John Day River drainage in northeastern Oregon, and the headwaters of the Kootenai River and several other disjunct regions in British Columbia. East of the Continental Divide, the historic distribution of WCT includes the headwaters of the South Saskatchewan River drainage (U.S. and Canada); the entire Missouri River drainage upstream from Fort Benton, Montana, and extending into northwest Wyoming; and the headwaters of the Judith, Milk, and Marias rivers, which join the Missouri River downstream from Fort Benton. The historic range of WCT is considered the most geographically widespread among the 14 subspecies of inland cutthroat trout.

Historic WCT distribution is anecdotal at best. No tributaries currently absent of WCT are known to have supported these fish in the past (ICBEMP 1996). However, Kostow (1995) reported "suspected" historical WCT habitat has been reduced 59%, based on assumptions (no substantive evidence) that WCT had a wider historical distribution in the North Fork and Middle Fork John Day watersheds. The distribution of WCT in various branches of the John Day River system may have been much further downstream than at present. Descriptions of the mainstem river valley by explorers and trappers such as Peter Skene Ogden indicate conditions suitable to these fish prior to European settlement of the West. Likewise, distribution of year-round resident fish in the valley and foothill reaches of tributaries may have been reduced from the historic distribution due to habitat alteration.

Identification of differences in distribution due to human disturbance.

Upper John Day River Watershed. Kostow (1995) reported mainstem John Day River drainage habitat modifications due to changes in stream channel structure, loss of riparian vegetation, dewatering and changes in the hydrographs of the mainstem and major tributaries. These habitat modifications were caused by agricultural development, irrigation diversions, livestock grazing and timber harvest. In the majority of occupied tributary streams, habitat modifications, especially on private lands, have probably shifted WCT distribution to upstream reaches, further exacerbating geographic isolation. However, in tributaries where WCT co-exist with bull trout, WCT have a greater downstream distribution, possibly indicating greater WCT tolerance than bull trout to modified habitat conditions.

Aforementioned habitat modifications have effectively isolated WCT in certain tributary systems for at least the warmer months due to warm water and low streamflows (Kostow 1995). While seasonally impassable physical barriers to WCT passage (i.e., irrigation diversion dams) often occur in the mainstem John Day River, occupied tributary streams do not exhibit WCT physical passage barriers, except for Strawberry Creek. A total of 62 water diversions with associated fish screens and passage features are present within occupied resident or migratory WCT habitat in the Upper Mainstem John Day River key watershed. It is unknown how many additional diversions without fish screening facilities exist in this key watershed, or the efficacy of existing fish screening and passage features at allowing unhindered fish movement during periods of operation.

WCT in the upper mainstem headwaters area (Graham, Roberts, Call, Rail, Reynolds, Deardorff creeks) exist within a "checkerboard" of public (Malheur National Forest) and private (mostly commercial timberlands, with some stream bottom pasture lands) land ownership. Due to this land ownership pattern, harvest on private timberlands is considered a potential threat to WCT in this area of the watershed. However, the highly-connected streams of this portion of the watershed would allow for rapid WCT recolonization.

Upper North Fork John Day River Watershed. A dirt road parallels the lower portion of WCT occupation along Clear Creek, and a road system accesses Olive Lake on Lake Creek near the lower portion of WCT occupation. Mines and access roads are located at the headwaters of tributaries to South Fork Desolation and West Fork Clear creeks. No other occupied WCT reach in this drainage is readily accessible to motorized travel. Forest Service file maps also indicate at least one diversion, for placer mining purposes, on East Fork Clear Creek. Two reservoirs (Olive Lake and Upper Reservoir) are located on Lake Creek; WCT distribution occurs above, between, and below these two reservoirs. No upstream passage is provided at these reservoirs. Extensive mining sites (placer and hard rock) historically and currently occur on or near several occupied tributaries. A majority of occupied WCT habitat in this drainage (85 %, or approximately 20 miles) is completely surrounded by, or has one stream bank directly adjacent to, either the Vinegar Hill-Indian Rock Scenic Area or North Fork John Day Wilderness Area.

<u>Description of Aquatic Introductions, Artificial Production and Captive Breeding Programs.</u>

Current Introductions and Production. Westslope cutthroat trout is not currently being introduced into the subbasin. There are no artificial production activities in the subbasin.

Historic Introductions and Production. Historically, WCT have been introduced into the John Day Subbasin. Approximately 100 WCT taken from Deardorff Creek, a mainstem John Day River tributary, were stocked into South Fork Desolation Creek and another 100 were stocked into Clear Creek by ODFW in 1960. These were stocked in an attempt to re-establish populations of fish after spruce budworm spraying occurred in 1958. ODFW records indicated Olive Lake was planted with WCT from Twin Lakes in the 1970s. The WCT in Twin Lakes originated from WCT taken from Washington. This stocking likely explains why WCT are now found in Lake Creek, which drains Olive Lake. Further details of past introductions of WCT are included in the "Current Distribution" section above.

Streams in the John Day were also stocked with what were presumed to have been Yellowstone cutthroat, although WCT were also cultured at the Yellowstone Hatchery. Consequently, populations identified as "pure" may still be the product of hatchery introductions.

The historical record on the presence of native WCT in the subbasin is not clear. Though it is certain that WCT have been stocked in the subbasin, there is no hard evidence indicating WCT were not indigenous to the subbasin. Stephanie Gunckel (2002) did an extensive literature review and interviewed many long time residents of the John Day Valley, who have no recollection of bringing westslope cutthroat into the subbasin. WCT's widespread distribution in the upper mainstem (16 tributaries) is an indication they have been here for a very long time. Brook trout were introduced about the same time as the alleged stocking of Yellowstone cutthroat by the Deardorff family, and they are restricted to relatively small reaches in two streams. (Tim Unterwegner, ODFW, personal communication, April 19, 2004).

Ecological Consequences of Artificial Production and Introduction. Today, many of the historic habitats of WCT have been extensively colonized by introduced (stocked) nonnative fishes. Among these nonnative species are brook trout, rainbow trout, brown trout and lake trout (*Salvelinus namaycush)*. Griffith (1988) considered brook trout to be the most significant competitor with all subspecies of cutthroat trout in streams, leading to the elimination of WCT in some areas. There are introduced brook trout in the John Day Subbasin, but they are limited to two streams: the upper reaches of Canyon Creek and the Upper Mainstem John Day River. The significance of impacts of brook trout introductions on WCT has not been evaluated. However, it is the professional opinion of Tim Unterwegner (Unterwegner, ODFW, personal communication, April 19, 2004) that the impacts are isolated to only those areas where brook trout are found. The problem is much more severe in upper Canyon Creek than in the Upper Mainstem John Day watershed, as upper Canyon Creek has a reservoir that is conducive to brook trout growth.

Nonnative fish species and subspecies can also pose threats to the genetic integrity of WCT. Liknes and Graham (1988) considered genetic introgression (interbreeding), particularly with rainbow trout or Yellowstone cutthroat trout, to be the primary threat to the continued existence of WCT where these species coexist. In the John Day Subbasin, where redband and steelhead overlap with WCT and are native, the threat of introgression is not significant. The reduction in WCT distribution associated with loss of habitat, reduced streamflows, warmer water temperatures in the summer, loss of off channel habitat and channelization; and further restriction of redband/steelhead distribution into the best habitat quality areas occupied by cutthroat has probably contributed to the threat of introgression.

Relationship between Naturally and Artificially-Produced Populations. During their evolutionary history in the Columbia River Basin, WCT shared habitats with several piscivorous (i.e., fish-eating) fish species, namely northern pikeminnow *Ptychocheilus oregonensis*, bull trout, chinook salmon, rainbow trout and their sea-run form, steelhead. In the Missouri River Basin, where WCT have occurred for probably 7000 to 10,000 years (Behnke 1992), the subspecies formerly coexisted with fewer species of fish, all of them essentially nonpiscivorous (e.g., Arctic grayling *Thymallus arcticus* and mountain whitefish *Prosopium williamsoni)*. In both river basins, WCT also coexisted with sculpins *Cottus* spp., suckers *Catostomus* spp., and dace *Rhinichthys* spp. and other minnows. Today, many of the historic habitats of WCT have been extensively colonized by introduced (stocked), nonnative fishes. Among these nonnative species are brook trout, rainbow trout, brown trout and lake trout *Salvelinus namaycush*. Griffith (1988) considered brook trout to be the most significant competitor with all subspecies of cutthroat trout in streams, leading to the elimination of WCT in some areas.

<u>Harvest in the Subbasin.</u>

In the Upper John Day River Watershed, ODFW biologists indicate a lack of a "targeted" WCT fishery due to a combination of small size of resident WCT and land ownership patterns/topographic features restricting or precluding angler access. In addition, ODFW stocking programs and angling regulations are currently designed to emphasize lake and pond fisheries, further minimizing possible over-harvest of exclusively stream-resident WCT.

In the Upper North Fork John Day River Watershed, Granite Creek and most of its tributaries are currently closed to angling to protect chinook salmon. However, Lake Creek and South Fork Desolation Creek are open to angling and are managed under a five-fish daily bag with an eight-inch minimum-size limit. However, there is no hatchery stocking program and no targeted fishery on either Desolation or South Fork Desolation Creek, due to a combination of small size of resident WCT and land ownership patterns/topographic features restricting or precluding angler access.

No information is available on historic harvest.

<u>Environmental Conditions for Aquatic Focal Species.</u>

Characterization of Historic. WCT currently occupy about 33,500 miles (59%) of the nearly 56,500 miles of historically-occupied habitats. However, the genetic status of WCT across all this area has not been determined by genetic testing. WCT currently occupy over 18,000 miles in Idaho (95% of historical), almost 13,000 miles in Montana (39% of historical), about 250 miles in Oregon (21% of historical), and almost 2000 miles in Washington (66% of historical).

Characterization of Current.

Upper John Day River Watershed. Habitat modifications have effectively isolated WCT in certain tributary systems for at least the warmer months due to warm water and low streamflows (Kostow 1995). While seasonally-impassable physical barriers to WCT passage (i.e., irrigation diversion dams) often occur in the mainstem John Day River, occupied tributary streams do not exhibit WCT physical passage barriers, except for Strawberry Creek. A total of 62 water diversions with associated fish screens and passage features are present within occupied resident or migratory WCT habitat in the Upper Mainstem John Day River key watershed. It is unknown how many additional diversions without fish screening facilities exist in this key watershed, or the efficacy of existing fish screening and passage features at allowing unhindered fish movement during periods of screen operation.

WCT in the upper mainstem headwaters area (Graham, Roberts, Call, Rail, Reynolds and Deardorff creeks) exist within a "checkerboard" of public (Malheur National Forest) and private (mostly commercial timberlands, with some stream bottom pasture lands) land ownership. Due to this land-ownership pattern, harvest on private timberlands is considered a potential threat to WCT in this area of the watershed. However, the highly-connected streams of this portion of the watershed would allow for rapid WCT recolonization.

Upper North Fork John Day River Watershed. A dirt road parallels the lower portion of WCT occupation along Clear Creek, and a road system accesses Olive Lake on Lake Creek near the lower portion of WCT occupation. Mines and access roads are located at the headwaters of tributaries to South Fork Desolation and West Fork Clear creeks. No other occupied WCT reach in this drainage is readily accessible to motorized travel. Malheur National Forest records also indicate at least one diversion, for placer mining purposes, on East Fork Clear Creek. Two reservoirs (Olive Lake and Upper Reservoir) are located on Lake Creek; WCT distribution occurs above, between, and below these two reservoirs. No upstream passage is provided at these reservoirs. Extensive mining sites (placer and hard rock) historically and currently occur on or near several occupied tributaries. A majority of occupied WCT habitat in this drainage (85 %, approximately 20 miles) is completely surrounded by, or has one stream bank directly adjacent to, either the Vinegar Hill-Indian Rock Scenic Area or North Fork John Day Wilderness Area.

Characterization of Potential and Estimated Reference Condition for Long-Term Sustainability. Federal regulations that protect WCT and their habitat in Oregon include CWA; NEPA; FLPMA; INFISH and PACFISH; and National Forest Management Plans. In addition, Endangered Species Act Section 7 actions directed toward the protection of listed bull trout and Mid-Columbia River steelhead and their habitats will also afford benefits to WCT.

In the John Day River drainage, ODFW surveys have been conducted since 1990 for WCT (Gray, *in litt.* 1998). These data are beneficial in ODFW, USFS, USFWS and others' analyses of project impacts to WCT. Bonneville Power Authority funding has been provided for ongoing fish-screen maintenance activities and has assisted in riparian and in-water habitat restoration activities along the mainstem John Day River, above the town of John Day.

Bull trout, listed as a threatened species in 1998, provide additional Endangered Species Act protection to aquatic habitats co-occupied by bull trout and WCT. Within the mainstem John Day River drainage, a total of 24% (47.5 miles) of resident WCT distribution and 45% (42 miles) of seasonal WCT distribution is sympatrically occupied by either resident or migratory bull trout (Pence, *in litt.* 1998). A total of 56% (13 miles) of WCT distribution in the North Fork John Day River watershed overlaps with bull trout. The listing of bull trout has resulted in additional awareness and diligence on the part of numerous agencies, including USFS, BLM, ODFW, Oregon Department of Forestry and Oregon Division of State Lands.

Westslope cutthroat trout occupy several protected areas, including the Strawberry and North Fork John Day Wilderness areas, and the Vinegar Hill-Indian Rock Scenic Areas. A total of approximately 44 miles of stream is within these protected areas, representing approximately 20% of current resident habitat in these two watersheds (approximately 20 miles [85%] in protected areas for North Fork John Day watershed and approximately 24 miles [12 %] in protected areas for mainstem John Day River drainage).

Characterization of Future with No New Actions. Many of the remaining WCT stocks are restricted to small, headwater streams in mountainous areas where the adverse effects of human activities on WCT and its habitat have often been negligible. This is especially true for many of the remaining, genetically-pure WCT stocks (e.g., Shepard *et al.* 1997). Such spatial separation precludes natural movement and interbreeding among stocks, however, thereby increasing the likelihood that some stocks will become extinct due to limited genetic variability. In addition, the probable small sizes of these individual WCT stocks and the short stream reaches that they might inhabit make individual stocks more vulnerable to extirpation due to natural catastrophes such as floods, landslides, wild fires and other stochastic environmental effects.

Despite the probable small sizes of the WCT stocks that inhabit these confined stream reaches, however, evidence of inbreeding depression in extant WCT stocks has not been found. Inbreeding depression would be anticipated if the effective population size (i.e., the number of breeding-age adults) of a WCT stock was too small and repeated inbreeding occurred, leading to accumulation and dominance of certain alleles (i.e. phenotypic expressions of a gene) and loss of genetic diversity. Thus, there is no evidence that the probable small effective population size of some WCT stocks is resulting in genetic changes that could have adverse effects on stock viability.

Similarly, although the probable small sizes of these individual WCT stocks and the short stream reaches that they might inhabit make individual stocks more vulnerable to extirpation due to floods, landslides, wild fires and other stochastic environmental effects, this review found no evidence that contemporary WCT stocks have been lost as the result of such natural catastrophes.

3.2.5 Terrestrial Focal Species Population Delineation and Characterization

Present Distribution and Population Data

Species accounts for the 11 terrestrial focal species are included in Appendix D (See Section 3.2.2 for a description of how the focal species – both terrestrial and aquatic – were selected.). These accounts discuss and illustrate range-wide the characterization and distribution for each focal species.

This section includes maps showing habitat potential within the John Day Subbasin for all focal species (Figures 33 through 39) except: American beaver, Columbia spotted frog, great blue heron and yellow warbler. Habitat potential maps are not available for these riparian-related species because data of sufficient resolution is not available for these "linear" habitats. In addition, the aquatic assessment in this plan deals entirely with the riparian habitat type that covers these four riparian terrestrial species. These terrestrial species receive numerous indirect benefits from riparian recovery projects.

These habitat potential maps (they are not distribution maps) for the terrestrial focal species were produced through three steps by the Oregon Natural Heritage Information Center. First, a species distribution map was produced using sixth field watershed refinements. Second, an updated vegetation layer was created from numerous sources. This vegetation layer identified habitat needs for each of the terrestrial species. Third, a simple habitat suitability index was created for the habitat types in the vegetative layer. The result of this modeling process was a data set that allowed mapping of habitat quality for each terrestrial focal species on a "ramped" scale from poor to excellent. Again, these are the habitat potential maps displayed in Figures 33 through 39.

Locally Extirpated and Introduced Species

A number of terrestrial wildlife species have been extirpated from the John Day Subbasin, including the Columbia sharp-tailed grouse, the gray wolf, the grizzly bear and the California bighorn sheep. Columbia sharp-tailed grouse were extirpated from Oregon in the 1960s due to a combination of factors, including over-hunting in the mid- to late- 19th century, the conversion of native habitats to crop production and habitat degradation from livestock grazing (Hays *et al.* 1998, Crawford and Coggins 2000). Sage grouse, a species dependent on shrub-steppe habitat, were extirpated from the John Day Subbasin by 1955 because of habitat conversion, overgrazing and over-hunting (Stinson *et al.* 2003). The gray wolf and grizzly bear were both extirpated from the subbasin by the 1940s, primarily due to predator control efforts. California bighorn sheep were extirpated from Oregon by 1915 due to over-hunting, unregulated domestic livestock grazing, and parasites and diseases carried by domestic livestock. However, these sheep have been successfully reintroduced in many areas of the John Day Subbasin (ODFW 2003b).

A large number of terrestrial wildlife species have been introduced to the John Day Subbasin, both intentionally and accidentally. Non-native gamebirds introduced into the subbasin to provide recreational activities include the ring-necked pheasant, wild turkey, California quail, chukar, and Hungarian partridge. Because these species are popular game species in the John Day Subbasin, wildlife managers in the subbasin work to maintain their populations. However, populations of many of these species have been declining in the last 20 to 30 years for a variety of reasons, including changes in agricultural practices, non-native weed invasions and weather variability (ODFW 1999).

Other species intentionally introduced as game animals in the John Day Subbasin or in adjacent subbasins include the bullfrog, the Virginia opossum, the eastern fox squirrel, and the European red fox. Bullfrogs are particularly problematic in the area due to their negative effects on native amphibian species. In fact, their introduction is considered a major factor in the decline of many of these species (Csuti *et al.* 1997). As a result of their aggressive behavior and rapid growth rate, bullfrogs out-compete native amphibians (Corkran and Thoms 1996). In addition, they are voracious predators, often eating the eggs, tadpoles and adults of native frog species. In the John Day Subbasin, the bullfrog's preferred habitat is similar to that of many other amphibians native to the John Day Subbasin, especially to that of the Columbia spotted frog. The Virginia opossum can also negatively impact native wildlife. As opportunistic feeders, they often consume a variety of small birds, mammals, and reptiles (Csuti *et al*. 1997).

Two non-native bird species common in the John Day Subbasin and virtually everywhere else in the United States are the European starling and the house sparrow. Intentionally introduced in the 1800s from Europe, these birds are aggressive competitors for nesting cavities. They commonly out-compete native cavity-nesting birds, and are known to destroy nests and eggs and kill nestlings and adults while taking over nest sites.

Two non-native mammalian species closely associated with humans globally also occur in the John Day Subbasin. The Norway rat and house mouse are found in cities and towns of the subbasin, but their prevalence and their effect on native wildlife in the subbasin are not known.

Other non-native animals common in the John Day Subbasin are pet animals that escape or are intentionally released. Common feral animals in the subbasin include cats, dogs, and red eared slider turtles. Cats, in particular, are known to have negative impacts on terrestrial wildlife, such as birds, rodents and reptiles, an effect that can be magnified in fragmented landscapes (Crooks and Soulé 1999). Introduced or escaped exotic mammals such as Mouflon and barbary sheep also pose significant health and potential genetic risks to native California bighorn sheep (Darren Brunings, ODFW, personal communication, May 24, 2004). Feral horses occur in significant numbers in the John Day Subbasin.

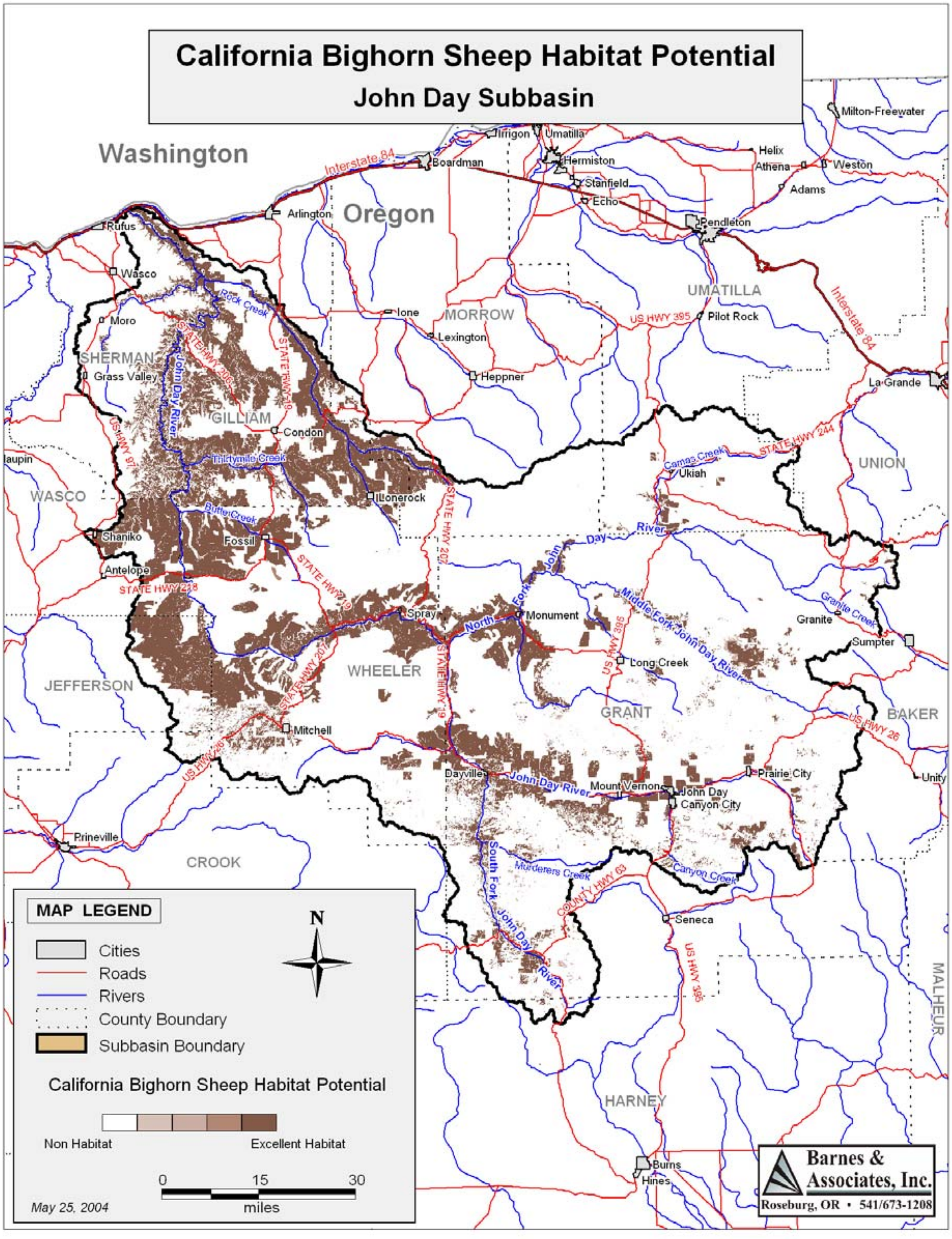


Figure 33. California bighorn sheep habitat potential in the John Day Subbasin.

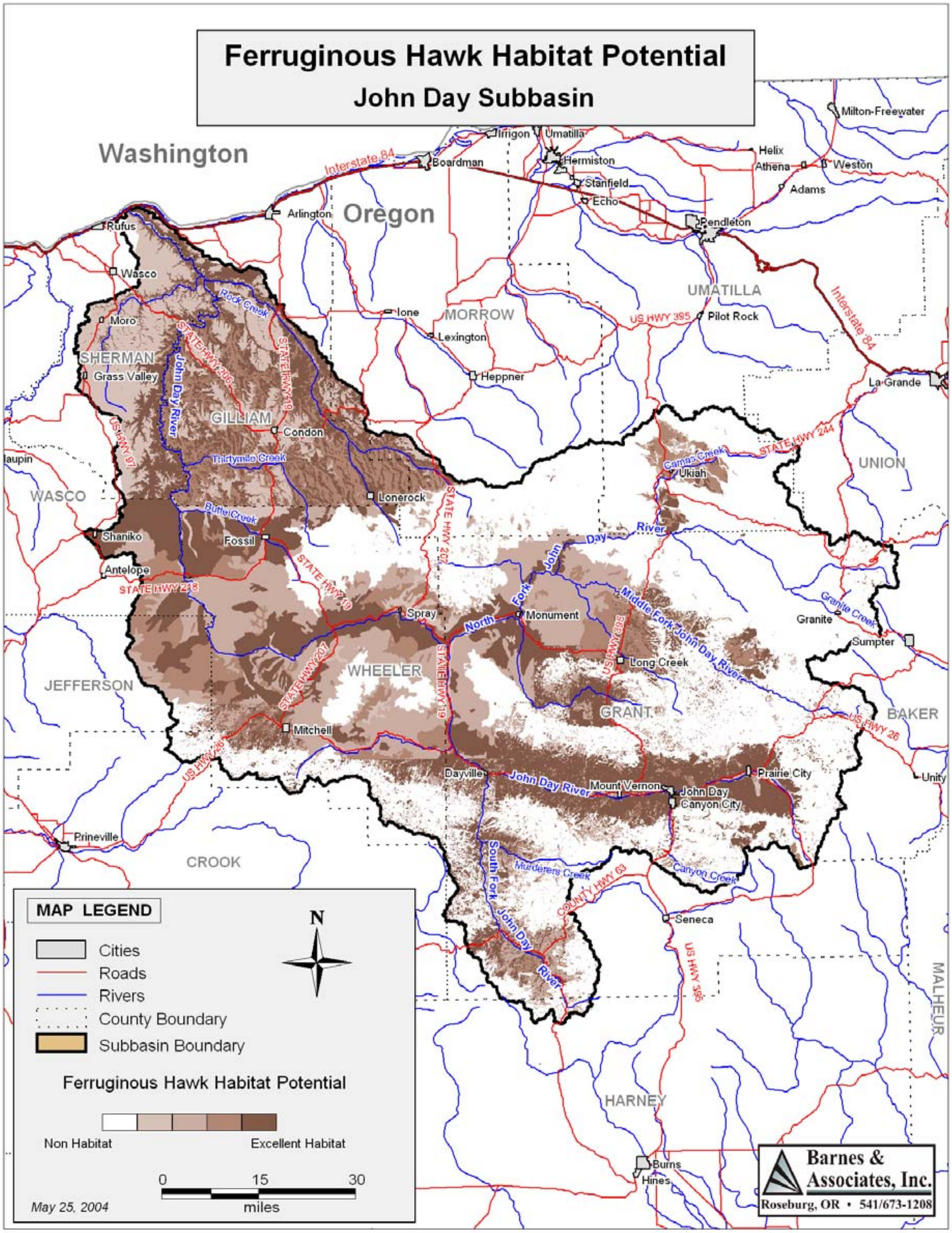


Figure 34. Ferruginous hawk habitat potential in the John Day Subbasin.

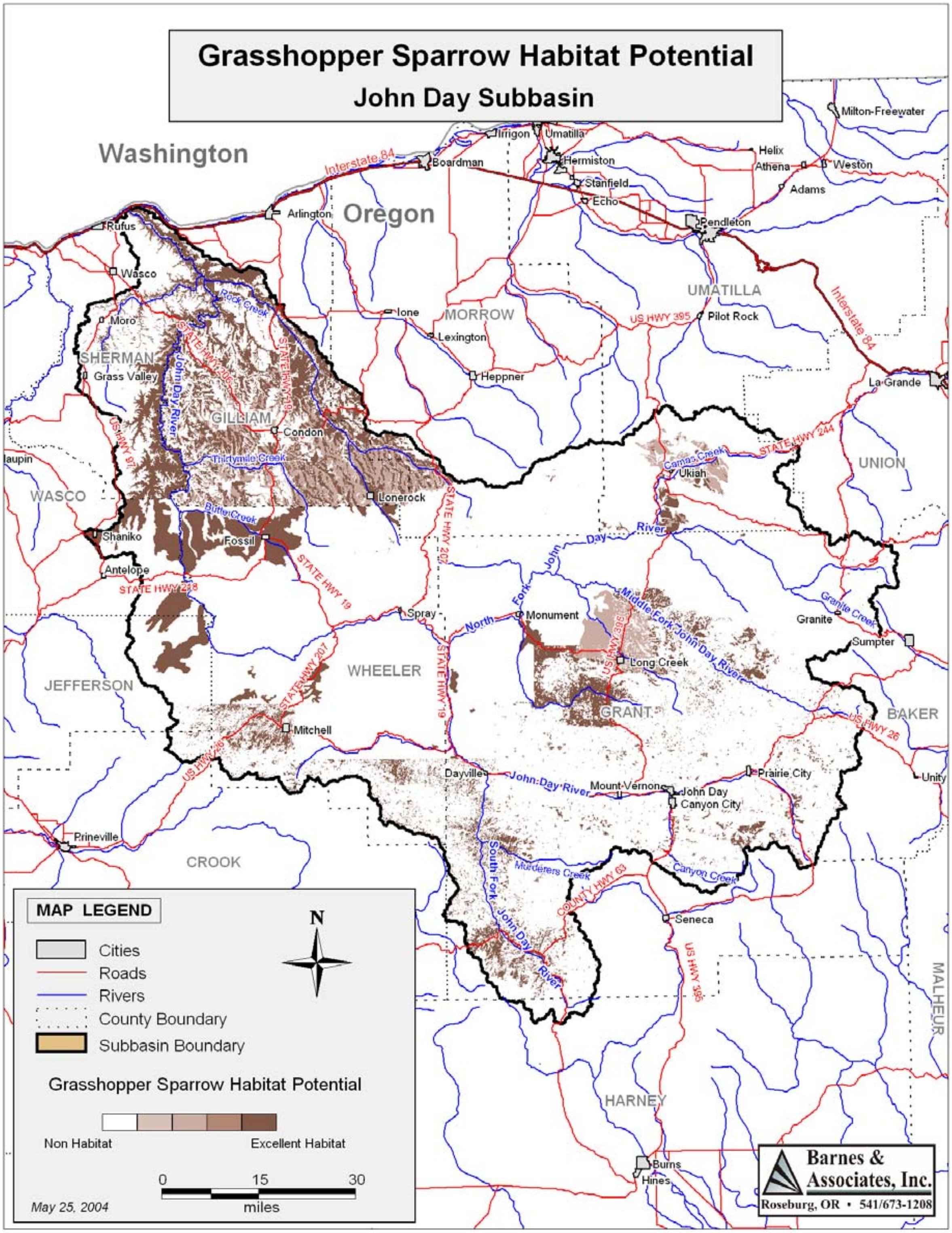


Figure 35. Grasshopper sparrow habitat potential in the John Day Subbasin.

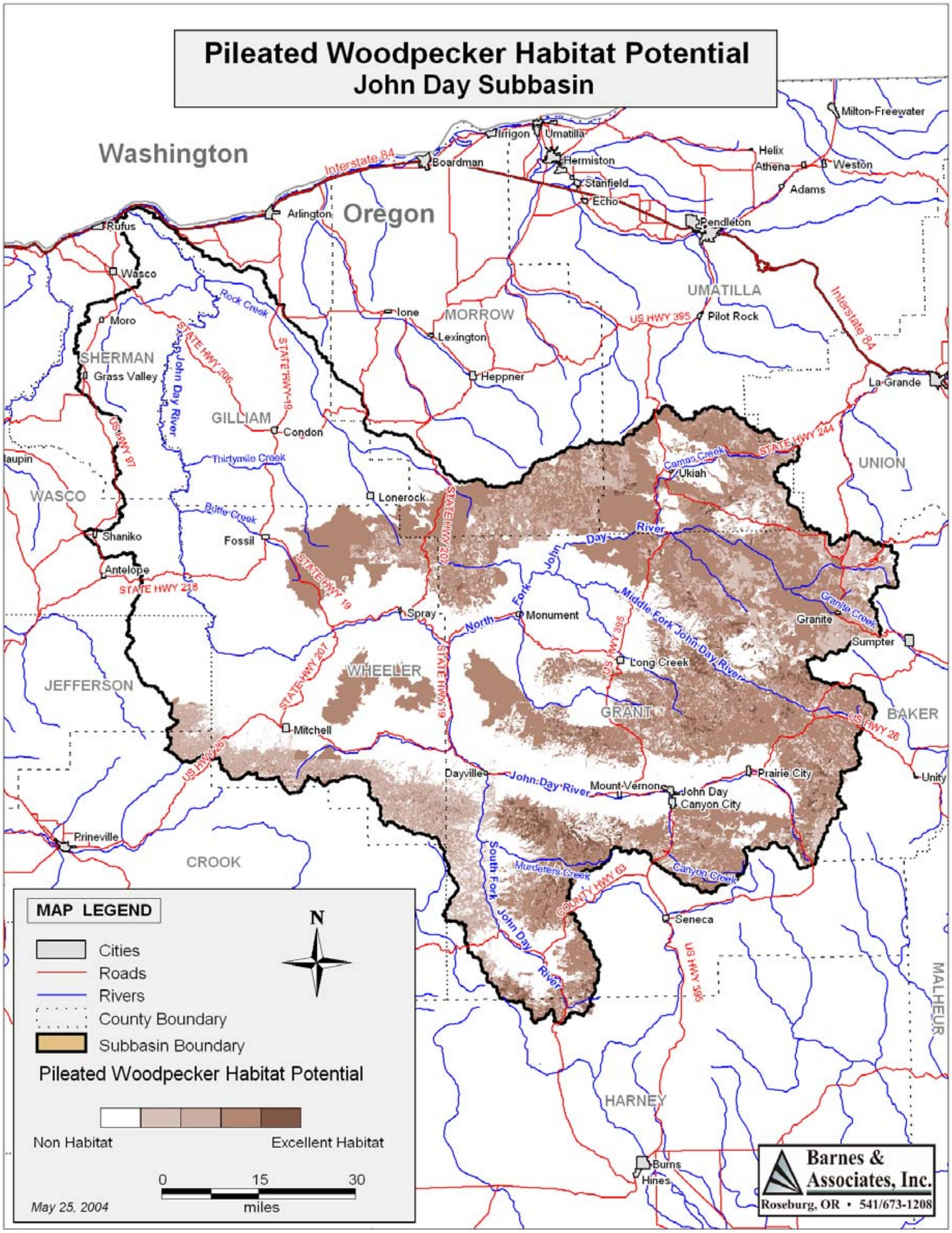


Figure 36. Pileated woodpecker habitat potential in the John Day Subbasin.

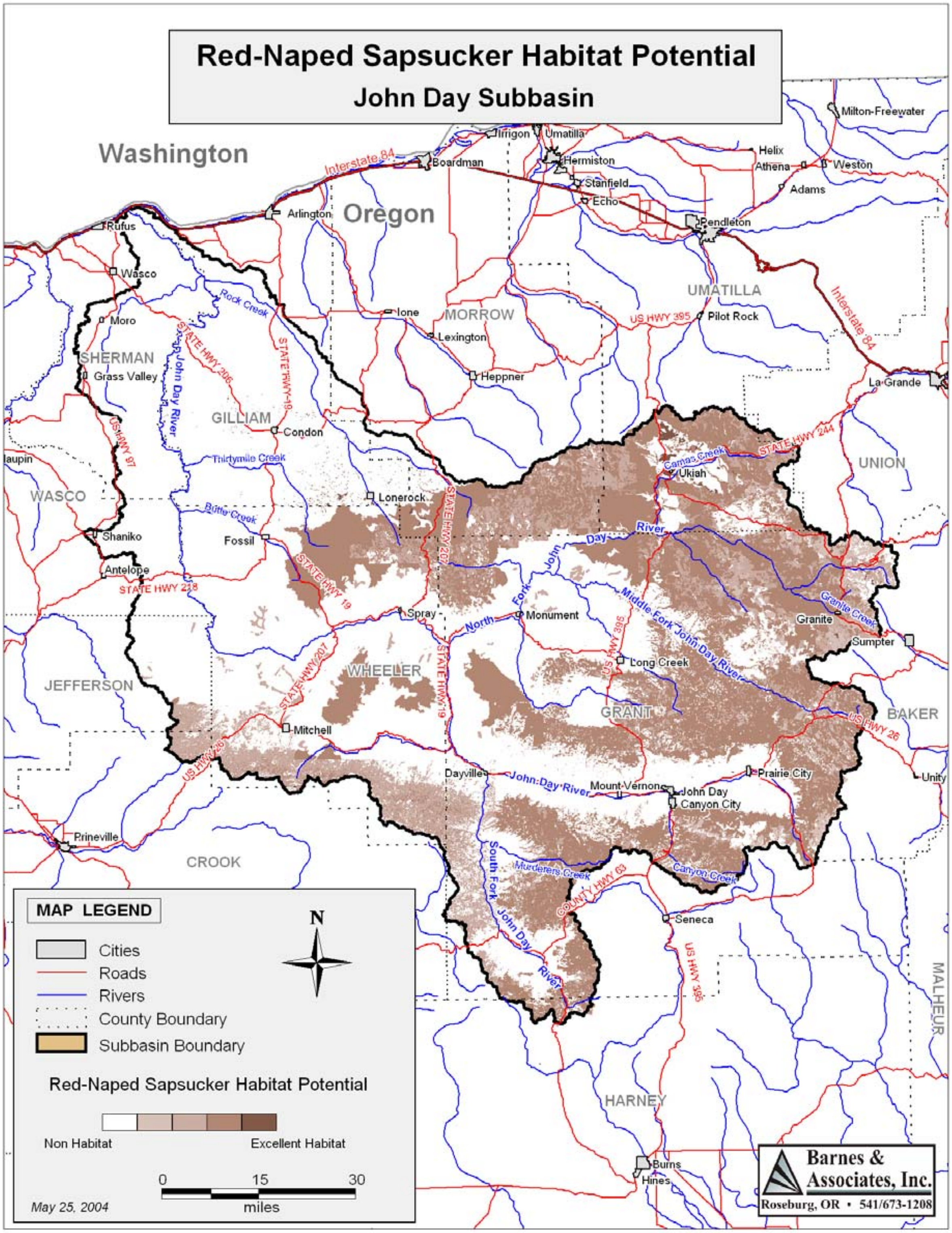


Figure 37. Red-naped sapsucker habitat potential in the John Day Subbasin.

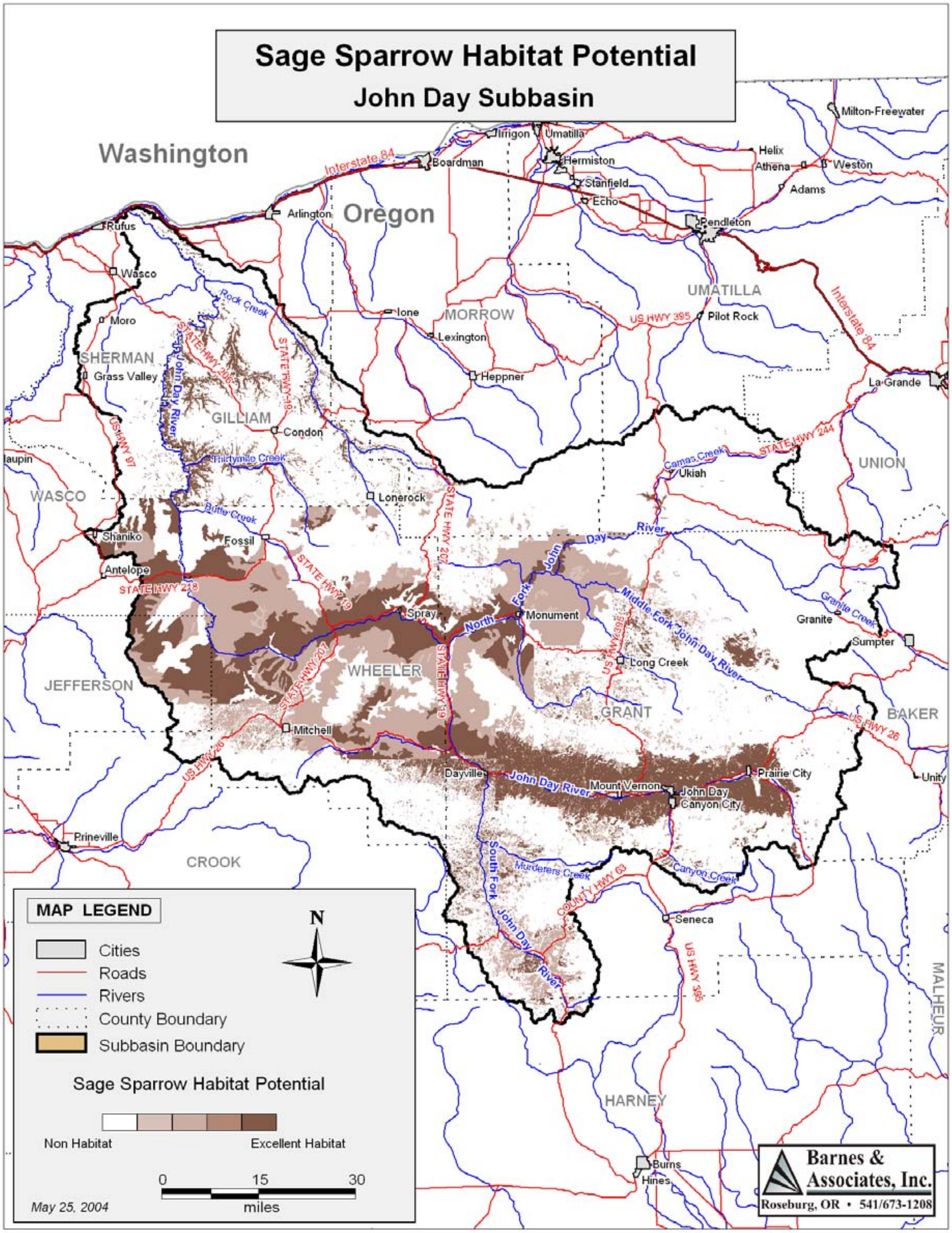


Figure 38. Sage sparrow habitat potential in the John Day Subbasin.

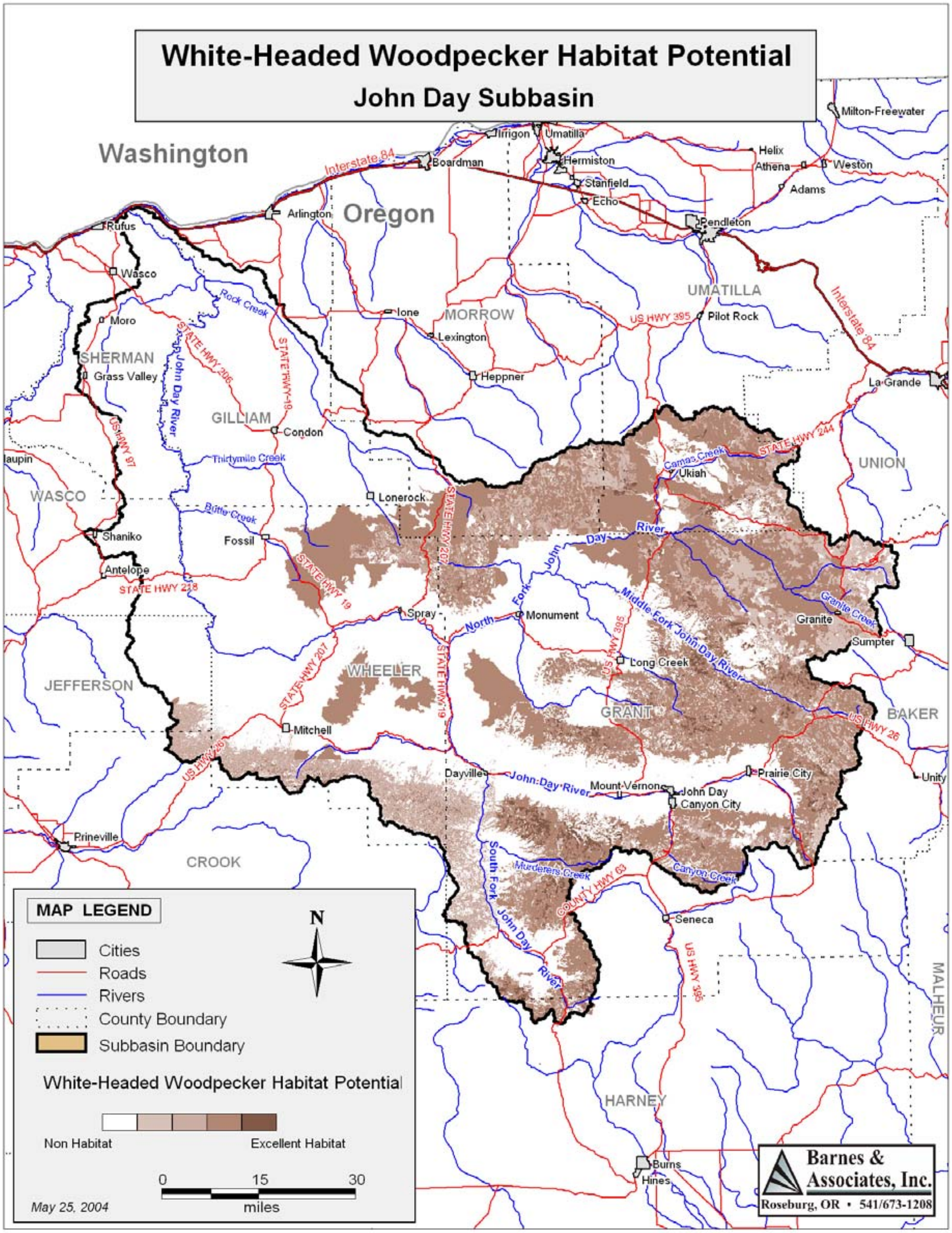


Figure 39. White-headed woodpecker habitat potential in the John Day Subbasin.

Assumptions about Productivity Environmental Conditions at HUC6 Level

Each of the terrestrial focal species is associated with a particular habitat. See Table 22 for a list of the terrestrial focal species and their associated habitats. Each of these focal habitats is discussed in detail in Appendix E.

Table 57 displays the acreages of both current (1999) and historic (circa 1850) habitat as well as absolute and percentage changes from historic to current. The spatial distributions of current and historic wildlife habitats across the entire John Day Subbasin are shown in Figures 40 and 41, respectively. These habitat types and acreages are from NWHI 2004.

Meaningful interpretation of these acreage changes should be looked at only for positive or negative trends, as habitat classification abilities differ significantly between the two time periods. The habitat type descriptions located in Appendix E describe the factors for the changes reflected in Table 57. The coarse resolution of the habitat distribution data needs to be considered when reviewing Figure 40. For instance, the "western juniper and mountain mahogany woodlands" habitat type displayed in Figure 40 also contains a significant component of grassland understory beneath the low canopy cover of western juniper in some areas.

Table 57. Habitat type changes from historic (c.1850) to current (1999) times.

	Acres		Change	
Habitat Type	Historic	Current	Acres	%
montane mixed conifer forest	11222	135281	124059	1105%
interior mixed conifer forest	196464	838318	641854	327%
lodgepole pine forest and woodlands	80938		-80938	-100%
ponderosa pine/white oak forest and woodlands	1862106	1278369	-583737	-31%
alpine grasslands and shrublands	2376	22192	19816	834%
western juniper and mountain mahogany woodlands	100420	1288505	1188085	1183%
interior grasslands	1623043	77857	-1545186	-95%
shrub-steppe	1182840	832387	-350453	-30%
desert playa and salt scrub shrublands	9143		-9143	-100%
open water (lakes, rivers, streams)	1013	5234	4221	417%
herbaceous wetlands	2718	35221	32503	1196%
interior canyon shrublands		163930	163930	
agriculture, pastures and mixed environs		385106	385106	
urban and mixed environs		8606	8606	
montane coniferous wetlands		851	851	
interior riparian wetlands		371	371	
Total	5072283	5072228	-55	

Two maps displaying the protection status of lands in the John Day Subbasin are in Figures 42 and 43.

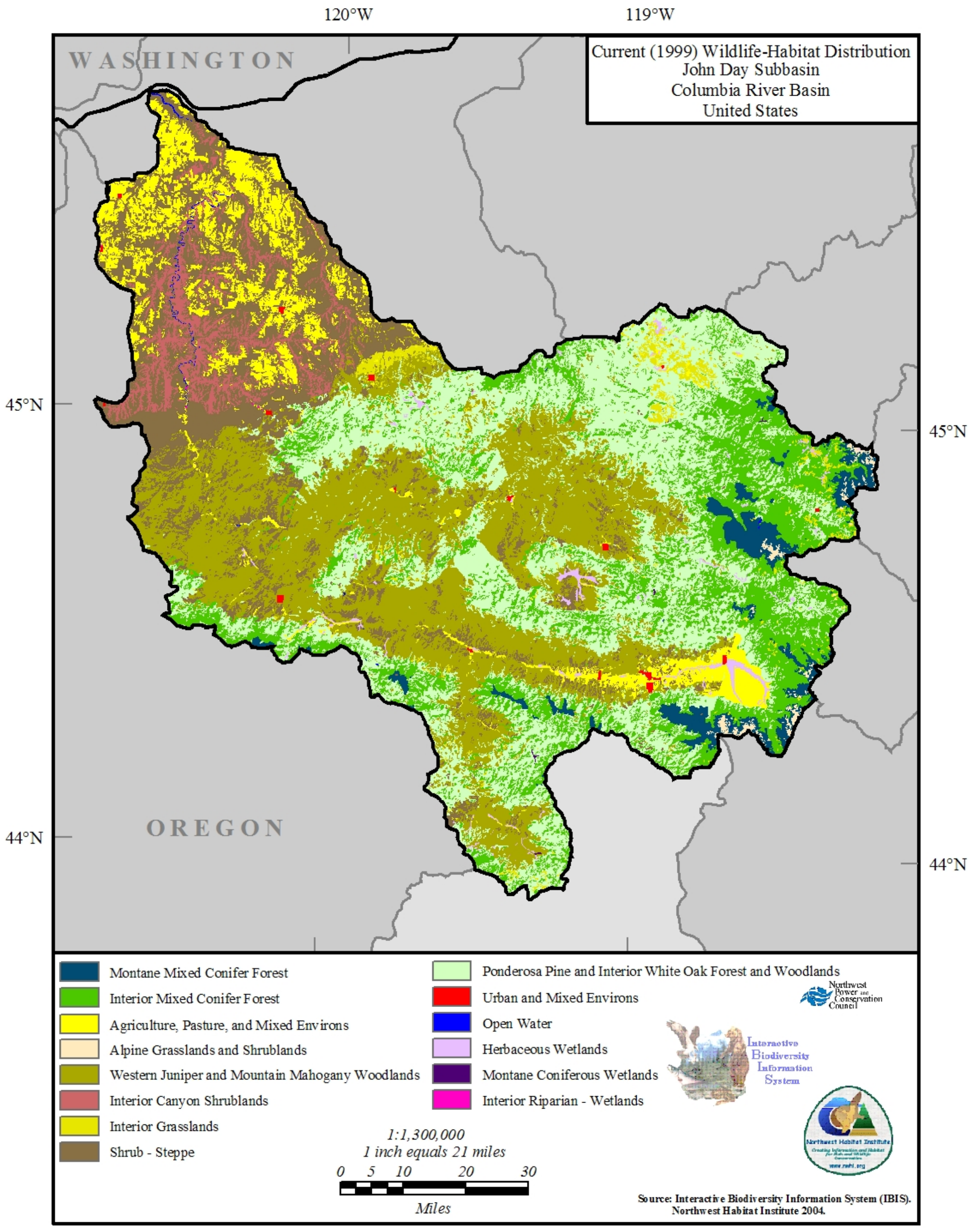


Figure 40. Current (1999) wildlife habitat distribution in the John Day Subbasin.

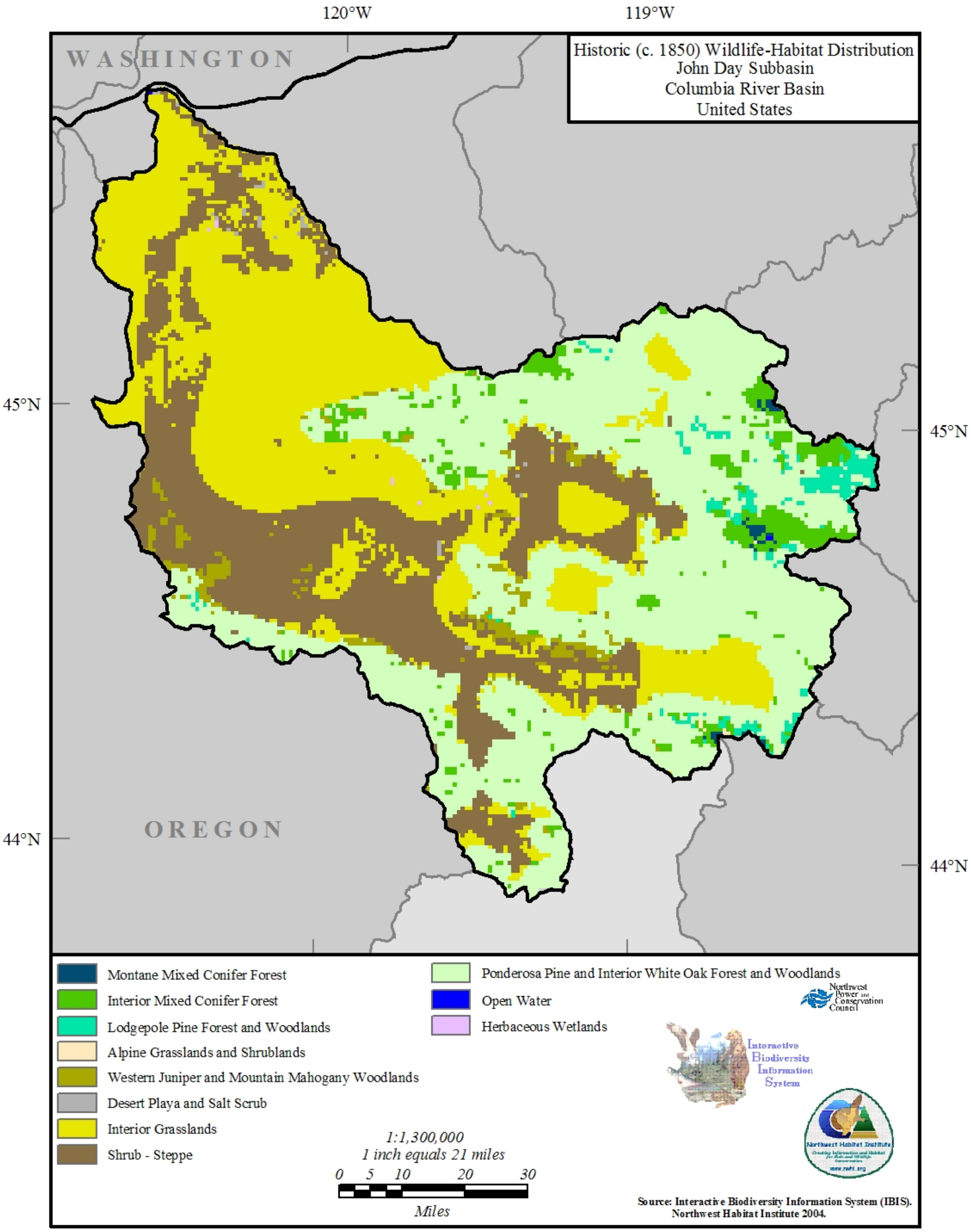


Figure 41. Historic (c. 1850) wildlife habitat distribution in the John Day Subbasin.

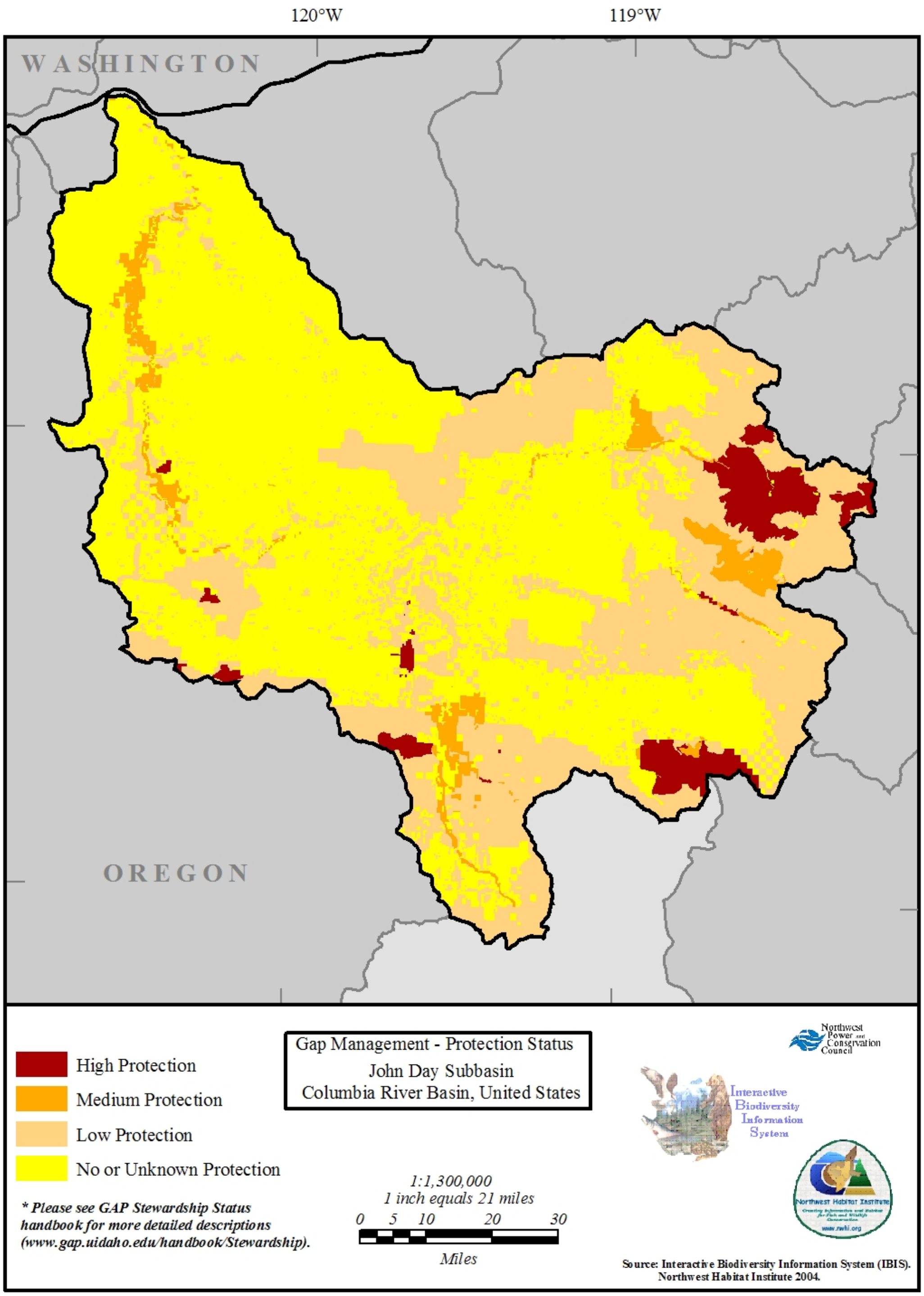


Figure 42. Protection status of lands in the John Day Subbasin.

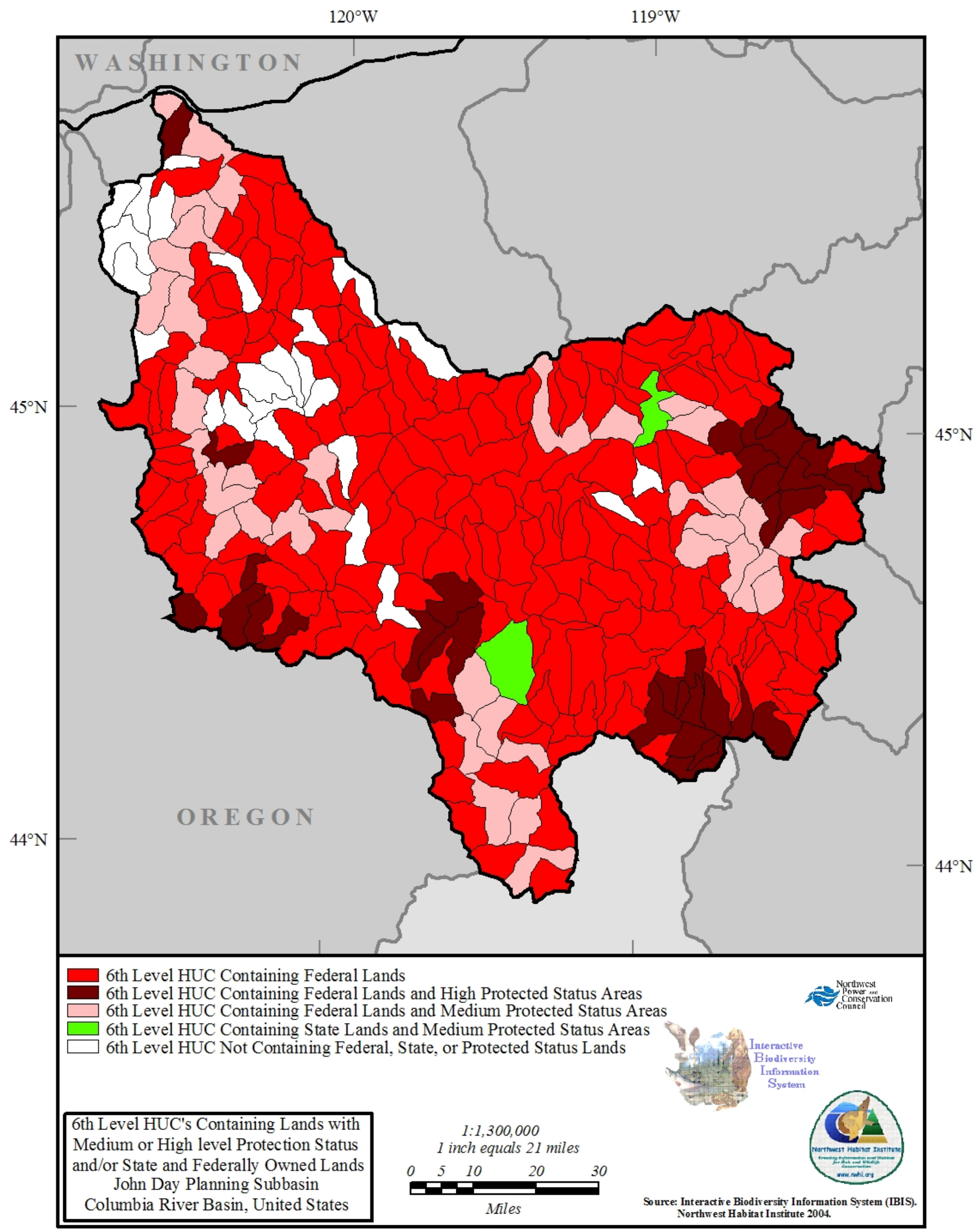


Figure 43. Protection status of HUC6 watersheds in the John Day Subbasin.

3.3 Out-of-Subbasin Effects

3.3.1 Aquatic

TOAST (2004) described out-of-subbasin effects (OOSE) in terms of all mortality factors that impact a migratory aquatic population from the time it leaves the subbasin to the time it returns to the subbasin. These effects can vary greatly from year to year, especially for wide ranging species such as salmon. Out-of-subbasin effects can be natural in origin, human-caused, or a combination of the two.

Within the John Day system, migratory aquatic focal species include summer steelhead and chinook salmon. These specific fish populations spawn within the John Day system, swim down the Columbia into the Pacific Ocean, and return to the John Day over the course of their life-cycle.

In the EDT model, survival rates are calculated for each life stage for a particular time and geographic area. The interaction of survival rates across areas and time determines the percentage of outmigrating juveniles from each subbasin that will return to that subbasin as adults. This survival rate is a measure of OOSE. Factors modeled in EDT include mainstem habitat quality and quantity, average monthly flows, juvenile travel time as a function of flow and habitat type, juvenile migration timing, survival at mainstem dams, in-river survival, fish transportation, interactions with hatchery fish, estuary survival, ocean survival, harvest impacts and upstream survival. A detailed description of these factors can be found in TOAST (2004). OOSE rates in EDT represent a 1992 to 1997 base period.

OOSE can vary greatly depending on ocean productivity. TOAST (2004) provided an overview discussing indicators of changing ocean conditions such as the Pacific Decadal Oscillation (PDO) and the El Nino/Southern Oscillation as well as the impact of climate change. The PDO is of particular interest to subbasin planners due to different PDO phases affecting ocean productivity and thus the juvenile survival rates. Periods of low ocean survival were from 1925 to 1947 and from 1977 to 1999, while the periods from 1947 to 1977 and the current period (2000 to present) are periods of higher ocean survival. The rates incorporated in the EDT model represent a period of relatively poor ocean conditions.

Synthesis

TOAST has provided the following synthesis of OOSE. To simplify application of OOSEs to subbasin assessments, the major sources of impact have been aggregated into a single smolt-to-adult-return rate (SAR) for survival from the time a year-class leaves the subbasin to the time it returns. If and when planners want to address the balancing of impacts across the four Hs (hydropower, habitat, harvest, hatcheries), SAR numbers will have to be disaggregated into their component fractions.

Aggregate Effects on Chinook

The smolt-to-adult ratios (SARs) that were used in the EDT Multi-Species Framework assessments were provided by Mobrand Biometrics (Chip McConnaha, Mobrand Biometrics, personal communication) and are shown in Table 58. These rates are the total survival rates of juvenile fish from the mouth of the subbasin to their return to the subbasin as adults. They were calculated from intermediate EDT results. The range limits in Table 58 were calculated from actual survival studies at Lower Granite Dam applied to the EDT estimates as described in TOAST (2004).

Table 58. Smolt-to-Adult (SAR) survival estimates (%) with range limits for John Day chinook outmigrants based upon in-river survival studies.

Point of Entry	EDT Point Estimate	Lower Range	Upper Range
Subyearling migrants	0.8	0.26	2.64
Yearling migrants	1.5	0.50	4.95

Late in the process of writing this plan, it was discovered that the SARs actually being computed for John Day spring chinook in the final EDT runs were almost four times those in Table 58. SAR survival estimates (%) produced by EDT analyses of John Day spring chinook salmon in December 2004 were:

- Granite Creek – 5.61%
- Middle Fork – 5.74%
- North Fork – 5.52%
- Upper John Day – 5.44%

These SAR estimates of over 5.4% appeared to be very high given the poor ocean conditions in 1992 to 1997 that EDT was supposed to be emulating. Mobrand staff could not provide an explanation for this discrepancy.

The latest EDT SAR estimates also appeared high compared to actual field estimates, which are available for the 1978 to 1980 and 1999 to 2001 outmigration years (Ruzycki (ODFW) e-mail to Phil Roger dated 1/6/2005 and Ruzycki (ODFW) e-mail to Jeff Fryer dated 2/2/05). Smolt-to-adult survival rates were 0.98%, 1.25%, and 1.32% for 1978 to 1980 with a geometric mean rate of 1.17%. This was a time of relatively poor ocean survival, similar to 1992 to 1997. The 1999 to 2001 SAR estimates, which coincide with a high productivity PDO regime, were 7.8%, 2.6%, and a projected rate of 2.7%[1] with a geometric mean rate of 3.8%.

Given the considerable uncertainty in the EDT SAR estimates, it is recommended that the current EDT results be used only to identify the major limiting habitat conditions on salmon production.

[1] The 2001 SAR estimate is currently 2.28%. The abundance of five-year-old returns from this cohort has not yet been estimated, but this age group typically contributes about 20% of the total returns. This would raise the 2001 SAR estimate by about 0.46%, resulting in a total SAR of 2.7% (Ruzycki e-mail to Jeff Fryer dated 2/2/05).

Aggregate Effects on Steelhead

EDT assessments for steelhead populations were not included in the Multi-Species Framework project. Instead, SAR rates were estimated from observed results obtained from other studies (TOAST 2004). The minimum SAR observed for Snake River populations above Lower Granite Dam since 1992 was 1.04% in the 1992 migration year, while the maximum SAR was 4.68% in the 2000 migration year (TOAST 2004). TOAST assumed the same per-dam mortality rate as that for spring chinook to develop the SAR estimates for John Day populations (Table 59).

Table 59. Smolt-to-Adult (SAR) survival point estimates (%) with range limits for John Day steelhead outmigrants.

Point of Entry	Point Estimate	Lower Range	Upper Range
John Day Pool	2.82	1.73	7.80

Late in the process of writing this plan, actual SAR rates computed from EDT output in December 2004 were made available:

- Lower John Day – 4.25%
- Middle Fork – 4.38%
- North Fork – 4.37%
- South Fork – 4.34%
- Upper John Day – 4.40%

As with spring chinook, the steelhead SARs appeared high given the poor ocean conditions prevalent during the 1992 to 1997 base period. No data are available on John Day steelhead SARs, although very preliminary estimates suggest a SAR of 1 to 2% for the 1999 to 2000 brood years (Ruzycki e-mail to Phil Roger). Data from the Umatilla Subbasin Plan indicate a mean SAR of 3.95% for the 1996 to 1997 brood years for natural spawning steelhead. This is greater than the estimate in Table 59, but slightly less than the EDT estimates for steelhead. However, the 1996 to 1997 brood years spent some of their ocean residency in a high productivity PDO regime, thus survival rates would be expected to be somewhat higher than those in Table 59.

Given the considerable uncertainty in the EDT SAR estimates, it is recommended that the current EDT results be used only to identify the major limiting habitat conditions on salmon production.

Discussion

Smolt-to-adult return rates obtained from the most recent EDT runs were unexpectedly higher than those from earlier runs and usually exceeded rates estimated from field observations. Steelhead SARs are about 50% greater than those estimated from earlier EDT model analyses and perhaps double very preliminary observations for John Day populations. They are, however, within the estimated range of SARs observed during the 1992 to 2000 period. SARs for yearling chinook smolts are more than 350% greater in recent EDT analyses than previously estimated. They are also higher than the upper end of the range of SARs estimated from studies during the 1992 to 2000 period.

These discrepancies can only be evaluated and resolved by detailed analysis of the EDT trajectory data – a slow and complex process because of the amount of detail involved. Several possible sources of the problem suggest themselves, however. Mobrand staff have been making changes to the EDT model regularly since the first analyses in the spring of 2004. Some of these changes may have affected mainstem Columbia River conditions and may also have affected the calculation of OOSE survival.

A second possible source of the problem is the usually unexamined interaction between within-subbasin and out-of-subbasin aggregate mortality factors. During the calibration and testing phase of EDT, users adjust habitat ratings and fish population parameters in an attempt to produce abundance numbers close to reality. The problem is that if out-of-subbasin survival is overestimated by EDT, then a lower within-subbasin survival is required to produce a given number of adults returns. This may be affect chinook populations, because the smolt numbers estimated by EDT are significantly less than those observed by smolt enumeration projects in the basin.

The net result of this SAR anomaly is that there is more confidence in the qualitative aspects and limiting habitat attributes of EDT than in its quantitative output, which depends so heavily on the interactions of a large number of sequential life stages and environmental impacts. That is, the EDT assessment of environmental effects on smolt production is more reliable than estimates of population responses over the entire life cycle. Consequently, EDT analyses have been used to identify limiting habitat conditions rather than to quantify benefits from alternative restoration scenarios.

Basin-wide Assumptions – Effects on Productivity and Sustainability

It is clear that to lay the onus for fish survival entirely on stakeholders within the John Day Subbasin would be misplaced. However, these outside influences to migratory fish populations should not dissuade stakeholders from implementing plans to enhance the waterways and riparian areas within their sphere of influence.

For example, information provided by TOAST (2004) indicates the potential for a long-term climate change. Computer models generally agree that the climate in the Pacific Northwest will become gradually warmer and wetter over the next half century, with an increase in winter precipitation and warmer, drier summers. Loss of medium-elevation snowpack in response to warmer winter temperatures would have enormous and mostly negative impacts on the region's water resources, forests and salmon. These impacts include a diminished ability to store water in reservoirs for summer use, increased frequency and magnitude of forest and grassland fire, earlier peak flows, lower summer flows, and higher summer water temperatures. This will increase the impacts of temperature and habitat quantity limiting factors.

Knowing the potential for such climate change impacts, restoration strategies should pay particular attention to actions that will improve summer conditions for salmon.

3.3.2 Terrestrial

As with aquatic species, out-of-subbasin effects for terrestrial species are influenced by migratory habits. Of the 11 terrestrial focal species in the John Day Subbasin, the following migrate out of the subbasin: great blue heron, yellow warbler, red-naped sapsucker, sage sparrow, grasshopper sparrow and ferruginous hawk.

Very little is known about specific OOSE for each species. However, some generalizations can be made. Habitat destruction along the migratory route, as well as in the wintering location, is assumed to be a limiting factor. Negative impacts to habitat, depending on the species and their typical range, may include: timber harvest, grazing, farming, invasive plants, lack of fire management and development.

<u>Species Specific Out-of-Subbasin Effects (Ashley and Stoval 2004)</u>

Great blue heron
One of the biggest impacts on the great blue heron is potential poor water quality within the winter range. Poor water quality reduces the amount of large fish and invertebrate species available in wetland areas. Toxic chemicals from runoff and industrial discharges pose yet another threat. These chemicals can move through the food chain, accumulate in the tissues of prey and may eventually cause reproductive failure in the herons.

Yellow warbler
The yellow warbler is impacted by poorly functioning riparian areas and increased pesticide use. Riparian management requires the protection of riparian shrubs and understory and the elimination of noxious weeds. Increased pesticide use in the metropolitan areas, especially with the outbreak of mosquito born viruses like West Nile Virus, may impact food availability.

Red-naped sapsucker
Red-naped sapsuckers interbreed with other sapsucker species. This may lead to potential hybridization with red-breasted sapsucker (*Sphyrapicus ruber*) and yellow-bellied sapsucker (*Sphyrapicus varius*) where distributions overlap.

Sage Sparrow and Grasshopper Sparrow
Both the sage sparrow and the grasshopper sparrow are especially vulnerable to loss and fragmentation of shrub steppe habitat throughout their respective travel corridors.

<u>Basin-wide Assumptions – Effects on Productivity and Sustainability</u>

As with the aquatic species, responsibility for survival of terrestrial species lies beyond the borders of the John Day subbasin. These outside influences should not be a deterrent to ecosystem management.

3.4 Environmental/Population Relationships

The environmental/population relationships for each of the five aquatic focal species are discussed at length earlier in this chapter in sections 3.2 and 3.3. Information on species significant to Native Americans, namely Pacific lamprey and freshwater mussels can be found in Appendix C. Detailed information on terrestrial focal species can be found in Appendix D.

3.5 Identification and Analysis of Limiting Factors/Conditions

3.5.1 Aquatic Limiting Factors

Details on aquatic limiting factors can be found in Section 3.2.4.

3.5.2 Terrestrial Limiting Factors

The limiting factors for the terrestrial focal species can be found in the individual species descriptions included in Appendix D. For each species, these limiting factors can be found in the section titled "Factors Affecting Population Status."

4. Inventory of Existing Activities

4.1 Existing Legal Protection

4.1.1 Laws/Regulatory Programs

Federally-Mandated Laws and Regulatory Programs

Listed below are a number of federally-mandated laws and regulatory programs that protect fish, wildlife and water quality in the John Day Subbasin.

Endangered Species Act (ESA), 1973: The USFWS and NOAA Fisheries work together to administer the Endangered Species Act. USFWS has responsibility for plant, wildlife and freshwater fish species that warrant listing. NOAA Fisheries has responsibility for anadromous fish species warranting listing. Threatened and endangered plants and animals under the ESA are protected from being jeopardized by federal activities. In addition, the ESA includes the following provisions: restrictions on take and trafficking, requirements for responsible agencies to develop and implement recovery plans for listed species under U.S. jurisdiction, authorization to seek land purchases or exchanges for important habitat, and federal aid to state and commonwealth conservation departments with cooperative endangered species agreements. (http://endangered.fws.gov/)

Four sections of the ESA that affect management in the John Day Subbasin are:

1. ESA Section 7 consultations on federal actions: Section 7 of the ESA directs federal agencies to use their legal authorities to conserve threatened and endangered species and, in consultation with the USFWS, to ensure that their actions do not jeopardize listed species or destroy or adversely modify critical habitat. Section 7 applies to management of federal lands as well as other federal actions that may affect listed species, such as approval of private activities through the issuance of federal permits.

There have been a number of consultations with both NOAA Fisheries and the USFWS in the John Day Subbasin. Table 60 lists the Biological Opinions that have been issued by NOAA Fisheries since 1999 as a result of consultations in the John Day Subbasin (http//www.nwr.http noaa.gov/1publcat/bo/2004/2004.htm). More information on the listed biological opinions can be obtained from NOAA Fisheries.

Table 60. Biological opinions issued by NOAA Fisheries in the John Day Subbasin since 1999.

Biological Opinion	Date
Biological Opinion on Ongoing and Proposed Bureau of Land Management Activities Affecting Middle Columbia River Steelhead, Central Oregon Resource Area, John Day River Basin, Oregon	Nov. 30, 1999
John Day River (Coles) Bridge Repair Project	April 13, 2000

Biological Opinion	Date
Effects of the Proposed Murderers Creek Road Reconstruction and Resurfacing Project on Middle Columbia River Steelhead, Malheur National Forest, Grant County, Oregon	May 12 ,2000
Antone Junction - John Day River Project and the Antone Junction Quarry (Fort Creek) Culvert Replacement	June 20, 2000
Effects of Proposed Harper Streambank Stabilization Project in Rock Creek watershed on Middle Columbia River Steelhead, John Day River Basin, OR	Sept. 11, 2000
Effects of Livestock Grazing Allotments Administered by the Bureau of Land Management in the John Day River Basin, OR for 2000 and 2001	January 17, 2001
Main Street Left Turn Refuge Project, John Day, Grant County, OR	Feb. 23, 2001
Amendment of Terms and Conditions in January 2, 2001 (Deschutes) and January 17, 2001 (John Day) Biological Opinions on the Effects of Livestock Grazing Allotments Administered by the Prineville District of the Bureau of Land Management on Middle Columbia River Steelhead and their Designated Critical Habitat	March 15, 2001
Amendment of Terms and Conditions in January 2, 2001 (Deschutes) and January 17, 2001 (John Day) Biological Opinions on the Effects of Livestock Grazing Allotments Administered by the Prineville District of the Bureau of Land Management on Middle Columbia River Steelhead and their Designated Critical Habitat	March 15, 2001
Corps of Engineers' Programmatic Consultation for Permit Issuance for 15 Categories of Activities in Oregon	March 21, 2001
Impacts of the Interim Management Agreement for upriver spring chinook, summer chinook, and sockeye on Salmon and Steelhead Listed Under the Endangered Species Act	March 21, 2001
Reinitiation of Endangered Species Act Formal Section 7 Consultation, and Magnuson-Stevens Act Essential Fish Habitat Consultation for Antone Junction - John Day River Project, Wheeler County and Grant County, Oregon	April 16, 2001
Effects of Malheur National Forest, Blue Mountain Ranger District, Livestock Grazing Allotments for FY 2001: Dixie, Mt. Vernon-John Day-Beech Creek, and Murderers Creek, Blue Mountain, Long Creek, and Upper Middle Fork	April 30, 2001
Consultation on Reissuance of the Corps of Engineers' Regional General Permit for Stream Restoration Activities in Oregon Involving Large Wood and Boulder Placement (Corps No. 2000-0001)	June 25, 2001
Impacts of Treaty Indian and Non-Indian Fall Season Fisheries in the Columbia River Basin in Year 2001	August 10, 2001
John Day River (Coles) Bridge #7696 Emergency Repair, Grant County, Oregon (Corps No. 1999-01050)	August 16, 2001
Programmatic Ongoing and Proposed Actions Affecting Middle Columbia River Steelhead on the Deschutes and Ochoco National Forests and Prineville District BLM in the Deschutes River Basin, and the Portion of the Ochoco National Forest in the John Day River Basin	October 24, 2001
Consultation on 15 Research Permits affecting Middle Columbia River Steelhead	Feb. 18, 2002
Middle Fork John Day (Ritter) Bridge Project, Grant County, Oregon	April 9, 2002
Effects of the Rimrock Ecosystem Restoration Projects, Wheeler, Morrow, and Grant County, Oregon	April 16, 2002
Crawford Vegetation Management Project, Grant County, Oregon	April 16, 2002
Rock Creek Bank Stabilization Project, John Day River Basin, Crook County, Oregon	April 22, 2002
Desolation Creek Watershed Demo Projects, Grant County, Oregon	May 29, 2002
Bear Creek Irrigation Siphon Project, Grant County, Oregon	May 29, 2002
Cable Creek Sidewall Replacement Project, Umatilla County, Oregon	June 12, 2002
John Day River Watershed Restoration Program: 2002 Watershed Restoration Projects,	July 3, 2002

Biological Opinion	Date
John Day River Basin, Grant, Oregon	
Minerals Activities on Lands Administered by the Umatilla and Wallowa-Whitman National Forests in the North Fork John Day River Subbasin, Oregon, FY2002-2007	July 25, 2002
Impacts of Treaty Indian and Non-Indian Fall Season Fisheries in the Columbia River Basin in Year 2002	August 15, 2002
Effects of Malheur National Forest Grazing Program for FY2002	August 26, 2002
Badger Creek Project, John Day River Basin, Wheeler County, Oregon	August 27, 2002
Strawberry Creek Geographic Priority Area 2002-2006 Watershed Restoration Projects, Upper John Day Subbasin, Grant County, Oregon (29 projects)	October 1, 2002
Effects of Livestock Grazing Allotments Administered by the Bureau of Land Management in the John Day River Basin, Oregon for 2002 and 2003	October 21, 2002
Research action regarding Pacific lamprey (Lampetra tridentata) proposed by the Confederated Tribes of the Umatilla Indian Reservation of Oregon (CTUIR)	November 15, 2002
Tower Fire Recovery Projects, Umatilla National Forest, Grant and Umatilla County, Oregon	January 13, 2003
Federal Highway Administrations' Programmatic Consultation for Statewide Drilling, Surveying, and Hydraulic Engineering Activities in Oregon	Feb. 6, 2003
Paulina Ranger District Culvert Replacement and Large Wood Placement Project, John Day River Basin, Wheeler County, Oregon	March 19, 2003
Blue Culvert Projects, Malheur National Forest, Grant County, Oregon	March 21, 2003
Integrated Noxious Weed Management Program for FY2003-2013, Bureau of Land Management Vale District, Union, Wallowa, Grant, and Umatilla Counties, Oregon Amendment, July 11, 2003	May 2, 2003
Emergency Fire Suppression and Burned Area Emergency Rehabilitation Activities and for High-Roberts and Easy Wildland Fires, Malheur National Forest, Grant County, Oregon	June 18, 2003
Programmatic Standard Local Operating Procedures for Endangered Species (SLOPES II) for Certain Regulatory and Operations Activities Carried Out by the Department of Army Permits in Oregon and the North Shore of the Columbia River	July 8, 2003
Amendment: Integrated Noxious Weed Management Program for FY2003-2013, Bureau of Land Management Vale District, Union, Wallowa, Grant, and Umatilla Counties, Oregon	July 11, 2003
Supplemental Biological Opinion to the 2001 U.S. v. Oregon "Interim Management Agreement for Upriver Spring Chinook, Summer Chinook, and Sockeye on Salmon and Steelhead Listed under the Endangered Species Act," Covering Winter, Spring, and Summer Season Treaty Indian and Non-Indian Columbia River Basin Fisheries for 2003-2005	July 11, 2003
Effects of the Malheur National Forest Grazing Program for CY2003, Middle Fork and Upper John Day River Subbasins, Oregon	July 14, 2003
John Day Watershed Restoration Projects 2003, Upper John Day Subbasin, Grant County, Oregon	July 25, 2003
Impacts of Treaty Indian and Non-Indian Fall Season Fisheries in the Columbia River Basin in Year 2003, on Listed Salmon and Steelhead	July 30, 2003
Programmatic for the Bonneville Power Administration Habitat Improvement Program (HIP) in the Columbia River Basin	August 1, 2003
Proposed Pine Creek Fish Passage Restoration Project in the Lower John Day River Subbasin, Grant County, Oregon	August 25, 2003
Effects of the USDA Forest Service and USDI Bureau of Land Management Ongoing and Proposed Actions for FY2003 to FY2013 in the North Fork John Day River Subbasin, Oregon	August 26, 2003
U.S. Forest Service Programmatic Culvert Replacement Activities in Washington and Eastern Oregon	Sept. 2, 2003
Proposed Bridge Creek Fish Passage and Irrigation Improvement Projects, West Fork Bridge Creek, Lower John Day River Subbasin, Wheeler County, Oregon	Nov. 10, 2003

Biological Opinion	Date
Emergency Fire Suppression Activities for the Bull Springs 2 Fire, Umatilla National Forest, Grant County, Oregon	Nov. 20, 2003
Little Canyon Mountain Timber Sale and Stewardship Project, Prineville District, John Day River Subbasin, Grant County, Oregon	January 2, 2004

Information on consultations that have been conducted by the USFWS can be obtained from the USFWS website: http://r1consult.fws.gov/Consultations.nsf/Default?OpenForm.

2. ESA Section 9 regulations regarding "take" during non-federal actions: Protection is authorized by Section 9 of the ESA, which makes it illegal to take, import, export, or engage in interstate or international commerce in listed animals except by permit for certain conservation purposes. It is unlawful to collect or maliciously damage any endangered plant on lands under federal jurisdiction. Removing or damaging listed plants on state and private lands in deliberate violation of state law, or in the course of violating a state criminal trespass law, also is illegal under the ESA.

3. 4(d) Rule: ESA Section 4(d) rules provide protections for species listed as "threatened." These 4(d) rules put take prohibitions in place *except* for specific categories of activities that contribute to conserving listed salmon and steelhead. (http://nwr. http noaa.gov/1publcat/bo/2004/2004.htm)

4. Habitat Conservation Plans (HCP): ESA Section 10(a)(1)B provides an opportunity for private landowners, corporations, state and local governments and other non-federal landowners who wish to conduct activities that might incidentally harm (or "take") a listed species to obtain an incidental take permit from the responsible agency (USFWS or NOAA Fisheries). To obtain a permit, the applicant must develop an HCP designed to offset any harmful effects the proposed activity might have on the species. Landowners can contact their local USFWS and NOAA Fisheries office to determine whether a contemplated activity is likely to require an incidental take permit. To date there have been no HCPs developed in the John Day Subbasin.

Clean Water Act, 1972: The Clean Water Act (CWA) is the cornerstone of surface water quality in the United States. The Act does not deal directly with ground water or with water quality issues. The statute employs a variety of regulatory and non-regulatory tools to sharply reduce pollutant discharges into waterways, finance municipal wastewater treatment facilities and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical and biological integrity of the nation's waters so that they can support the protection and propagation of fish, shellfish, and wildlife and recreation on the water. (http://www.epa.gov/watertrain/cwa/)

The state of Oregon has a number of regulations in place to meet the requirements of the Clean Water Act.

1. CWA programs administered by the Oregon Department of Agriculture (ODA):
   A. Confined Animal Feeding Operations (CAFO) regulations: The National Pollutant Discharge Elimination System (NPDES) regulates the discharge of

pollutants from point sources to waters of the United States. Concentrated Animal Feeding Operations (CAFOs) are point sources, as defined by the Clean Water Act. The ODA CAFO permit program began in the early 1980s to prevent CAFO wastes from contaminating groundwater and surface water. CAFOs are generally defined as the concentrated confined feeding or holding of animals in buildings, pens or lots where the surface is prepared to support animals in wet weather or where there are wastewater treatment facilities (e.g., manure lagoons). CAFO wastes include but are not limited to manure, silage pit drainage, wash down waters, contaminated runoff, milk wastewater, and bulk tank wastewater. The ODA's Natural Resource Division provides assistance to help livestock and other animal agricultural producers comply with water quality regulations. (http://oda.state.or.us/nrd/cafo/prg.html).

B. Senate Bill 1010 (ORS 568.900-568.933) (Agricultural Water Quality Management Act [AgWQM]), 1993: In 1993 the Oregon Legislature passed Senate Bill 1010 - the Agricultural Water Quality Management Act - which provides for the ODA to be the lead agency working with agriculture to address water pollution. The AgWQM Act directs ODA to work with farmers and ranchers to develop Agricultural Water Quality Management Area Plans (AgWQMAP) and rules for watersheds.

   Listed below are the AgWQMAPs that have been developed in the John Day subbasin. (http://www.oda.state.or.us/nrd/water_quality/manprac.html)

   i. North and Middle Forks John Day AgWQMAP, 2002
   ii. Upper Mainstem and South Fork John Day River AgWQMAP, 2003
   iii. Middle John Day AgWQMAP, 2003
   iv. Proposed Lower John Day AgWQMAP, 2004

2. CWA Programs administered by the Oregon Department of Environmental Quality (ODEQ):

   A. 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 TMDL implementation plans. Through monitoring in the subbasin, water quality concerns have been identified for these constituents: temperature, bacteria, sedimentation, biologic criteria (aquatic invertebrates), pH and dissolved oxygen. The ODEQ is working with stakeholders to prepare numeric targets for maximum allowable levels of "pollutants" (TMDLs) in streams and rivers. These goals are scheduled for completion in 2006.

      The implementation of this 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 BLM and Forest Service lands. These plans vary from voluntary to proscriptive (though all should have reasonable assurance of implementation). Any oversight that occurs is normally done through the local, state or federal land use authority. (http://www.deq.state.or.us)

B. Water Quality Limited Streams (303(d) Lists): DEQ is required by the federal Clean Water Act to maintain a list of stream segments that do not meet water quality standards. The 303(d) list takes its name from the section of the Clean Water Act that makes the requirement. The U.S. Environmental Protection Agency approved DEQ's 2002 303(d) list on March 24, 2003. The list can be found on the Oregon Department of Environmental Quality webpage http://www.deq.state.or.us/wq/303dlist. Streams in the John Day Subbasin that are on the 303(d) list are listed in Section 3.1.2 of this document.

3. CWA programs administered by the Oregon Division of State Lands (DSL): Section 404 of the Clean Water Act established a permit program to be administered by the U.S. Army Corps of Engineers to regulate the non-point source discharges of dredged or fill material into waters of the United States. Permits are required for projects involving 50 cubic yards or more of removal or fill material in wetlands and streams. Permits are also required for any volume of removal or fill in a stream designated as essential salmon habitat or the bed and banks of scenic waterways. Permit applications are reviewed by ODFW and may be modified or denied based on project impacts to fish. Projects in habitat where ESA-listed fish are present require formal consultation with NOAA Fisheries to insure compliance with the Endangered Species Act. The removal-fill law requires a permit for most removal and fill activities in areas designated as essential indigenous salmonid habitat (map available at http://statelands.dsl.state.or.us). The vast majority of the John Day River is designated as having essential salmonid habitat. Joint application forms for Division of State Lands – Army Corps of Engineers removal-fill permits can be obtained from the Oregon Division of State Lands. (http://statelands.dsl.state.or.us)

Migratory Bird Treaty Act, 1989: The Migratory Bird Treaty Act is the domestic law that affirms, or implements, the United States' commitment to four international conventions (with Canada, Japan, Mexico, and Russia) for the protection of a shared migratory bird resource. Each of the conventions protects selected species of birds that are common to both countries. The act decreed that all migratory birds and their parts (including eggs, nests, and feathers) are fully protected.

National Forest Management Act, 1974: The National Forest Management Act reorganized, expanded and otherwise amended the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on national forest lands. The National Forest Management Act requires the Secretary of Agriculture to assess forest lands, develop a management program based on multiple-use, sustained-yield principles, and implement a resource management plan for each unit of the National Forest System. This is the primary statute governing the administration of national forests. Portions of the Malheur, Umatilla, Wallowa-Whitman, and Ochoco national forests are in the John Day Subbasin.

Federal Land Policy and Management Act, 1976: The Federal Land Policy and Management Act of 1976 (FLPMA) is the most comprehensive law that dictates the BLM's policies, procedures and management actions. Congress recognized the value of the remaining public lands by declaring that these lands would remain in public ownership. Congress also utilized the term "multiple use" management, defined as "management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people."

Wilderness Act, 1964: In 1964 Congress passed the Wilderness Act to secure for present and future generations of American people the benefits of an enduring resource of wilderness. They established a National Wilderness Preservation System to be composed of federally-owned areas designated by Congress as "wilderness areas" and administered for the use and enjoyment of the American people in such manner that will leave them unimpaired for future use and enjoyment as wilderness. No federal lands shall be designated as "wilderness areas" except as provided for in this Act or by a subsequent Act. Wilderness areas within the John Day Subbasin are addressed in Section 4.1.3.

Federal Wild and Scenic Rivers Act, 1968: Portions of the lower mainstem, North Fork and the South Fork of the John Day River are designated as Wild and Scenic Rivers. The Wild and Scenic Rivers Act identified certain rivers of the nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values. The act directed that these rivers shall be preserved in free-flowing condition, and they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Wild and Scenic Rivers Act does not generally lock up a river like a wilderness designation. The idea is not to halt development and use of a river; instead, the goal is to preserve the character of a river. Uses compatible with the management goals of a particular river are allowed, with change expected to happen. Developments not damaging to the outstanding resources of a designated river, or curtailing its free flow, are usually allowed. Wild and Scenic rivers receive one of three designations, or a combination thereof:

1. Wild – Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shoreline essentially primitive and waters unpolluted.

2. Scenic – Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

3. Recreational – Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

State-Mandated Regulatory Programs

Listed below are a number of state-mandated laws and regulatory programs that protect fish, wildlife and water quality in the John Day Subbasin.

Oregon Department of Fish and Wildlife Regulations and Policies:

1. **Fish Management and Hatchery Operation, 1992 (OAR Chapter 635, Division 007):** This Division in the Oregon Administrative Rules addresses fish management and hatchery operations. This division outlines policies that help direct the ODFW on management in the John Day Subbasin. Some of the key policies are listed below:

    A. **Native Fish Conservation Policy (OAR Chapter 635, Division 007-0502):** The intent of the Native Fish Conservation Policy is to provide a basis for managing hatcheries, fisheries, habitat, predators, competitors, and pathogens in balance with sustainable production of naturally produced native fish. The policy has three areas of emphasis. The first is defensive to ensure the avoidance of serious depletion of native fish. The second is more proactive to restore and maintain native fish at levels providing ecological and societal benefits. The third ensures that, consistent with native fish conservation, opportunities for fisheries and other societal resource uses are not unnecessarily constrained. This approach will allow Oregon to play a vital role in the recovery of ESA-listed species and the prevention of future listings. The John Day River currently is exclusively native fish as no hatchery fish have been introduced into the river system. (ODFW, Native Fish Conservation Policy, November 8, 2002 and revised September 12, 2003)

    B. **Fish Hatchery Management Policy (OAR Chapter 635, Division 007-0542):** The ODFW has developed a Fish Hatchery Management Policy. The purpose of the policy is three fold:

        i. The Hatchery Management Policy complements and supports the Native Fish Conservation Policy OAR 635-007-0502 through 635-007-0506 and will be implemented through conservation plans developed for individual species management units, hatchery program management plans, or other formal agreements with management partners. The Hatchery Management Policy provides a foundation for the management and reform of hatcheries in Oregon, whereas the Native Fish Conservation Policy establishes the process for defining the specific use of the hatchery tool in specific watersheds. (ODFW, Fish Hatchery Management Policy, May 9, 2003).
        ii. This policy describes best management practices that are intended to help ensure the conservation of both naturally produced native fish and hatchery produced fish in Oregon through the responsible use of hatcheries. The conservation of hatchery produced fish is important to maintain opportunities for fisheries and aid conservation of naturally produced native fish.
        iii. The purpose of the Hatchery Management Policy is to describe the hatchery tool and its range of applications. The Hatchery Management

Policy also provides general fish culture and facility guidelines and measures to maintain genetic resources of native fish populations spawned or reared in captivity. This policy applies to all Department hatchery operations and programs including Salmon and Trout Enhancement Program (STEP), fish propagation projects (OAR 635-009-0090 through 635-009-0240) and Cooperative Salmon Hatchery Programs (OAR 635-009-0400 through 635-009-0455).

C. **Fish Health Policy (OAR Chapter 635, Division 007-0965**): The Oregon Department of Fish and Wildlife have developed a policy for fish health. The Department must restrict the introduction, amplification, and dissemination of disease agents in hatchery produced fish (hatchery produced stock or naturally produced native stock) and in natural environments by controlling egg and fish movements and by prescribing a variety of preventative, therapeutic, and disinfecting strategies to control the spread of disease agents in fish populations of the state. This entails inspecting and detecting disease agents from fish in all hatchery facilities and natural environments. It also entails containing and treating disease agents to minimize impacts on fish populations. (ODFW, Fish Health Management Policy, September 12, 2003).

2. **Fish Passage Program (OAR Chapter 635, Division 412**): This chapter states, "No person shall construct or maintain any artificial obstruction across any waters of this state that are inhabited, or were historically inhabited, by native migratory fish without providing passage for native migratory fish." (OAR 635-412-0020). On August 8th, 2001, Governor Kitzhaber signed into law HB 3002, a fish passage statute. One of the main objectives of HB 3002 was to craft legislation that combined the existing statutes into one meaningful piece of legislation, was reasonable for owners/operators, benefited migratory fish, and had enough flexibility for the Oregon Fish and Wildlife Commission to waive passage requirements under appropriate circumstances. Another object of the legislative was to encourage cooperation and minimize the burden to owners and operators of artificial obstructions, while maintaining the authority of the Fish and Wildlife Commission to enforce its laws. This policy also requires the ODFW to complete and maintain a statewide inventory of artificial obstructions to include: an evaluation of existing barriers to fish passage, the fish species impacted, the extent of lost fish habitat, opportunities to restore fish passage and other important biological and economic factors. It also requires the creation of a Fish Passage Task Force to advise the ODFW in fish passage matters. (http://www.dfw.state.or.us/ODFWhtml/InfoCntrFish/Management/FishPassage.html).

3. **Department of Wildlife Land (OAR Chapter 635, Division 008):** Administrative rules for ODFW owned or controlled lands have been developed and adopted to protect wildlife, fish, and lands and to assist with meeting the management objectives for the land. The details of this policy can be found in OAR Chapter 635, Division 8. Rules and regulations for the Bridge Creek, Philip W. Schneider and Moon Creek Wildlife Areas, all located in the John Day Subbasin, can be found in this administrative rule. (OAR 635-008)

4. **Wildlife Diversity Program (OAR Chapter 635, Division 100):** The Wildlife Diversity Plan provides the program goals, objectives and strategies to identify and coordinate non-game wildlife management, research and status survey needs, and education and recreation needs related to Oregon's wildlife. The document provides direction to the Oregon Department of Fish and Wildlife in carrying out its mandated responsibilities. The plan is also intended as an informational document to be used in wildlife programs by public agencies and others concerned with the conservation of non-game and other fish and wildlife species. (OAR 635-100-0005).

5. **Fish and Wildlife Habitat Mitigation Policy (OAR Chapter 635, Division 415):** This Chapter states, "The purpose of these rules is to further the Wildlife Policy (ORS 496.012) and the Food Fish Management Policy (ORS 506.109) of the State of Oregon through the application of consistent goals and standards to mitigate impacts to fish and wildlife habitat caused by land and water development actions. The policy provides goals and standards for general application to individual development actions, and for the development of more detailed policies for specific classes of development actions or habitat types."(OAR 635-415-0000) "It is the fish and wildlife habitat mitigation policy of the Oregon Department of Fish and Wildlife to require or recommend, depending upon the habitat protection and mitigation opportunities provided by specific statutes, mitigation for losses of fish and wildlife habitat resulting from development actions. Priority for mitigation actions shall be given to habitat for native fish and wildlife species. Mitigation actions for nonnative fish and wildlife species may not adversely affect habitat for native fish and wildlife." (OAR 635-415-0010)

6. **Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources, June 2000:** The ODFW under its authority to manage Oregon's fish and wildlife resources updated the guidelines in June 2000 for timing of in-water work. The guidelines are to assist the public in minimizing potential impacts to important fish, wildlife and habitat resources.

7. **Restoration and Enhancement Program:** On June 29, 1989, the Oregon Fisheries Restoration and Enhancement Act of 1989 was signed into law. The Act allows the Department of Fish and Wildlife to undertake a comprehensive program to restore state-owned fish hatcheries, enhance natural fish production, expand hatchery production, and provide additional public access to fishing waters. The Department's program provides increased recreational fishing opportunities and supports and improves the commercial salmon fishery. A surcharge was imposed on all sport fishing licenses and commercial salmon fishing licenses and poundage fees. Any public or private non-profit organization may request funds to implement fish restoration or enhancement. Program expenditures will be made in the same proportion as the revenues derived from the surcharges. (http://www.dfw.state.or.us/ODFWhtml/InfoCntrFish/RnEProgram/R%26EHistory.html)

8. **Oregon State Police Coordinated Enforcement Program (CEP):** Oregon State Police and ODFW develop annual action plans to focus enforcement effort in specific areas and to resource priorities identified by ODFW.

9. **Statewide Angling Regulations (OAR Chapter 635, Division 011-0050):** These regulations require the ODFW to continually monitor the status of fish, shellfish, and marine invertebrates and report promptly any serious or abnormal changes in health or abundance of resource. The Oregon Fish and Wildlife Commission shall adopt annually those rules prescribing seasons, bag limits, method of harvest, and specific restrictions considered necessary to provide optimum recreational and aesthetic benefits to anglers and other citizens. If more restrictive rules are needed to protect or preserve a species or stock experiencing depletion or drastic decline in health or abundance, the Commission shall consider adopting rules at its earliest opportunity to prevent further depletion or decline.

10. **Hunting Regulations (OAR Chapter 635, Divisions 051 through 080):** The State of Oregon has developed hunting regulations for some wildlife species. Hunting is a popular form of recreation in the John Day Subbasin. Big game hunting regulations can be found in the ODFW publication, 2004 Oregon Big Game Regulations. The purpose of these rules is to establish license and tag requirements, limits, areas, methods and other restrictions for hunting game mammals. Regulations for Oregon Game birds can be found in the ODFW publication, 2003-2004 Oregon Game Bird Regulations. This publication identifies the seasons, bag limits, public access programs and other hunting information.

Oregon Water Resources Department/Oregon Water Law, 1909: In 1909, the State of Oregon passed its water codes to determine how water would be shared among users within the state. These laws determined that, with some exceptions, all surface and ground water was considered to be a public resource and its use required permission, or a “water right,” from the state. Oregon water law is based on the “prior appropriation doctrine” which gives seniority according to the day the application for the water right was made. In times of shortage, water is allocated based on this “priority date,” with the more recent water rights getting shut off in order to satisfy the demands of the senior water rights. The Oregon Water Resources Department program for the John Day subbasin can be found in OAR Chapter 690, Division 506.

Water Quality Standards: Beneficial Uses, Policies, and Criteria for Oregon (OAR Chapter 340, Division 41): This division sets forth Oregon’s plans for management of the quality of public waters within the State of Oregon. The Department of Environmental Quality will continue to manage water quality by evaluating discharges and activities on a case-by-case basis, whether an existing use or a new proposal, based on the best information currently available and within the limiting framework of minimum standards, treatment criteria and policies which are set forth in the plan.

Oregon Instream Water Rights 1955 (OAR 635, Division 400): The 1955 Oregon Legislature passed the Minimum Perennial Streamflow Act, which allowed the Water Policy Review Board to adopt rules setting minimum streamflows for fish, wildlife and pollution abatement. On May 24, 1962, four minimum streamflows were set in the John Day Subbasin. In 1987, the Legislature passed the Instream Water Right Act which allowed the ODEQ, ODFW and the Oregon Parks and Recreation Department to apply for in-stream water rights for recreation, pollution abatement, navigation, and maintenance and enhancement of fish and wildlife and their habitats. The act also directed the department to convert most of the minimum perennial streamflows to in-stream water rights. The Oregon Water Resources Department converted all four of the minimum streamflows in the John Day Subbasin to in-stream water rights in 1990. Currently, 41 in-stream water right certificates have been issued on the main river, major forks and tributaries within the subbasin. Another 17 in-stream water right applications are under review by the department and awaiting certificates. A summary of the 41 current in-stream water rights is presented in Table 61.

Table 61. In-stream water rights in the John Day Subbasin as of April, 2004.

CERTIFICATE NUMBER	PRIORITY DATE	STREAM (Tributary of)	UPPER RIVER MILE	LOWER RIVER MILE
72645	03/27/1990	BEAR CR (BRIDGE CR)	11.0	0.0
59779	11/03/1983	BEECH CR (JDR)	11.2	0.0
63259	06/12/1989	BIG WALL CR (NFJDR)	15.0	4.5
63257	06/12/1989	BIG WALL CR (NFJDR)	4.5	0.0
59780	11/03/1983	BRIDGE CR (JDR)	5.7	0.0
72644	03/21/1990	BRIDGE CR (JDR)	19.0	13.0
62318	12/22/1988	CAMAS CR (NFJDR)	23.0	17.9
62319	12/22/1988	CAMAS CR (NFJDR)	17.9	10.8
62320	12/22/1988	CAMAS CR (NFJDR)	10.8	0.0
63256	06/12/1989	CAMP CR (MFJDR)	3.0	0.0
59781	11/03/1983	CANYON CR (JDR)	15.1	0.0
59782	11/03/1983	CLEAR CR (MFJDR)	0.0	0.0
59783	11/03/1983	COTTONWOOD CR (JDR)	0.0	0.0
63251	06/12/1989	COTTONWOOD CR (NFJDR)	17.6	0.0
73272	09/11/1990	CRANE CR (NFJDR)	6.7	0.0
62317	12/22/1988	DESOLATION CR (NFJDR)	21.5	0.0
63253	06/12/1989	EF BEECH CR (BEECH CR)	4.0	0.0
63252	06/12/1989	EF BEECH CR (BEECH CR)	8.0	4.0
73270	09/11/1990	EF CANYON CR (CANYON CR)	8.0	0.0
59784	11/03/1983	GRANITE CR (NFJDR)	5.0	0.0
64193	06/12/1989	INDIAN CR (JDR)	7.0	2.0
59786	11/03/1983	JOHN DAY RIVER	211.8	184.7
59787	11/03/1983	JOHN DAY RIVER	250.9	217
59788	11/03/1983	JOHN DAY RIVER	275.8	250.9
59798	05/24/1962	JOHN DAY RIVER	156.7	156.7
66609	05/24/1962	JOHN DAY RIVER	20.8	0.0
63255	06/12/1989	LONG CR (MFJDR)	25.6	0.0
63254	06/12/1989	LONG CR (MFJDR)	31.2	25.6
73269	09/11/1990	MF CANYON CR (CANYON CR)	8.0	0.0
59789	11/03/1983	MF JOHN DAY RIVER (JDR)	14.9	0.0
66610	05/24/1962	MF JOHN DAY RIVER (JDR)	14.9	0.0
63258	06/12/1989	MURDERERS CR (SFJDR)	7.0	0.0
66611	05/24/1962	NF JOHN DAY RIVER (JDR)	15.2	0.0
72643	06/12/1989	NF JOHN DAY RIVER (JDR)	15.0	0.0
59792	05/24/1962	NF JOHN DAY RIVER (JDR)	60.0	60.0

72646	09/11/1990	NF JOHN DAY RIVER (JDR)	101.0	65.4
73271	09/11/1990	NF JOHN DAY RIVER (JDR)	112.0	101.0
59793	11/03/1983	ROCK CR (JDR-ANTOINE)	4.6	0.0
59794	11/03/1983	SF JOHN DAY RIVER (JDR)	14.8	0.0
73273	09/11/1990	TRAIL CR (NFJDR)	2.0	0.0
64192	06/12/1989	VINEGAR CR (MFJDR)	4.0	0.0

Allocation of Conserved Water (OAR Chapter 537, Division 455 to 500): The Oregon Water Resources Department Allocation of Conserved Water Program allows a water user who conserves water to use a portion of the conserved water on additional lands, lease or sell the water, or dedicate the water to in-stream use. Use of this program is voluntary and provides benefits to both water right holders and in-stream values. (OAR Chapter 537, Division 455 to 500)

Oregon Division of State Lands Fill and Removal Laws (OAR Chapter 141, Division 85): Oregon Division of State Lands, under Removal-Fill Law (ORS 196.795-990) and the U.S. Army Corps of Engineers, under Section 404 of the Clean Water Act, regulate the removal and filling of materials in wetlands and waterways. More details can be found in the discussion of the Clean Water Act in Section 4.1.1 above. Joint application forms for Division of State Lands – Army Corps of Engineers removal-fill permits can be obtained from the Oregon Division of State Lands.

Oregon Forest Practices Act (ORS 527 and OAR Chapter 629, Divisions 600 to 680), 1971: The Oregon Forest Practices Act regulates forest management activities on state and private lands. These regulations recognize that the leading use of private forestlands is the growing and harvesting of trees, consistent with sound management of soil, air, water, fish and wildlife resources. The forest practices rules are designed to maintain forest productivity and protect wildlife and water resources. Water protection rules are incorporated into the Oregon Forest Practices Act to protect, maintain and, where appropriate, improve the functions and values of streams, lakes, wetlands, and riparian management areas.

Miscellaneous Land Use and Zoning Laws: There are a number of state, county and local land use and zoning laws that have been developed to protect fish, wildlife and water quality while maintaining the productivity of the land. To illustrate, portions of the Grant County and Wheeler County Comprehensive Plans are discussed below.

An example of land use policies is the natural resource element of the Grant County Comprehensive Plan. This element states, “Natural Resources are considered vital to Grant County’s historical and future development and are recognized as a primary base for the County’s economy. The County recognizes the following resources: land, vegetation, land quality, minerals, water, air, and fish and wildlife. General natural resource policies are to:

1. Manage natural resources to preserve original character where no conflicts are found;
2. Weigh economic, energy, environmental and social consequences when uses conflict;
3. Emphasize multiple use of resources;
4. Support coordinated resource management; …”

The natural resource element also points out that, “The County’s overall land use policies are to:

1. Support the County’s economic base;
2. Maximize preservation of agricultural and forest uses; …”(Grant County Comprehensive Plan)

Wheeler County also has a number of goals stated in their Comprehensive Land Use Plan that are of importance to the subbasin plan. Examples of these are:

1. To preserve and maintain agricultural lands.
2. To conserve forestlands for forest uses.
3. To conserve open space and protect natural, scenic, historic and cultural resources.
4. To maintain and improve the quality of air, water and land resources of Wheeler County.

Wheeler County’s policies also emphasize the importance of maintaining the economic viability and productivity of their natural resources. The county policy is: “to preserve agricultural lands and protect agriculture as an economic enterprise” and “to allow the application of management practices that maximize the continued productivity of timberlands, such as addressed by the Oregon Forest Practices Act.” (Wheeler County’s Comprehensive Plan.)

4.1.2 Treaties between Tribes and the Federal Government

Much of the John Day Subbasin is within the ceded lands of the CTUIR and the CTWSRO. The tribes have reserved treaty rights to the use of this land and its resources. These areas are still used for ceremonial and subsistence purposes, including hunting, fishing, livestock grazing and gathering plants. The treaties that give these rights are as follows:

1. **Treaty with the Tribes of Middle Oregon, 1855**

The Confederated Tribes of the Warm Springs Reservation of Oregon ceded nearly all of the lands within the John Day Subbasin to the U.S. Government through the Treaty with the Tribes of Middle Oregon on June 25, 1855. The treaty reserves to the Indians the rights to take fish at all usual and accustomed stations, and the privilege of hunting, gathering roots and berries, and pasturing their stock on unclaimed lands. The fish and wildlife resources of the John Day are of great significance to the Tribes, who co-manage these resources with the U.S. and Oregon governments.

2. **Treaty with the Cayuse, Umatilla and Walla Walla Tribes, 1855**

The Treaty of June 9, 1855, generally referred to as "The Treaty of 1855", between the United States Government and Cayuse, Walla Walla and Umatilla Indian Tribes, collectively known as the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), is the basis for CTUIR involvement in natural resource management issues within the John Day Subbasin. The three tribes once had a homeland of 6.4 million acres in northeastern Oregon and southeastern Washington. In The Treaty of 1855, the tribes "ceded," or surrendered possession of, much of the 6.4 million acres in exchange for a reservation homeland of 250,000 acres. Through the treaty, the CTUIR gave up ownership of a vast area of land extending from the lower Yakima River and along the mid-Columbia River to beyond the Blue Mountains into the Grande Ronde River drainage, south to the Powder River Subbasin, west into the John Day Subbasin, and north into the Willow Creek drainage. Included within this territory are parts of the Snake, Imnaha, Tucannon, Burnt, and Malheur river drainages. The three tribes reserved rights in the treaty, which include the right to fish at "usual and accustomed" sites, and to hunt and gather traditional foods and medicines on public lands within ceded areas, including portions of the John Day Subbasin. These rights are generally referred to as "treaty reserved rights."

4.1.3 Lands with Legal Mandates for Conservation

Areas with Statutory Mandates

Wilderness Areas: In the John Day Subbasin there are four designated wilderness areas, all managed by the U.S. Forest Service:

1. North Fork John Day Wilderness, 85,000 acres on Malheur and Wallowa-Whitman National Forests
2. Strawberry Wilderness, 68,700 acres on Malheur National Forest
3. Black Canyon Wilderness, 13,400 acres on Ochoco National Forest
4. Bridge Creek Wilderness, 5400 acres on Ochoco National Forest

Riparian Conservation Areas: Riparian Habitat Conservation Areas (RHCAs) were created by the Environmental Assessment for the Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH) to protect the riparian areas along streams. In addition, the Inland Native Fish Strategy Environmental Assessment (INFISH) created RHCAs and developed interim strategies for management of non-anadromous fish-producing watersheds on federal lands in eastern Oregon. These assessments amended pertinent USFS Land Management Plans and BLM Resource Management plans. Protection of these areas directly affects the hydrologic, geomorphic and ecologic processes of the riparian ecosystem.

Public Law 106-257, the Oregon Land Exchange Act of 2000: This act resulted in a major land exchange in eastern Oregon. The Act directs BLM to manage the lands acquired along the North Fork John Day River for the benefit of fish, wildlife, and recreation. Interim management actions are being taken while a management plan is completed through a public planning process. Some roads crossing sensitive fish streams are closed to motorized travel year-round and some areas that provide critical deer and elk winter range are closed to motorized travel during winter months.

John Day Fossil Beds National Monument: The John Day Fossil Beds National Monument is a 14,000 acre park which was established in 1975. It is divided into three widely separated units: the Sheep Rock Unit, Painted Hills Unit and Clarno Unit. Within the heavily-eroded volcanic deposits of the John Day Subbasin is a well-preserved fossil record of plants and animals. This remarkably complete record, spanning more than 40 of the 65 million years of the Cenozoic Era (the “Age of Mammals and Flowering Plants”) is world renowned. The visitor center is located at the Sheep Rock Unit.

State Wildlife Areas:

1. Bridge Creek Wildlife Area near Ukiah, OR: This wildlife area is managed as a winter range for elk by the Oregon Department of Fish and Wildlife. More than 1000 elk may congregate here during the winter to escape snows at higher elevations and feed on the rangelands. The Ron Bridges Memorial Trail (1/8-mile long) provides an overlook of Bridge Creek Flats year-round.

2. Philip W. Schneider Wildlife Area (formerly known as Murderers Creek Wildlife Area) near Dayville, OR: This 24,000+ acre wildlife area is located in the lower South Fork John Day River/Aldrich Mountain area. The area contains 37 miles of flowing streams. It offers excellent wildlife viewing year-round and hunting opportunities for many species including deer, elk, pronghorn, bighorn sheep, wild turkey and upland game birds.

3. Moon Creek Wildlife Area near Mt. Vernon, OR: This 13-acre wildlife area is located along the John Day River approximately 5.5 miles west of Mt. Vernon. The area is used for bird/wildlife viewing and nature interpretation. Hunting is not allowed. Wildlife species that can be viewed at Moon Creek Wildlife Area include waterfowl, song birds, osprey and beaver.

Federal Wild and Scenic Rivers: Portions of the John Day River are designated as Federal Wild and Scenic Rivers. These areas are listed below:

1. The lower mainstem of the John Day River from Service Creek downstream to Tumwater Falls (147.5 miles): This segment of the John Day is designated for recreation due to its exceptional anadromous steelhead and warm-water bass fishing; whitewater boating; and archeological, historical and paleontological values. This segment of the river flows through a number of colorful canyons, broad valleys, and breathtaking terrain.

2. North Fork of the John Day from its headwaters located in the North Fork of the John Day Wilderness Area downstream to its confluence with Camas Creek (54.1 miles). This section of river has three different designations with 27.8 miles designated as wild, 10.5 miles designated as scenic and 15.8 miles designated as recreational. This segment of river receives wild and scenic river designation because it is one of the most important rivers in northeast Oregon for the production of anadromous fish and has a wide variety of wildlife which can be found along the river's corridor. Its diverse landscape and geologic formations create high quality natural scenery. Recreation opportunities include hunting, fishing, sightseeing, horseback riding, hiking, snowmobiling, skiing, camping and whitewater rafting. There is also a great deal of mining remains and history from the gold mining era which began in the 1860s.

3. South Fork of the John Day River from the Malheur National Forest boundary downstream to Smoky Creek (47 miles). This section of river is designated for recreation as it offers outstanding scenery, wild steelhead fishing, hunting, hiking, swimming and camping.

Oregon Scenic Waterways (ORS 390.805 to 390.25): The State of Oregon has identified certain lakes and free-flowing rivers as having outstanding scenic, fish, wildlife, geological, botanical, historic, archaeologic, and outdoor recreation values of present and future benefit to the public. The free-flowing character of these waters are to be maintained in quantities necessary for recreation, fish and wildlife uses. No dam, or reservoir, or other water impoundment facility is allowed to be constructed on waters within scenic waterways. No water diversion facility shall be constructed or used except by previously established rights or as permitted by the Water Resources Commission. All fills and removals in State Scenic Waterways require a permit from the Division of State Lands. The portions of the John Day River system designated as scenic waterways include:

1. The John Day River from its confluence with Parrish Creek downstream to Tumwater falls.

2. The North Fork John Day River from the boundary of the North Fork John Day Wilderness (near river mile 76), as constituted on December 8, 1988, downstream to river mile 20.2 (northern boundary of the south one-half of Section 20, Township 8 South, Range 28 East, Willamette Meridian).

3. The Middle Fork John Day River from its confluence with Crawford Creek (near river mile 71) downstream to the confluence of the Middle Fork John Day River with the North Fork John Day River.

4. The South Fork John Day River from the Post-Paulina road crossing (near river mile 35) downstream to the northern boundary of the Philip W. Schneider Wildlife Area, as constituted on December 8, 1988 (near river mile 6).

Areas with Contractual Mandates

Tribal Mitigation Properties

The Confederated Tribes of the Warm Springs Reservation of Oregon manage three fish and wildlife mitigation properties in the John Day Subbasin. The 33,557-acre Pine Creek Conservation Area is in and near the Pine Creek watershed on the lower mainstem John Day River. The 1022-acre Oxbow Conservation Area and the 4232-acre Forrest Conservation Area are located on the Middle Fork John Day and mainstem John Day rivers, respectively.

Legally binding agreements are in place between BPA and the Tribes to achieve “the protection, mitigation, and enhancement of wildlife habitat permanently to help fulfill BPA's duties under the Northwest Power Act.” These agreements call for the Tribes to prepare site-specific management plans for each property, and for BPA to “provide a reasonable amount of additional funds for operation and maintenance to help the Tribe ensure the habitat's natural characteristics and mitigation qualities are developed and self-sustaining.” The Tribes will manage these properties for fish and wildlife habitat in perpetuity.

Private Conservation Easements/Conservation Areas
There is an active easement acquisition program in the subbasin. Listed below are examples of some of these efforts (Shaun Robertson, Rocky Mountain Elk Foundation, personal communication, April 29, 2004):

1. Aldrich Front Project: This project currently includes 2300 acres in a conservation easement.

2. China Peak: This project is a three-phase conservation easement in the North Fork John Day watershed that will total approximately 10,000 acres when complete. Two phases of the project have been completed and the remaining phase is projected to be completed in the next few years.

3. Bogg Canyon Conservation Easement: This is a 4000-acre conservation easement located in the North Fork John Day watershed.

4. The Nature Conservancy Dunstan Homestead, Middle Fork John Day River: The Nature Conservancy purchased the 1199-acre Dunstan homestead because the John Day River has never had hatcheries and as a result is a key resource for recovery of wild salmon in the Columbia Basin. The conservation challenge is to restore 4.5 miles of the river to former river meanders and streamside vegetation in order to increase and improve habitat for fish, elk, beaver, songbirds and other native wildlife. A 1996 wildfire burned two-thirds of the preserve, causing no damage to structures but returning fire to the site, and providing ecologists with an opportunity to study the effects of the fire over time. Conservancy works in partnership with ODFW, Malheur National Forest, the Umatilla and Warm Springs Confederated Tribes and others to restore natural flows and vegetation to the river floodplain. (http://nature.org/wherewework/northamerica/states/oregon/preserves/art6799.html)

4.2 Existing Plans

4.2.1 General Management Plans

Previous Subbasin Plan - John Day Subbasin Summary (NWPPC 2001): The John Day Subbasin Summary was drafted to meet the interim need for a facilitated, subbasin project review by the Independent Scientific Review Panel. Termed the "rolling provincial review," this review and renewal process was designed to establish the budgets and approve activities for existing and newly funded BPA projects. In addition, the summary was a substantial beginning towards developing this document, the John Day Subbasin Plan.

Federal Plans

1. **Federal Caucus All-H Paper, Basin Wide Salmon Recovery Strategy 2000**: On December 21, 2000 a team of nine federal agencies released a long-term strategy to recover threatened and endangered fish in the Columbia Basin. It calls for significant

habitat improvements in the Columbia estuary and its tributaries and changes in the hatchery system, while leaving the four lower Snake River dams in place.

2. **Clean Water Action Plan, EPA:** The Clean Water Action Plan builds on the solid foundation of existing clean water programs and proposes new actions to strengthen efforts to restore and protect water resources. In implementing this action plan, the federal government will:
    a. support locally-led partnerships that include a broad array of federal agencies, states, tribes, communities, businesses, and citizens to meet clean water and public health goals;
    b. increase financial and technical assistance to states, tribes, local governments, farmers, and others; and
    c. help states and tribes restore and sustain the health of aquatic systems on a watershed basis. (http://www.cleanwater.gov/action/overview.html)

3. **Columbia River Fish Management Plan:** The Columbia River Fish Management Plan is the agreement resulting from the U.S. District Court case of U.S. v. Oregon (Case No. 68-513). This agreement between the federal agencies, Indian Tribes and state agencies (except Idaho) involved set guidelines for the management, harvest, hatchery production and rebuilding of Columbia River Basin salmonid stocks. (http://www.efw.bpa.gov/Environment/DOCS/LITIGATION/wp0138zz.html)

4. **Stream Restoration Program for the Upper Mainstem of the John Day River, 1993**: The major goals of the program are to increase wild anadromous fish populations, increase soil stability, and enhance the local economy. Specific objectives include moderating stream temperatures, increasing summer flows, improving fish passage, reducing soil erosion, improving streambank stability, and maintaining agricultural production.

5. **ESA 2002 Implementation Plan for the FCRPS, 2002**: Implemention plans were developed as a result of the Biological Opinions issued by the National Marine Fisheries Service and the US Fish and Wildlife Service for the Federal Columbia River Power System. This plan address the measures to be undertaken by the action agencies, with the primary focus on endangered fish.

6. **BPA Fish & Wildlife Implementation Plan Draft EIS, DOE, June 2001:** This planning effort is based upon the premise that all fish and wildlife resources are interrelated parts of a singular ecosystem, and humans are integral components of the ecosystem through their many and diverse activities. The needs of humans, fish and wildlife are addressed together and simultaneously in this plan.

7. **Draft Bull Trout Recovery Plan, USFWS:** A Bull Trout *Salvelinus confluentus* Draft Recovery Plan, Chapter 9, John Day Unit (U.S. Fish and Wildlife Service, 2003) was prepared. The overall goal for bull trout in the John Day Recovery Unit is to increase their stability and potential for 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:

A. Maintain current distribution of bull trout and restore distribution in previously occupied areas within the John Day River Recovery Unit.
B. Maintain stable or increasing trends in abundance of bull trout.
C. Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies.
D. Conserve genetic diversity and provide opportunity for genetic exchange, while maintaining the genetic integrity of all life history types.

8. **Interior Columbia Basin Ecosystem Management Project (ICBEMP) USDA-FS, USDI-BLM, 2000:** In 1993, President Clinton directed the Forest Service to develop a scientifically sound ecosystem-based strategy for management of eastside forests. The project received more than 83,000 public comments on two draft EIS documents in June 1997. A supplemental draft EIS was released in March 2000 and a final EIS and proposed decision in December 2000. In January 2003 the regional executives for the US Forest Service, Forest Service Research, Bureau of Land Management, US Fish and Wildlife Service, the National Marine Fisheries Service and the Environmental Protection Agency signed a Memorandum of Understanding (MOU) completing the project. The agencies signing the MOU agreed to cooperatively implement The Interior Columbia Basin Strategy.

9. **USDA Forest Service Resource Management Plans:** Management of USDA Forest Service lands in the John Day Subbasin are governed by a set of forest plans which are based on the Forest and Rangeland Renewable Resources Planning Act (RPA) as amended by the National Forest Management Act of 1976 (NFMA).

   Four national forests – the Umatilla, Wallowa-Whitman, Malheur, and Ochoco – are responsible for managing these lands in the John Day Subbasin. The Umatilla NF manages lands draining into the North Fork, Middle Fork, and mainstem of the John Day River. The Malheur NF manages lands draining into the Middle Fork, South Fork, and Upper John Day River. The Wallowa-Whitman NF manages lands that drain into the North Fork John Day River. The Ochoco NF manages lands that drain into the South Fork and the mainstem of the John Day River.

   The Forest Plans for these National Forests were signed in 1990. The Umatilla, Wallowa-Whitman, and Malheur National Forests are in the process of revising their forest plans.

10. **John Day River Management Plan, Two Rivers, John Day, and Baker Resource Management Plan Amendments, February 2001:** The John Day River Management Plan was prepared with the cooperation of the BLM, Bureau of Indian Affairs, John Day River Coalition of Counties, Confederated Tribes of Warm Springs, and the State of Oregon. The record of decision was made in February of 2001. The John Day River Management Plan provides decisions for BLM resources in Grant County. The Two Rivers Resource Management Plan provides decisions for Hood River, Wasco, Sherman,

Gilliam, Wheeler, as well as portions of Crook and Jefferson counties. The Baker Resource Management Plan provides decisions for all or portions of Baker, Malheur, Wallowa, Morrow, Umatilla, and Union counties in Oregon. The only portion of the Baker Resource Management planning area that overlaps the John Day River corridor is in extreme southern Umatilla County.

11. **Amendments to USFS Forest Plans and/or BLM Resource Management Plans:**
    A. **Inland Native Fish Strategy Environmental Assessment (INFISH), USDA-FS, 1995:** The U.S. Forest Service and the BLM implemented an interim management strategy (INFISH) for management of non-anadromous fish-producing watersheds on federal lands in eastern Oregon in 1995. These management strategies supersede the forest plans where applicable.

    B. **Environmental Assessment for the Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and portions of California (PACFISH), USDA-FS, USDI-BLM, 1994**: The U.S. Forest Service and the BLM implemented an interim management strategy (PACFISH) for management of anadromous fish-producing watersheds on federal lands in eastern Oregon in 1995. These management strategies supersede the forest plans were applicable.

ODFW Plans

ODFW has developed a number of management plans which facilitate the management of wildlife in the John Day Subbasin. Examples of these plans are listed below:

1. **Vision 2006, a Six Year Strategic Plan, May 2000**: Vision 2006 was published in May 2000 and builds upon the strategies outlined in the ODFW strategic operational plan, lays a strong foundation for new initiatives, and provides vision for the ODFW into 2006. Vision 2006 includes ODFW's, vision and principles, trends, strategic themes, statutory authority and a financial outlook. Interested constituents and department staff participated in the development of the plan. (ODFW, Vision 2006 a Six Year Strategic Plan, May 2000).

2. **Mule Deer Management Plan, February 2003**: The goal of the Mule deer Management Plan is to manage mule deer populations to attain the optimum balance among recreational uses, habitat availability, primary land uses and other wildlife species. (ODFW Mule Deer Management Plan, February 2003)

3. **Elk Management Plan, February 2003:** The purpose of Oregon's Elk Management Plan is to guide elk management in Oregon for the next 10 years, with an interim review at 5 years. This plan will be used by the Oregon Department of Fish and Wildlife (ODFW) to guide management decisions related to elk and to identify ODFW elk management policies and strategies to the public, other agencies, and private landowners. (ODFW Elk Management Plan, February 2003).

4. **Oregon's Bighorn Sheep and Rocky Mountain Goat Management Plan, December 2003:** This plan provides overall management direction for Oregon's bighorn sheep and

Rocky Mountain goat programs for the next 10 years. It is ODFW's goal to have healthy populations of bighorn sheep and Rocky Mountain goats in all available, suitable habitat within Oregon. This plan summarizes the history and current status of Oregon's bighorn sheep and Rocky Mountain goats. It presents management guidelines for populations in Oregon and will guide future transplant activities, as well as assisting other concerned resource management agencies with planning efforts. (ODFW 2003, Oregon's Bighorn Sheep and Rocky Mountain Goat Management Plan, December 2003).

5. **Cougar Management Plan, 1993 to 1998:** The ODFW manages cougar in the John Day Subbasin based on the 1993 to 1998 Cougar Management Plan. ODFW's goals as established in this plan are to:
    A. Recognize the cougar as an important part of Oregon's wildlife fauna, valued by many Oregonians.
    B. Maintain healthy cougar populations within the state into the future.
    C. Conduct a management program that maintains healthy populations of cougar and recognizes the desire of the public and the statutory obligations of the department. (ODFW 1993, Oregon's Cougar Management Plan 1993-1998).

6. **Black Bear Management Plan, 1993 to 1998:** The ODFW manages black bear in the John Day Subbasin utilizing the Black Bear Management Plan 1993 to 1998. In this plan ODFW identifies its goals for management of the black bear as:
    A. Recognize the black bear as an important part of Oregon's wildlife fauna, valued by many Oregonians.
    B. Maintain healthy black bear populations within the state into the future.
    C. Conduct a management program that maintains healthy populations of black bear, and recognizes the desires of the public and the statutory obligations of the ODFW. (ODFW 1993, Oregon's Black Bear Management Plan (1993-1998).

7. **Oregon Migratory Game Bird Program Strategic Management Plan, October 1993:** The ODFW has developed a strategic management plan for the Oregon Migratory Game Bird Program. ODFW's mission is to protect and enhance populations and habitats of native migratory game birds and associated species at prescribed levels throughout natural geographic ranges in Oregon and the Pacific Flyway to contribute to Oregon's wildlife diversity and the uses of those resources. (ODFW October 1993, Oregon Migratory Game Bird Program Strategic Management Plan).

8. **Oregon Wildlife Diversity Plan, January 1999:** The ODFW's "Oregon Wildlife Diversity Plan" is designed to conserve the diversity of fish and wildlife species in the state. The plan is a blueprint for addressing the needs of Oregon's native fish, amphibians, reptiles, birds and mammals, and contains information on all species and habitats in the state. The Plan was first adopted in 1986, and was updated in November 1993 and again in January 1999. (http://www.dfw.state.or.us/ODFWhtml/InfoCntrWild/Diversity/Diversity.html)

9. **Fish Management Plans (OAR Chapter 635, Division 500):** The administrative rules contained in this division are the legally-enforceable elements of fish management plans.

Fish management plans are comprehensive documents which the ODFW regards both as a means to implement policy and as an explanation of the intent and rationale of management direction. Plans contain factual background material, statements of the rationale for selection of objectives, strategies to be applied to attain objectives, and statements of general priorities for various actions. Copies of all plans are available from the ODFW.

A. **Steelhead Management Policy (OAR Chapter 635, Division 500-0010**): These rules are established to guide management and conservation of steelhead (*Oncorhynchus mykiss*) in Oregon. It is the policy of the State of Oregon that steelhead be managed as a game fish. This management plan fulfills OAR 635-007-0515, which states that resources of the state shall be managed according to management plans.
B. **Trout Management Objectives (OAR Chapter 635, Division 500-0012):** The Department shall proceed with programs and other efforts to achieve the following statewide objectives, consistent with applicable law, agency policy and rule, and recognized funding priorities for the agency. The Statewide Trout Plan will provide specific guidance for the production, harvest and management of trout statewide, consistent with the following objectives:
    a. Maintain the genetic diversity and integrity of wild trout stocks throughout Oregon.
    b. Protect, restore and enhance trout habitat.
    c. Provide a diversity of trout angling opportunities.
    d. Determine the statewide management needs for hatchery trout.
    e. Enhance the public awareness of Oregon's trout resources.

10. **Murderer's Creek Wildlife Area Long Range Management Plan, December 1993:** This plan documents the history and physical and biological description of the Phillip W. Schneider Wildlife Area (formerly the Murderer's Creek Wildlife Area). The plan also establishes goals and objectives for long range management and conservation of the natural resources of the wildlife area. The primary purpose of the Phillip W. Schneider Wildlife Area is protection and enhancement of mule deer winter range.

OWRD Plans

There are a number of OWRD plans which have been prepared in the John Day subbasin. These plans were developed to “provide the public with important, economic, social, and environmental benefits.” (OAR 690-506)

1. Stream Restoration Program for the Middle Fork Subbasin of the John Day River, 1991
2. Stream Restoration Program for the Upper Mainstem of the John Day River, 1992
3. Stream Restoration Program for the South Fork of the John Day River, 1992
4. Stream Restoration Program for Upper South Fork of the John Day River, 1992
5. Stream Restoration Program for the Rock Creek Tributary of the John Day River, 1993

Tribal Plans

1. ***Wy-Kan-Ush-Mi Wa-Kish-Wit*****:** Spirit of the Salmon Columbia River Anadromous Fish Restoration Plan of the Nez Perce, Umatilla, Warm Springs, and Yakama Tribes, CRITFC, 1995: The objectives of this plan are:
   a. to halt the decline of salmon, lamprey and sturgeon populations above Bonneville Dam within seven years.
   b. to rebuild salmon populations to annual run sizes of four million above Bonneville Dam within 25 years in a manner that supports tribal ceremonial, subsistence and commercial harvests.
   c. to increase lamprey and sturgeon to natural sustaining levels within 25 years in a manner that supports tribal harvests.

   To achieve these objectives, the plan emphasizes strategies and principles that rely on natural production and healthy river systems.

2. **Tribal Wildlife Habitat and Watershed Management Plans:** The Confederated Tribes of the Warm Springs Reservation of Oregon mitigation properties were previously described above in Section 4.1.2. The Pine Creek Conservation Area Wildlife Habitat and Watershed Management Plan was submitted to BPA for final review and approval in October 2003. The Forrest and Oxbow Conservation Areas Fish and Wildlife Habitat Management Plan is currently being developed.

U.S. Forest Service Ecosystem/Watershed Analyses:
The U.S. Forest Service has conducted a number of watershed analyses in various national forests in the John Day Subbasin. These include:

1. Malheur National Forest
   A. Deer Creek Ecosystem Analysis (2000)
   B. Galena Watershed Analysis (1999)
   C. Upper Middle Fork John Day Ecosystem Analysis (1998)
   D. Murderers Creek Ecosystem Analysis (1997)
   E. Strawberry Mountain Ecosystem Analysis (1997)
   F. Upper South Fork John Day River Watershed Analysis (1995)

2. Umatilla National Forest
   A. Desolation Ecosystem Analysis (July 1999)
   B. Tower Fire Ecosystem Analysis (Jan. 1997)
   C. Granite Creek Watershed Analysis (July 1997)
   D. Upper North Fork John Day Watershed Analysis (July 1997)
   E. Camas Ecosystem Analysis (May 1995)
   F. Wall Ecosystem Analysis (Sept. 1995)

3. Ochoco National Forest
   A. Keeton-Fry Watershed Analysis (1997)

Other Miscellaneous Assessments:

1. Hay Creek/Scott Canyon Watershed Assessment (May 2003): Completed by the Gilliam-East John Day Watershed Council

2. Camas Creek Watershed Assessment: This watershed assessment is being completed by the Corp of Engineers in conjunction with the CTUIR.

3. Pine Hollow Watershed Enhancement Action Plan: Pine Hollow Watershed Council, 1997

4. Upper South Fork of the John Day River Watershed Assessment, Draft Report, March 2003. The report was prepared for the Grant Soil and Water Conservation District by ABR, Inc--Environmental Research & Services.

Oregon Department of Agricultural Plans:

1. **Water Quality Management Area Plans (1010 Plans):** There have been four AgWQMAPs completed in the John Day Subbasin. These plans are:
   A. North and Middle Forks John Day Agricultural Water Quality Management Area Plans (AgWQMAP), Local SWCD, Advisory Committees, 2002
   B. Upper and South Fork John Day AgWQMAP, Local SWCD, Advisory Committees, 2003
   C. Middle John Day AgWQMAP, Local SWCD, Advisory Committees, 2003
   D. Proposed Lower John Day AgWQMAP, Local SWCD, Advisory Committees, 2004

2. **Coordinated Resource Management Planning:** Coordinated Resource Management Planning (CRMP) is a process by which natural resource owners, managers and users work together as a team to formulate plans for the management of major resources within a specific area, and/or seek to identify and resolve specific conflicts concerning management activities. The CRMP process has been in existence in Oregon for over 40 years and has helped many landowners to more effectively manage their resources. The concept follows the principle that adjoining landowners who work together to solve resource issues can be more effective than they can be by working individually. The process is voluntary and non-regulatory. Its power comes from the commitment of all parties to work for the maximum resolution and coordination possible, given the particular constraints and necessities of the individuals and entities involved. There are two CRMPs in the John Day Subbasin: one on Bridge Creek (original Bridge Creek CRMP process was completed in 1997 and updated in February 2004) and another on the South Fork John Day River.

4.3 Existing Management Programs

4.3.1 Voluntary Conservation Programs

Farm Bill Programs Administered by NRCS and FSA
A variety of Farm Bill programs have been used extensively for conservation and restoration projects in the subbasin.

1. **Environmental Quality Incentives Program:** The Environmental Quality Incentives Program (EQIP) was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as comparative national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land. EQIP may cost share up to 75 percent of certain conservation practices. Incentive payments may be provided for up to three years to encourage producers to carry out management practices they may not otherwise use without incentive. This program is administered by the Farm Service Agency.

2. **Conservation Reserve Program:** The Conservation Reserve Program (CRP) provides technical and financial assistance to eligible farmers and ranchers to address soil, water and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The program provides assistance to farmers and ranchers in complying with federal, state and tribal environmental laws, and encourages environmental enhancement. The program encourages farmers to convert highly-erodible cropland or other environmentally-sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filterstrips, or riparian buffers. Farmers receive an annual rental payment for the term of the multi-year contract. The program is administered by the Farm Service Agency, with NRCS providing technical land eligibility determinations, environmental benefit index scoring and conservation planning. This program has been used extensively in the subbasin, particularly in the lower portions of the subbasin. The following are examples of CRP usage in the subbasin: Sherman County – over 37,000 acres, Wheeler County – 6857 acres, Morrow County – 2600 acres, and Gilliam County – 66,159 acres.

3. **Conservation Reserve Enhancement Program:** The Conservation Reserve Enhancement Program (CREP) is an offshoot of the CRP program. CREP is a voluntary program for agricultural landowners. Unique state and federal partnerships allow landowners to receive incentive payments for installing specific conservation practices. Through CREP, farmers can receive annual rental payments and cost-share assistance to establish long-term, resource conserving covers on eligible land. The CREP program is administered by the Farm Service Agency. The CREP program has limited use in the subbasin: Sherman County – 429 acres, Wheeler County – 155 acres, and Gilliam County – 915 acres (includes CCRP acres for Gilliam County).

4. **Wildlife Habitat Incentives Program (WHIP):** The Wildlife Habitat Incentives Program is a voluntary program for people who want to develop and improve wildlife habitat primarily on private land. Through WHIP the NRCS provides both technical assistance and up to 75 percent cost-share assistance to establish and improve fish and wildlife habitat. WHIP agreements between NRCS and the participant generally last from five to 10 years from the date the agreement is signed.

Bureau of Reclamation Habitat Program: NOAA Fisheries issued a Biological Opinion in December 2000 on the continued operation of the Federal Columbia River Power System (FCRPS). As part of this opinion, Reasonable and Prudent Alternatives (RPA) were identified to prevent a jeopardy opinion to be issued for the continued operation of the FCRPS. RPA Action 149 requires that Reclamation "shall initiate programs in three priority subbasins per year over five years, in coordination with NOAA Fisheries, U.S. Fish and Wildlife Service (USFWS), states, and others, to address all flow, passage, and screening problems in each subbasin over 10 years". In Oregon, three John Day River subbasins have been designated as priority subbasins: the Upper (above Kimberly), the Middle Fork, and the North Fork. Reclamation has established a subbasin liaison position in John Day, Oregon to coordinate Reclamation activities in these three basins. Currently, Reclamation has authority to provide technical assistance to private landowners who volunteer to correct passage barriers and screen diversions. Reclamations is actively working with soil and water conservation districts, watershed councils, tribes, ODFW, and others to provide funding or direct engineering and planning support for passage barrier and fish screen projects on private lands. At this time, Reclamation does not have authority to provide funding for construction activities, but is seeking this authority from the U.S. Congress. Reclamation does have authority under the Endangered Species Act to purchase or lease water from willing sellers for conversion to in-stream flows to meet the flow restoration obligations of RPA Action 149.

CTWSRO Program: The majority of the John Day Subbasin was ceded to the federal government in 1855 by the Confederated Tribes of the Warm Springs Reservation of Oregon (Tribes). In 1997, the Tribes established an office in the subbasin to coordinate restoration projects, monitoring, planning and other watershed activities on private and public lands. Once established, the John Day Basin Office (JDBO) formed a partnership with the Grant Soil and Water Conservation District (GSWCD), also located in the town of John Day, which contracts the majority of the construction implementation activities for these projects from the JDBO. The GSWCD completes the landowner contact, preliminary planning, engineering design, permitting, construction contracting, and construction implementation phases of most projects. The JDBO completes the planning, grant solicitation/defense, environmental compliance, administrative contracting, monitoring, and reporting portion of the program. Most phases of project planning, implementation, and monitoring are coordinated with the private landowners and subbasin agencies, such as the Oregon Department of Fish and Wildlife and Oregon Water Resources Department.

ODFW Programs:

1. **Screen Shop:** The ODFW has a facility located in John Day that designs and constructs fish screens. There are numerous fish screens in the John Day Subbasin to keep fish in streams and out of irrigation ditches.

2. **Green Forage Program:** This program offers cost-share to private landowners experiencing crop damage from game animals. Projects are designed to improve forage or provide alternate food sources for big game. Cost-share projects include developing wildlife water sources, seeding and/or fertilizing forage plants for big game, and enhancing or controlling vegetation to benefit wildlife by utilizing prescribed fire, chemical or mechanical methods.

3. **D.E.A.R. Program:** The D.E.A.R. (Deer Enhancement And Restoration) program offers cost-share and technical assistance to private and public landowners to improve mule deer habitat. Cost-share practices in this program include herbaceous seeding, tree and shrub planting, water-source development, fencing, and vegetation enhancement or control utilizing prescribed fire, chemical or mechanical methods.

4. **Access and Habitat Program:** This program is designed to improve wildlife habitat and public hunting access to private and public land. A seven member board reviews and recommends projects to the Oregon Fish and Wildlife Commission for funding. Funds for this program are generated by the sale of hunting licenses.

OWEB Programs

1. **Oregon Plan, Oregon Watershed Enhancement Board (ORS Chapter 541.351 to 541.420), 1997:** Approved by the Oregon legislature in 1997, the Oregon Plan for Salmon and Watersheds and the 1998 Steelhead Supplement outline a statewide approach to ESA concerns based on watershed restoration, ecosystem management, coordination among state agencies, community involvement and local solutions to protect and improve salmon and steelhead habitat. The Oregon Watershed Enhancement Board provides grant funds and technical and financial support to the various watershed councils in the John Day Subbasin to help implement the Oregon Plan.

2. **Watershed Council Programs:** There are numerous active watershed councils in the John Day Subbasin including the Pine Hollow/Jackknife Watershed Council, Grass Valley Canyon Watershed Council, North Sherman Watershed Council, North Fork Watershed Council, Bridge Creek Watershed Council, Gilliam-East John Day Watershed Council, Mid John Day Watershed Council and the Upper South Fork Watershed Council. These watershed councils are comprised of local citizens working together to identify and implement restoration projects.

USFS/BLM Programs for Work on Private Lands: Title III, Section 323 and Title I, Section 136 of Public Law 105-277 (Omnibus Consolidated and Emergency Supplemental Appropriations Act, 1999). This act, commonly and locally referred to as the "Wyden Amendment," provides the Forest Service and Bureau of Land Management the authority to enter into collaborative arrangements with other state, federal and local partners to accomplish high priority restoration, protection and enhancement work on public or private lands.

SWCD Programs: Besides having their own programs supported through the U.S. Department of Agriculture, the SWCDs are frequently the conduit between other funding sources and the private landowners undertaking restoration projects. The SWCDs also establish conservation priorities within their local districts. These priorities guide funding for programs such as EQIP and OWEB small grants.

Blue Mountains Elk Initiative: A federal, private, state, and tribal partnership to manage ek in the Blue Mountains of Oregon and Washington. The mission of this initiative includes: working with private land owners to alleviate damage to crops, trees, and forage; obtaining concensus on elk management priorities from all partners and interest groups; spending 90 percent of program funds for on-the-ground projects and remaining funds allocated to research and education. Voluntary conservation and management projects funded by the Blue Mountains Elk Initiative include fencing, vegetation management, water development, noxious plant control, prescribed burning, and fertilization.

Private Landowner Initiatives: There are numerous examples of landowners volunteering to complete restoration projects on their land as they realize the benefit of these projects. These volunteer efforts clearly illustrate the good land stewardship that is practiced by the vast majority of private land owners in the John Day Subbasin.

4.3.2 Monitoring and Evaluation Programs

Monitoring Programs in the John Day Subbasin

There are several monitoring programs active within the John Day Subbasin, geared variously toward base-line measurement, time-trend estimation, and evaluation of the effectiveness of management strategies designed to improve aquatic habitat or water quality. Despite the large amount of stream monitoring occurring in the subbasin, it is clear from a breakdown of monitoring by type, location and frequency that understanding the myriad of processes in this large and diverse landscape can be a major challenge and that even more data is needed. Table 62 below summarizes some of the main stream monitoring efforts in the subbasin. In addition, aerial photography, airborne thermal infrared remote sensing, and other geospatial datasets continue to be produced; and stream gaging, fish counting and assessments of land use and management practices are underway.

Table 62. Monitoring programs in the John Day Subbasin.

Organization	Program	Sample Type	Location	Time	Parameter
DEQ	Biomonitoring	Water column, channel, riparian	Statistical sample of upper and reference watersheds	2000-2002, some repeated sites	Habitat, invertebrates, fish, vegetation, temperature, chemistry
	TMDL	Water column, channel, riparian	Longitudinal distribution on subbasin mainstems	2002-2004, one-time sites	Channel, temperature, chemistry, vegetation, flow
	Ambient	Water column	3 mainstem sites 1 each at North Fork and South Fork mouths,	Decades, quarterly, ongoing	pH, temperature, dissolved oxygen, turbidity and lab analyses
Monument SWCD		Water column, riparian	North & Middle Fork subbasins	1999 Ongoing	Temperature, some grab samples of other properties, photos.
Umatilla National Forest		Water column, channel, riparian	North, Middle & Lower John Day	As early as 1993, ongoing	Temperature, morphology, vegetation, sediment, macrovertebrates
Malheur National Forest		Water column	Middle Fork subbasin	Ongoing	Temperature
Ochoco National Forest, Paulina Ranger District		Water column	Rock, Keeton, Fry, Cottonwood, Black Canyon, Wind, N.F. Wind, Sunflower, and Frazier creeks; S.F. John Day River	Ongoing	Stream temperatures
		Water column	Black Canyon Creek	Ongoing	Stream discharge and peak flows
		Stream substrate	Rock, Keeton, Fry, Cottonwood, Black Canyon, Wind and N.F. Wind creeks	Ongoing	Redd surveys
		Stream	Keeton and Fry creeks	Starting in 2004	Presence/absence surveys for bull trout
USBR/OSU/ODFW Fish Production Study		Water column, channel, riparian	North, Middle & South Forks drainage areas	2004 ongoing	Habitat, invertebrates, fish, vegetation, temperature, chemistry

Organization	Program	Sample Type	Location	Time	Parameter
Confederated Tribes of the Warm Springs Indian Reservation	Mitigation Properties	Water column, riparian	Middle Fork, Pine Creek, mainstem John Day	Ongoing	Temperature, streamflow, vegetation, photo monitoring, breeding birds
		Upland	Middle Fork, Pine Creek, mainstem John Day	Ongoing	HEP, upland vegetation, game surveys, photo monitoring, breeding birds
	Watershed Restoration Program	Riparian, water column, project sites, uplands	Mainstem, Middle Fork, South Fork, North Fork John Day rivers, associated tributaries	Ongoing	Temperature, streamflow, riparian vegetation recovery, photo monitoring, upland vegetation, thermal profiles, aquatic populations, macroinvertebrates, channel cross sections, irrigation project effectiveness.
	Salmon Recovery Monitoring Program	Riparian, stream column	John Day Subbasin	Ongoing	Water quality, streamflow, irrigation groundwater recharge, riparian recovery and changes, spawning distribution, scour effects on salmonid redds.
The Nature Conservancy		Water column, channel, riparian, upland	Middle Fork	1992 Ongoing	Temperature, water table elevation, flow, vegetation, channel cross, weeds, photopoints
BLM		Water column, channel, riparian	Mainstem, North Fork	Ongoing	Temperature, vegetation
U.S. Geological Survey - Streamflow Gaging Station Program		Water column	3 John Day River sites, 1 Middle Fork site and 1 North Fork site	Between 1904 and present at various sites, ongoing	Streamflows, Temperature

Organization	Program	Sample Type	Location	Time	Parameter
Oregon Water Resources Department - Streamflow Gaging Station Program		Water column	1 John Day River, Mountain Creek, Canyon Creek, Strawberry Creek, Butte Creek, Deer Creek, Murderer's Creek site and 2 South Fork sites	Between 1926 and present at various site, ongoing	Streamflows
ODFW Terrestrial Species Monitoring	Upland Game Bird and Waterfowl	Post-harvest monitoring, breeding bird surveys, aerial counts and surveys, direct counts	John Day Subbasin (species dependent)	Ongoing	Population status and trends, habitat suitability, species distribution, breeding/hatching chronology, sex/age determination.
	Big Game	Aerial counts and surveys, hunter telephone surveys	John Day Subbasin (species dependent)	Ongoing	Composition and population sizes, harvest statistics.
	Non game wildlife	Direct counts, nest counts.	John Day Subbasin (species dependent)	Ongoing	Population status and trends, reproductive success

4.4 Existing Restoration and Conservation Projects

4.4.1 Restoration and Conservation Projects

Numerous restoration projects have taken place in the John Day Subbasin. During the planning process a database was developed to record and track these projects. This database is designed to allow users to sort and query the project data in a number of ways for analysis purposes. For example, data can be sorted and queried by project type, steelhead population area, HUC5 watershed, or limiting factor. The inventory of restoration and conservation projects is extensive. Thus, it has been placed in the appendix as Appendix X.

4.4.2 Research, Monitoring and Evaluation Projects (includes studies)

A number of the existing monitoring efforts in the John Day subbasin are listed in Table 62 in Section 4.3.2. Listed below are additional details on a few of the organizations' monitoring efforts.

BLM monitoring efforts: The BLM's monitoring program focuses on compliance and effectiveness monitoring. Planned and permitted activities are monitored for compliance with specifications designed to maintain or improve fish and wildlife habitat. Effectiveness monitoring measures the adequacy of these specifications in maintaining or improving habitat conditions. Effectiveness monitoring includes riparian trend studies, greenline studies, riparian photopoints, and a variety of watershed cover studies. Validation monitoring has been restricted to redd counts. Validation monitoring has generally been limited to species with fewer legal regulations than fish, such as beavers. BLM also conducts monitoring in areas with special management emphasis (such as Wild and Scenic Rivers and Wilderness Study Areas) to supplement district-wide monitoring. Imagery collected in 2004 will be used to map riparian vegetation along the lower mainstem and South Fork of the John Day River.

CTWSRO monitoring efforts: The overall purpose of the John Day Basin Office's Salmon Recovery Monitoring Program is to expand the ongoing research, monitoring, and evaluation program being conducted in the John Day Subbasin by the John Day Basin Office of the Confederated Tribes of Warm Springs. Objectives are being addressed, through a combination of tasks, to meet issues that have been identified with the existing monitoring effort and to address emerging issues associated with the program. The objectives are related to three primary areas of interest: 1. assessing resource recovery that has resulted from past restoration activities; 2. evaluating trends in resource recovery resulting from the ongoing watershed program, and 3. identifying the current condition and trends in resources as a background to other ongoing evaluations.

Since 1997, the John Day Basin Office has conducted a watershed restoration program in the John Day Subbasin in cooperation with multiple funding and implementing agencies. Integral to the watershed program is an annual monitoring and evaluation effort, implemented for the purpose of assessing the effectiveness of various agency funded watershed restoration projects. The monitoring program is conducted under an annual monitoring plan(s), which is prepared by the John Day Subbasin Office in cooperation with other subbasin agencies.

4.5 Gap Assessment of Existing Protections, Plans, Programs and Projects

There are a significant number of existing fish and wildlife protections, plans and programs already in place in the John Day Subbasin. In addition, many projects have been undertaken for the benefit of fish and wildlife throughout the subbasin (see Appendix X for an inventory of these projects). However, there is a great deal of habitat protection and restoration work left to accomplish. Adequate funding will be critical to accomplishing this needed work. Following are some specific gaps that have been identified.

4.5.1 Existing Legal Protection

No additional legal protection has been identified that would benefit this management plan in the John Day Subbasin. Individuals trying to implement projects on the ground often report that the administrative requirement to meet legal obligations can cause a substantial delay and increase project costs. In other cases, projects are not permitted because of their short-term negative effects. An example is in-stream projects that may cause short-term adverse effects, yet achieve significant long-term benefits, for ESA-listed fish species. A close review of the administration and interaction of the numerous rules and regulations should be made to identify areas where the administrative process can be streamlined to allow positive restoration projects to move forward in a timely and cost-effective manner.

An example of successful streamlining is the Oregon Division of State Lands' General Authorizations for removal and fill activities that have minimal individual and cumulative environmental impacts and do not result in long-term harm to water resources of the state. Other examples are programmatic biological opinions and region wide permits. Permit requirement exemptions and general authorizations greatly facilitate projects that fall within their requirements.

4.5.2 Existing Plans and Studies

There are two fish species listed by the ESA that do not yet have final recovery plans. Recovery plans for the two listed species – steelhead and bull trout – are in various stages of progress. Once finalized, these plans will affect natural resource management in the John Day Subbasin.

<u>Steelhead Recovery Plan</u>
NOAA Fisheries is currently working on the development of a Steelhead Recovery Plan. Once this steelhead plan is completed, the John Day Subbasin Plan may need to be modified as appropriate to be consistent with this recovery plan.

<u>Bull Trout Recovery Plan</u>
The USFWS has completed a draft plan for the recovery of bull trout. If the final recovery plan is significantly different from the draft, it may be necessary to modify the John Day Subbasin Plan to be consistent with the final recovery plan.

<u>Additional Gaps for Plans and Studies</u>

- Study on metapopulation behavior. As habitat conditions improve and fish populations increase in abundance, it is anticipated that 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.
- Data for non-anadromous focal species. There is a need to determine the abundance, distribution, life-stage survival and age-composition of fish in the John Day Subbasin. Data for bull trout, cutthroat trout and redband trout are almost nonexistent. Bull trout distribution within non-core areas (see Section 3.2.4 – bull trout for core areas as defined by USFWS) needs to be researched for viability/inclusion in recovery efforts.
- Cutthroat trout assessment. ODFW and the U.S. Forest Service should undertake a fine-scaled assessment of westslope cutthroat populations in the John Day Subbasin. This assessment should examine population trends and identify specific actions to be undertaken to maintain and enhance cutthroat stocks.

- Research the interactions between redband trout and summer steelhead. Increased populations of these species could result in increased hybridization with cutthroat trout. The causes, prevelance, and impact of this hybridization should be investigated with further research.
- Research bull trout migration patterns and the role of habitat conditions. 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 research efforts by ODFW and U.S. Forest Service. However, the nature and role of migrant life histories is poorly understood, even though 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. Research into these topics will provide us with information we need to effectively target bull trout restoration efforts.
- Analysis of 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.
- Research lamprey status, trend and habitat requirements in the John Day Subbasin. We need to improve our understanding of lamprey population dynamics and habitat requirements in the John Day Subbasin.
- Develop statistically reliable abundance, productivity, spatial structure and diversity data for summer steelhead and spring chinook. The base data to determine the salmonid viable population parameters for summer steelhead and spring chinook are limited. There is a need to conduct statistically reliable studies to utilize these parameters in setting realistic biological objectives and priorities.
- Research the 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.
- Research restoration potential in the lower subbasin. Fisheries conservation work in the John Day Subbasin has traditionally focused on the upper half of the basin, where relatively good habitat supports several native salmonid species. Conservation of steelhead has become more of a focus making the restoration potential of the lower subbasin a topic of increasing interest. Both EDT analysis and expert opinion emphasize 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 suggest that restoration efforts are best focused on the upper subbasin where habitat of higher quality and quantity 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 one year, compared to the two three years typical in the upper subbasin) suggest 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 steelhead productivity and response to restoration efforts at 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.

- Updated OWRD Basin Report. There is a need for additional studies to aid decision-makers in the subbasin. One such gap is the need for a Basin Report such as that produced by OWRD in 1986. 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 Basin 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.
- 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). Filling this data gap would help determine reasonable restoration objectives for in-stream habitat and channel restoration.
- Refine the EDT model. In this planning process, extensive effort was put into working with the EDT model. Efforts to refine this model (as it specifically applies to the John Day Subasin) will enhance our ability to run what-if-scenarios and produce finer-grained (reach-by-reach) assessments of habitat conditions and fisheries response. These efforts need to be undertaken to ensure that the time, effort, and resources that went into the model produce data that justifies its cost. If work with EDT is continued, it needs to be made accessible to project planners in a form and at a cost in which it can be used to evaluate proposed activities. It would be appropriate to complete EDT ratings on all remaining reaches.
- Riparian conditions studies. Studies to determine how improvements in habitat conditions affect summer rearing habitat, over-winter survival and smolt production are needed to evaluate the value of various restoration projects.
- Water temperature studies. There is a need to determine how streamflow and various habitat conditions affect water temperature.
- Conduct an aquatic invertebrate study and use data for water quality indicator. 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 basin.
- 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 to determine the effects of conifer density on base streamflows, peak streamflows and timing of streamflows.
- Electronic 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 which often leads to questions of accuracy and limits their use.

4.5.3 Existing Management Programs

- Support for efforts to use improved grazing systems in riparian areas. Effective control of grazing in riparian areas is an important element in maintaining and enhancing riparian conditions. A wide range of programs currently offered through NRCS and ODFW, and the Warm Springs and Umatilla tribes offer support to landowners in the John Day Subbasin who wish to exclude livestock from riparian areas. However, while effective, livestock exclusion is not the only way to control grazing to the benefit of riparian vegetation. Far fewer options for assistance are available for landowners and managers who wish to continue to graze riparian areas in a manner that allows for riparian area recovery. Programs that offer technical assistance and cost-shares for grazing infrastructure (e.g. fencing and water developments) should be expanded.

4.5.4 Existing Restoration and Conservation Projects

- Improve location information for projects. In developing the project inventory it was apparent that project location information was either non-existent or too coarse to determine where the projects have been implemented. There is also a need to ensure the availability of the inventory for both localized gap analysis by project proponents and synthesis of subbasin-wide activities for regional discussions.
- Subbasin wide coordination. 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.
- Extensive passage barrier inventory. While there are some local inventories, there is no comprehensive inventory of fish passage barriers in the John Day Subbasin. A passage barrier inventory is a gap that should be filled soon.
- Funding for active restoration on public lands. Much of the key habitat for all of the focal species in this plan is located on federal lands. Federal land management agencies currently have limited access to funding for proactive restoration. They are often prevented from accessing funding sources from outside their own agencies by either specific exclusions or the extensive non-federal match required by most federal funding sources. This deficiency could be addressed internally through agency budgets directed to fisheries enhancement or externally by increasing agency access to other sources of funding for fisheries enhancement (e.g. NOAA Fisheries restoration programs and

BPA/NWPCC programs or private foundations). In addition, effective partnerships need to be built to ensure that such funding is used effectively and efficiently.

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.

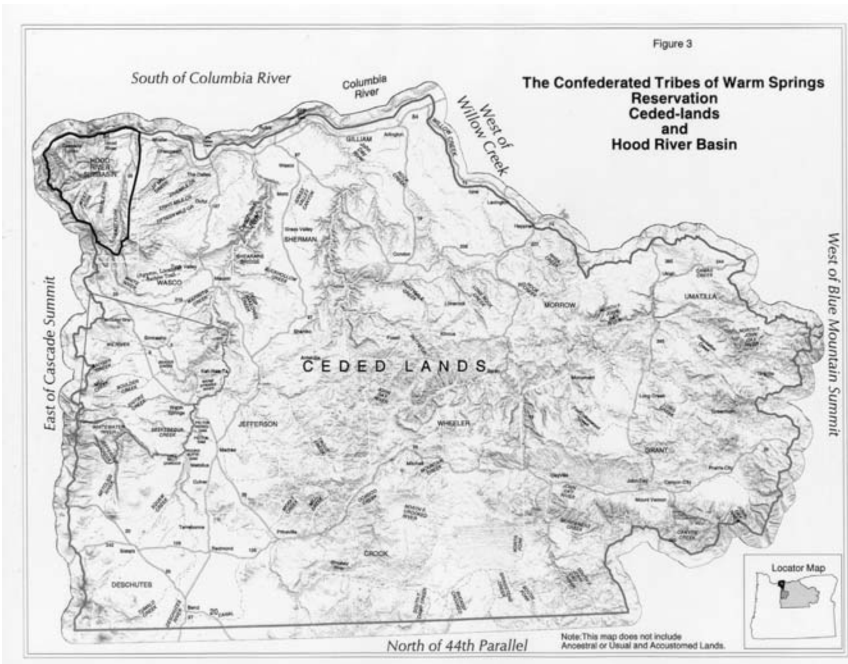


Figure 44. Ceded territory of the CTWSRO.

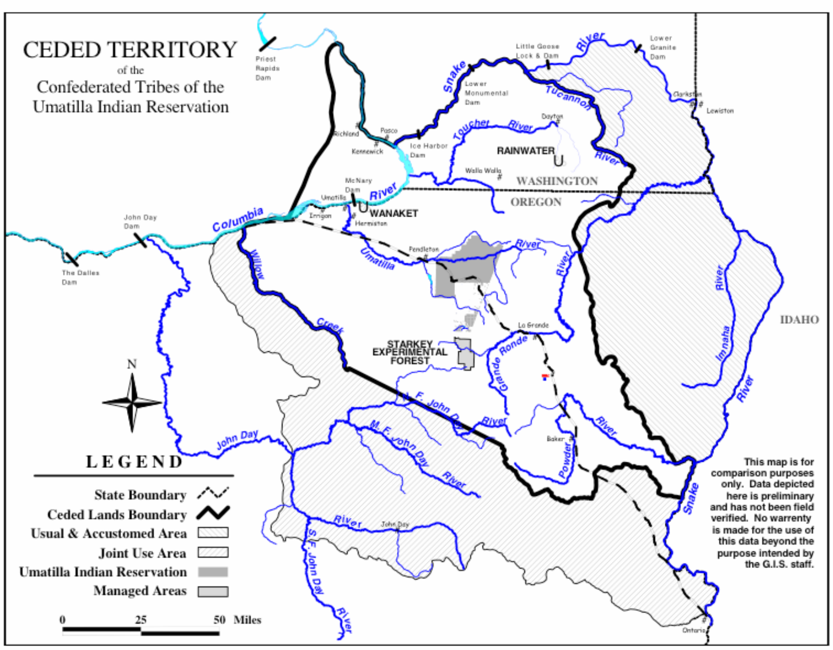


Figure 45. Ceded territory of the CTUIR.

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.

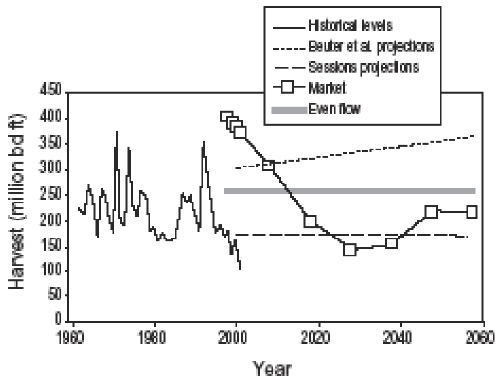


Figure 12. Projected base-case timber harvest levels for NIPF lands in eastern Oregon, derived using market-based and even-flow simulators. Historical levels and projections from Beuter et al. (1976) and Sessions (1991) shown for comparison.

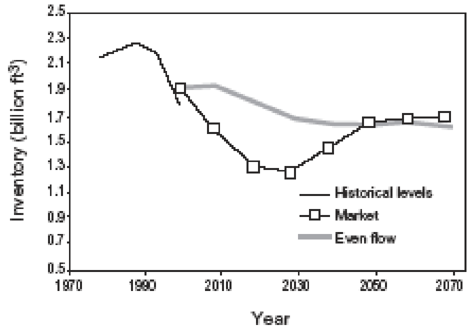


Figure 13. Projected base-case timber inventory for NIPF lands in eastern Oregon, derived using market-based and even-flow simulators.

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

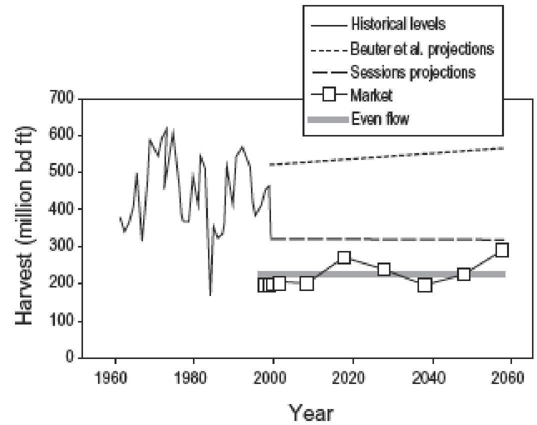


Figure 9. Projected base-case timber harvest levels on industrial lands in eastern Oregon, derived using market-based and even-flow simulators. Historical levels and projections from Beuter et al. (1976) and Sessions (1991) shown for comparison. Initial MIC distributions endogenous.

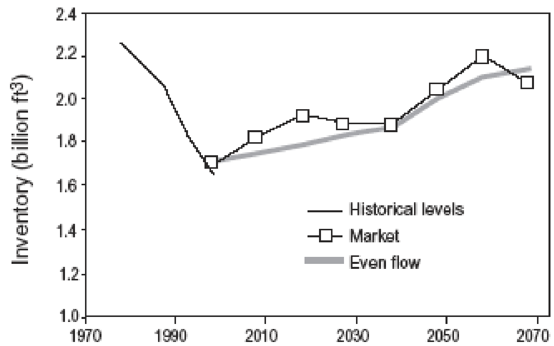
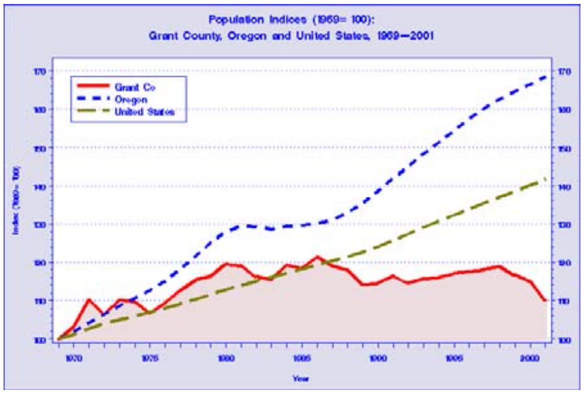
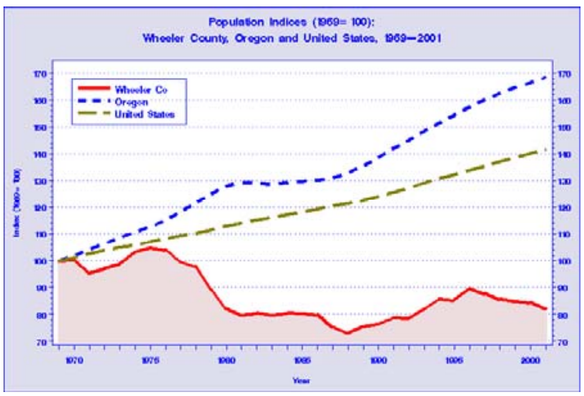


Figure 47. Projected base case timber harvest and inventory levels on industrial forestlands in eastern Oregon.



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**

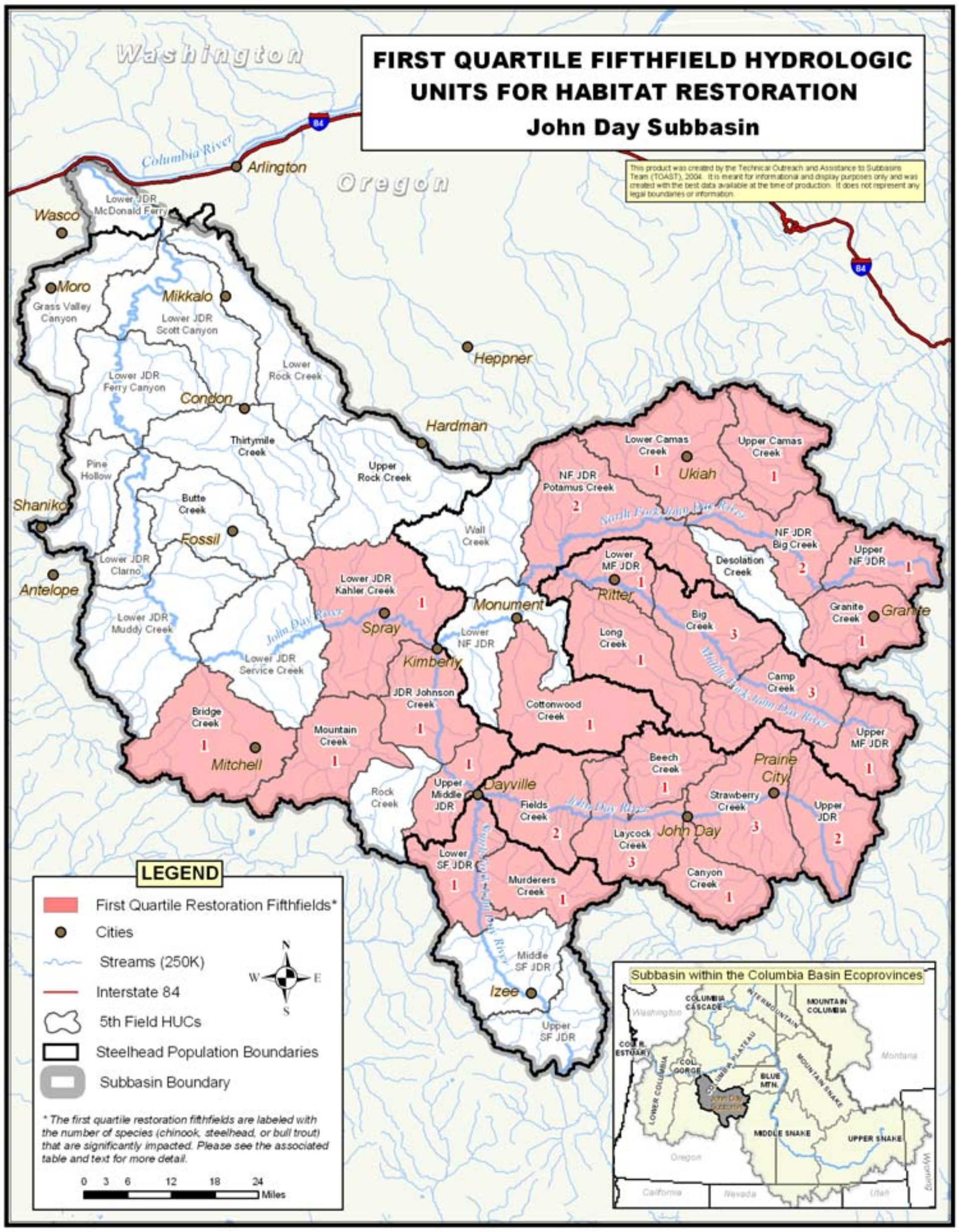


Figure 50. First quartile HUC5s for restoration potential of nine chinook and steelhead populations identified by EDT and QHA analysis in the John Day Subbasin.

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 embeddness.** 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	25-YR. INTERIM GOAL		50-YEAR GOAL		HISTORIC	25-YR	50-YR
		ABUNDANCE	#	%	#	%	POTENTIAL	GOAL	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.

Subbasin Habitat Objectives

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	

Limiting Factors	Habitat Objectives	Restoration Strategies A Passage	B Fish Screens	C Flow Restoration	D In-stream Activities	E Riparian Habitat Improvements	F Pollution Control	G Protect Existing Habitat	H Upland Improvements	I Education and Outreach	J 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	

<u>Establishing Strategy Priority Rankings within HUC5s and Restoration Priority Rankings among HUC5s.</u>

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.

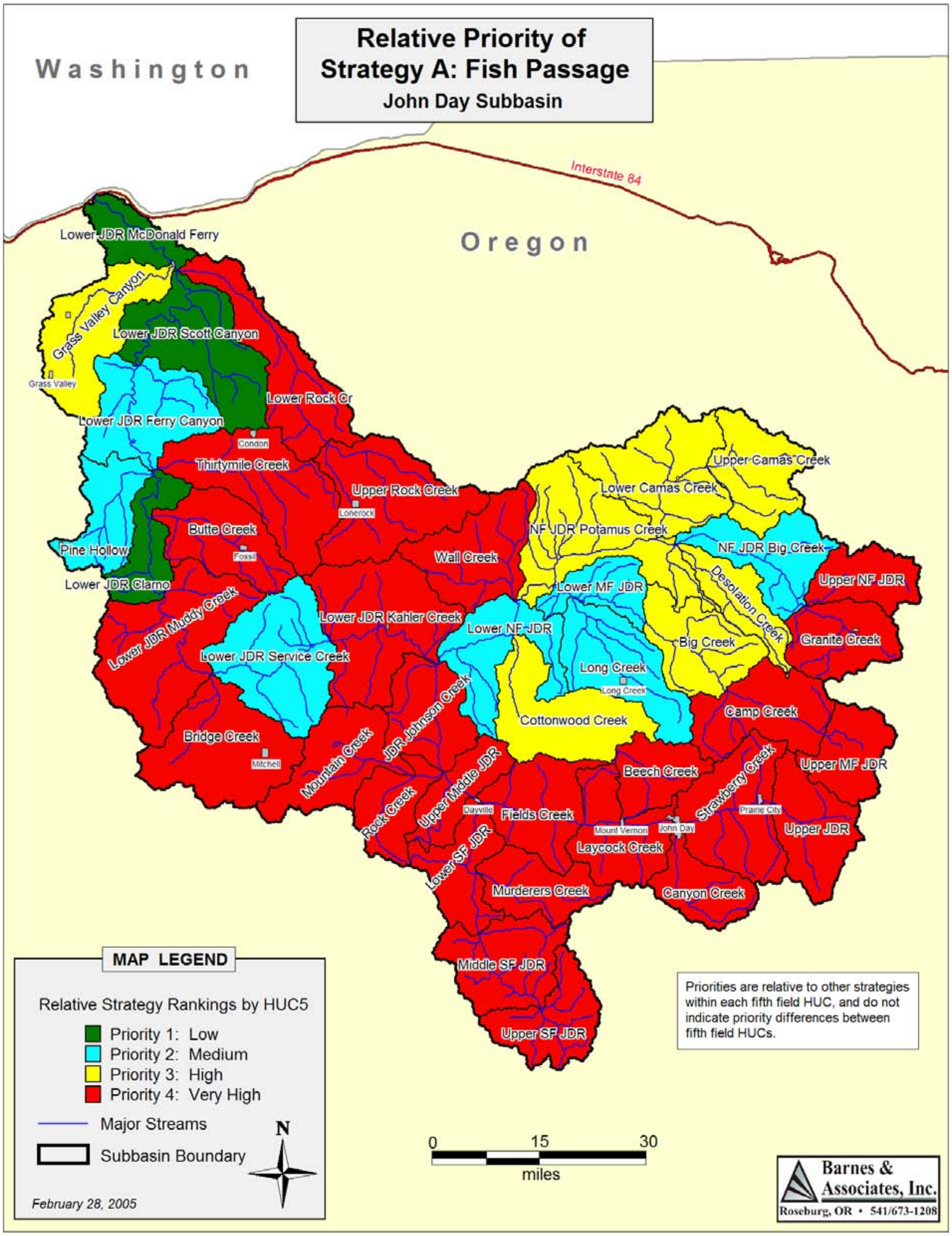


Figure 51. Map illustrating relative priority for improving fish passage by HUC5.

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.

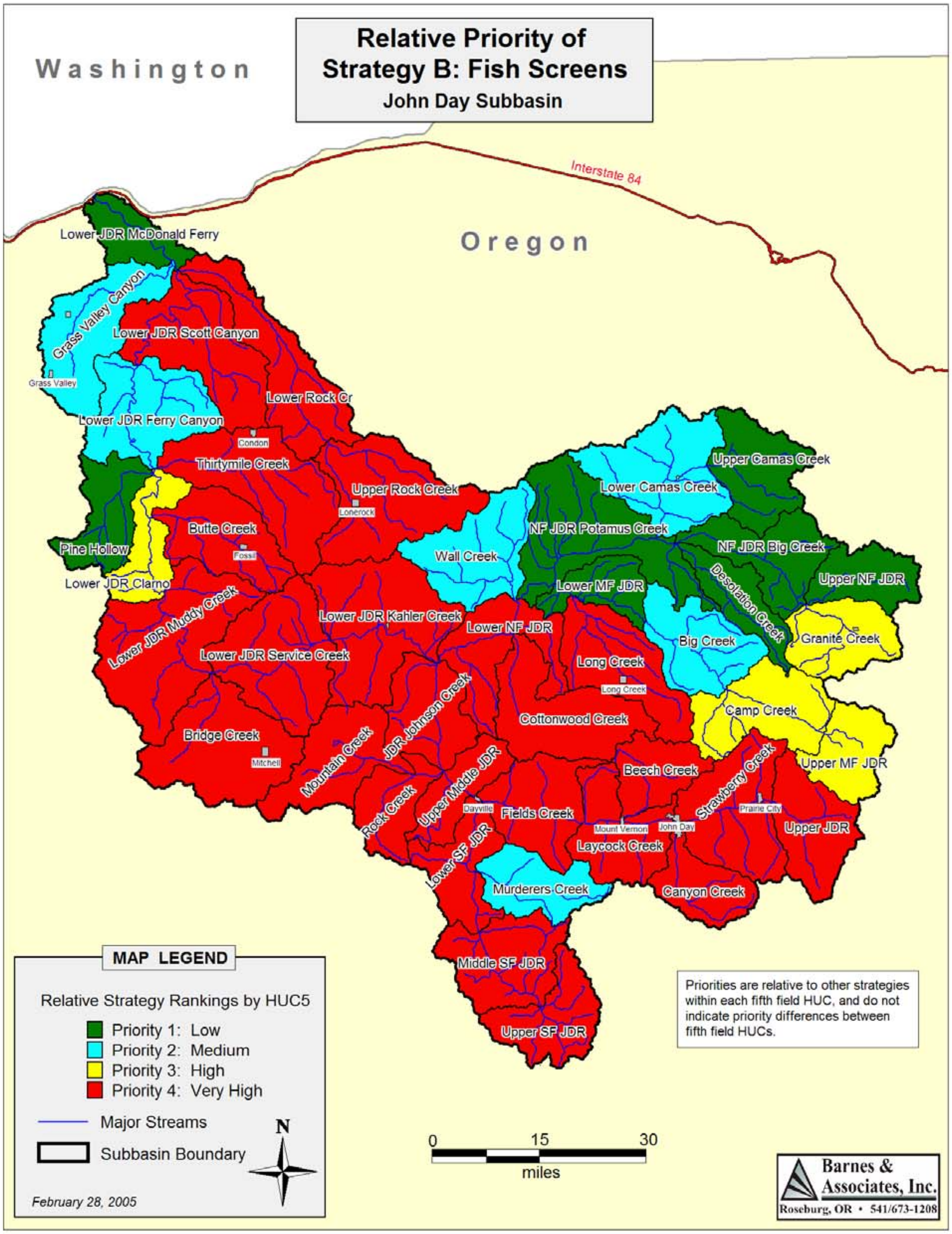


Figure 52. Map illustrating relative priority for installing fish screens by HUC5.

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.

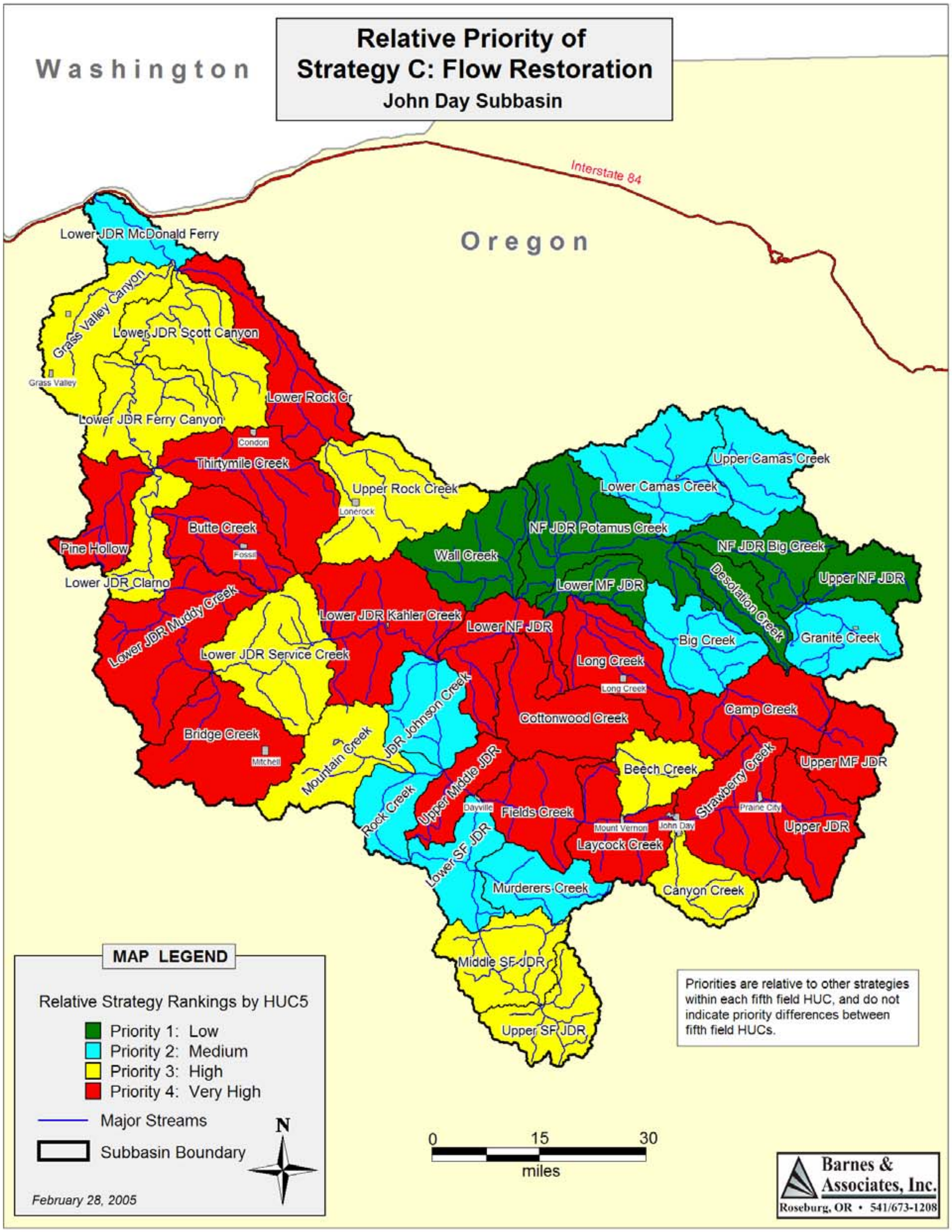


Figure 53. Map illustrating relative priority for flow restoration by HUC5.

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.

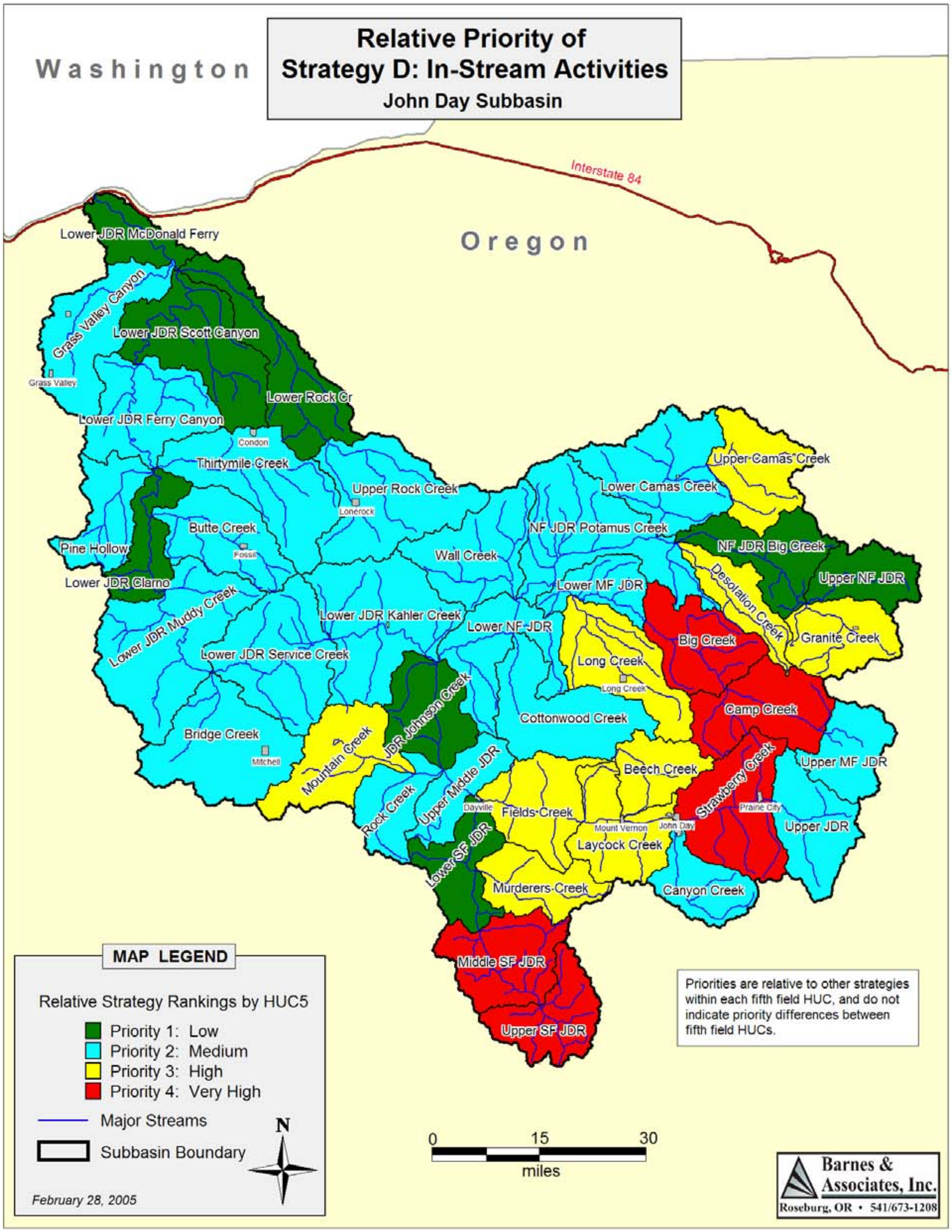


Figure 54. Map illustrating relative priority for in-stream activities by HUC5.

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.

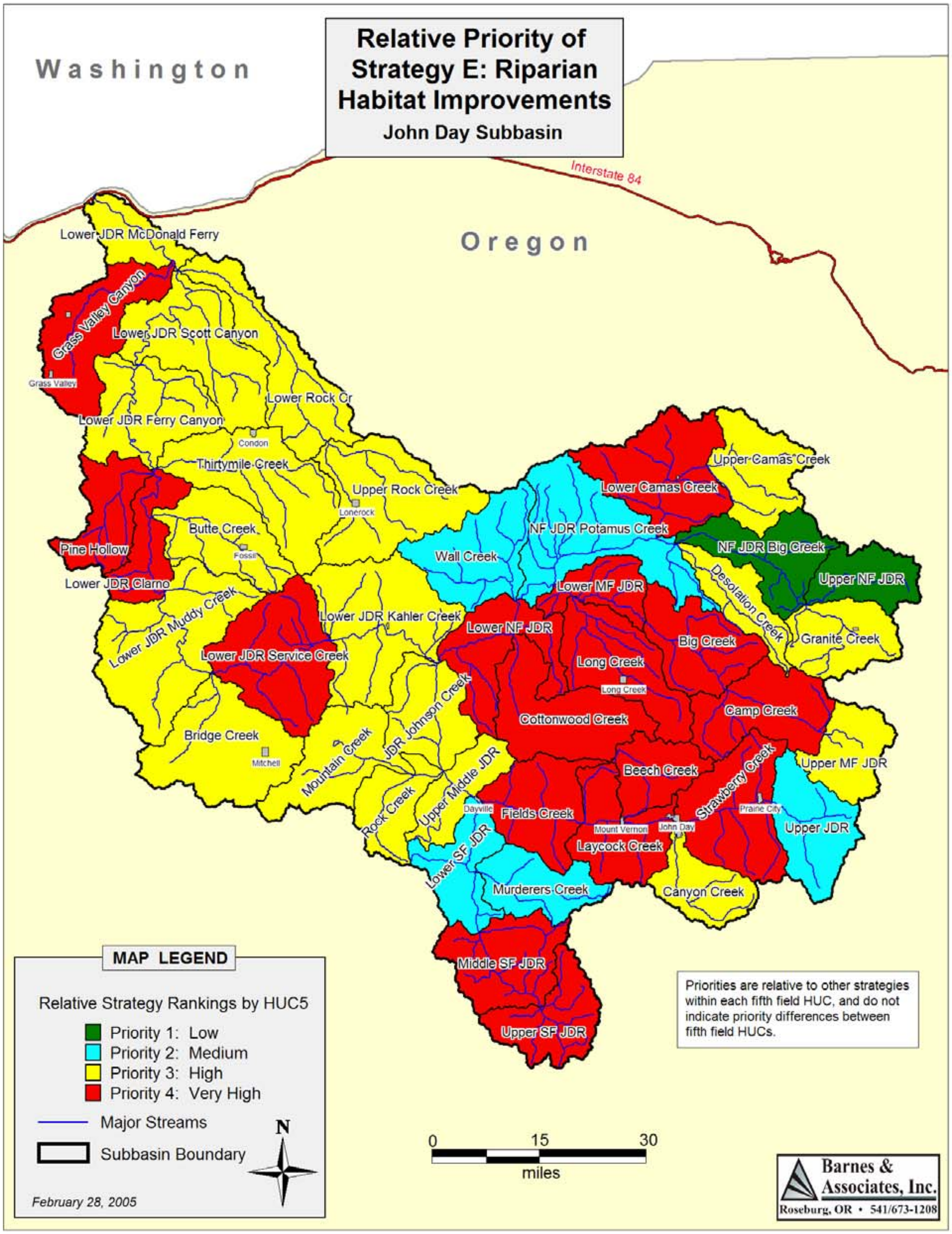


Figure 55. Map illustrating relative priority for riparian habitat improvements by HUC5.

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.

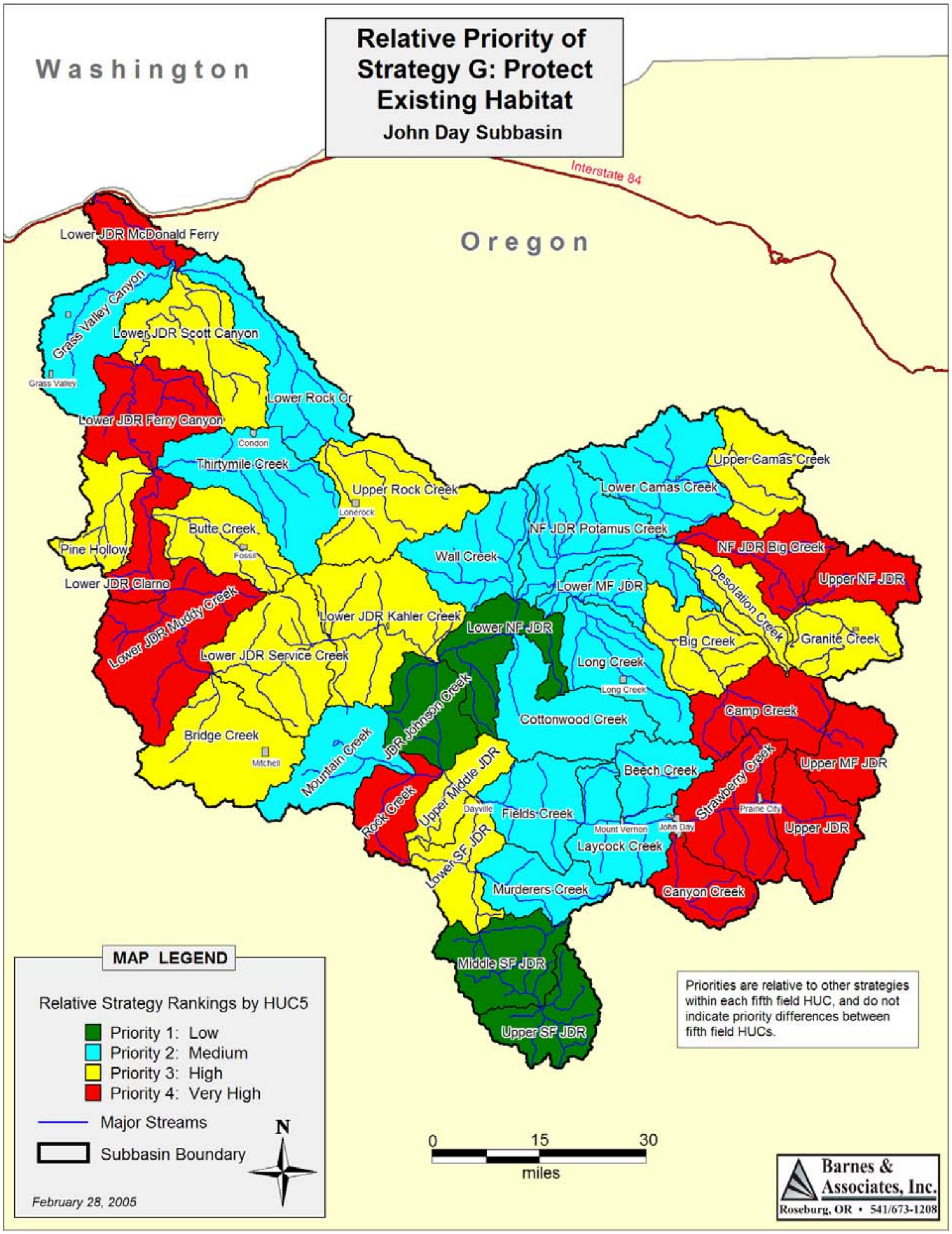


Figure 57. Map illustrating relative priority for protecting high quality habitat by HUC5.

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.

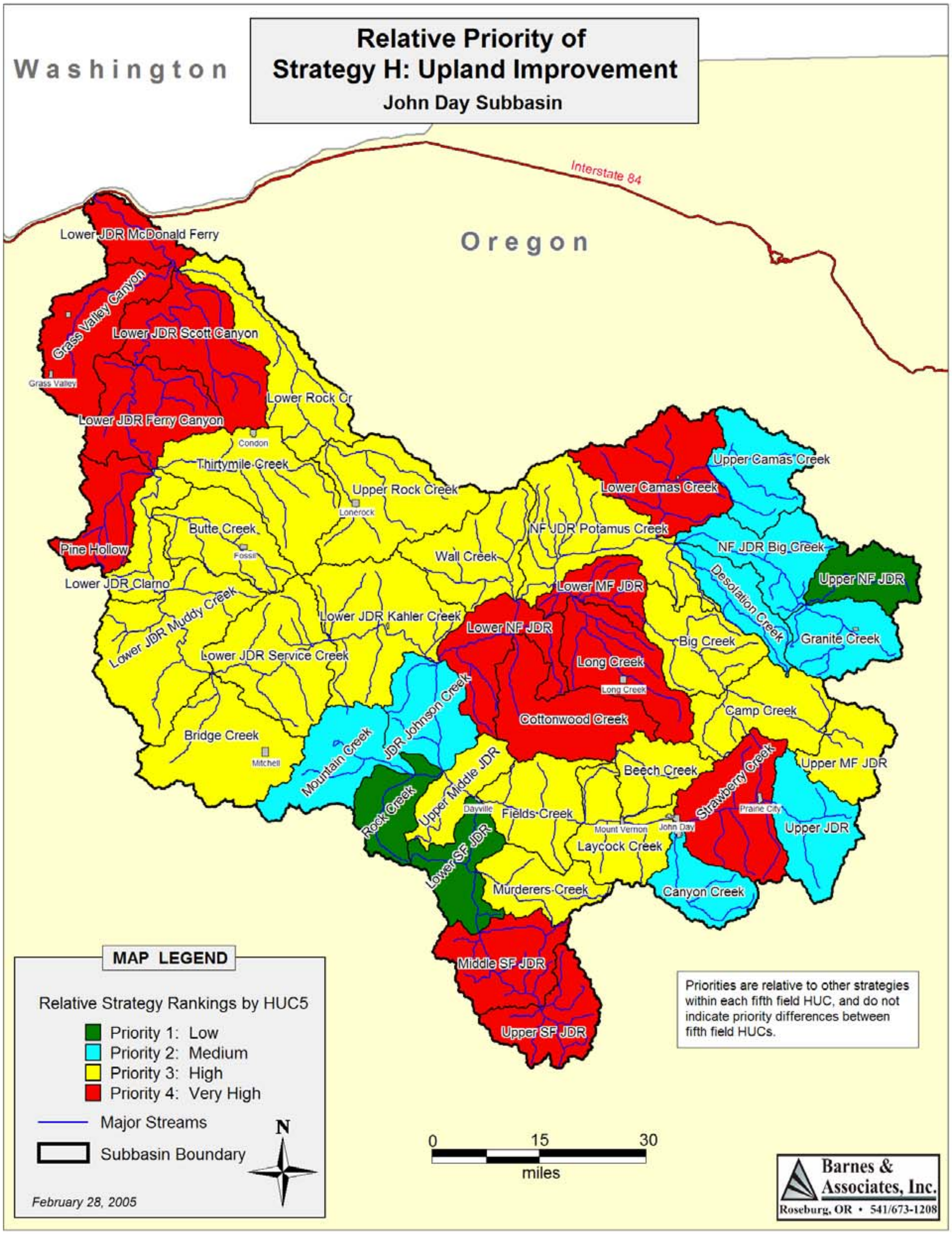


Figure 58. Map illustrating relative priority for upland improvement projects by HUC5.

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.

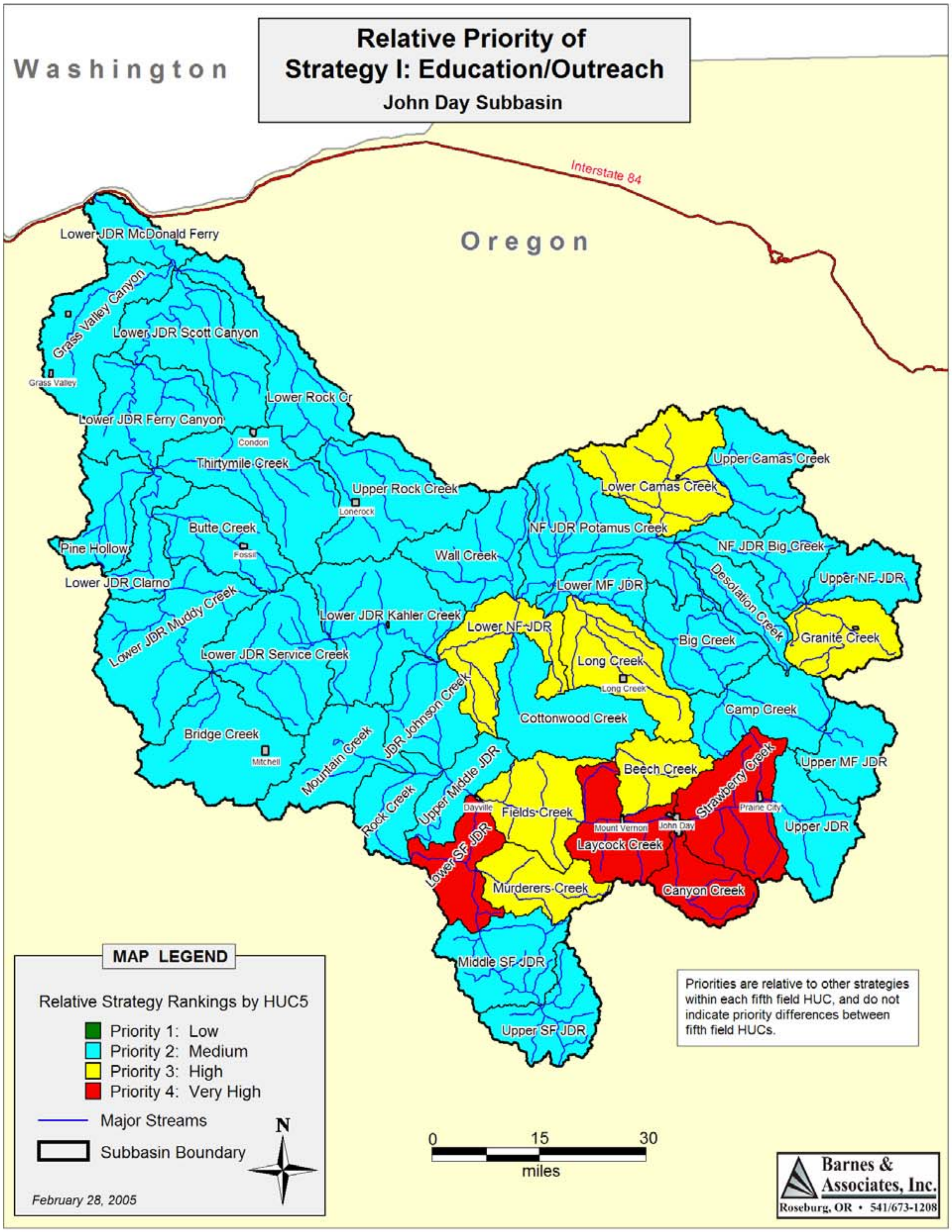


Figure 59. Map illustrating relative priority for education/outreach by HUC5.

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.

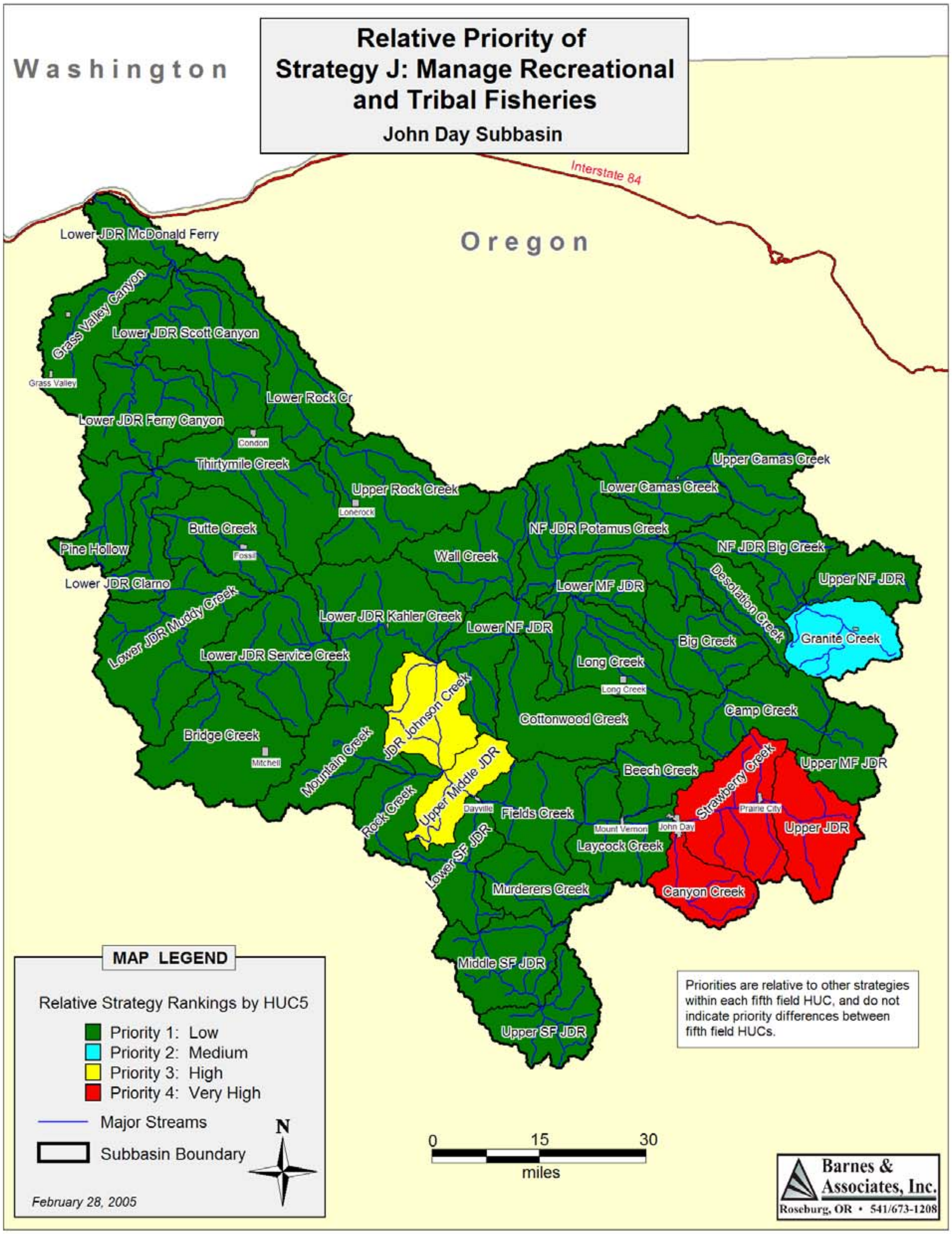


Figure 60. Map illustrating relative priority for managing recreational/tribal fisheries by HUC5.

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
<u>For Native Grasslands</u>

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

<u>For Non-Native and Agricultural Grasslands (e.g. CRP lands)</u>

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

<u>Landscape Level</u>

- 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.

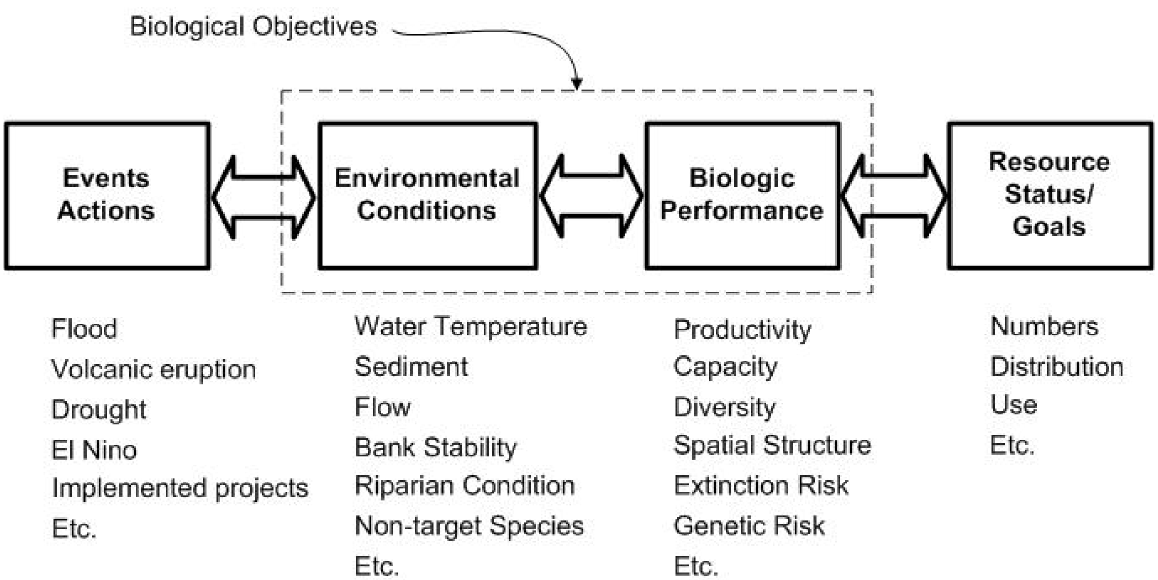


Figure 61. Subbasin assessment framework.

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.

<u>Research Needs</u>

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.

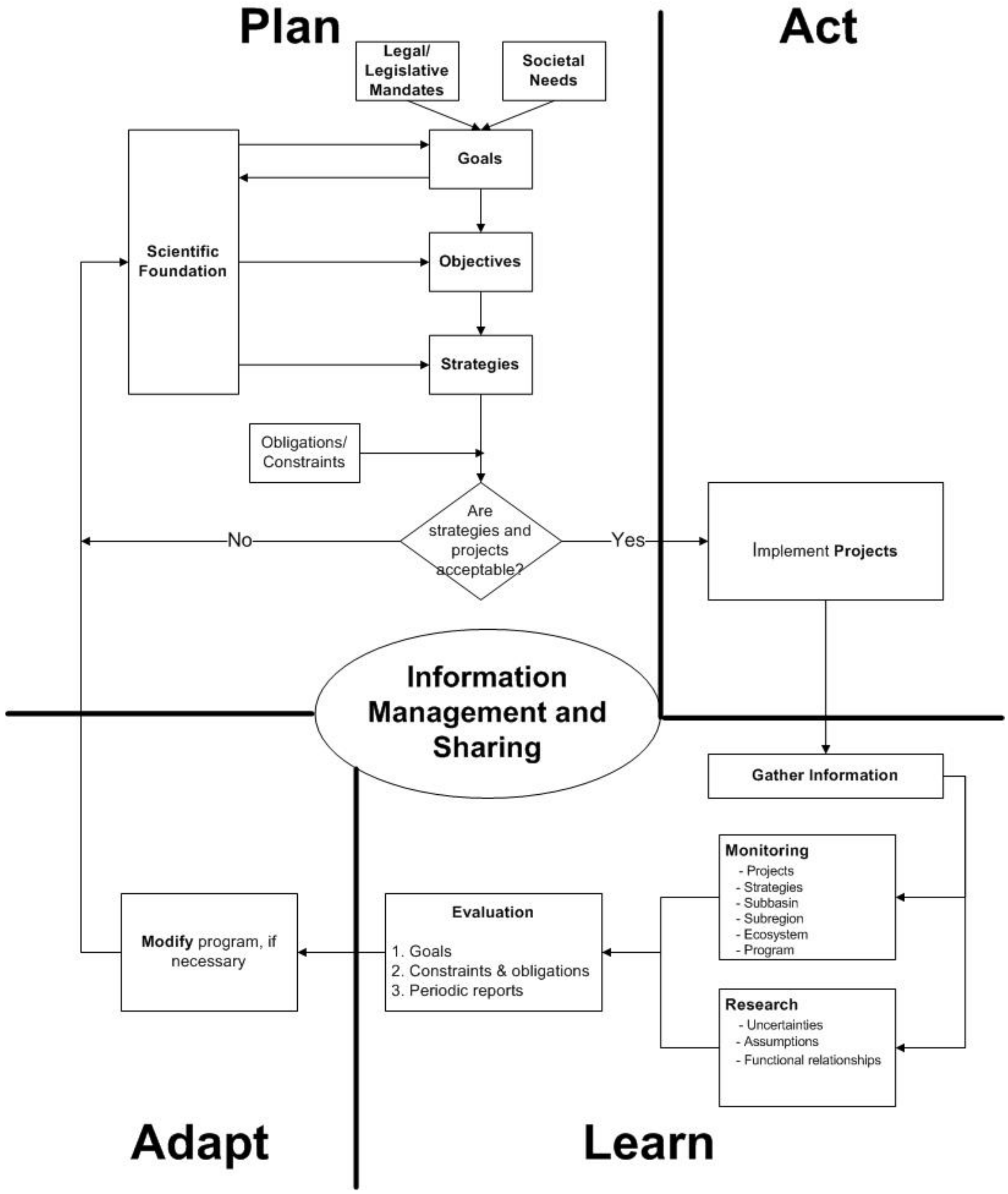


Figure 62. The adaptive management cycle, showing the roles of research, monitoring and evaluation.

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.

<u>Monitoring Needs</u>

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.