

Owyhee River Basin Watershed Health Indicators

Prepared for

The Oregon Watershed Enhancement Board
Salem, Oregon

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Introduction

The Owyhee River Basin is located in the southeastern corner of Oregon in Malheur County. The river basin encompasses drainage areas in western Idaho and northern Nevada, however, this summary is limited to lands in Oregon. The Owyhee River Basin drains into the Middle Snake River Hydrologic Unit (HUC 170501), which is part of the Columbia River Basin. Seven 4th field HUCs comprise the Owyhee River Basin as indicated in Table 1 with the Lower Owyhee, Crooked-Rattlesnake, Middle Owyhee, and Jordan Creek comprising the majority of the basin area (Figure 1).

Table 1. Area of subbasins and stream miles for the Owyhee River Basin

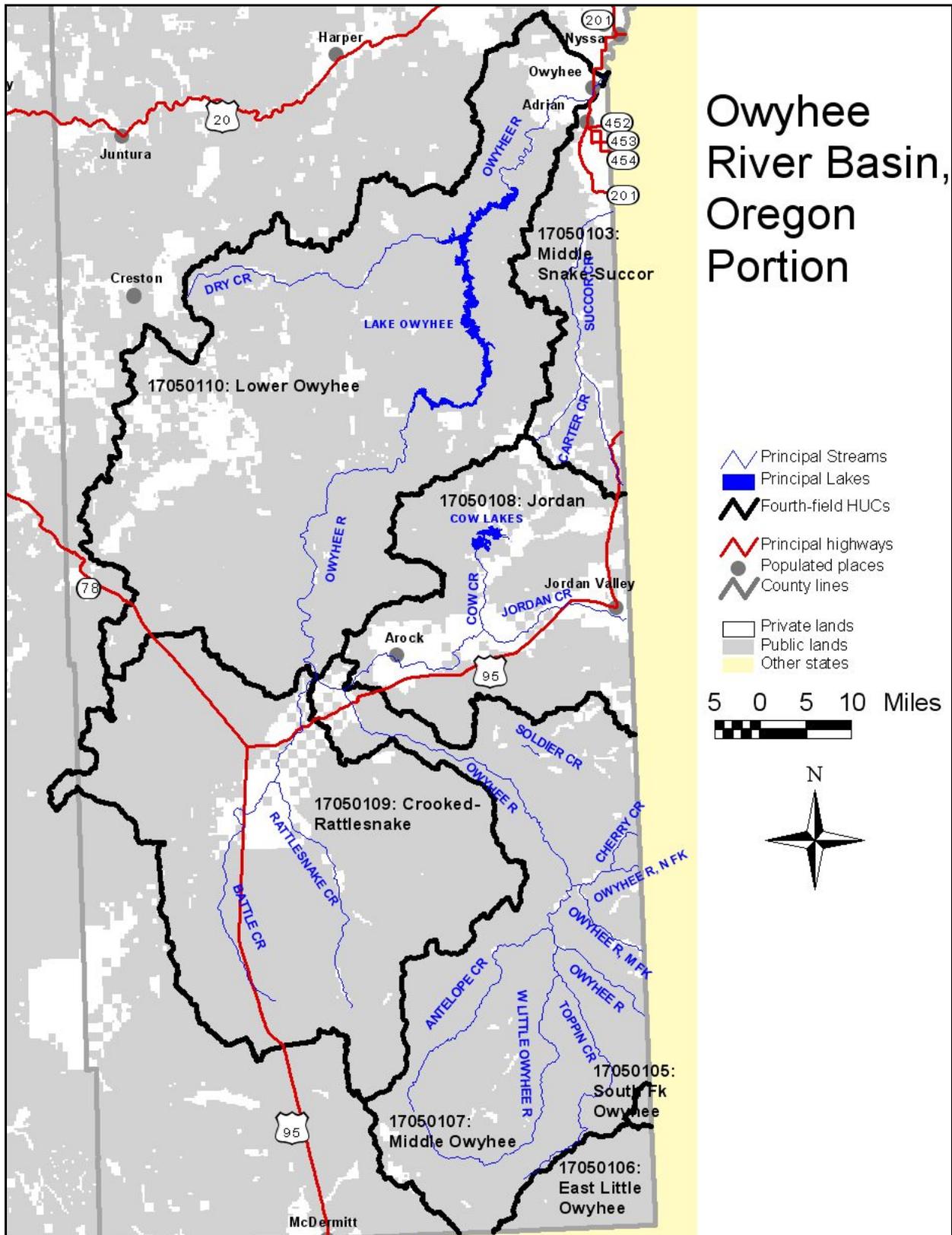
HUC4	Area in Oregon (mi ²)	Total area (mi ²)	Stream Miles (Oregon only)		
			Perennial	Intermittent/ephemeral	Total
17050110: Lower Owyhee	1,975	1,975	552	3,846	4,398
17050109: Crooked-Rattlesnake	1,329	1,329	93	3,503	3,596
17050108: Jordan	700	1,220	161	1,210	1,371
17050107: Middle Owyhee	1,203	1,492	272	2,861	3,133
17050106: East Little Owyhee	133	929	1	272	273
17050105: South Fork Owyhee	8	1,851	0	25	25
17050103: Middle Snake-Succor	322	2,326	101	588	689

The Owyhee River Basin encompasses a diversity of habitats and consequently the ecoregions have been classified in different ways. The Lower Owyhee Watershed Assessment provides a summary of four classification approaches that have been applied in the basin (Owyhee Watershed Council 2009). At the southern most end of the basin, the Owyhee River flows through the Snake River Plains, which contain lands that have been converted to irrigated agriculture. On the north, the basin is characterized by the Owyhee Uplands Ecoregion, a large remote plateau that has geological and ecological features that distinguish it from the adjoining ecoregions (Shaaf 1996). The primary rationale for considering the Owyhee Uplands as an ecoregion is the geology that has shaped the region - a broad northward tilting plateau that is cut by several large river systems. The region lacks the mountain ranges that are characteristic of the basin and range topography, and this geology has been responsible for defining vegetation characteristics. The Owyhee

Uplands is dominated by sagebrush steppe vegetation but has some different endemic plant species.

The Oregon Conservation Strategy (ODFW 2006) describes conservation strategies for the Owyhee Basin as part of the Northern Basin and Range Ecosystem. This document is useful in describing general limiting factors and in identifying conservation strategies so it will be used here for these purposes.

Figure 1. Fourth field HUCs and major streams in the Owyhee River Basin



The Owyhee Basin has desert conditions with an annual precipitation of 8-12 inches. The rolling plateau landscape of the Owyhee Uplands has resulted in large areas that are dominated by big sagebrush communities. Interspersed in the big sagebrush communities are shallow, rocky soil sites that support low sagebrush and rigid sagebrush communities. Sagebrush communities are characterized by the dominant shrub species and the understory bunchgrasses with a scattering of annual and perennial herbs. The most common communities are: Wyoming big sagebrush/ bluebunch wheatgrass, Wyoming big sagebrush/Idaho fescue, mountain big sagebrush/Idaho fescue, low sagebrush/Idaho fescue, and low sagebrush/Sandberg bluegrass (Shaaf 1996).

Purpose and Scope

The goal of this project was to summarize limiting factors¹ that are limiting the health of watersheds. This report fulfills the Oregon Watershed Enhancement Board's legislative mandate to establish priorities that will help guide funding decisions in line with OWEB's mission to achieve healthy watersheds and sustainable communities. A decision making process for establishing priorities will necessarily involve additional factors such as cost effectiveness, willing partners and opportunities for partnerships.

The OWEB project aimed to summarize limiting factor information at the fifth field HUC scale in a consistent manner across the state. In the closed basins, data is very limited and therefore the information was summarized at the fourth field HUC scale. This report represents a summary of the information available at this time and should be revisited and updated as additional information becomes available.

¹ Limiting factor in this context is used broadly to refer to physical factors in the environment that preclude the achievement of water quality goals, fish and wildlife habitat, or sustainable water and soil resources.

Information Sources

Information on watershed conditions in these basins is contained in broad-scale evaluations or in limited site-specific studies of fish and wildlife populations, riparian conditions, and water quality. The following sources were evaluated for information in describing watershed health, however, these sources do not each contain information for every 4th field HUC in the basin.

- The Oregon Conservation Strategy (ODFW 2006) is useful in describing ecoregion scale limiting factors and current restoration strategies.
- The Oregon Native Fish Status Report (ODFW 2005) assesses the population status of native fish populations and identifies factors thought to be limiting population sustainability.
- ODFW Aquatic Habitat Inventory Data Base (ODFW 2009)
- Riparian Conditions – Proper Functioning Condition Data (BLM 2009)
- ODEQ Water Quality Limited Stream Lists: 303(d) lists (ODEQ 2009)
- OWRD Flow Restoration Priority Areas (OWRD 2003)
- Watershed Council – Watershed Assessments

The summary of watershed health indicators is organized in the following manner.

- 1) Limiting factors for key terrestrial and aquatic habitats are described at the ecoregion scale for the Northern Basin and Range Ecoregion.
- 2) Limiting factors and conservation opportunities are then stepped down to the 4th field HUC, where information is available, to include:
 - a) Recommended Conservation Actions in specific Opportunity Areas
 - b) Native Fish Populations: Status, limiting factors, and opportunities
 - c) Fish Habitat Assessments
 - d) Water Quality Summary

- e) Riparian Conditions
 - f) Wetlands information
 - g) Uplands – primarily invasive species and noxious weeds
- 3) Issues and Opportunities identified by Watershed Councils

Ecoregion Scale Limiting Factors

The Conservation Strategy (ODFW 2006) identifies characteristic habitat types in the ecoregion and identifies threats and recommended approaches to lessen the effect of these threats. Conservation strategy habitats in the Northern Basin and Range Ecoregion include: sagebrush shrublands (particularly big sagebrush habitats), aspen woodlands, riparian, wetlands, and aquatic habitats.

Invasive species and altered fire regimes are the greatest terrestrial conservation issues in this ecoregion. As a result of altered fire regime, encroachment of juniper has displaced grasses and sagebrush, especially in the northern portions of the ecoregion. However, old-growth juniper occurs in some areas, especially in rock outcrops where grasses and sagebrush are uncommon and where fire is less of a factor, and is extremely beneficial to wildlife.

Stream water quality in the Northern Basin and Range ecoregion is poor when compared to other ecoregions. Throughout the Northern Basin and Range ecoregion, water quality is impacted by high temperatures and in some areas by bacteria, pollutants, and aquatic weeds. Water is limited in the ecoregion, fully allocated in storage and other uses.

Aquatic habitats are affected by altered channel and flow conditions, obstructions, and poor riparian condition. Efforts to assess the quality of aquatic habitats are ongoing and obtaining an understanding of natural temperature and water quality dynamics in the ecoregion is a research priority.

Watershed Health Limiting Factors

These limiting factors for watershed health were identified at the broad scale for the Northern Basin and Range Ecoregion and are generally applicable to the Owyhee River Basin (Oregon Conservation Strategy, ODFW 2006).

- Invasive Species (Cheatgrass/juniper/noxious weeds)
- Altered Fire Regimes

- Ongoing recovery from historic overgrazing
- Off Highway Vehicle Use/ Unmanaged Recreation
- Water distribution – fully allocated in storage and other uses
- Water Quality – primarily high stream temperature (applicability of state standards to desert streams is identified as a research need)
- Water Quality – Some areas may be impacted by bacteria, pollutants, and aquatic weeds
- Aquatic Habitats – altered channel and flow conditions, migration barriers, and poor riparian conditions.

Fisheries Information

Information on historical and current fish distribution was compiled in the Draft Owyhee River Basin Fish Management Plan (ODFW 2000) and in the Lower Owyhee Watershed Assessment (Owyhee Watershed Council 2009). Historically, the Owyhee River basin supported a run of spring Chinook salmon. Steelhead trout and coho salmon may also have occurred in the basin but this is not well documented. The construction of the Owyhee Dam in 1932 ended the runs of anadromous fish up the Owyhee River, so all anadromous salmonids are now listed as extinct in the basin.

In relationship to understanding watershed health indicators, or habitat limiting factors, it's important to recognize that most of the streams in this desert basin are intermittent or ephemeral and do not support fisheries resources. For example, in the Lower Owyhee River subbasin (17050110), an area which covers 1,983 square miles, there are few streams in addition to the Owyhee River that flow year-round, and these are isolated reaches that do not connect to downstream tributaries (Owyhee Watershed Council 2009). As a consequence there is very limited fisheries habitat data that is comparable to other basins in the state. Only one habitat survey is listed in the ODFW Aquatic Inventory database for the basin, which is in Dry Creek, in the Lower Owyhee River Basin (ODFW 2009).

Fish species in the basin and their status are shown in Table 2. Native salmonids, aside from the now extinct anadromous species, are redband trout and mountain whitefish. These species are limited to the few perennial reaches of disconnected desert streams and sections of the Owyhee River. Most game fish in the basin are introduced species: rainbow trout, brown trout, and species in the catfish, sunfish, and perch families.

Table 2. Fish Species in the Owyhee River Basin

Common name	Scientific name	Status
Native Fish		
Trout – Family Salmonidae		
Inland Redband trout	<i>Oncorhynchus mykiss gairdneri</i>	C2, GF
Mountain Whitefish	<i>Prosopium williamsoni</i>	GF
Minnnows--Family Cyprinidae		
Chiselmouth	<i>Acrocheilus alutaceus</i>	U
Redside shiner	<i>Richardsonius balteatus balteatus</i>	U
Fathead minnow	<i>Pimephales promelas</i>	U
Longnosed dace	<i>Rhinichthys cataractae</i>	U
Speckled dace	<i>Rhinichthys osculus</i>	U
Leopard dace	<i>Rhinichthys falcatus</i>	U
Northern squawfish	<i>Ptychocheilus oregonensis</i>	U
Peamouth	<i>Mylocheilus caurinus</i>	U
Suckers--Family Catostomidae		
Coursescale sucker	<i>Catostomus macrocheilus</i>	U
Bridgelip sucker	<i>Catostomus columbianus</i>	U
Sculpins—Family Cottidae		
Paiute sculpin	<i>Cottus beldingi</i>	U
Shorthead sculpin	<i>Cottus confusus</i>	U
Mottled sculpin	<i>Cottus bairdi semicaber</i>	U
Non-Native Fish		
Trout – Family Salmonidae		
Rainbow trout	<i>Oncorhynchus mykiss irridus</i>	GF
Brown trout	<i>Salmo trutta</i>	GF
Catfish -- Family Ictaluridae		
Channel catfish	<i>Ictalurus punctatus</i>	GF
Brown bullheads	<i>Ameiurus nebulosus</i>	GF
Black bullheads	<i>Ameiurus melas</i>	GF
Tadpole madtoms	<i>Noturus gyrinus</i>	U
Flathead catfish	<i>Pylodictus olivaris</i>	GF
Sunfish--Family Centrarchidae		
Largemouth bass	<i>Micropterus salmoides</i>	GF
Smallmouth bass	<i>Micropterus dolomieu</i>	GF

Common name	Scientific name	Status
White crappie	<i>Pomoxis annularis</i>	GF
Black crappie	<i>Pomoxis nigromaculatus</i>	GF
Bluegill	<i>Lepomis macrochirus</i>	GF
Pumpkinseed	<i>Lepomis gibbosus</i>	GF
Warmouth	<i>Lepomis gulosus</i>	GF
Perches--Family Percidae		
Yellow perch	<i>Perca flavescens</i>	GF
Loach—Family Cobitidae		
Oriental Weatherfish	<i>Misgurnus anguillicaudatus</i>	U
<i>Status: FE - federal endangered; SE - state endangered; FT - federal threatened; ST - state threatened; C2 - federal category II; SS - state sensitive; GF - state game fish; U - state unclassified.</i> <i>Source: Draft Owyhee River Basin Fish Management Plan (ODFW 2000).</i>		

The native redband trout provides an indicator species for evaluating aquatic habitat in the limited stream reaches where these fish occur. Redband trout are found in five tributaries and the mainstem of the Owyhee River and in a tributary of Succor Creek (ODFW 2000). The estimated miles of occupied habitat and results of genetic testing are shown in Table 3. These populations were not identified as Species Management Units (SMU) in the ODFW Native Fish Status Report (ODFW 2005).

Table 3. Estimated distribution of inland redband trout populations in the Owyhee River Basin (ODFW 2000)

Stream	Estimated Miles of Habitat	Genetically Tested	Results of Test
Dry Creek		Yes	Redband
N. F. Owyhee River	1		
Jordan Creek	5	Yes	Redband
Antelope Creek	1		
S. F. Carter Cr.	5	Yes	Redband
W. L. Owyhee R.	5	Yes	Redband
Owyhee River	159		
TOTAL	180		

Streamflow Restoration Priority Areas

The Water Resources Department and the Department of Fish and Wildlife jointly identified priority areas for streamflow restoration in basins throughout the state with input from OWRD watermasters (OWRD 2003). These priority areas represent watersheds

in which there is a combination of need and opportunity for flow restoration to support fish recovery efforts under the Oregon Plan for Salmon and Watersheds. Flow restoration needs for fish were identified by ODFW and flow restoration opportunities were identified by OWRD staff. These two rankings are combined to identify the priority areas. Restoring streamflows is based on voluntary local actions.

Flow restoration priorities for the Owyhee River Basin are shown on the OWRD website (OWRD 2003). The geographic areas overlay several 5th field HUC's so the information is shown in the table below rather than in the 4th-field HUC sections.

Table 4. Owyhee River Basin Stream Flow Priority Areas

Streamflow Priority Area	Priority	HUC 5
Owyhee River at Snake R At Mouth	Current Resources Priority	1705011007: Owyhee River-Sand Hollow Cr 1705011006: Owyhee River-Three Fingers Gulch 1705011002: Owyhee River-Jackson Creek 1705011001: Owyhee River-Ryegrass Creek 1705011005: Lower Dry Creek 1705010807: Lower Cow Creek 1705010905: Lower Crooked Creek
Jordan Creek at Owyhee R Above Cow Creek	Priority	1705010805: Jordan Creek-Sheep Spring Cr 1705010804: Jordan Creek-Trout Creek
Owyhee River > Snake R Above Crooked Creek	Priority	1705010707: Owyhee River-Skull Creek 1705010705: Owyhee River-Oregon Lake

Wetlands

We evaluated several sources of information to get an indication of wetland loss/gain (National Wetland Inventory, NRCS digital soil survey, and the Oregon Natural Heritage Program), however, these sources did not provide adequate coverage or sufficiently robust information. Wetland distribution in the Owyhee Basin should be re-investigated when the National Wetland Inventory digital maps are completed and made available. The Oregon Conservation Strategy (ODFW 2006) listed the following acres as the current acres of strategy habitats in the Owyhee Basin. The 55 acres in the Lower Owyhee subbasin is shown as an increase over historic acres. This table indicates the current lack of information on wetlands in the Owyhee subbasin.

Table 5. Wildlife Strategy Habitats in the Owyhee River Basin

Fourth-field HUC (Subbasin)	Subbasin Acres*	Sagebrush Steppe & Shrublands	Riparian	Wetlands	Aspen Woodlands
17050103: Middle Snake-Succor	206,351	83,502	2,931	-	24
17050105: South Fork Owyhee	5,437	5,082	-	-	-
17050106: East Little Owyhee	85,099	47,622	-	-	-
17050107: Middle Owyhee	770,030	495,172	1,352	-	12
17050108: Jordan	447,888	306,889	5,826	-	456
17050109: Crooked-Rattlesnake	850,283	534,763	936	-	-
17050110: Lower Owyhee	1,264,226	744,987	3,880	55	135
<i>* Oregon portion only</i>					

Noxious Weeds

We investigated several sources of potential information for noxious weed coverage.

The BLM “Weeds” geodatabase², did not have information currently for this area, but, is expected to have completed coverage by the end of 2009. The BLM Vale District office is the contact for this information (Contact: GIS Specialist, Brent Grasty).

The statewide weed database, Weedmapper³, contains information on weed distribution but we could not access the underlying database to provide specific information for the Owyhee basin.

² <http://www.blm.gov/or/gis/data-details.php?data=ds000117>

³ <http://www.weedmapper.org/>

LOWER OWYHEE BASIN (17050110)

Conservation Opportunity Areas

Conservation opportunity areas listed in the Oregon Conservation Strategy (ODFW 2006) are described below, and their location is shown in Figure 1.

NBR-12. Saddle Butte

Located along the Owyhee River, this area encompasses most of the Saddle Butte Wilderness Study Area, including the Saddle Butte Area of Critical Environmental Concern (ACEC).

Key Habitats:

- Big Sagebrush Shrublands

Key Species:

- Ferruginous hawk, sage grouse, Swainson’s hawk, and pygmy rabbit

Recommended Conservation Actions:

- Restore and maintain complex, continuous sage habitat

NBR-13. Middle Owyhee River Area

Special Features:

- High quality mountain-mahogany-sagebrush communities in the Mahogany Ridge ACEC provide important habitat for many landbird species.
- Canyon areas provide habitat for a number of rare endemic plant species.
- Unique volcanic ashbeds provide habitat for endemic plants.

Key Habitats:

- Aspen Woodland
- Big Sagebrush Shrublands
- Riparian

Recommended Conservation Actions:

- Restore and maintain complex, continuous sagebrush habitat

Aquatic

A. Native Fish Status Report

No native fish Species Management Units (SMU) are described for the Owyhee River Basin (ODFW 2005).

B. Fish Habitat

There is only one data file listed in the ODEQ Aquatic Habitat Inventory Project (ODFW 2009) for this subbasin. Fourteen segments of Dry Creek, Tributary to Owyhee River, were surveyed. There is some uncertainty on the date sampled; the file has an error in the date field, but the website identifies the sample date as 2001. See the Appendix for the explanation of limiting factor determination.

Table 6. Aquatic Habitat Limiting Factors

Dry Creek			
Segments	Length	Status	Limiting Factor
1 - 7	31.6 miles	Dry	
8		Limiting	sediment, shade, bank erosion
9		Adequate	
10		Moderate	sediment, shade
11		Moderate	sediment, shade
12		Moderate	shade
13		Moderate	sediment, shade
14		Dry	

Notes to Table: There is some uncertainty on the date sampled; the file has an error in the date field, but the website identifies the survey year as 2001.

C. Water Quality

Water Quality Limited Streams, 2004-2006 303(d) List (ODEQ)

The Lower Owyhee River is listed in the 2004-2006 303(d) list (ODEQ 2009) for parameters shown in the table below with a planned start date for the TMDL in 2009.

Table 7. Water Quality Limited Streams identified by ODEQ.

Priority	HUC	Name	Planned Start Date for TMDL	Listed Parameters to be Address in the TMDL
IV	17050110	Lower Owyhee	2009	Arsenic, bacteria, chlorophyll a, copper, DDT, dieldrin, iron, lead, manganese, mercury, temperature

Riparian

Proper Functioning Condition (PFC) assesses the physical functioning of riparian-wetland areas. PFC defines a minimum level for assessing the physical functioning of riparian-wetland areas through consideration of hydrology, vegetation, and soil/landform attributes (BLM 1998). PFC data that was available from BLM in electronic format is summarized in the table below. (Note: There is a discrepancy in the data files as to the year the data was collected, but it is either 1998 or 2000.)

Table 8. Proper Functioning Condition Rating of Riparian Areas

HUC5	Miles Rated	% Proper Functioning Condition (PFC)	% Functional at Risk			% Non-functional (NF)
			upward trend (FARU)	no apparent trend (FARN)	downward trend (FARD)	
1705011001: Owyhee River-Rye-grass Creek	21.2	100%	0%	0%	0%	0%
1705011002: Owyhee River-Jackson Creek	30.6	97%	0%	3%	0%	0%
1705011003: Crowley Creek	0.0					
1705011004: Upper Dry Creek	8.5	31%	0%	36%	9%	24%
1705011005: Lower Dry Creek	32.6	8%	0%	92%	0%	0%
1705011006: Owyhee River-Three Fingers Gulch	1.1	0%	0%	100%	0%	0%

HUC5	Miles Rated	% Proper Functioning Condition (PFC)	% Functional at Risk			% Non-functional (NF)
			upward trend (FARU)	no apparent trend (FARN)	downward trend (FARD)	
1705011007: Owyhee River-Sand Hollow Creek	38.3	43%	0%	46%	0%	11%

Watershed Council Identified Issues and Recommendations

The Owyhee Watershed Council identified watershed condition indicators and prioritized the indicators from low to high.

Table 9. Owyhee Watershed Council Priorities for Aquatic, Riparian, and Uplands

4 th Field Subbasin: Lower Owyhee 17050110 (Perennial Streams)			
Watershed Condition Indicator Definition	Watershed Condition Indicator	Council Priority*	Council Rating Rationale**
System: Aquatic			
Water Quality: Changes in water quality, both harmful to fish and public health.	Water Quality: <ul style="list-style-type: none"> ▪ Mercury ▪ Temperature ▪ Pesticide ▪ Fecal Chloroform (Below the dam) ▪ Dissolved Oxygen ▪ Invasive species (Tamarisk) ▪ Excess nutrients (Below the dam) ▪ Storm Events ▪ Sediment ▪ Bacteria ▪ Turbidity 	High NFS Low High Low High High NFS High High High	What is natural compared to man-made. Extent of high flows causing erosion and removal of riparian vegetation on an aquatic system.
Water Quantity: Adequate summer and winter stream flows that support designated beneficial uses.	Water Quantity: <ul style="list-style-type: none"> ▪ Invasive species ▪ Precipitation variation ▪ Evapotranspiration ▪ Water Use 	High NFS Low Medium	How does precipitation variation affect designated beneficial uses
Fishery Habitat Quality: Spawning and rearing habitat appropriate to the fish species identified in ODFW management plans for the watershed.	Warm Water <ul style="list-style-type: none"> ▪ Undercut banks ▪ Invasive species ▪ Introduced Fish Cold Water <ul style="list-style-type: none"> ▪ Undercut banks ▪ Summer refugia ▪ Invasive species 	High High Low Medium High High	

4 th Field Subbasin: Lower Owyhee 17050110 (Perennial Streams)			
Watershed Condition Indicator Definition	Watershed Condition Indicator	Council Priority*	Council Rating Rationale**
Sediment Sources: Sediment loading in the Owyhee Watershed.	<ul style="list-style-type: none"> ▪ Storm events ▪ Streambank Stability ▪ Recreation ▪ Invasive Species 	NFS High NFS High	What extent do ORVs affect sediment loading on aquatic systems?
System: Riparian			
Invasive Species: Non-native invasive species that modify riparian habitat and displace native species.	<ul style="list-style-type: none"> ▪ Invasive species 	High	
Riparian Restoration: Develop off-channel water sources to move pressure out of sensitive riparian areas to firmer, more stable landforms where damage can be controlled and minimized. Fencing around riparian areas with or without water gaps to protect the habitat. Revegetation to improve habitat.	<ul style="list-style-type: none"> ▪ Off-channel Water Development ▪ Fencing ▪ Revegetation ▪ Streambank Stabilization 	High High High High	
System: Uplands			
Invasive Species: Non-native invasive species that modify riparian habitat and displace native species.	<ul style="list-style-type: none"> ▪ Invasive species ▪ Recreation 	High NFS	What effect does it have on the watershed uplands
Fire: Prescribed fires with low to moderate burn severity rarely produce adverse hydrologic effects. Post wildfire flooding is a concern.	Fire <ul style="list-style-type: none"> ▪ Prescribed ▪ Wildfire 	High High	
Accessibility of Water: There are few perennial water sources in the Watershed.	<ul style="list-style-type: none"> ▪ Accessibility of Water 	High	
Land Stability: Sediment loading on uplands occur from storm events, streambank instability, invasive species, ORV recreation, and etc.	Land Stability <ul style="list-style-type: none"> ▪ Recreation ▪ Storm events ▪ Undercut banks ▪ Streambank stabilization ▪ Invasive species 	NFS NFS High High High	
* Low, Medium, High, Needs further study (NFS)			
** Owyhee Watershed does not have TMDLs at this time			

Crooked Rattlesnake (17050109)

Conservation Opportunity Areas

None identified in this 4th field HUC (ODFW 2006).

Aquatic

A. Native Fish Status Report

No native fish Species Management Units (SMU) are described for the Owyhee River Basin (ODFW 2005).

B. Fish Habitat

No fisheries habitat data reported in the ODFW Aquatic Inventories Project database for this basin (ODFW 2009).

C. Water Quality

Water Quality Limited Streams, 2004-2006 303(d) List (ODEQ)

There no Category 5 streams listed on the 303(d) list. Category 5 are Water Quality Limited Waters Needing a TMDL (ODEQ 2009).

Riparian

Proper Functioning Condition (PFC) assesses the physical functioning of riparian-wetland areas. PFC defines a minimum level for assessing the physical functioning of riparian-wetland areas through consideration of hydrology, vegetation, and soil/landform attributes (BLM 1998). PFC data that was available from BLM in electronic format is summarized in the table below. (Note: There is a discrepancy in the data files as to the year the data was collected, but it is either 1998 or 2000.)

Table 10. Proper Functioning Condition Rating of Riparian Areas

HUC5	Miles Rated	% Proper Functioning Condition (PFC)	% Functional at Risk			% Non-functional (NF)
			upward trend (FARU)	no apparent trend (FARN)	downward trend (FARD)	
1705010901: Upper Crooked Creek	0.0					
1705010902: Rattlesnake Creek	12.9	0%	0%	90%	10%	0%
1705010903: Wildcat Creek	1.3	0%	0%	0%	100%	0%
1705010904: Dry Creek	0.0					
1705010905: Lower Crooked Creek	0.1	0%	0%	0%	0%	100%

Watershed Council Identified Issues and Recommendations

The Owyhee Watershed Council identified watershed condition indicators and prioritized the indicators from low to high.

Table 11. Owyhee Watershed Council Priorities for Aquatic, Riparian, and Uplands

4 th Field Subbasin: Crooked – Rattlesnake 17050109 (Intermittent)			
Watershed Condition Indicator Definition	Watershed Condition Indicator	Council Priority*	Council Rating Rationale**
System: Aquatic			
Water Quality: Changes in water quality, both harmful to fish and public health.	Water Quality: <ul style="list-style-type: none"> ▪ Mercury ▪ Temperature ▪ Pesticide ▪ Fecal Chloroform ▪ Dissolved Oxygen ▪ Invasive species (Tamarisk) ▪ Excess nutrients ▪ Storm Events 	High NFS Low High Low High High NFS	Need to know environmental potential To what extent does this affect the other criteria
Water Quantity: Adequate summer and winter stream flows that support designated beneficial uses	Water Quantity: <ul style="list-style-type: none"> ▪ Invasive species ▪ Precipitation variation ▪ Evapotranspiration ▪ Water Use 	High NFS Low Medium	How does precipitation variation affect designation of beneficial use.

4 th Field Subbasin: Crooked – Rattlesnake 17050109 (Intermittent)			
Watershed Condition Indicator Definition	Watershed Condition Indicator	Council Priority*	Council Rating Rationale**
Fishery Habitat Quality: Spawning and rearing habitat appropriate to the fish species identified in ODFW management plans for the watershed.	Warm Water <ul style="list-style-type: none"> ▪ Undercut banks ▪ streambank stability ▪ Invasive species ▪ Introduced Fish 	High High Low not rated	
	Cold Water <ul style="list-style-type: none"> ▪ Undercut banks ▪ Streambank stability ▪ Summer refugia ▪ Invasive species 	Medium High High not rated	
Sediment Sources: Sediment loading in the Owyhee Watershed.	<ul style="list-style-type: none"> ▪ Storm events ▪ Streambank Stability ▪ Recreation ▪ Invasive Species 	NFS High NFS High	
System: Riparian			
Invasive Species: Non-native invasive species that modify riparian habitat and displace native species.	Invasive species	High	
Riparian Restoration: Develop off-channel water sources to move pressure out of sensitive riparian areas to firmer, more stable landforms where damage can be controlled and minimized. Fencing around riparian areas with or without water gaps to protect the habitat. Revegetation to improve habitat.	<ul style="list-style-type: none"> ▪ Off-channel Water Development ▪ Fencing ▪ Revegetation ▪ Streambank Stabilization 	High High High High	
System: Uplands			
Invasive Species: Non-native invasive species that modify riparian habitat and displace native species.	<ul style="list-style-type: none"> ▪ Invasive species ▪ Recreation 	High High	What effect does it have on the watershed uplands?
Fire: Prescribed fires with low to moderate burn severity rarely produce adverse hydrologic effects. Post wildfire flooding is a concern.	Fire <ul style="list-style-type: none"> ▪ Prescribed ▪ Wildfire 	High High	

4 th Field Subbasin: Crooked – Rattlesnake 17050109 (Intermittent)			
Watershed Condition Indicator Definition	Watershed Condition Indicator	Council Priority*	Council Rating Rationale**
Accessibility of Water: There are few perennial water sources in the Watershed.	<ul style="list-style-type: none"> ▪ Accessibility of Water 	High	
Land Stability: Sediment loading on uplands occurs from storm events, streambank instability, invasive species, ORV recreation, and etc.	Land Stability <ul style="list-style-type: none"> ▪ Recreation ▪ Storm events ▪ Undercut banks ▪ Streambank stabilization ▪ Invasive species 	NFS NFS High High High	
* Low, Medium, High, Needs further study (NFS) ** Owyhee Watershed does not have TMDLs at this time			

Jordan Creek (17050108)

Conservation Opportunity Areas

None identified in this 4th field HUC (ODFW 2006).

Aquatic

A. Native Fish Status Report

No native fish Species Management Units (SMU) are described for the Owyhee River Basin (ODFW 2005).

B. Fish Habitat

No fisheries habitat data reported in the ODFW Aquatic Inventories Project database for this basin (ODFW 2009).

C. Water Quality

Water Quality Limited Streams, 2004-2006 303(d) List (ODEQ)

Jordan Creek is listed in the 2004-2006 303(d) list for parameters shown in the table below with a planned start date for the TMDL in 2009.

Table 12. Water Quality Limited Streams identified by ODEQ

Priority	HUC	Name	Planned Start Date for TMDL	Listed Parameters to be Address in the TMDL
IV	17050108	Jordan Creek	2009	Arsenic, mercury

Riparian

No PFC data was reported in the BLM database for this hydrologic unit.

Watershed Council Identified Issues and Recommendations

The Owyhee Watershed Council identified watershed condition indicators and prioritized the indicators from low to high.

Table 13. Owyhee Watershed Council Priorities for Aquatic, Riparian, and Uplands

4th Field Subbasin: Jordan 17050108 (Perennial Streams)			
Watershed Condition Indicator Definition	Watershed Condition Indicator	Council Priority*	Council Rating Rationale**
System: Aquatic			
Water Quality: Changes in water quality, both harmful to fish and public health.	Water Quality: <ul style="list-style-type: none"> ▪ Mercury ▪ Temperature ▪ Pesticide ▪ Fecal Chloroform ▪ Dissolved Oxygen ▪ Invasive species (Tamarisk) ▪ Excess nutrients ▪ Storm Events 	High NFS Low High Low High High NFS	Need to know environmental potential To what extent does this affect the other criteria
Water Quantity: Adequate summer and winter stream flows that support designated beneficial uses	Water Quantity <ul style="list-style-type: none"> ▪ Invasive species ▪ Precipitation variation ▪ Evapotranspiration ▪ Water Use 	High NFS Low Medium	How does precipitation variation affect designation of beneficial use?
Fishery Habitat Quality: Spawning and rearing habitat appropriate to the fish species identified in ODFW management plans for the watershed.	Warm Water <ul style="list-style-type: none"> ▪ Undercut banks ▪ Invasive species ▪ Introduced Fish Cold Water <ul style="list-style-type: none"> ▪ Undercut banks ▪ Summer refugia ▪ Invasive species 	High High Low Medium High High	
Sediment Sources: Sediment loading in the Owyhee Watershed.	<ul style="list-style-type: none"> ▪ Storm events ▪ Streambank Stability ▪ Recreation ▪ Invasive Species 	NFS High NFS High	
System: Riparian			
Invasive Species: Non-native invasive species that modify riparian habitat and displace native species.	<ul style="list-style-type: none"> ▪ Invasive species 	High	

4th Field Subbasin: Jordan 17050108 (Perennial Streams)			
Watershed Condition Indicator Definition	Watershed Condition Indicator	Council Priority*	Council Rating Rationale**
Riparian Restoration: Develop off-channel water sources to move pressure out of sensitive riparian areas to firmer, more stable landforms where damage can be controlled and minimized. Fencing around riparian areas with or without water gaps to protect the habitat. Revegetation to improve habitat.	<ul style="list-style-type: none"> ▪ Off-channel Water Development ▪ Fencing ▪ Revegetation ▪ Streambank Stabilization 	High High High High	
System: Uplands			
Invasive Species: Non-native invasive species that modify riparian habitat and displace native species.	<ul style="list-style-type: none"> ▪ Invasive species ▪ Recreation 	High High	What effect does it have on the watershed uplands
Fire: Prescribed fires with low to moderate burn severity rarely produce adverse hydrologic effects. Post wildfire flooding is a concern.	Fire <ul style="list-style-type: none"> ▪ Prescribed ▪ Wildfire 	High High	
Accessibility of Water: There are few perennial water sources in the Watershed.	<ul style="list-style-type: none"> ▪ Accessibility of Water 	High	
Land Stability: Sediment loading on uplands occur from storm events, streambank instability, invasive species, ORV recreation, and etc.	Land Stability <ul style="list-style-type: none"> ▪ Recreation ▪ Storm events ▪ Undercut banks ▪ Streambank stabilization ▪ Invasive species 	NFS NFS High High High	
* Low, Medium, High, Needs further study (NFS)			
** Owyhee Watershed does not have TMDLs at this time			

Middle Owyhee Basin (17050107)

Conservation Opportunity Areas

Conservation opportunity areas listed in the Oregon Conservation Strategy (ODFW 2006) are described below, and their location is shown in Figure 1.

NBR-14. Upper Owyhee

(Also includes the East Little Owyhee HUC, #17050106)

Located in the southeast corner of the state, this area encompasses several Wilderness Study Areas including Owyhee Canyon, Lookout Butte, and Upper West Little Owyhee.

Special Features:

- Encompasses one of the largest remaining blocks of high quality sagebrush habitat in the west.
- Toppin Creek Butte ACEC / RNA (3,996 acres) was established here in 2002 by the BLM to protect high-quality sagebrush steppe communities and habitat for sage grouse and other landbirds.
- The BLM (2003) adopted a new management strategy for the Louse Canyon wildlife area which emphasizes sagebrush-associated wildlife and at-risk species.

Key Habitats:

- Big Sagebrush Shrublands
- Riverine Canyons

Recommended Conservation Actions:

- Protect playas in SE corner of the state for newly discovered fairy shrimp population and other rare species/habitats
- Protect riverine canyons and riparian zones within them

- Restore and maintain complex, continuous sage habitat

Aquatic

A. Native Fish Status Report

No native fish Species Management Units (SMU) are described for the Owyhee River Basin (ODFW 2005).

B. Fish Habitat

No fisheries habitat data reported in the ODFW Aquatic Inventories Project database for this basin (ODFW 2009).

C. Water Quality

Water Quality Limited Streams, 2004-2006 303(d) List (ODEQ)

Jordan Creek is listed in the 2004-2006 303(d) list for parameters shown in the table below with a planned start date for the TMDL in 2009.

Table 14. Water Quality Limited Streams identified by ODEQ

Priority	HUC	Name	Planned Start Date for TMDL	Listed Parameters to be Address in the TMDL
IV	17050107	Middle Owyhee	2009	Arsenic, mercury

Riparian

Proper Functioning Condition (PFC) assesses the physical functioning of riparian-wetland areas. PFC defines a minimum level for assessing the physical functioning of riparian-wetland areas through consideration of hydrology, vegetation, and soil/landform attributes (BLM 1998). PFC data that was available from BLM in electronic format is summarized in the table below. (Note: There is a discrepancy in the data files as to the year the data was collected, but it is either 1998 or 2000.)

Table 15. Proper Functioning Condition Rating of Riparian Areas

HUC5	Miles Rated	% Proper Functioning Condition (PFC)	% Functional at Risk			% Non-functional (NF)
			upward trend (FARU)	no apparent trend (FARN)	downward trend (FARD)	
1705010701: West Little Owyhee River	101.5	75%	0%	23%	0%	1%
1705010702: Antelope Creek	93.2	60%	2%	32%	5%	2%
1705010703: Middle Fork Owyhee River	0.0					
1705010704: North Fork Owyhee River	0.0					
1705010705: Owyhee River-Oregon Lake	20.6	72%	0%	28%	0%	0%
1705010706: Soldier Creek	0.0					
1705010707: Owyhee River-Skull Creek	44.2	100%	0%	0%	0%	0%

Watershed Council Identified Issues and Recommendations

The Owyhee Watershed Council identified watershed condition indicators and prioritized the indicators from low to high.

Table 16. Owyhee Watershed Council Priorities for Aquatic, Riparian, and Uplands

4th Field Subbasin: Middle Owyhee 17050107 (Perennial Streams)			
Watershed Condition Indicator Definition	Watershed Condition Indicator	Council Priority*	Council Rating Rationale**
System: Aquatic			
Water Quality: Changes in water quality, both harmful to fish and public health.	Water Quality <ul style="list-style-type: none"> ▪ Mercury ▪ Temperature ▪ Pesticide ▪ Fecal Chloroform ▪ Dissolved Oxygen ▪ Invasive species (Tamarisk) ▪ Excess nutrients ▪ Storm Events 	High NFS Low High Low High High NFS	Need to know environmental potential To what extent does this affect the other criteria
Water Quantity: Adequate summer and winter stream flows that support designated beneficial uses	Water Quantity <ul style="list-style-type: none"> ▪ Invasive species ▪ Precipitation variation ▪ Evapotranspiration ▪ Water Use 	High NFS Low Medium	How does precipitation variation affect designation of beneficial use?

4th Field Subbasin: Middle Owyhee 17050107 (Perennial Streams)			
Watershed Condition Indicator Definition	Watershed Condition Indicator	Council Priority*	Council Rating Rationale**
Fishery Habitat Quality: Spawning and rearing habitat appropriate to the fish species identified in ODFW management plans for the watershed.	Warm Water <ul style="list-style-type: none"> Undercut banks Invasive species Introduced Fish 	High High Low	
	Cold Water <ul style="list-style-type: none"> Undercut banks Summer refugia Invasive species 	Medium High High	
Sediment Sources: Sediment loading in the Owyhee Watershed.	<ul style="list-style-type: none"> Storm events Streambank Stability Recreation Invasive Species 	NFS High NFS High	
System: Riparian			
Invasive Species: Non-native invasive species that modify riparian habitat and displace native species.	Invasive species	High	
Riparian Restoration: Develop off-channel water sources to move pressure out of sensitive riparian areas to firmer, more stable landforms where damage can be controlled and minimized. Fencing around riparian areas with or without water gaps to protect the habitat. Revegetation to improve habitat.	<ul style="list-style-type: none"> Off-channel Water Development Fencing Revegetation Streambank Stabilization 	High High High High	
System: Uplands			
Invasive Species: Non-native invasive species that modify riparian habitat and displace native species.	<ul style="list-style-type: none"> Invasive species Recreation 	High High	What effect does it have on the watershed uplands?
Fire: Prescribed fires with low to moderate burn severity rarely produce adverse hydrologic effects. Post wildfire flooding is a concern.	Fire <ul style="list-style-type: none"> Prescribed Wildfire 	High High	
Accessibility of Water: There are few perennial water sources in the Watershed.	<ul style="list-style-type: none"> Accessibility of Water 	High	
Land Stability: Sediment loading on uplands occurs from storm events, streambank instability, invasive species, ORV recreation, and etc.	Land Stability <ul style="list-style-type: none"> Recreation Storm events Undercut banks Streambank stabilization Invasive species 	NFS NFS High High High	
* Low, Medium, High, Needs further study (NFS) ** Owyhee Watershed does not have TMDLs at this time			

East Little Owyhee Basin (17050106)

Conservation Opportunity Areas

The conservation opportunity area, NBR-14, occurs in this HUC and in the Middle Owyhee Basin HUC (17050107); refer to the Middle Owyhee Basin for a description of this opportunity area.

Aquatic

A. Native Fish Status Report

No native fish Species Management Units (SMU) are described for the Owyhee River Basin (ODFW 2005).

B. Fish Habitat

No fisheries habitat data reported in the ODFW Aquatic Inventories Project database for this basin (ODFW 2009).

C. Water Quality

Water Quality Limited Streams, 2004-2006 303(d) List (ODEQ)

There no Category 5 streams listed on the 303(d) list. Category 5 streams are Water Quality Limited Waters Needing a TMDL (ODEQ 2009).

Riparian

Proper Functioning Condition (PFC) assesses the physical functioning of riparian-wetland areas. PFC defines a minimum level for assessing the physical functioning of riparian-wetland areas through consideration of hydrology, vegetation, and soil/landform attributes (BLM 1998). PFC data that was available from BLM in electronic format is summarized in

the table below. (Note: There is a discrepancy in the data files as to the year the data was collected, but it is either 1998 or 2000.)

Table 17. Proper Functioning Condition Rating of Riparian Areas

HUC5	Miles Rated	% Proper Functioning Condition (PFC)	% Functional at Risk			% Non-functional (NF)
			upward trend (FARU)	no apparent trend (FARN)	downward trend (FARD)	
1705010606: Willow Creek	0.0					
1705010607: Tent Creek	26.2	52%	0%	43%	5%	0%

Watershed Council Identified Issues and Recommendations

The Owyhee Watershed Council identified watershed condition indicators and prioritized the indicators from low to high.

Table 18. Owyhee Watershed Council Priorities for Aquatic, Riparian, and Uplands

4th Field Subbasin: East Little Owyhee 17050106 (Intermittent Streams)			
Watershed Condition Indicator Definition	Watershed Condition Indicator	Council Priority*	Council Rating Rationale**
System: Aquatic			
Water Quality: Changes in water quality, both harmful to fish and public health.	Water Quality <ul style="list-style-type: none"> Mercury Temperature Pesticide Fecal Chloroform Dissolved Oxygen Invasive species (Tamarisk) Excess nutrients Storm Events 	High NFS Low High Low High High NFS	Need to know environmental potential To what extent does this affect the other criteria
Water Quantity: Adequate summer and winter stream flows that support designated beneficial uses	Water Quantity <ul style="list-style-type: none"> Invasive species Precipitation variation Evapotranspiration Water Use 	High NFS Low Medium	How does precipitation variation affect designation of beneficial use?
Fishery Habitat Quality: Spawning and rearing habitat appropriate to the fish species identified in ODFW management plans for the watershed.	Warm Water <ul style="list-style-type: none"> Undercut banks Invasive species Introduced Fish Cold Water <ul style="list-style-type: none"> Undercut banks Summer refugia Invasive species 	High High Low Medium High High	

4th Field Subbasin: East Little Owyhee 17050106 (Intermittent Streams)			
Watershed Condition Indicator Definition	Watershed Condition Indicator	Council Priority*	Council Rating Rationale**
Sediment Sources: Sediment loading in the Owyhee Watershed.	<ul style="list-style-type: none"> ▪ Storm events ▪ Streambank Stability ▪ Recreation ▪ Invasive Species 	NFS High NFS High	
System: Riparian			
Invasive Species: Non-native invasive species that modify riparian habitat and displace native species.	Invasive species		
Riparian Restoration: Develop off-channel water sources to move pressure out of sensitive riparian areas to firmer, more stable landforms where damage can be controlled and minimized. Fencing around riparian areas with or without water gaps to protect the habitat. Revegetation to improve habitat.	<ul style="list-style-type: none"> ▪ Off-channel Water Development ▪ Fencing ▪ Revegetation ▪ Streambank Stabilization 	High High High High	
System: Uplands			
Invasive Species: Non-native invasive species that modify riparian habitat and displace native species.	<ul style="list-style-type: none"> ▪ Invasive species ▪ Recreation 	High High	What effect does it have on the watershed uplands?
Fire: Prescribed fires with low to moderate burn severity rarely produce adverse hydrologic effects. Post wildfire flooding is a concern.	Fire <ul style="list-style-type: none"> ▪ Prescribed ▪ Wildfire 	High High	
Accessibility of Water: There are few perennial water sources in the Watershed.	<ul style="list-style-type: none"> ▪ Accessibility of Water 	High	
Land Stability: Sediment loading on uplands occur from storm events, streambank instability, invasive species, ORV recreation, and etc.	Land Stability <ul style="list-style-type: none"> ▪ Recreation ▪ Storm events ▪ Undercut banks ▪ Streambank stabilization ▪ Invasive species 	NFS NFS High High High	
* Low, Medium, High, Needs further study (NFS) ** Owyhee Watershed does not have TMDLs at this time			

South Fork Owyhee Basin (17050105)

Conservation Opportunity Areas

None identified in this 4th field HUC (ODFW 2006).

Aquatic

A. Native Fish Status Report

No native fish Species Management Units (SMU) are described for the Owyhee River Basin (ODFW 2005).

B. Fish Habitat

No fisheries habitat data reported in the ODFW Aquatic Inventories Project database for this basin (ODFW 2009).

C. Water Quality

Water Quality Limited Streams, 2004-2006 303(d) List (ODEQ)

There no Category 5 streams listed on the 303(d) list. Category 5 streams are Water Quality Limited Waters Needing a TMDL (ODEQ 2009).

Riparian

No PFC data was reported in the BLM database for this hydrologic unit.

Watershed Council Identified Issues and Recommendations

The Owyhee Watershed Council identified watershed condition indicators and prioritized the indicators from low to high.

Table 19. Owyhee Watershed Council Priorities for Aquatic, Riparian, and Uplands

4th Field Subbasin: South Fork Owyhee 17050105			
Watershed Condition Indicator Definition	Watershed Condition Indicator	Council Priority*	Council Rating Rationale**
System: Uplands			
Invasive Species: Non-native invasive species that modify riparian habitat and displace native species.	<ul style="list-style-type: none"> ▪ Invasive species ▪ Recreation 	High High	What effect does it have on the watershed uplands?
Fire: Prescribed fires with low to moderate burn severity rarely produce adverse hydrologic effects. Post wildfire flooding is a concern.	Fire <ul style="list-style-type: none"> ▪ Prescribed ▪ Wildfire 	High High	
Accessibility of Water: There are few perennial water sources in the Watershed.	<ul style="list-style-type: none"> ▪ Accessibility of Water 	High	
Land Stability: Sediment loading on uplands occur from storm events, streambank instability, invasive species, ORV recreation, and etc.	Land Stability <ul style="list-style-type: none"> ▪ Recreation ▪ Storm events ▪ Undercut banks ▪ Streambank stabilization ▪ Invasive species 	NFS NFS High High High	
* Low, Medium, High, Needs further study (NFS)			
** Owyhee Watershed does not have TMDLs at this time			

Middle Snake Succor Basin (17050103)

Conservation Opportunity Areas

None identified in this 4th field HUC (ODFW 2006).

Aquatic

A. Native Fish Status Report

No native fish Species Management Units (SMU) are described for the Owyhee River Basin (ODFW 2005).

B. Fish Habitat

No fisheries habitat data reported in the ODFW Aquatic Inventories Project database for this basin (ODFW 2009).

C. Water Quality

Water Quality Limited Streams, 2004-2006 303(d) List (ODEQ)

There no Category 5 streams listed on the 303(d) list. Category 5 streams are Water Quality Limited Waters Needing a TMDL (ODEQ 2009).

Riparian

No PFC data was reported in the BLM database for this hydrologic unit.

Watershed Council Identified Issues and Recommendations

The Owyhee Watershed Council identified watershed condition indicators and prioritized the indicators from low to high.

Table 20. Owyhee Watershed Council Priorities for Aquatic, Riparian, and Uplands

4th Field Subbasin: Mid-Snake Succor 17050103 (Perennial Streams)			
Watershed Condition Indicator Definition	Watershed Condition Indicator	Council Priority*	Council Rating Rationale**
System: Aquatic			
Water Quality: Changes in water quality, both harmful to fish and public health.	Water Quality <ul style="list-style-type: none"> Mercury Temperature Pesticide Fecal Coliform Dissolved Oxygen Invasive species (Tamarisk) Excess nutrients Storm Events Sediment Bacteria Turbidity 	High NFS Low High Low High High NFS High High High	What is natural compared to man-made. Extent of high flows causing erosion and removal of riparian vegetation on an aquatic system.
Water Quantity: Adequate summer and winter stream flows that support designated beneficial uses	Water Quantity <ul style="list-style-type: none"> Invasive species Precipitation variation Evapotranspiration Water Use 	High NFS Low Medium	How does precipitation variation affect designated beneficial uses?
Fishery Habitat Quality: Spawning and rearing habitat appropriate to the fish species identified in ODFW management plans for the watershed.	Warm Water <ul style="list-style-type: none"> Undercut banks Invasive species Introduced Fish Cold Water <ul style="list-style-type: none"> Undercut banks Summer refugia Invasive species 	High High Low Medium High High	
Sediment Sources: Sediment loading in the Owyhee Watershed.	<ul style="list-style-type: none"> Storm events Streambank Stability Recreation Invasive Species 	NFS High NFS High	What extent do ORVs affect sediment loading on aquatic systems?
System: Riparian			
Invasive Species: Non-native invasive species that modify riparian habitat and displace native species.	Invasive species	High	
Riparian Restoration: Develop off-channel water sources to move pressure out of sensitive riparian areas to firmer, more stable landforms where damage can be controlled and minimized. Fencing around riparian areas with or without water gaps to protect the habitat. Revegetation to improve habitat.	<ul style="list-style-type: none"> Off-channel Water Development Fencing Revegetation Streambank Stabilization 	High High High High	

4th Field Subbasin: Mid-Snake Succor 17050103 (Perennial Streams)			
Watershed Condition Indicator Definition	Watershed Condition Indicator	Council Priority*	Council Rating Rationale**
System: Uplands			
Invasive Species: Non-native invasive species that modify riparian habitat and displace native species.	<ul style="list-style-type: none"> ▪ Invasive species ▪ Recreation 	High NFS	What effect does it have on the watershed uplands
Fire: Prescribed fires with low to moderate burn severity rarely produce adverse hydrologic effects. Post wildfire flooding is a concern.	Fire <ul style="list-style-type: none"> ▪ Prescribed ▪ Wildfire 	High High	
Accessibility of Water: There are few perennial water sources in the Watershed.	<ul style="list-style-type: none"> ▪ Accessibility of Water 	High	
Land Stability: Sediment loading on uplands occur from storm events, streambank instability, invasive species, ORV recreation, and etc.	Land Stability <ul style="list-style-type: none"> ▪ Recreation ▪ Storm events ▪ Undercut banks ▪ Streambank stabilization ▪ Invasive species 	NFS NFS High High High	
* Low, Medium, High, Needs further study (NFS) ** Owyhee Watershed does not have TMDLs at this time			

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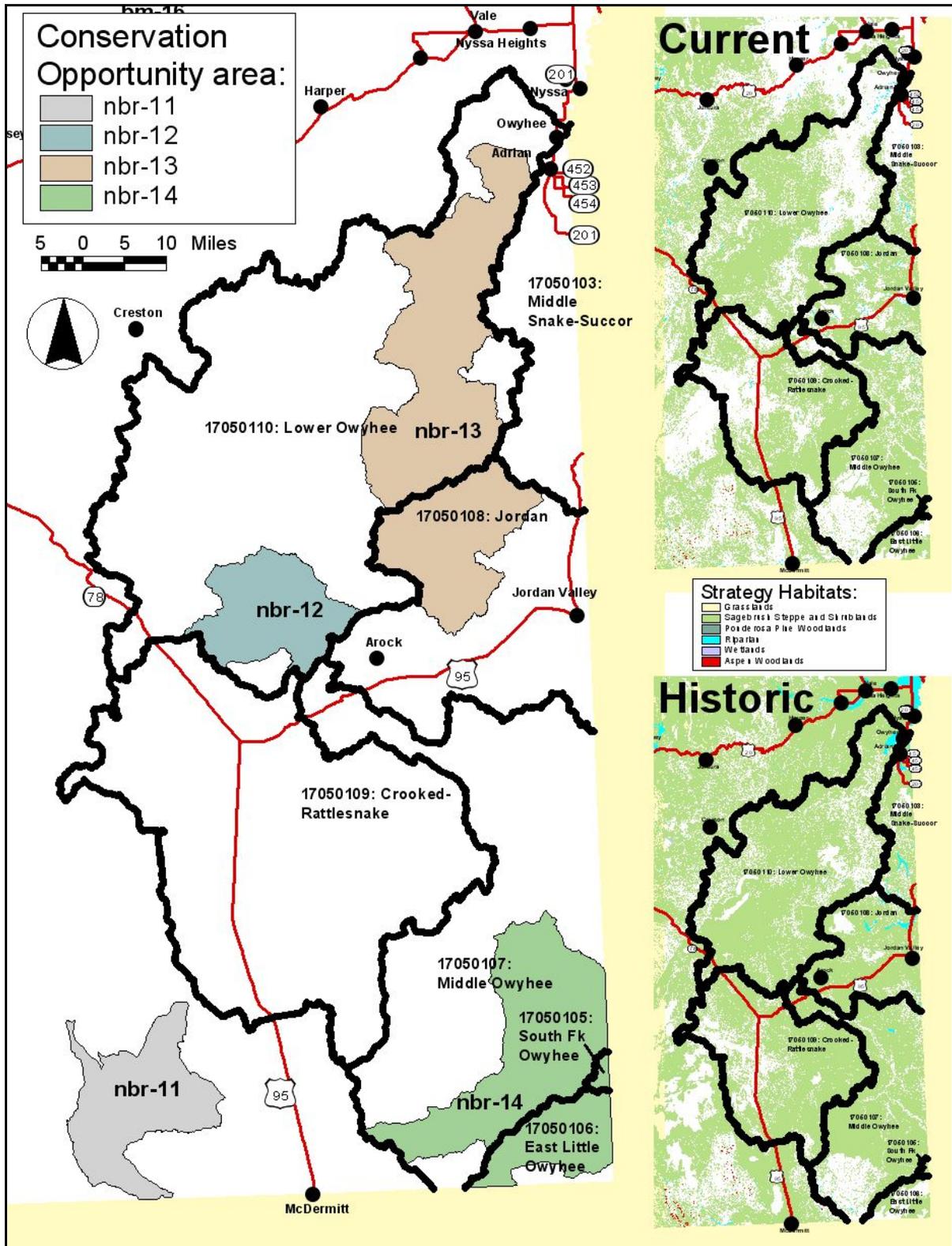
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Figure 2. Conservation Opportunities identified in the Oregon Conservation Strategy (ODFW 2006)



Appendix: Notes on Information Sources

ODEQ 303(d) List

Oregon’s 303(d) list is maintained as part of the 2004/2006 Integrated Report⁴. The 303(d) list contains several categories of streams including stream segments that have been delisted. For the purpose of this assessment we list only those water bodies that are active on the list. This includes three categories: 1) Category 5: Water quality limited, 303(d) list, TMDL needed, 2) Category 4A: Water quality limited, TMDL approved, and 3) stream bodies listed only as “303(d)”.

ODFW Aquatic Inventories Project

Oregon Department of Fish and Wildlife (ODFW) Aquatic Inventories Project⁵ assesses aquatic habitat using standard protocols. The habitat surveys provide a large number of possible habitat variables. For the purpose of this assessment we focused on variables that could be applied and interpreted across a large diverse landscape in the sagebrush desert stream systems. To accomplish this objective we selected native redband trout, *Oncorhynchus mykiss gairdneri*, as a representative indicator species and interpreted the variables based on habitat ratings adapted from Zoellick and Cade⁶ (2006).

Zoellick and Cade (2006) evaluated abundance of redband trout relative to five site-specific variables (stream shading, bank cover, bank stability, fine sediment and adult cover habitat). They found that stream shade explained most of the variation in trout abundance and therefore stream shade was recommended as the primary habitat variable to evaluate in sagebrush desert streams. In these landscapes, livestock grazing is a potential issue so we included bank stability and fine sediments as habitat measures to evaluate.

⁴ <http://www.deq.state.or.us/wq/assessment/rpt0406.htm>

⁵ <http://oregonstate.edu/dept/ODFW/freshwater/inventory/index.htm>

⁶ B.W. Zoellick and B.S. Cade. 2006. Evaluating redband trout habitat in sagebrush desert basins in southwestern Idaho. *N.A. J. Fisheries Management* 26: 268-281.

The ODFW habitat survey measures three variables that are comparable to variables used by Zoellick and Cade. These variables are shown in the table below with the stream rating based on the BLM habitat rating referenced in Zoellick and Cade. We assigned numeric scores to indicate the degree of effect on aquatic habitat: 1) Limiting, 2) Moderate and 3) Adequate. The ODFW habitat data is reported by stream reach. Habitat ratings were calculated for each stream reach, and then the overall average rating calculated for the stream. The resulting rating provides an overall indication of stream habitat conditions.

BLM Variable (Zoellick & Cade 2006)	ODFW Metric	Unit	Limiting (1)	Moderate (2)	Adequate (3)
Percent Stream Shade (solar pathfinder)	SHADE	% shade	< 40	40 - 60	> 60%
Bank Stability (% eroding bank)	BANKEROSI	% eroding banks	> 20%	> 11 - 20%	< 11%
Percent Fine Sediment (Wolman Pebble Count or ocular)	RIFSNDOR	% riffle fines	> 25%	15 - 25%	< 15%

Proper Functioning Condition Assessment

Proper Functioning Condition (PFC) refers to the BLM method⁷ of assessing riparian areas. Riparian wetlands are considered to be functioning properly when the riparian area is dissipating stream energy, filtering sediment, capturing bedload, aiding floodplain development, improving water retention, stabilizing streambanks, and providing diverse habitats. The PFC assessment results in a rating of 1) PFC, 2) Functional – at risk, or 3) Nonfunctional.

Data obtained from BLM was summarized for each stream by percent of stream miles placed into each category.

Wetlands

We evaluated several sources of information to get an indication of wetland loss/gain or wetland alteration.

⁷ Bureau of Land Management. 1998. Riparian area management: a user guide to assessing proper functioning condition and the supporting science for lotic areas. Technical Reference 1737-15, National Applied Science Center, Denver, CO.

- National Wetlands Inventory (NWI) digital data⁸: Used to identify the current (1980's) locations of wetlands, wetland types, and wetland disturbances
- Natural Resources Conservation Service (NRCS) digital soil survey data⁹: Used to identify hydric soils, which may indicate locations of current or historic wetlands
- Oregon Natural Heritage Program (ONHP) historic vegetation data set¹⁰: Used to identify historic wetland locations in areas lacking NWI and or soils data
- National Land Cover Database (NLCD)¹¹: Used to identify current wetland locations in areas lacking NWI and or soils data

However, these sources did not provide adequate coverage or sufficiently comparable information for interpretation. The Oregon Conservation Strategy (ODFW 2006) identifies the current and historic acres of strategy habitats including wetlands. But, there is virtually no wetlands listed for the Owyhee subbasin, which indicates that this is a data gap for this area.

Oregon Native Fish Status Report

The Oregon Native Fish Status Report describes the current conservation status of native fishes based on interim criteria defined in Oregon's Native Fish Conservation Policy [OAR 635-007-0507]. The purpose of the Native Fish Conservation Policy (NFCP) is to ensure conservation and recovery of native fish in Oregon. The policy focuses on naturally-produced fish. This assessment focuses on groups of populations from a common geographic area with similar genetic and life history characteristics called Species Management Units (SMUs). SMUs are groups of populations from a common geographic area that share similar life history, genetic, and ecological characteristics. Populations within an SMU are locally adapted to the specific conditions encountered in their native streams.

⁸ <http://www.fws.gov/wetlands/>

⁹ <http://soildatamart.nrcs.usda.gov/>

¹⁰ http://www.oregon.gov/DAS/EISPD/GEO/docs/metadata/historic_vegetation.htm

¹¹ <http://seamless.usgs.gov/>

The status report is an interim assessment intended to flag acute problems and help identify priorities for more detailed conservation planning evaluations. Risk, as used in this report, refers to the risk to the conservation of a unique group of populations (e.g. SMU), not the risk of extinction. Interim criteria were based on six biological characteristics related to species performance. These include existing populations, habitat use distribution, abundance, productivity, reproductive independence, and hybridization. Each of these attributes was evaluated for every population based on benchmark values related to species viability, persistence probability, and conservation risks. Criteria for individual SMUs were met when at least 80% of existing constituent populations met the standard.