

Middle Deschutes Watershed Council

Watershed Restoration Action Plan

April 2015

Lower Willow Creek Canyon



April 2015

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Middle Deschutes Watershed Council

Restoration Action Plan

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Acronyms and Abbreviations

Area Plan – Middle Deschutes Agricultural Water Quality Management Area Plan

BLM – Bureau of Land Management

CREP – Conservation Reserve Enhancement Program

cfs – Cubic feet per second

CRP – Conservation Reserve Program

DEQ – Oregon Department of Environmental Quality

EIS – Environmental Impact Statement

ESA – Endangered Species Act

NRCS – USDA Natural Resources Conservation Service

NUID – North Unit Irrigation District

OAR – Oregon Administrative Rules

ODA – Oregon Department of Agriculture

ODF – Oregon Department of Forestry

ODFW – Oregon Department of Fish and Wildlife

OWEB – Oregon Watershed Enhancement Board

PGE – Portland General Electric

PFC – Properly Functioning Condition

PSP – Pesticide Stewardship Partnership

SWCD – Soil and Water Conservation District

TMDL – Total Maximum Daily Load

USDA – United States Department of Agriculture

USFS – U.S Forest Service

Introduction

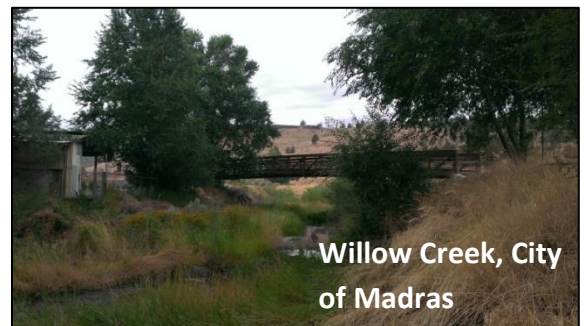
The Middle Deschutes Watershed Council is a diverse group of landowners, residents, government agencies, and organizations working together to enhance the natural resources of the Trout Creek and Willow Creek Watersheds. The Council collaborates with landowners and partner organizations to foster an understanding of watershed resources and to improve watershed health through voluntary restoration actions.

The Middle Deschutes Watershed Council service area includes Trout Creek, Willow Creek, Campbell Creek, and other contributing streams. The combined watersheds encompass over 600,000 acres and include over 1,000 miles of streams and associated riparian and upland habitats. The Trout Creek and Willow Creek Watersheds play a critical role in maintaining and restoring the Deschutes River Basin's fish and wildlife populations, water quality, and stream and upland habitats.

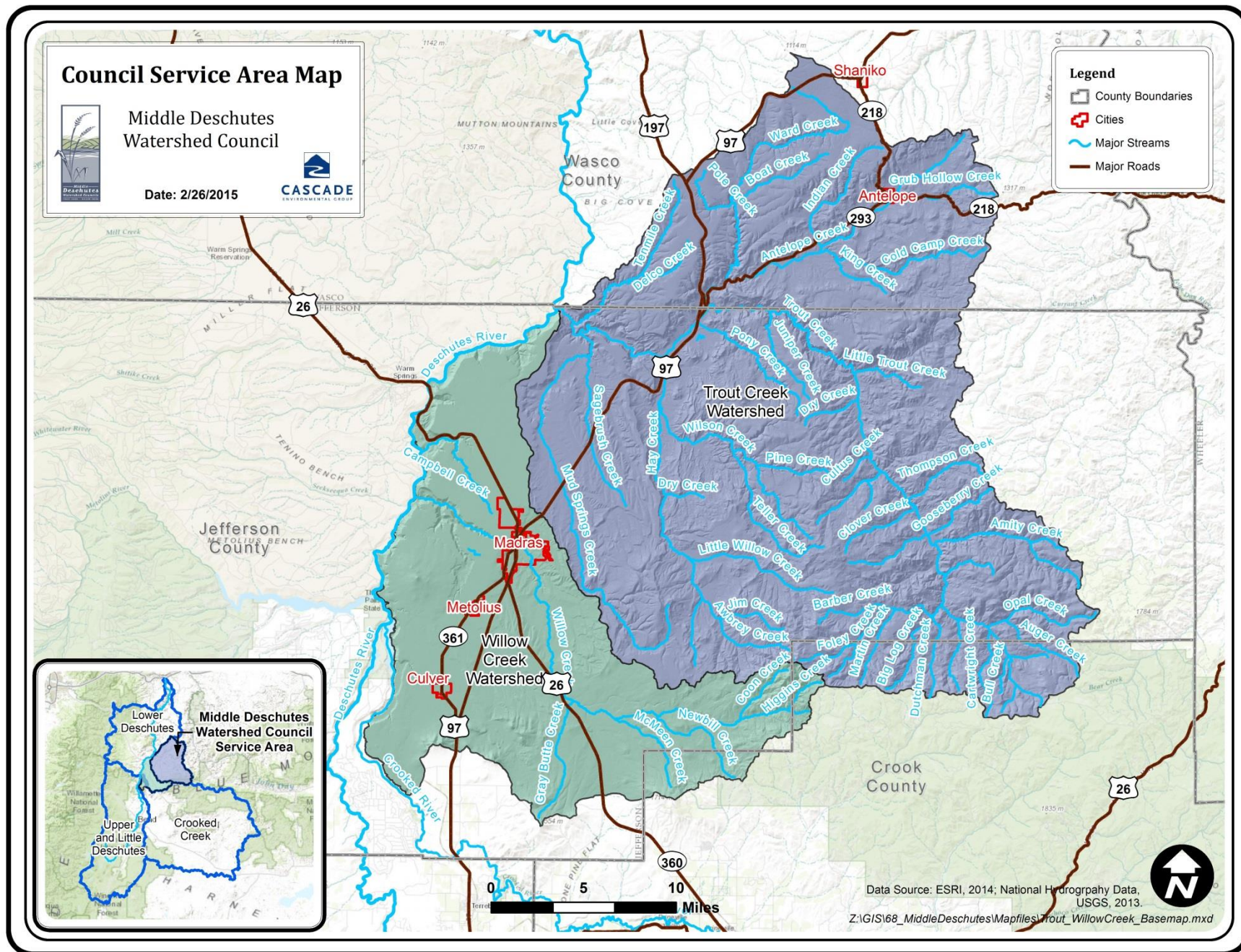
Jefferson County – home to more than 21,145 residents (2013 estimate) – covers most of the Willow Creek and Trout Creek Watersheds. Portions of Crook and Wasco Counties are also within the Council's service area. More than 80% of the area is in private ownership. The City of Madras, with 6,363 residents (2013), is the area's primary urban center. Other communities include Metolius, Culver, Gateway, Ashwood, and Antelope. The watersheds also include significant areas managed by the federal government, including the Ochoco National Forest and the Crooked River National Grassland (managed by the USDA Forest Service), and lands managed by the Bureau of Land Management (BLM).

The lands within the watersheds support agriculture, grazing, timber harvest, recreation, and other businesses that sustain the local economy. The Council service area includes the entire North Unit Irrigation District (NUID), which provides water to 58,860 acres. The NUID irrigated lands drain primarily into the Crooked River, Deschutes River, Mud Springs Creek, and Willow Creek.

The Middle Deschutes Watershed Council's Restoration Action Plan advances the Council's mission to improve the health of the Willow Creek and Trout Creek watersheds while supporting a sustainable economy. The Action Plan is the strategic framework and roadmap to guide Council activities over the next five years. These activities include voluntary restoration project planning and implementation, Council organizational development, building partnerships, community and landowner education and involvement, collecting information on watershed conditions, and evaluating the effectiveness of restoration actions.



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Middle Deschutes Watershed Council

Participating Organizations

City of Madras
Jefferson County SWCD
Wasco County SWCD
Jefferson County
North Unit Irrigation District
Confederated Tribes of the Warm Springs
Oregon Dept. of Environmental Quality
Oregon Dept. of Forestry
Oregon Dept. of Agriculture
Oregon Dept. of Fish and Wildlife
Oregon State University Extension
U.S. Forest Service
U.S. Natural Resources Conservation Service
U.S. Bureau of Land Management
Portland General Electric
Culver and Madras School Districts
Friends of Willow Creek
Oregon Watershed Enhancement Board
Bonneville Power Administration

Watershed Council History, Organization, and Partnerships

The Willow Creek and Trout Creek Watershed Councils were formed as separate watershed councils in the 1990s. Each council engaged watershed landowners, agencies, and other organizations in studies to understand the factors contributing to declining fish populations, degraded stream and upland habitats, and poor water quality. Based on the each council's watershed assessment and other information, the councils prioritized restoration projects and developed strong partnerships with landowners, agencies, and funding sources. Over time, each council has completed a large number of voluntary actions to improve the health of the Willow Creek and Trout Creek Watersheds.

Recently, the Willow Creek and the Trout Creek Watershed Councils joined to create the Middle Deschutes Watershed Council. Combining the two councils provides an efficient organizational framework and coordinated approach for supporting restoration and other activities within the broader Trout Creek and Willow Creek Watersheds. Through Oregon Watershed Enhancement Board (OWEB) grants and other funding sources, the Middle Deschutes Watershed Council facilitates collaborative watershed restoration activities by providing professional staff – the Watershed Council Coordinator – and assisting with project funding, landowner and partner organization planning, restoration project implementation, and community outreach activities. The Council meets periodically to report on activities, discuss broader issues, plan project proposals, and coordinate actions.

The Middle Deschutes Watershed Council is organized and governed by watershed landowners, residents, government agencies, and other stakeholders. The Council strives to convene a broad representation of the watershed's community and interests through its board membership and partnerships. The members of the Council's Board of Directors are elected biannually and consist of a chair and vice chair elected from within the Council. The coordinator serves as the secretary. Jefferson County Soil and Water District (SWCD) provides fiscal support for the Council's activities. Council members discuss all topics and, with a quorum present, vote by a simple majority of the members in attendance at the meetings. Differences of opinion are resolved through discussion and Council member and Board of Director retention is improved through offering members opportunities to provide feedback on each project and prioritize project areas, which helps to foster a strong vested interest and purpose within each watershed. Agency representatives provide important technical expertise, contribute to Council deliberations, and assist with project planning, funding, and implementation.

Action Plan Development

The recent joining of the Willow Creek and Trout Creek Watershed Councils into the Middle Deschutes Watershed Council created a need for a Watershed Restoration Action Plan that covered both watersheds. The Council applied for, and received, grant funding from OWEB to develop a Restoration Action Plan that would describe watershed restoration goals and strategies for the larger area, as well as actions focused on Willow Creek and Trout Creek.



Action Plan development began with hiring a contractor to facilitate the planning process and to develop the Action Plan document. The action planning process began at the July 2014 Council meeting, followed by a series of field tours and periodic Council meetings. At these meetings, participants discussed watershed issues and opportunities, partnerships, and past restoration projects and other accomplishments. The participants explored future restoration goals and priorities, described current and future partnerships to advance the Council's mission, and discussed ideas for future projects. After extensive Council discussion, organizations and individuals submitted project ideas to incorporate into the Action Plan. The participants also outlined a process for broader public and stakeholder outreach and review of the Action Plan.

Watershed Conditions

This section describes watershed conditions and fish populations, outlines the issues and factors affecting watershed health, and summarizes restoration projects and other accomplishments completed by the Council and partner organizations, including past activities completed under the past framework of the separate Willow Creek and Trout Creek Watershed Councils. Each watershed is described separately because the Willow Creek and Trout Creek Watersheds each have unique land uses, stream habitats, fish populations, and other characteristics.

Climate and Stream Flow Patterns

Willow Creek and Trout Creek begin in the Ochoco Mountains and then flow generally west to their confluence with the Deschutes River. Elevations in the Willow and Trout Creek Watersheds range from 1,280 feet where Trout Creek enters the Deschutes River to 5,940 feet in the Ochoco Mountains. The elevation at the City of Madras is 2,241 feet. Typical summers are dry and hot, with average high temperatures near 87°F during July and August. Winters are wet and cold, with minimum temperatures averaging 33°F in December through January. Average annual precipitation increases with elevation within the watershed, ranging from 9 inches near Madras, to 30 inches or more in the upper portions of the Ochoco Mountains. Almost all the precipitation falls between November and April, and in the highest elevations more than half of annual participation falls as snow.

Stream flows in Willow and Trout Creek are influenced by the area's precipitation patterns, topography, and historical and current land management actions. The watersheds' relatively low elevations results in a more limited mountain snowpack to sustain stream flows into the summer months. Changes in the watershed from past management include channelizing sections of streams and creating berms along channels which limit floodplain access during high flows. In addition, the draining of wetland areas, compaction of soils from historical grazing practices, and changes in rangeland vegetation, including a dramatic increase in juniper trees, have resulted in less water storage in upland areas. All of these conditions, combined with water withdrawal activities, have resulted in "flashy" stream flows: more rapid runoff and larger flood events during periods of precipitation and snow melt, and lower flows during the dry summer and fall months.



The North Unit Irrigation District also influences the hydrology of the Willow Creek and Trout Creek Watersheds. NUID supplies water to 92 square miles (58,860 acres) of irrigable farmland, from the mouth of Trout Creek throughout the Agency Plains, Madras, and Culver areas, to around Juniper Butte and to Trail Crossing (just northwest of Smith Rock). Water is obtained from Wickiup Reservoir south of Bend, with water pumped from the Crooked River to lower Crooked River acreage. The NUID system consists of 65 miles of main canal and 235 miles of laterals. There is no tailwater system.

Willow Creek Watershed

Overview

The Willow Creek Watershed includes Willow Creek and two other small drainage areas that extend along the eastern side of the Deschutes River and along the lower Crooked River: The Agency Plains Area, which includes Campbell Creek, and the Culver/Round Butte Area. The City of Madras and the communities of Metolius and Culver are the major population centers. The total Willow Creek watershed area encompasses 176,777 acres, of which 115,758 acres are drained by Willow Creek. From its headwaters in the forested Ochoco Mountains, Willow Creek flows 26 miles northwest, eventually entering Lake Simtustus, an impoundment on the Deschutes River. Major tributaries include Higgins, Coon, Newbill, McMeen, and Gray Butte creeks.

More than 66% of the Willow Creek Watershed area is privately owned. A significant portion of the watershed (3,933 acres) is within urban growth boundaries (UGBs), primarily in the City of Madras. The Crooked River National Grassland occupies 48,720 acres in the middle of the Willow Creek drainage. The National Grasslands cover a significant portion of the watershed (27.6%) and 6 miles of Willow Creek flow through this unique area. The Oregon Department of Fish and Wildlife (ODFW) manages the Rim Rock Springs Wildlife Management area within the National Grassland, where a small dam traps spring-fed water to create wetlands that support a thriving population of birds and other wildlife. Haystack Reservoir, east of Culver, is within the Willow Creek Watershed area. The Reservoir provides off-stream storage for the NUID system and serves as a re-regulating reservoir; it was constructed to drastically reduce seasonal canal transmissions and spill losses. The reservoir is within the National Grassland and is a popular location for camping, boating, and other recreation.

Willow Creek Watershed			
Land Ownership	Area (acres)	Area (sq. mi.)	Percent of Total
BLM	4,545	7.10	2.6 %
Cities (UGB)	3,933	6.15	2.2%
Tribal	214	0.33	0.1%
Private ownership	117,518	183.62	66.5%
State of Oregon	1,215	1.90	0.7%
USFS	273	0.43	0.2%
USFS: Grasslands	48,720	76.13	27.6%
Water	358	0.56	0.2%
Total	176,777	276.21	100%
Notes: UGB = Urban Growth Boundary; State = primarily ODFW managed Rim Rock Springs Wildlife Management Area; water = Haystack Reservoir			

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Trout Creek Watershed Overview

Trout Creek extends 51 miles from its headwaters in the Ochoco Mountains to its confluence at river mile (RM) 87 of the lower Deschutes River. The drainage includes approximately 115 miles of perennial streams and 41.2 miles of intermittent streams. Significant tributaries to Trout Creek include Opal, Foley, Amity, Clover, Antelope, Ward, Hay, Mud Springs, and Tenmile creeks. Antelope and Ashwood are the main population centers.

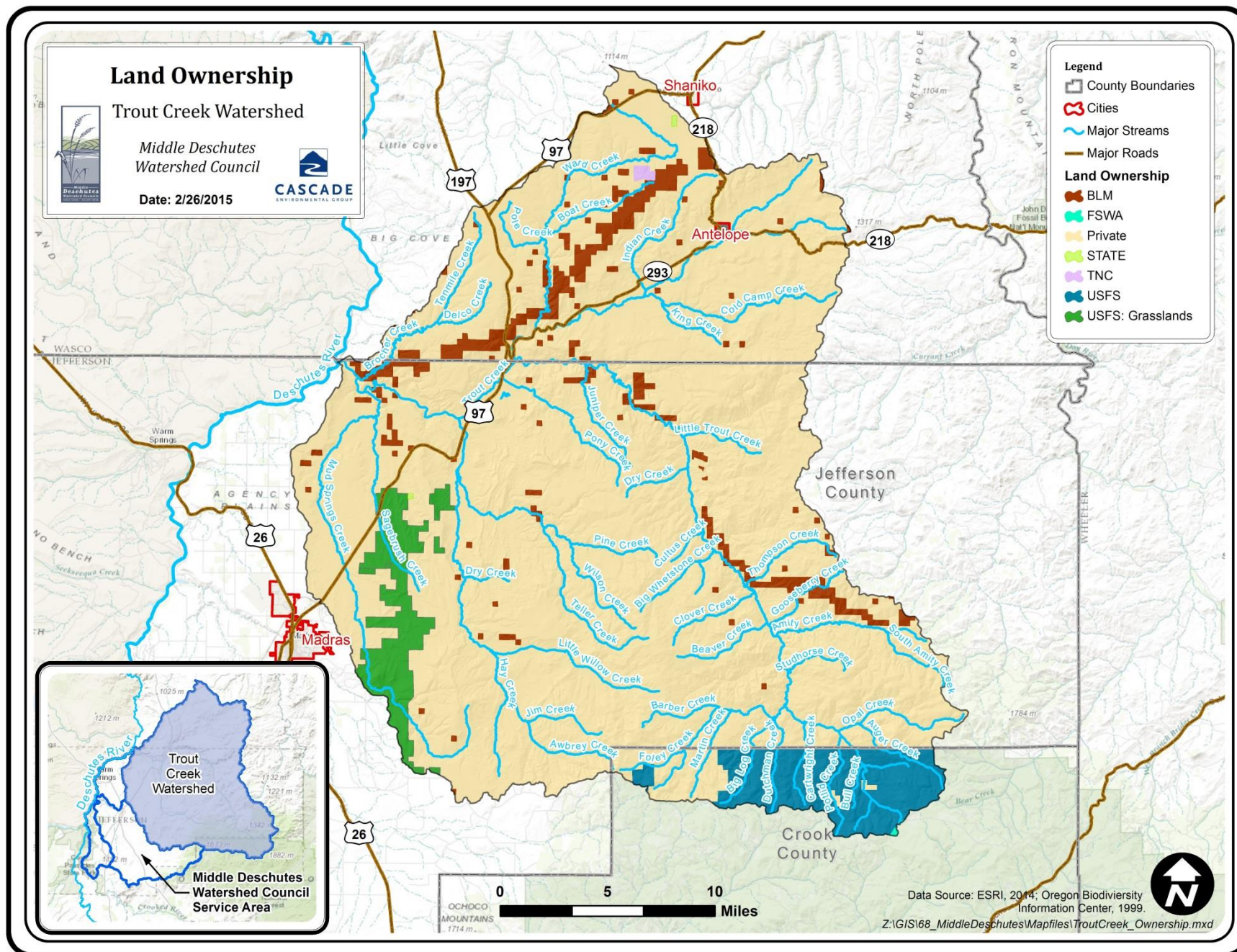


The total Trout Creek Watershed area encompasses 442,696 acres. Nearly 88% of the watershed is in private ownership. A significant portion of the watershed (12%) is owned by the federal government: 18,127 acres (4.1%), consisting of scattered parcels, is managed by the BLM; 21,091 acres (4.8%) is managed by the USFS, primarily within the headwaters of Trout Creek; and 13,429 acres (3.0%) are within the Crooked River National Grassland in the Mud Springs and Sagebrush Creek tributary drainages.

Trout Creek Ranch, a large landholding in lower Trout Creek, is owned by Portland General Electric (PGE) and the Confederated Tribes of the Warm Springs Reservation of Oregon [the Confederated Tribes (Tribes) consists of the Wasco, Warm Springs, and Paiute tribes]. Pelton Round Butte dam on the Deschutes River is the only hydroelectric project in the U.S. jointly owned by Native American tribes and a utility. Currently, PGE owns two-thirds of the project and the Tribes own one-third. The Federal Energy Regulatory Commission (FERC) issued a new 50-year project license to PGE and the Tribes on June 21, 2005. The new project license agreement specifies mitigation and watershed restoration activities to mitigate for the project's impacts on fish and wildlife populations. As part of the restoration effort, Trout Creek Ranch was purchased by PGE in 1999 through the River Conservancy and is now jointly owned with the Tribes. The Ranch encompasses 3,000 acres of stream, riparian, and upland habitats. In addition to steelhead and redband trout

Trout Creek Watershed			
Land Ownership	Area (acres)	Area (sq. mi.)	Percent of Total
BLM	18,127	28.32	4.1%
Cities (UGB)	303	0.47	0.1%
Private ownership	389,258	608.22	87.9%
State	113	0.18	0.0%
TNC	374	0.59	0.1%
USFS	21,091	32.96	4.8%
USFS: Grasslands	13,429	20.98	3.0%
Total	442,696	691.71	100%
Notes: TNC = The Nature Conservancy			

habitat, the ranch also supports mule deer, elk, birds of prey such as golden eagles, and upland bird species.



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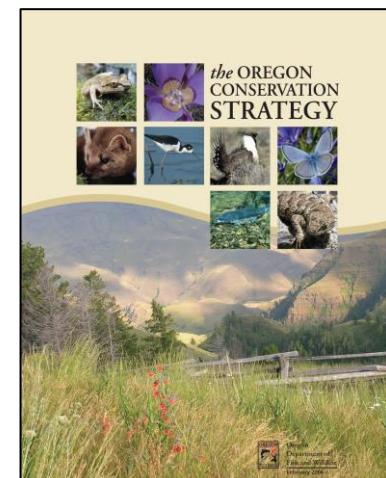
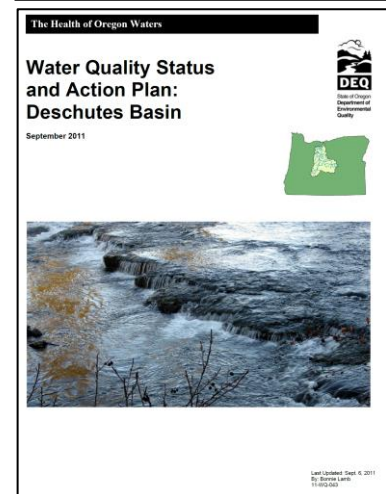
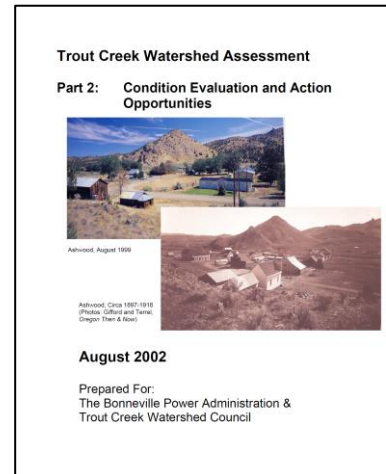
Watershed Inventory: Studies and Plans

Studies and plans relevant to Willow Creek and Trout Creek were reviewed with the purpose of:

- Summarizing historical and current stream, riparian, and upland habitat conditions;
- Assessing fish population and water quality status and trends;
- Identifying the factors contributing to declines in fish populations, water quality, and watershed health; and
- Outlining recommended strategies for improving stream and riparian habitat conditions and watershed health.

The document review is summarized in the table below. The review included documents, such as watershed assessments, that focus specifically on Willow or Trout Creek Watershed; Deschutes River basin plans and studies that include local watershed conditions; and plans and studies that outline regional and local fish and wildlife habitat conservation priorities and recommendations, such as the Middle Columbia Steelhead Endangered Species Act (ESA) Recovery Plan.

The document summaries and recommendations provide an understanding of the factors that are affecting watershed health in the Willow Creek and Trout Creek Watersheds. This information, when combined with the Middle Deschutes Watershed Council's past accomplishments and partnerships, are the foundation for the Action Plan's goals, strategies, and actions.



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Watershed Inventory: Studies and Plans

Source	Summary	Key Findings and Recommendations
ODFW: Crooked River Basin Plan (1996)	ODFW’s assessment of stream habitat, fish populations, and recommended actions for the Crooked River Basin, including Willow Creek. Willow Creek supports redband trout where there is year round flow, instream cover, cobble and boulder substrate, spawning gravel, and good streamside vegetation. Key habitat components have been severely reduced or modified by water and land management practices, particularly in all reaches except the lower 5 miles where the creek flows through a canyon. The redband trout population is significantly reduced in abundance compared to historical levels.	<p>Key findings:</p> <p>Redband trout are isolated and fragmented into 3 separate populations within sections of Willow Creek:</p> <p>Lower: 4.5 miles in the lower canyon (healthiest redband trout population and other native fish species including largescale and bridgelip sucker, chiselmouth, northern squawfish, and longnose dace</p> <p>Middle: 8 miles through the National Grasslands (which also includes a very abundant bridgelip sucker population)</p> <p>Upper: 4 miles below Higgins Creek, and 1 mile of Higgins Creek</p> <ul style="list-style-type: none">Streamflow in the upper section was moderate in the forested reaches ranging from 0.5 to 3 cfs, until it reached irrigated farm lands, where flow became intermittent to nonexistentIn the middle section, streamflow was also intermittent to nonexistent, with the exception of the Crooked River National Grasslands, where flows ranged from 0.5 to 3 cfsStreamflow below the Grasslands once again became intermittent to nonexistent on irrigated agricultural lands Streamflow was most consistent in the canyon below Madras downstream to Lake SimtustusForty-eight springs were observed in the lower section, contributing to stream flow <p>Recommended Actions:</p> <ul style="list-style-type: none">Monitor population trends of redband trout in selected index reaches of Willow Creek and tributariesVerify and document distribution, abundance, and upper limits of redband trout in Willow Creek and tributariesWork with USFS, BLM, watershed council, Jefferson County SWCD, and private landowners in the development of a redband trout recovery plan for the Willow CreekPrioritize future work on limiting factors such as instream habitat, harvest, migration barriers, and interactions with introduced species
Willow Creek Watershed Analysis (2000)	The watershed analysis was produced in cooperation with Jefferson County SWCD, Willow Creek Watershed Council, and the NRCS. The watershed analysis described stream flows, fish habitat and populations, upland habitat conditions, and other factors affecting the health of the Willow Creek watershed.	<p>Key Findings:</p> <ul style="list-style-type: none">Willow Creek was relocated through the city of Madras during the early settlement in 1900 – 1925.The channelized reaches of Willow Creek are not connected to the natural floodplain and severely degraded.During flooding events this channelized system has caused substantial damage city infrastructure, fish habitat, and riparian vegetation
Trout Creek Watershed Assessment / Condition Evaluation and Action Opportunities (2002)	The Watershed Assessment (Part 1) and Condition Evaluation and Action Opportunities (Part 2) were completed for the Trout Creek Watershed Council with funding from the BPA. The Trout Creek Watershed contains important fish habitats and populations of steelhead trout, especially in the upper watershed, and along key reaches of Trout Creek, Ward Creek, and other tributaries. While the watershed retains some high quality fish habitat, particularly within the National Forest Lands, historical and current management impacts have adversely altered watershed processes and habitats. There are a number of opportunities and funding sources for voluntary actions to improve watershed conditions and fish populations.	<p>Key Findings:</p> <ul style="list-style-type: none">Flood control berms along Trout Creek and channelization of other streams have affected areas that once had very productive fish habitat by widening stream channel (or causing down cutting), reducing habitat complexity, limiting riparian vegetation, and constraining interaction with the floodplainThese changes in channel characteristics can result in reduced summertime flows, increased water temperatures, less water storage in the floodplain substrate, and less productive fish habitatFish passage barriers affect the quality of and quantity of fish habitat, including permanent installations such as road and railroad crossings, or temporary barriers through water withdrawal management activities (such as pushup dams) or extreme low flow conditions that isolate stream habitatsThe road network, especially the gravel roads, can generate and deliver excess sedimentto the streamsBy the early 1900s, most of the Trout Creek watershed had been intensively grazed by sheep and cattle; these historical grazing management actions have reduced the quantity and quality of range and riparian vegetationThese historical conditions, combined with current factors such as reduced summertime stream flows, “flashy peak flows”, and areas where riparian vegetation are not properly managed, have reduced the quality and quantity of fish habitat in the Trout Creek Watershed <p>Recommended Actions:</p> <ul style="list-style-type: none">Remove berms and restore channel form and riparian areasRestore stream flows during the summer in the Trout CreekAddress high water temperatures through flow restoration, channel restoration, and riparian planting / managementMaintain riparian enclosures and plant riparian areas with native speciesAddress / monitor road-related sediment delivery to stream channelsIncrease upland water capture and retention

Source	Summary	Key Findings and Recommendations
Nitrate Concentrations in Willow Creek and the Agency Plains Aquifer (2003)	During the 1990s, sampling at the mouth of Willow Creek indicated elevated levels of nitrate relative to other bodies of water in the surrounding area. Because Willow Creek is warmer than Lake Simtustus into which it flows, the water remained in the upper portions of the lake and sustained high levels of algae growth, and exceeded state standards for chlorophyll a and pH. This study examined the potential sources of nitrate in lower Willow Creek.	<ul style="list-style-type: none">• Address key fish passage barriers <p>Key Findings:</p> <ul style="list-style-type: none">• The many springs within lower Willow Creek Canyon appear to be the source of the nitrate in Willow Creek.• The nitrate concentrations in Willow Creek are ten times greater than nearby waterbodies• Sampling also indicated that Campbell and Mud Springs creeks had elevated nitrate levels• Willow, Campbell, and Mud Springs creeks all drain a lava-capped region known as Agency Plains• Anecdotal information indicated that flow from the springs, which deliver warm water, began to increase during the 1950s• These springs appear to be originating the Pelton Basalt that underlies Agency Plains• The increase in water appears to be related to irrigation in the area that began in the 1940s• Sediment runoff into streams can carry nitrate that is in the soils• There is some evidence from a study in the 1930s, that the soils in the Agency Plains area have naturally high nitrate concentrations <p>Recommended Actions:</p> <ul style="list-style-type: none">• Continue to study the source of elevated nitrate concentrations• Limit sediment delivery to streams from agricultural and other activities
Deschutes Subbasin Plan (2004)	An assessment of fish and wildlife populations and habitat status throughout the Deschutes River Basin, including Willow and Trout Creeks. The plan includes recommended restoration, assessment, and monitoring actions.	<p>Key Findings:</p> <ul style="list-style-type: none">• Trout Creek is listed as a Deschutes River Basin priority area for restoration <p>Findings for Willow and Trout Creek:</p> <ul style="list-style-type: none">• Watershed and stream corridor degradation has resulted in low or intermittent flow and higher peak flows in most small miscellaneous streams.• Channel alterations, flood scouring and loss of riparian vegetation have contributed to the general lack of instream habitat complexity and pool habitat• Sediment from uplands, including cropland, rangeland and road system run-off, degrades stream substrate• Headwater stream channel scouring has reduced natural water storage and valley water tables, exacerbating low summer stream flows and water temperature extremes• Low summer stream flow and high water temperature limit redband trout and summer steelhead distribution and production Agricultural irrigation return flows entering the Deschutes River and tributaries may pose water quality concerns <p>Recommended Actions:</p> <ul style="list-style-type: none">• Restore riparian ecosystem habitat complexity and species diversity by improving the extent and composition of riparian areas• Provide an adequate and sustainable supply of standing and downed dead wood in streamside environments• Connect favorable habitats by providing passage past artificial barriers, increasing low season flows, reducing stream temperatures• Reduce extreme streamflow fluctuations caused by artificial water withdrawals, storage and releases• Increase the interaction of rivers and floodplains• Restore stream channel complexity• Reduce extreme streamflow fluctuations caused by artificial water withdrawals, storage and releases.• Control invading or noxious exotic vegetation
Proper Functioning Assessment (PFC) Report, Willow Creek Watershed (2005)	An interdisciplinary team conducted Proper Functioning Condition (PFC) assessments of 17.7 miles within upper Willow Creek Watershed during July 5-8, 2005.	<p>Key Findings:</p> <ul style="list-style-type: none">• Upper watershed tributaries including Higgins Creek, Coon Creek and Newbill Creek are mostly unaltered stream systems• Upper Willow Creek has been severely degraded in some reaches by elimination of willows 50-60 years ago• There is stream channel downcutting of 20 feet or more in places• Other alterations have occurred, including straightening out sections of stream channel, relocating channels, and installation of a variety of log, rock and other structures, and construction of ponds and reservoirs• Continuing headcuts pose major threats to the future of a number of reaches in the headwater areas• Many of the headcuts are draining, or soon will drain, extensive areas of highly productive wet meadows <p>Recommended Actions:</p> <p>The highest priority for restoration is to repair and stabilize the headcuts, and to provide management on the adjacent lands that will restore riparian vegetation</p>

Source	Summary	Key Findings and Recommendations
Oregon Conservation Strategy (2006)	The document describes important aquatic, wetland, riparian and upland habitats to focus conservation actions on and limiting factors that should be addressed through restoration or other actions. Willow and Trout Creek watersheds are part of the Strategy’s Blue Mountains Ecoregion.	<p>Key Findings:</p> <p>Strategy Habitats: ponderosa pine woodlands, aspen woodlands, grasslands, sagebrush steppe and shrublands, wetlands, riparian, and aquatic habitats</p> <p>Ecoregion-level limiting factors include:</p> <ul style="list-style-type: none">• Altered fire regimes• Low elevation sites are vulnerable to habitat impacts• Development and increased growth (central Oregon is growing fast)• Recreational vehicle use is increasing• Water distribution in arid areas and wildlife entrapment in water developments• Invasive species <p>Recommended Actions:</p> <ul style="list-style-type: none">• Restore and protect habitats with a focus on Strategy Habitats• Pursue restoration of habitats and other actions with an emphasis on addressing limiting factors
NMFS and ODFW: Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment (NMFS 2009; ODFW 2010)	The plan describes steelhead trout population status, limiting factors and recommended strategies and actions for recovery of the population. Steelhead Trout were historically present in both Trout Creek and Willow Creek. Historically, large numbers of wild summer steelhead trout entered Trout Creek for spawning. The plan concludes that Willow Creek population is now extinct. The Trout Creek steelhead population is managed as part of the Deschutes River Eastside greater steelhead population. The Trout Creek Population is the uppermost extent for summer steelhead as part of the Deschutes River Eastside management complex, and contributes significantly to the recovery of the complex’s population. The Deschutes River Eastside summer steelhead population is currently considered viable with a low extinction risk, but in need of recovery actions, including habitat restoration.	<p>Key Findings:</p> <p>Trout Creek system is characterized as ‘upper’ and ‘lower’ Trout Creek in which the majority of high quality fish habitat lies in the upper drainage</p> <p>Key limiting factors that should be addressed through restoration actions include:</p> <ul style="list-style-type: none">• Loss of instream habitat complexity• Loss of riparian vegetation and floodplain function• Reduced pool habitat for rearing• Reduced spawning habitat• High water temperatures• Decreased channel stability• Increased peak flows• Decreased low flows• Fish passage barriers <p>Recommended Actions for Trout Creek and its tributaries:</p> <ul style="list-style-type: none">• Remove or replace barriers blocking fish passage• Reconnect floodplains to channels• Restore natural channel form and complexity, including berm and levee removal and adding large wood• Restore riparian and floodplain vegetation• Implement agricultural water conservation measures
Water Quality Status and Action Plan: Deschutes Basin (2011)	The Department of Environmental Quality (DEQ) is undertaking a watershed approach to assist in managing water quality throughout Oregon. The new approach is intended to provide greater opportunities for stakeholder involvement and interagency cooperation, and also address some of the regulatory limitations of the Total Maximum Daily Load (TMDL) process. The Deschutes Basin report, which includes Trout and Willow Creeks, provides a broad assessment of the status of surface and ground water quality and other environmental indicators within the watersheds.	<p>Key Findings:</p> <p>Water quality findings were classified based on a qualitative rating:</p> <p>Generally poor condition – substantial concern for water quality</p> <p>Deteriorating condition – moderate concern for water quality</p> <p>Generally good condition – not an urgent concern for water quality</p> <p>Unknown condition or lack of data</p> <p>Surface water:</p> <ul style="list-style-type: none">• Bacteria: Deteriorating condition in Trout and Willow Creek Watersheds• Harmful algae blooms: Deteriorating condition in Willow Creek Watersheds• Temperature: Generally poor condition in Willow and Trout Creek Watersheds• Total dissolved gas: Unknown condition• Nutrients, Dissolved oxygen, pH, chlorophyll a: Deteriorating condition in Trout and Willow Creek Watersheds• Altered hydrology (stream flows): Generally poor condition in Willow and Trout Creek Watersheds• Habitat modification (stream / riparian: Generally poor condition in Willow and Trout Creek Watersheds• Sediment and turbidity: Generally poor condition in Willow and Trout Creek Watersheds• Toxics and pesticides: Unknown condition <p>Groundwater:</p> <ul style="list-style-type: none">• General groundwater quality: Unknown condition in Willow and Trout Creek Watersheds• Groundwater quantity: Deteriorating condition in Trout and Willow Creek Watersheds

Source	Summary	Key Findings and Recommendations
		<ul style="list-style-type: none">Nitrate: Deteriorating condition in Trout and Willow Creek Watersheds, but additional study is need to identify sourcesBacteria: Deteriorating condition in Trout and Willow Creek Watersheds
Middle Deschutes Agricultural Water Quality Management Area Plan (2014)	The Plan provides guidance for addressing agricultural water quality issues in the Middle Deschutes Agricultural Water Quality Management Area (Management Area). The purpose of the Plan is to identify strategies to reduce water pollution from agricultural lands through a combination of educational programs, suggested land treatments, management activities, and monitoring. ODA exercises its enforcement authority for the prevention and control of water pollution from agricultural activities under Oregon Administrative Rules. The Plan addresses the following water quality concerns through better agricultural land and crop management and conservation: sediment, nutrient, bacteria, toxics, temperature, dissolved oxygen, habitat, and flow.	<p>Key Findings:</p> <p>Land conditions associated with the following agricultural activities were identified as potential contributors to water quality concerns through their effects on streambank stability, soil erosion, vegetation on uplands and along streams, and the amount and content of runoff to ground or surface water:</p> <ul style="list-style-type: none">Use of streambanks and uplandsLivestock grazing and areas of concentrated livestockIrrigation water use and drainageApplication and storage of crop nutrients and farm chemicals <p>Recommended Surface Water Actions:</p> <ul style="list-style-type: none">Increase native streamside vegetationImprove water conservationIncrease instream flowsRestore stream channelsReduce JunipersCombat invasive weedsReduce erosion and nutrient pesticide inputs <p>Recommended Groundwater Actions:</p> <ul style="list-style-type: none">Minimize nitrate contamination from agriculture.Assess effects of groundwater pumping and irrigation efficiency projects on stream flowsAssess cause, extent and magnitude of risks associated with bacteria in groundwater
Pesticide Stewardship Partnership (PSP)	The Council is involved in the Pesticide Steward Partnership (PSPs). DEQ coordinates the sampling, conducts the sample analysis, and reports the results. Through the water quality monitoring, the PSP identifies potential concerns and improves water quality affected by pesticide use. This partnership combines local expertise and water quality sampling results to encourage voluntary changes in pesticide use and management practices. Samples were collected in the following locations: Campbell Creek at the mouth; Mud Springs Creek at the mouth; Trout Creek upstream from Mud Springs Creek; and lower Willow Creek. Samples were collected at 6 different dates in 2014.	<p>Key Findings:</p> <ul style="list-style-type: none">Pesticides were generally detected at very low concentrations or not detectedCampbell Creek had the most detections of pesticides followed by Mud Springs CreekThere was only one detection in Willow Creek (Linuron) but at very low concentrationsThere were no detections in Trout Creek upstream of Mud Springs CreekWith the exception of Linuron in Campbell Creek, none of the detections were over benchmark concentrations <p>Recommended Actions:</p> <ul style="list-style-type: none">Work with DEQ to interpret the findings and to determine if additional sampling is necessary
ODFW Fish Passage Barriers and Water Diversion Screen Assessment	ODFW maintains a database of barriers (culverts and other structures) that may limit fish passage. The database includes barriers that have been assessed and a rating (passable, partially passible) and barriers that have not been assessed (unknown fish passage status). ODFW also maintains a database of water diversion screens with an evaluation of whether they meet standards for preventing fish mortality.	<p>Key Findings:</p> <p>Fish Passage:</p> <ul style="list-style-type: none">There are a number of fish passage barriers in Willow and Trout Creek WatershedsMost of the barriers in the Trout Creek Watershed have been assessed for fish passage status, and many of these have been addressed through past actionsThere are many unknown fish passage barriers in Willow Creek Watershed <p>Diversion Screens:</p> <ul style="list-style-type: none">All diversion screens in Trout Creek meet ODFW standardsThere a many diversions in Willow Creek that have not been assessed <p>Recommended Actions:</p> <ul style="list-style-type: none">Continue to address fish passage barriers in Trout CreekAssess fish passage barrier status in Willow Creek Watershed and address issues where identifiedAssess fish screens on diversions in Willow Creek Watershed and address issues where identified

Source	Summary	Key Findings and Recommendations
Crooked River National Grassland Vegetation Management / Grazing Final Environmental Impact Statement (2004)	<p>The Environmental Impact Statement (EIS) describes the evaluation of alternatives and the final recommended approach for how the USFS is to manage a variety of resources within the Crooked River National Grasslands. The EIS was created out of the need to evaluate the environmental impacts of the following actions:</p> <ul style="list-style-type: none">• Reducing the density and distribution of western juniper to a more ecologically balanced mix, and to maintain existing sagebrush shrublands and grasslands.• Restoring buchgrasses and accelerating the recovery of previously farmed and heavily disturbed sites.• Meeting the social/economic need to continue grazing on the National Grasslands.• Managing grazing to leave a diversity of grass stubble heights at the end of the grazing season to address for ground nesting birds and to assist with accumulating organic matter, particularly for the historically farmed sites.• Closing livestock grazing on certain allotments due to poor ecological conditions, vacant allotments, and to address riparian and aquatic habitat needs.	<p>After evaluating the impacts and reviewing the alternatives, the Ochoco Forest Supervisor selected a modified Alternative C as the preferred alternative that best met the identified needs. Key actions to be undertaken over the next 10 years under the preferred alternative include:</p> <ul style="list-style-type: none">• Implementing 49,000 acres of western Juniper density management actions using chainsaw cutting, prescribed fire, mechanical methods, and a combination of all three. Old growth junipers will be retained and no treatments will occur in any of the Forest Plan-designated old growth juniper areas• Implementing vegetation rehabilitation, including tilling, drilling, and seeding, and/or fertilizing, on 8,344 acres of previously farmed and disturbed sites. Only half of the sites will be treated (effective footprint of treatment would equal 4,200 acres). The half of each treatment unit will be left untreated to preserve existing remnant sagebrush stands, create of mosaic of habitats, and provide on-site native seed sources• Authorizing livestock grazing on 82,923 acres within 20 allotments. The upper limit for authorized livestock stocking will be 20,621 animal unit months. Ten allotments will be managed under a rest rotation grazing system. Areas that are reseeded will be rested (not grazed) for a minimum of two growing seasons. Resumption of grazing in areas that have been burned will be approved in coordination with the relevant resource specialists. The length of the rest periods will depend on pre-fire ecological condition; post-prescribed burn condition and burn results; size of the prescribed burn in relation to the entire pasture size; and vegetation response to the prescribed fire• Implementing action to protect ESA-listed species consistent with the project design criteria for livestock grazing described in the Joint Aquatic and Terrestrial Programmatic Biological Assessment for Lands with the Deschutes and Ochoco National Forests, 2003 - 2006

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Fish Populations

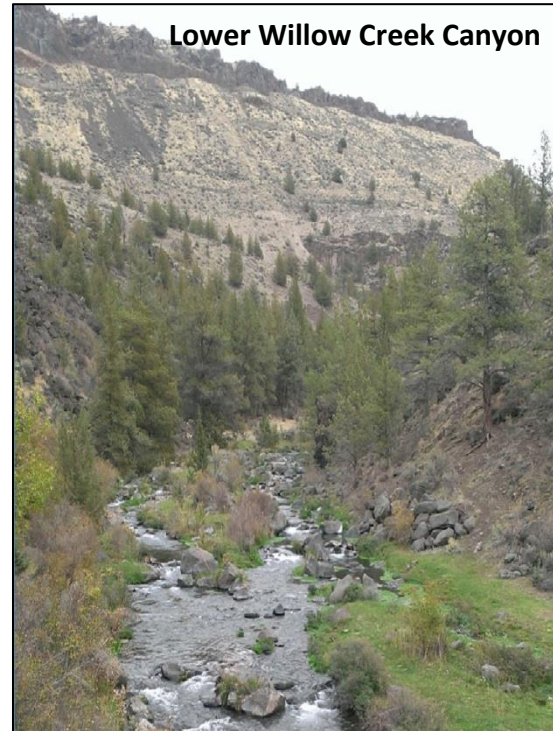
The Willow Creek and Trout Creek Watersheds are home to native redband trout, anadromous summer steelhead, and other native fish species. Steelhead were historically present in both Trout Creek and Willow Creek. The lower portions of Willow Creek support redband trout and have sufficient flows and habitat to support steelhead. The Willow Creek steelhead population is now extinct due to the dam system on the Deschutes River. Anadromous Pacific lamprey also once spawned in both watersheds but are no longer present. Pacific lamprey populations, like steelhead and salmon, have experienced precipitous declines, particularly in the upper Columbia Basin above Bonneville Dam. The Confederated Tribes of the Warm Springs are assessing Deschutes Basin Pacific lamprey populations and are working to restore the population throughout the basin.

Steelhead are listed as threatened under the U.S. Endangered Species Act (ESA). A recovery plan has been developed for the Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment. Historically, large numbers of wild summer steelhead trout entered Trout Creek for spawning. The Trout Creek steelhead population is managed as part of the Deschutes River Eastside greater steelhead population. The Trout Creek Population is the uppermost extent for summer steelhead as part of the Deschutes River Eastside management complex, and contributes significantly to the recovery of the complex's population. The Deschutes River Eastside summer steelhead population is currently considered viable with a low extinction risk, but in need of recovery actions, including habitat restoration.

Native Fish Found in Willow and Trout Creek Watersheds

Watershed	Steelhead	Redband Trout	Bridgelip Sucker	Largescale Sucker	Longnose Dace	Northern Pikeminnow	Chiselmouth
Trout Creek	X	X	X	X	X	X	X
Willow Creek	Extirpated	X	X	X	X	X	X

Redband trout are listed as both federal and Oregon State sensitive species. Redband trout populations are declining for many of the same reasons that steelhead populations are threatened: fish passage barriers, increased water temperatures, reduced stream and riparian habitat and complexity, changes in stream flow patterns, and other factors. Steelhead and redband trout distributions have been reduced in both Trout Creek and Willow Creek, with the most severe reductions in Willow Creek. Limited flow during the summer and early fall, habitat reductions, and fish passage barriers have fragmented the Willow Creek redband trout population into three isolated populations:



Lower: 4.5 miles in the lower canyon. The healthiest population of redband trout and other native fish species including largescale and bridgelip sucker, chiselmouth, northern squawfish, and longnose dace.

Middle: 8 miles through the National Grasslands (which also includes a very abundant bridgelip sucker population).

Upper: 4 miles below Higgins Creek, and 1 mile of Higgins Creek. This section contains the poorest habitat of the areas that still support redband trout.

Redband and Steelhead Trout Distribution



Willow Creek Watershed

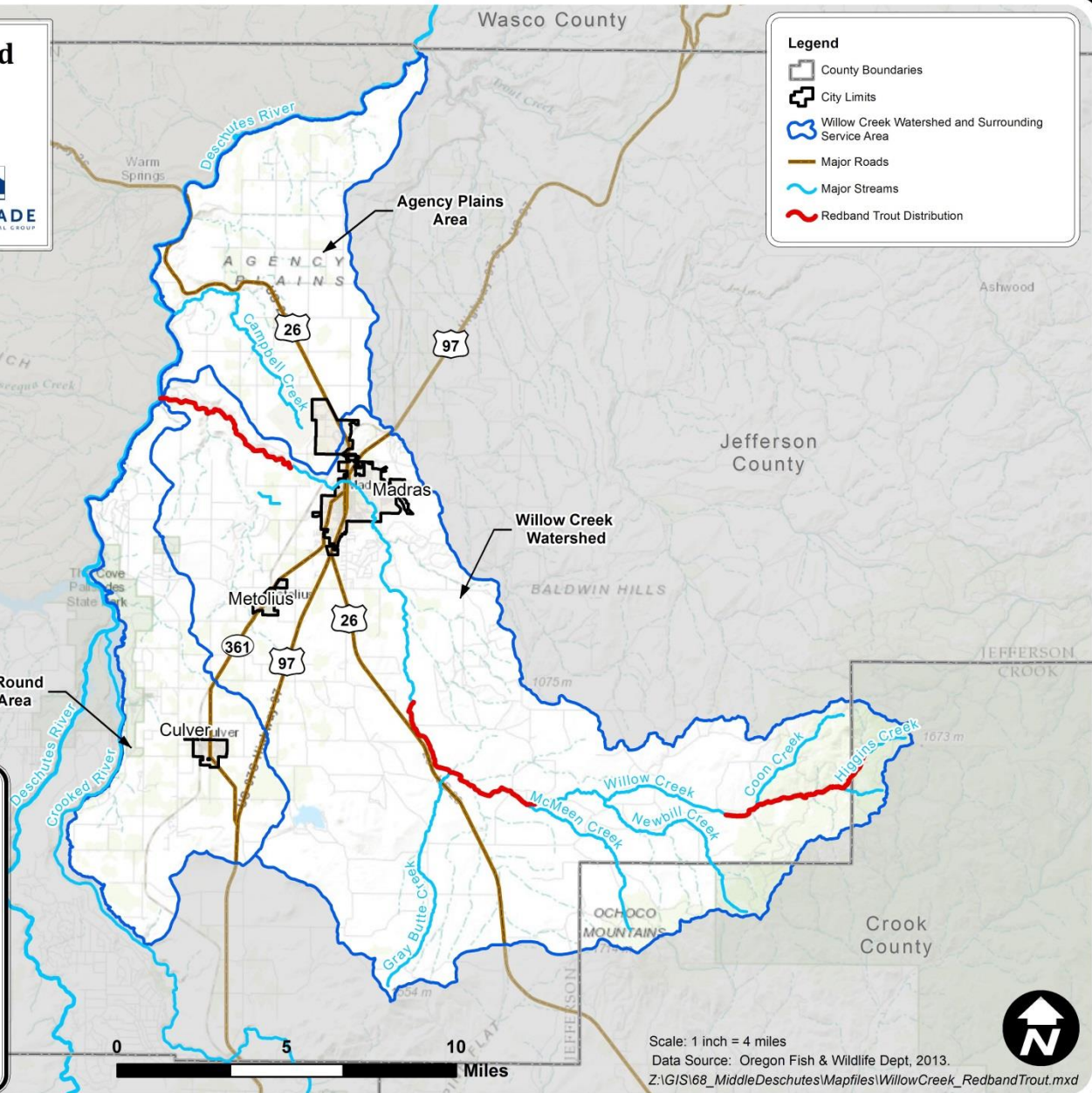
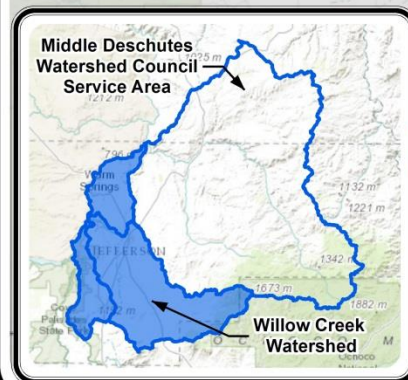
Middle Deschutes
Watershed Council

Date: 2/26/2015

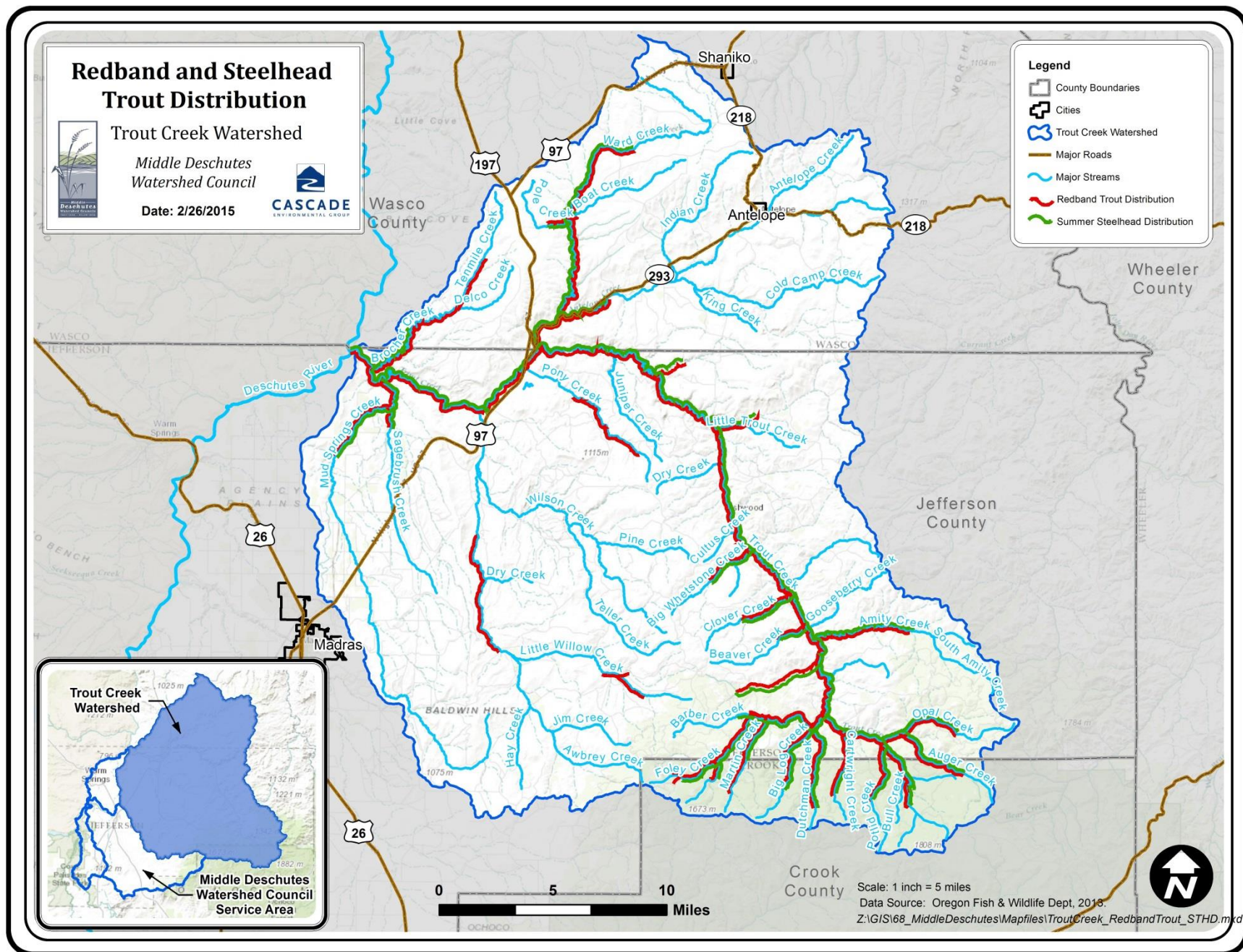


Legend

- County Boundaries
- City Limits
- Willow Creek Watershed and Surrounding Service Area
- Major Roads
- Major Streams
- Redband Trout Distribution



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Watershed Council Restoration Accomplishments

The separate Willow Creek and Trout Creek Watershed Councils implemented a number of restoration projects as individual Councils and through partnership organizations. These activities have continued since the formation of the Middle Deschutes Watershed Council. Much of the work has been accomplished through the Council's partnership organizations, including ODFW, Jefferson County SWCD, the USFS, the NUID, and the City of Madras. The Council provides a forum for prioritizing and coordinating activities among the partner organizations and assists with securing grants and other funding.

The Middle Deschutes Watershed Council has completed a number of outreach activities in the Willow Creek watershed, including giving presentations and placing articles in the local media.

The Council has also worked with ODA, DEQ, and Jefferson County SWCD on collecting and analyzing water samples in a number of tributary streams in both the Willow Creek and Trout Creek Watersheds. Water quality monitoring has also involved participating in DEQ's Pesticide Stewardship Partnership, which focused on collecting samples from Willow, Campbell, Trout, and Mud Springs creeks and analyzing them for pesticides.

Other work has been completed by the Council's partner organizations in the Willow Creek Watershed. The SWCD has completed enrolling a landowner in the Conservation Reserve Enhancement Program (CREP) in the upper watershed. This covers a 19.9-acre riparian buffer, noxious weed treatments on 15.5 acres, riparian fencing over 4,800 feet, and planting of more than 3,000 riparian shrubs and cuttings. The Forest Service has completed a number of projects along Willow Creek in the Crooked River National Grassland. These activities have focused on several juniper cutting and broadcast burning projects; treatment of spotted knapweed, medusahead, and other weeds over hundreds of acres; and installation of fencing along Willow Creek that is maintained yearly to exclude cattle from the riparian area.

Much of the work in the Trout Creek Watershed has been achieved through the joint efforts of ODFW and Jefferson County SWCD. A number of conservation, restoration, and irrigation

efficiency projects were completed in the 1990s and early 2000s, and the pace of activities increased after the 2002 Trout Creek Watershed Assessment. Actions completed before 2002 include agreements for Conservation Reserve Enhancement Program (CREP) buffers, spring developments, construction of several floodplain infiltration galleries, irrigation efficiency projects, and juniper control.

Actions completed since 2002 in the Trout Creek Watershed include removing floodplain berms, re-meandering channels, planting and fencing riparian areas, addressing fish passage barriers, controlling noxious weeds, improving irrigation efficiency, and implementing other actions that address low flows and high water temperatures. Appendix A provides a detailed listing of the joint ODFW-SWCD restoration accomplishments in the Trout Creek Watershed since 2002.

In addition to the cooperative ODFW-SWCD restoration actions, the NUID and the Forest Service have completed other work in the Trout Creek Watershed since 2002. The NUID has, among other actions, installed 3.5 miles of underground pipe in the Mud Springs Creek drainage, conserving 0.8 cfs per day. The Forest Service has completed a number of actions on National Forest lands in the upper watershed, including addressing fish passage barriers on Trout Creek and its tributaries; floodplain berm removal and reconnection on Trout Creek; meadow system restoration on Dick Creek, including reconnecting the channel with the floodplain; a number of large wood placements in Trout Creek and its tributary streams; riparian vegetation restoration; treatment of spotted knapweed, medusahead, and other weeds over hundreds of acres; and road decommissioning.

Trout Creek Project Example

Trout Creek: 1.82 miles of stream/riparian/wetland restoration – Removed flood control berms to reconnect floodplain; re-meandered the channel; created off-channel wetlands; and installed riparian planting and fencing



Nye Lower Phase 1 May 2004



Nov 2004



June 2014

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Trout Creek Project Example

Trout Creek: 0.49 miles of stream/riparian/wetland restoration – Removed flood control berms to reconnect floodplain; re-meandered the channel; created off-channel wetlands; and installed riparian planting and fencing



Priday Phase
2 March 2003



May 2006

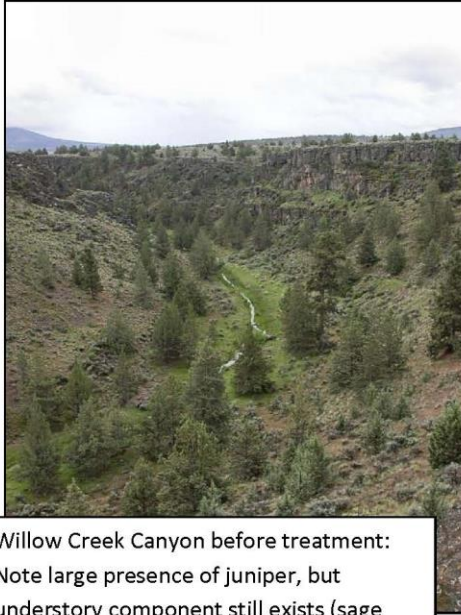


June 2014

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Willow Creek Project Example

USFS, National Grassland, 2008: Juniper cutting and stream habitat restoration in Willow Creek



Willow Creek Canyon before treatment: Note large presence of juniper, but understory component still exists (sage brush, grasses, and forbs).



Example Junipers were felled into Willow Creek to provide complexity for native redband trout.



Example of upland juniper treatment site: Note sagebrush that is beginning to die and there is an understory component of native bunchgrasses and forbs.



Note dogwood and other native shrubs are beginning to recolonize the riparian area after treatment.

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Key Factors and Threats Limiting Watershed Health

Problems that currently affect the health of both watersheds include habitat connectivity, modified disturbance regimes, altered upland and stream processes, and altered habitats. There are also emerging threats that, if not addressed, will impact the watersheds in the future. These emerging threats include a growing population and a limited understanding of watershed issues by local residents.

Key factors and threats that are limiting watershed health include:

- Impaired stream and riparian habitat connectivity from fish passage barriers and other factors;
- Altered stream and upland hydrology that affect low and high stream flows;
- Modified stream habitat;
- Impaired riparian and floodplain habitats and processes;
- Degraded water quality;
- Impaired upland habitats and processes; and
- A growing population and limited understanding of watershed issues and restoration opportunities by watershed residents

Significant progress has been made in restoring the health of streams, riparian areas, and uplands, particularly in the Trout Creek Watershed. Issues that need to be addressed in the Trout Creek Watershed include the remaining floodplain berms; lack of in-channel complexity; need for riparian restoration; invasive weed removal; upland actions, including Juniper removal; and other actions. Aging culverts should be addressed in the future, including replacing them with bridges where appropriate.

The key issue affecting the Willow Creek Watershed is stream connectivity. Changes in stream habitat, flows, and the presence of fish passage barriers have all contributed to isolating segments of stream and fragmenting redband trout populations into three disconnected habitats. There are also significant opportunities for public outreach and education because the area's largest population center, the City of Madras, is also located in the Willow Creek Watershed.

The tables on the next pages describe the key factors and threats that are affecting the health of the Willow Creek and Trout Creek Watersheds, the current status, and recommended actions.

Limiting Factor or Threat	Description
Impaired stream and riparian habitat connectivity	Stream habitat connectivity is modified by culverts, irrigation diversion dams, and other structures that limit or block passage by juvenile or adult fish. Stream connectivity can also be impaired by water quality and quantity factors that limit fish movement. Examples include high water temperatures and de-watered stream segments. In addition, improperly screened water diversion structures can lead to fish mortality. Riparian connectivity is modified by actions that reduce the extent and width of riparian vegetation, which impacts stream shade and inputs of large wood into channels.
Altered hydrology	Changes in low and high stream flow patterns have modified aquatic habitats and limited fish populations. Changes in flow regimes are exacerbated by channel straightening, berms, and loss of floodplain wetlands. Examples include flashy flood flows that create incised channels and low stream flows that limit fish habitat and increase water temperatures.
Modified stream habitat	Stream channel habitats have been modified through removal of large wood from channels, limited inputs of wood and shade from impaired riparian areas, channel straightening, increased sediment loads, and other actions. All of these factors contribute to reduced pools, less complex habitats, and changes in channel substrate, which limits fish spawning and rearing habitat.
Impaired riparian areas and floodplains	Connectivity between riparian areas and floodplains has been reduced by channel incision and channel berms. Riparian functions and habitats have been impaired through native vegetation removal and infestations of weeds. All of these factors have reduced stream shading and limited inputs of large wood that contribute to stream habitat complexity.
Degraded water quality	Surface and ground water quality have been impaired through a number of factors, including water withdrawal and inputs of sediments and increased thermal loading from reduced riparian shade. Key water quality concerns include high water temperatures, sediment, modified flows, groundwater levels and groundwater nitrate concentrations.
Impaired upland habitats	Upland habitat and functions have been impaired through historical grazing patterns, shifting fire regimes and vegetation patterns, juniper encroachment, and invasive weeds. These factors have reduced habitat quality and reduced upland water absorption and erosion, which contributes to flashy flows and stream sedimentation.

<p>Growing population and limited understanding of watershed issues and restoration opportunities by watershed residents</p>	<p>The combined population of Deschutes and Jefferson Counties increased to 186,739 residents in 2013, from 39,538 residents in 1970. Recreational activities have also increased as a result of local and regional population growth and demand. At the same time, fewer people, particularly the young, are not pursuing hunting and fishing, which has dramatically reduced license fees, in turn reducing ODFW's budget for fish and wildlife programs. Much of central Oregon's population growth has been driven by individuals moving from urban centers into the area. In addition, most of the job growth in central Oregon has been in the urban centers, and not in agricultural, ranching, and natural resource management sectors. These social/economic trends are leading to a population that has very little understanding of natural resource issues, and the balance between natural resource management and conservation.</p>
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Limiting Factor or Threat	Willow Creek Watershed		Trout Creek Watershed	
	Status	Recommended Priority Actions	Status	Recommended Actions
Impaired stream and riparian habitat connectivity	Willow Creek's redband trout population is fragmented into 3 isolated stream segments. The lower canyon area contains the highest quality habitat and flows, followed by the segment in the National Grassland. The upper stream segment, while still supporting a population of redband trout, is largely degraded. There appears to be insufficient water flows and degraded stream / riparian habitats between the isolated segments. There are also a number of fish passage barriers and unscreened diversions. Habitat, water temperature, fish passage barriers, and unscreened diversions have not been comprehensively inventoried and evaluated.	Evaluate passage barriers, low flows, water temperatures, and habitat modifications that are limiting Willow Creek's connectivity for redband trout and other aquatic organisms. Implement an inventory and evaluate the factors contributing to poor habitat quality, including inventorying water diversions, passage barriers, and stream/riparian habitat conditions. Continue to improve habitats where there is existing redband trout to secure the population from threats. The restoration priority should be on the segment within the National Grassland followed by the segment in the upper watershed. Based on an inventory and evaluation of problems, address flow, passage barriers, and stream/riparian habitat issues in the areas between the 3 redband trout populations to provide connectivity.	ODFW/Jefferson County SWCD has made significant progress addressing stream and riparian habitat connectivity throughout the Trout Creek Watershed. Numerous fish passage and stream connectivity restoration projects completed since 2003. Appropriate fish screens on water diversion structures have been addressed throughout Trout Creek Watershed. Most key fish passage barriers, including more than 7 push-up dams other diversion structures have been addressed. Aging culverts should be addressed in the future, including replacing them with bridges where appropriate.	ODFW/Jefferson County SWCD: Opal Creek – Replace culverts with bridges. Realign creek from bridge to confluence with Trout Creek. Trout Creek below Ashwood – Remove a stream crossing with a bridge. Little Trout Creek – Replace crossing with bridge. Foley Creek – Replace culverts with bridges
Altered hydrology	Low flows in Willow Creek limit aquatic habitat and fish distribution, and increase water temperatures. Willow Creek does not flow throughout the year in Madras and other stream segments, limiting fish populations and habitat connectivity. High flows and channel and floodplain modifications in Madras increase flooding issues.	Evaluate flows throughout the system and prioritize projects based on the findings. Target Juniper control and other projects in the upper watershed to improve upland conditions and stream flows during low flow periods. Improve water retention in the upper portions of Willow Creek by improving wetland and upland water storage and release. Work with the City of Madras to improve floodplain habitat and vegetation.	ODFW/Jefferson County SWCD has made significant progress addressing altered stream and watershed hydrology throughout the Trout Creek Watershed. Numerous stream flow restoration projects completed since 2003. Off-channel wetlands created; numerous infiltration galleries installed to replace push-up dams; more than 8 miles of flood control berms have been removed, reconnecting the stream to the floodplain; numerous off channel alcoves and a side channel constructed; several sites with floodplain shaping and log structures for bank protection. Numerous irrigation efficiency projects, including replacement of irrigation ditches with closed mainlines. NUID: Installed 3.5 miles of underground pipe in Mud Springs Creek drainage conserving 0.8 cfs per day.	ODFW/Jefferson County SWCD: Antelope Creek – Realign and reconnect floodplain on 3 miles of stream below Indian Creek. Trout Creek – Continue to improve stream reaches/ riparian areas affected by floodplain berms. Foley Creek – Work with private landowner on Foley Creek to evaluate a restoration plan that includes the use of artificial beaver dams.

Modified stream habitat	The 2005 PFC inventory found that there is extensive stream channel downcutting of 20 feet or more in sections of upper Willow Creek. Other alterations have occurred, including straightening out sections of stream channel, relocating channels, and installation of a variety of log, rock and other structures, and construction of ponds and reservoirs.	Evaluate stream habitat throughout the Willow Creek system. As part of a comprehensive inventory of stream conditions, include a follow up on photo point and areas where PFC was completed in 2005 for sections of stream/riparian areas in upper Willow Creek above the National Grassland. Engage landowners in restoring channels and riparian areas where there is head cutting or other problems.	ODFW/Jefferson County SWCD has completed numerous stream habitat restoration projects completed since 2003. Channel re-meandering resulted in adding more than a mile of total stream length; constructed nearly a hundred pool/riffle complexes; numerous large wood and rootwad structures installed to improve complexity and stabilize banks.	ODFW/Jefferson County SWCD: Trout Creek below Ashwood – Implement 1.25 miles of channel realignment and floodplain shaping with large wood structures. Little Trout Creek – Implement 3.5 miles of large wood habitat structures and bank/floodplain shaping. Foley Creek – Realign creek and existing road to increase floodplain connectivity.
Impaired riparian areas and floodplains	The 2005 PFC inventory found that some sections of upper Willow Creek have been severely degraded by elimination of willows 50-60 years ago. Extensive headcuts are draining, or soon will drain, extensive areas of highly productive wet meadows. There have been a very limited number of riparian restoration projects in the watershed. In 2011, Jefferson County SWCD enrolled a landowner in CREP. The project enrolled 19.9 acres in riparian buffer, and included planting 1,400 riparian shrubs, noxious weed treatment over 15.5 acres, 4,800 feet of riparian fencing for livestock exclusion, range planting by seeding native grasses over 15.5 acres.	Evaluate riparian and floodplain habitat throughout the Willow Creek system Upper Willow Creek. Follow up on photo point and areas where PFC was completed in 2005. Engage landowners in restoring riparian areas.	ODFW/Jefferson County SWCD has completed numerous riparian restoration and weed control projects since 2003. Native grass seeding on more than 160 acres of riparian area; native trees and shrubs planted on more than 250 acres; several off-channel watering facilities installed; numerous other riparian planting and seeding sites. Throughout Trout Creek Watershed: 120 miles of riparian fencing installed. Trout Creek Noxious Weed Program: treated more than 160 acres in riparian areas.	ODFW/Jefferson County SWCD: Trout Creek below Ashwood – Implement 1.25 miles of channel realignment and floodplain shaping and native grass/forb/tree/shrub plantings. Enroll area into CREP. Little Trout Creek – Implement 3.5 miles of large wood habitat structures and bank/floodplain shaping native grass/forb/tree/shrub plantings. Enroll area into CREP. Trout Creek – Continue to improve stream reaches / riparian areas affected by floodplain berms. Little Trout Creek – Implement 3.5 miles of large wood habitat structures and bank/floodplain shaping.
Degraded water quality	Water temperature and flow are the key water quality issues in Willow Creek. The elevated nitrate concentration from groundwater that flows in to the springs in lower Willow Creek is also a concern. Sediment from land use activities in the Agency Plains area can carry nitrates into the soil.	Continue to study the source of elevated nitrate concentrations. Implement actions and Best Management Practices (BMPs) that limit sediment delivery to streams from agricultural and other activities. Assess water temperatures in Willow Creek and implement riparian and other restoration actions to address elevated temperatures.	ODFW/Jefferson County SWCD has completed a large number of riparian restoration and flow restoration projects have improved stream temperatures. NUID: Installed 3.5 miles of underground pipe and surge pond in Mud Springs Creek drainage, reducing irrigation carry water that was eroding soils and delivering sediment, nutrients, and E. coli into Trout Creek.	ODFW/Jefferson County SWCD: Mud Springs Creek – Continue to Address high sedimentation levels during irrigation season.

Impaired upland habitats	Junipers and noxious weeds are impairing upland habitats and watershed processes, including stream flows. Invasive weed control has been focused on Trout Creek Watershed. Jefferson County SWCD: Secured OWEB funding to treat and remove 85 acres of juniper in upper Willow Creek and Coon Creek. The USFS has implemented Juniper control in areas along Willow Creek in the National Grassland.	USFS: Juniper reduction along 5 miles of Willow Creek (1850 acres) where the creek enters the National Grassland. Prioritize noxious weed control throughout the watershed.	ODFW/Jefferson County SWCD: Numerous upland habitat and weed control projects completed since 2003. Numerous junipers removed throughout Trout Creek Watershed. Trout Creek Noxious Weed Program: treated more than 1200 acres.	Continue Trout Creek Noxious Weed Program. Upper Trout Creek Juniper Eradication Project: Work with the Jefferson SWCD Trout Creek Project Manager on ways to improve upland condition by removing Juniper and controlling annual grasses and noxious weeds.
A growing population and limited understanding of watershed issues and restoration opportunities by watershed residents	The Council has actively engaged Trout Creek Watershed landowners in Council leadership, outreach, and participation in restoration actions. The Watershed Council Coordinator has given numerous presentations and provided information on watershed health issues to a range of audiences in the area. There is a need to reach out to residents in Madras and other community centers, and engage students in watershed education and restoration activities.	Implement a Community Watershed Outreach Program: Provide education and outreach on the salmonid life cycle and habitat needs, water quality status, and other factors that impact watershed health. Implement. Develop Watershed Education Program for Central Oregon: engage local students with stewardship projects and participating in a regional watershed summit where they present their projects to other local students. USFS: Develop a Youth Watershed Council/ Restoration Team at Culver High School. Engage students in the field with stream restoration activities from initial project planning, implementation, and post-project effectiveness monitoring.	The Council has actively engaged Trout Creek Watershed landowners in Council leadership, outreach, and participation in restoration actions.	Trout Creek (PGE) Ranch / Redband Ranch – The Middle Deschutes Outdoor School: Through collaborative partnerships develop and implement a local two-day, one-night Outdoor School, targeting 5th and 6th graders.

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**Middle Deschutes Watershed
Council**

Action Plan Structure

Purpose → Goals → Strategies → Actions

Purpose: Broad and visionary. The reason for the Action Plan and coordinated actions

Goals: Specific outcomes that will define success

Strategies: Overall approach used to achieve the goals in alignment with the purpose

Watershed Restoration Action Plan Purpose, Goals, Strategies, and Actions

The Middle Deschutes Watershed Council's Restoration Action Plan is a guide for the Council's activities and coordinated actions with landowners, watershed residents, and partner organizations. The Action Plan is organized around a framework that describes the overarching purpose of the plan, goals that define success, and the strategies and actions designed to achieve the goals.

Action Plan Purpose

Working in partnership with other organizations, individuals, and landowners, the Middle Deschutes Watershed Council's Restoration Action Plan will advance the Council's mission to improve the health of the Willow Creek and Trout Creek Watersheds and supporting a sustainable economy.

Goal 1: Maintain high quality aquatic and floodplain habitats and their productive capacity to support healthy fish and wildlife populations, enhance watershed health, sustain agricultural production and the local economy, and foster thriving communities

Strategy 1-A: Protect and conserve natural aquatic and floodplain ecological processes and habitats

Goal 2: Improve aquatic/riparian habitats, hydrologic processes, and stream connectivity to support healthy fish and wildlife populations, enhance watershed health, sustain agricultural production and the local economy, and foster thriving communities

Strategy 2-A: Restore fish passage and connectivity to habitats blocked or impaired by artificial barriers and maintain passage and connectivity

Strategy 2-B: Restore floodplain connectivity and function

Strategy 2-C: Restore and enhance channel structure and complexity

Strategy 2-D: Restore riparian and wetland habitats

Strategy 2-E: Restore stream flow, groundwater levels, and water quality to provide sustainable water sources

Strategy 2-F: Improve and maintain water quality

Goal 3: Protect, conserve, and restore groundwater function and levels to support healthy fish and wildlife populations, enhance watershed health, sustain agricultural production and the local economy, and foster thriving communities

Strategy 3-A: Study groundwater- and surface-water Interaction

Strategy 3-B: Identify actions to address stabilizing aquifers

Goal 4: Maintain high quality upland habitats and their productive capacity to support healthy fish and wildlife populations, enhance watershed health, sustain agricultural production and the local economy, and foster thriving communities

Strategy 4-A: Protect and conserve natural upland ecological processes and habitats

Goal 5: Improve upland ecosystem and hydrologic processes to support healthy fish and wildlife populations, enhance watershed health, sustain agricultural production and the local economy, and foster thriving communities

Strategy 5-A: Restore upland ecological processes and habitats

Strategy 5-B: Restore degraded areas and maintain upland processes to maximize soil productivity and minimize unnatural rates of erosion and runoff

Goal 6: Work collaboratively with organizations and residents on watershed restoration, research, education and outreach, and monitoring to promote understanding of watershed conditions, foster support for the Council's activities, and assure active and growing participation in actions to support healthy fish and wildlife populations, enhance watershed health, sustain agricultural production and the local economy, and foster thriving communities

Strategy 6-A: Recruit landowners for demonstration projects

Strategy 6-B: Provide landowners with information on Best Management Practices and watershed health issues

Strategy 6-C: Provide educational materials, workshops, and other forms of outreach and collaboration with landowners and organizations

Goal 7: Organize the Watershed Council and the Board of Directors to support full implementation of the Action Plan, increase organizational capacity, and improve and expand partnerships to support healthy fish and wildlife populations, enhance watershed health, sustain agricultural production and the local economy, and foster thriving communities

Strategy 7-A: Improve the Council's and Board's capacity to implement the Action Plan

Strategy 7-B: Improve the Council's capacity to implement the Action Plan through partnerships and collaboration

Goal 8: Track and examine watershed conditions, assess restoration opportunities, and evaluate restoration outcomes through monitoring and assessment to determine if activities are achieving the goal of supporting healthy fish and wildlife populations, enhancing watershed health, sustaining agricultural production and the local economy, and fostering thriving communities

Strategy 8-A: Assess, track, and report on watershed conditions, including surface and groundwater water quality and quantity, fish populations, stream habitat, and riparian vegetation over time

Strategy 8-B: Evaluate restoration projects and programs

Strategy 8-C: Report on watershed monitoring results and restoration activities

Action Plan Implementation

Action Plan Review and Project Phasing

The Restoration Action Plan is intended to guide the Middle Deschutes Watershed Council over a five year period. The Action Plan's goals, strategies and actions provide a framework for comprehensive watershed restoration and evaluating Council activities over time. The Action Plan is adaptive, and will be modified as new projects are identified, new partnerships are formed, and funding opportunities arise. The Action Plan will be reviewed annually by the Council and Board of Directors in collaboration with landowners and partner organizations. This review will prioritize actions and produce an annual work plan that will outline Action Plan implementation over the next year. The work plan will include actions described in the Action Plan and any new project or activities identified since the creation of the Action Plan.

Restoration Priorities

Properly functioning watersheds are characterized by connected stream systems and healthy processes that link upland areas, riparian habitats, and stream channels. Watershed processes create, maintain, and enhance upland and aquatic habitat, shape stream channels, and help define the factors that limit steelhead, redband trout, and other aquatic organisms. Upland and stream linkages include surface and groundwater conveyance and sediment movement and delivery to channels. Riparian and floodplain vegetation is connected to stream channels through multiple processes and functions, including shading the water's surface, delivering wood to channels that create cover and complex habitats, and providing organic matter that supports aquatic insects and other parts of the food web. In addition, upland and riparian habitats have been impaired as a result of altered disturbance regimes, such as modified fire return intervals, noxious weeds replacing native vegetation, and historical land use practices, including unsustainable grazing practices.

Priorities for watershed restoration actions should focus first on improving habitat connectivity and watershed processes that support and sustain healthy habitats and fish and wildlife populations over the long-term. Restoring habitats through structural fixes, such as the placement of large wood in stream channels, should be considered as a short-term measure that is taken in combination with actions that are focused on restoring watershed connectivity and processes that create and sustain habitats over the long term¹.

¹ Roni, P, and T. Beechie (eds). 2012. Stream and Watershed Restoration: A Guide to Restoring Riverine Processes and Habitats. Wiley-Blackwell, 319 p.

Prioritizing restoration actions should take into account five important questions:

- **Is the action restoring stream or riparian connectivity?** An example is addressing fish passage barriers.
- **Is the action improving watershed processes or disturbance regimes?** For example, increasing low stream flows, improving the ability of uplands to store and slowly release water, reducing sediment delivery to stream channels, and improving large wood delivery or shade.
- **Is the action addressing a problem that will rapidly degrade habitat and expand in scope if not addressed?** An example is taking an action that quickly eliminates the first infestation of an aggressive noxious weed that, if not addressed, would spread quickly and be very difficult and expensive to control.
- **Is the action addressing a key habitat type or other factor that is limiting ESA-listed or sensitive fish or wildlife populations or water quality limited streams?** An example is improving stream habitat complexity through the placement of wood to address a factor that is limiting ESA-listed Middle Columbia steelhead or addressing an Oregon Conservation Strategy priority upland habitat, such as oak woodlands.
- **Is the action based on good information and data?** For example, is a proposed riparian or channel restoration project based on a stream reach assessment or other inventories that evaluate and identify key issues affecting fish populations and outline prioritized restoration approaches to address the identified issues.

Finally, a framework to help prioritize restoration actions takes into account three important components:

- The response time of the system to the action;
- The probability and variability of success; and
- The longevity of the restoration action.

For example, watershed restoration actions that address stream connectivity and flow have a high probability of success, low variability among projects, and relatively quick response time should be implemented before other techniques. The table below lists a range of strategies that could be implemented and their ranking according to this prioritization scheme. Removing fish passage barriers, for example, has a high probability of success and a fast response because fish and other aquatic organisms can quickly recolonize the habitat. While it is important to be

opportunistic with actions (for example, when there is funding and willing landowners), this framework provides guidance for planning future projects.

Restoration Strategy	Probability of Success	Response Time	Longevity
Increasing in-stream flows (by purchase or lease of water rights with willing landowners)	High	Fast	Long term (must be maintained)
Removing fish passage barriers	High	Fast	Long term
Removing berms / adding channel sinuosity	Medium	Medium	Long-term
Riparian fencing	Medium	Medium	Long-term (must be maintained)
Controlling sediment sources (e.g., road closure)	High	Medium	Long Term
Addressing flashy runoff by increasing upland storage capacity / floodplain connectivity	High	Medium	Long term
In-stream habitat structures	Medium	Fast	Variable

Restoration Focus Areas and Actions

The table on the following pages describes the Restoration Action Plan goals, strategies, and actions. The table includes general actions, such as applying Best Management Practices (BMPs) to maintain water quality. The table also lists a range of appropriate restoration actions – for example, replacing barriers blocking passage— that can be applied if opportunities arise. There are also actions focused on improving the Council’s organizational structure, capacity, partnerships, and landowner and public outreach. Finally, the table includes specific projects for the Willow Creek and Trout Creek watersheds that have been proposed by the Council or partners. The proposed restoration projects and other activities include location, activities, and phasing.

Goals	Strategies	Action Descriptions	Middle Deschutes Watershed Council Focus Areas	Willow Creek Watershed Action Areas and Actions	Trout Creek Watershed Action Areas and Actions
Goal 1: Maintain high quality aquatic and floodplain habitats and their productive capacity to support healthy fish and wildlife populations, enhance watershed health, create a sustainable economy and agricultural production, and foster thriving communities	Strategy 1-A: Protect and conserve natural aquatic and floodplain ecological processes and habitats that support the viability of fish and wildlife populations, agriculture, and communities	1-A-1. Protect the highest quality aquatic and riparian habitats, particularly rare and unique functioning habitats, through acquisition, easements, or other conservation measures	Focus Area: Willow Creek and Trout Creek Watersheds		
		1-A-2. Consistently apply Best Management Practices to protect and conserve aquatic and riparian ecological processes	Focus Area: Willow Creek and Trout Creek watersheds		
Goal 2: Improve aquatic/riparian habitats, hydrologic processes, and stream connectivity to support healthy fish and wildlife populations, enhance watershed health, create a sustainable economy and agricultural production, and foster thriving communities	Strategy 2-A: Restore fish passage and connectivity to habitats blocked or impaired by artificial barriers and maintain passage and connectivity	2-A-1. Provide screening at 100% of irrigation diversions that meet ODFW criteria	Focus Area: Willow Creek (Trout Creek completed)		
		2-A-2. Replace barriers blocking passage including dams, road culverts, and irrigation structures	Focus Area: Willow Creek and Trout Creek Watersheds		Action: Trout Creek and Opal Creek – Replace culverts with bridges. Realign Opal Creek from bridge to confluence with Trout Creek. Add large wood structures for habitat complexity. Phasing: 2015 (Also Fulfills Action: 2-C-1) Action: Throughout Trout Creek Watershed – Address stream crossings and potential passage issues, including aging culverts. Phasing: 2018 +

Goals	Strategies	Action Descriptions	Middle Deschutes Watershed Council Focus Areas	Willow Creek Watershed Action Areas and Actions	Trout Creek Watershed Action Areas and Actions
	Strategy 2-B: Maintain and restore floodplain connectivity and function	2-B-1. Reconnect floodplains to channels, including reconnecting side channels and off-channel habitats, to stream channels	Focus Area: Willow Creek and Trout Creek Watersheds		Action: Antelope Creek – Realign and reconnect floodplain on 3 miles of stream below Indian Creek. Phasing: 2018 + Action: Trout Creek – Continue to improve stream reaches / riparian areas affected by floodplain berms. Phasing: 2018 + (Also Fulfills Action 2-D-2)
	Strategy 2-C: Restore and enhance channel structure and complexity	2-C-1. Restore natural channel form and complexity, including increasing the role and abundance of large wood in streams	Focus Area: Willow Creek and Trout Creek Watersheds	Focus Area: Upper Willow Creek Action: Follow up on photo point and areas where PFC was completed in 2005 for sections of stream/riparian areas in upper Willow Creek above the National Grasslands. Engage landowners in restoring channels where there is head cutting or other problems.	Action: Trout Creek below Ashwood – Implement 1.25 miles of channel realignment and floodplain shaping with large wood structures and native grass/forb/tree/shrub plantings. Remove a stream crossing with a bridge. Enroll area into CREP. Phasing: 2015-2017 (Also Fulfills Actions 2-A-2, 2-B-1, 2-C-3, 2-D-2) Action: Little Trout Creek – Implement 3.5 miles of large wood habitat structures and bank/floodplain shaping native grass/forb/tree/shrub plantings. Replace crossing with bridge. Enroll area into CREP Phasing: 2015-2017 (Also Fulfills Actions 2-A-2, 2-B-1, 2-C-3, 2-D-2) Action: Foley Creek – Realign creek and existing road to increase floodplain connectivity and replace culverts with bridges Phasing: 2017-2019 (Also Fulfills Actions 2-A-2, 2-B-1)

Goals	Strategies	Action Descriptions	Middle Deschutes Watershed Council Focus Areas	Willow Creek Watershed Action Areas and Actions	Trout Creek Watershed Action Areas and Actions
	Strategy 2-D: Restore riparian and wetland habitats	2-C-2. Increase instream habitat through manual placement of structures	Focus Area: Willow Creek and Trout Creek Watersheds		Action: Foley Creek – Work with private landowner on Foley Creek which drains into Trout Creek to evaluate a restoration plan that includes the use of artificial beaver dams. (Also Fulfills Action 2-C-1)
		2-D-1. Install off-stream livestock watering	Focus Area: Willow Creek and Trout Creek Watersheds		
		2-D-2. Restore natural riparian vegetative communities including vegetative planting and eradicating invasive plant species	Focus Area: Willow Creek and Trout Creek Watersheds	Focus Area: Upper Willow Creek Action: Follow up on photo point and areas where PFC was completed in 2005 for sections of stream/riparian areas in upper Willow Creek above the National Grasslands. Engage landowners in riparian restoration in degraded areas.	
		2-D-3. Develop grazing strategies that promote riparian recovery	Focus Area: Willow Creek and Trout Creek Watersheds		
		2-D-4. Install/maintain fencing to exclude livestock from riparian areas	Focus Area: Willow Creek and Trout Creek Watersheds		
		2-D-5. Prevent invasion of feral pigs into new areas	Focus Area: Willow Creek and Trout Creek Watersheds		
	Strategy 2-E: Restore stream flow, groundwater levels, and water quality to provide sustainable water sources	2-E-1. Implement agricultural water conservation measures, including Improving irrigation conveyance and efficiency in order to improve stream flows	Focus Area: Willow Creek and Trout Creek Watersheds		

Goals	Strategies	Action Descriptions	Middle Deschutes Watershed Council Focus Areas	Willow Creek Watershed Action Areas and Actions	Trout Creek Watershed Action Areas and Actions
		2-E-2. Lease or purchase water rights and convert to instream	Focus Area: Willow Creek Watershed		
		2-E-3. Implement urban water conservation measures	Focus Area: Willow Creek Watershed		
	Strategy 2-F: Improve and maintain water quality	2-F-1. Implement riparian restoration and stream flow improvement strategies to improve water temperatures	Focus Area: Willow Creek and Trout Creek Watersheds		
		2-F-2. Minimize factors that lead to sediment delivery to streams	Focus Area: Willow Creek and Trout Creek Watersheds		Action: Mud Springs Creek – Address high sedimentation levels during irrigation season Phasing: 2018+
		2-F-3. Reduce chemical pollution inputs	Focus Area: Willow Creek and Trout Creek Watersheds		
		2-F-4. Implement Agricultural Water Quality Management Program	Focus Area: Willow Creek and Trout Creek Watersheds		
		2-F-5. Manage flows, including irrigation return flows, to reduce extreme stream temperatures	Focus Area: Willow Creek and Trout Creek Watersheds		
Goal 3: Protect and restore groundwater function and levels to support healthy fish and wildlife populations, enhance watershed health, sustain agricultural	Strategy 3-A: Study groundwater- and surface-water Interaction	3-A-1. Identify and quantify impacts on groundwater quality and quantity, and ground and surface water interactions from agriculture and other human activities	Focus Area: Agency Plains		

Goals	Strategies	Action Descriptions	Middle Deschutes Watershed Council Focus Areas	Willow Creek Watershed Action Areas and Actions	Trout Creek Watershed Action Areas and Actions
production and the local economy, and foster thriving communities	Strategy 3-B: Identify actions to address stabilizing aquifers	3-A-2. If groundwater quality and quantity impacts are documented, implement actions to address the issue	Focus Area: Agency Plains		
Goal 4: Maintain high quality upland habitats and their productive capacity to support healthy fish and wildlife populations, enhance watershed health, create a sustainable economy and agricultural production, and foster thriving communities	Strategy 4-A: Protect and conserve natural upland ecological processes and habitats	4-A-1. Protect the highest quality upland habitats, particularly rare and unique functioning habitats, through acquisition easements, or other conservation measures	Focus Area: Conservation Strategy key habitats		
		4-A-2. Consistently apply Best Management Practices to protect and conserve natural upland ecological processes	Focus Area: All private lands		
Goal 5: Improve upland ecosystem and hydrologic processes to support healthy fish and wildlife populations, enhance watershed health, create a sustainable economy and agricultural production, and foster thriving communities	Strategy 5-A: Restore upland ecological processes and habitats	5-A-1. Restore native upland plants and remove noxious weeds	Focus Area: Willow Creek and Trout Creek Watersheds		Action: Throughout Trout Creek Watershed – Improve upland condition by removing Juniper and controlling annual grasses and noxious weeds. Reintroduce fire regime (prescribed burns) Phasing: 2018 +
		5-A-2. Develop grazing strategies that promote upland habitat recovery	Focus Area: Willow Creek and Trout Creek Watersheds		
		5-A-3. Implement uplands fuel management	Focus Area: Willow Creek and Trout Creek Watersheds		

Goals	Strategies	Action Descriptions	Middle Deschutes Watershed Council Focus Areas	Willow Creek Watershed Action Areas and Actions	Trout Creek Watershed Action Areas and Actions
		5-A-4. Identify areas of dangerous fuels buildup and develop plans or programs to systematically address them	Focus Area: Willow Creek and Trout Creek Watersheds		
		5-A-5. Apply Best Management Practices (BMPs) to restore natural upland ecological processes	Focus Area: Willow Creek and Trout Creek Watersheds		
		5-A-6. Remove junipers to enhance stream flows, and improve habitat and soil conditions	Focus Area: Willow Creek and Trout Creek Watersheds	Focus Area: National Grasslands Action: Juniper reduction along 5 miles of Willow Creek (1850) acres where the creek enters the National Grassland.	Focus Area: Upper Trout Creek Watershed Action: Upper Trout Creek Juniper Eradication Project: Work with the Jefferson SWCD Trout Creek Project Manager on ways to improve upland condition by removing Juniper and controlling annual grasses and noxious weeds.
	Strategy 5-B: Restore degraded areas and maintain upland processes to maximize soil productivity and minimize unnatural rates of erosion and runoff	5-B-1. Maintain or improve soil quality and quantity through the proper implementation of BMPs	Focus Area: Willow Creek and Trout Creek Watersheds		
		5-B-2. Install water control structures	Focus Area: Willow Creek and Trout Creek Watersheds		
		5-B-3. Employ BMPs to minimize unnatural rates of erosion	Focus Area: Willow Creek and Trout Creek Watersheds		
		5-B-4. Upgrade, block or remove problem roads that contribute sediment or cause other impacts	Focus Area: Willow Creek and Trout Creek Watersheds		

Goals	Strategies	Action Descriptions	Middle Deschutes Watershed Council Focus Areas	Willow Creek Watershed Action Areas and Actions	Trout Creek Watershed Action Areas and Actions
Goal 6: Work collaboratively with organizations and residents on watershed restoration, research, education and outreach, and monitoring to promote understanding of watershed conditions, foster support for Council activities, and assure active and growing participation in actions to support healthy fish and wildlife populations, enhance watershed health, create a sustainable economy and agricultural production, and foster thriving communities	Strategy 6-A: Recruit landowners for demonstration projects	6-A-1. Initiate and promote stream / riparian and upland improvement demonstration projects	Focus Area: Willow Creek and Trout Creek Watersheds		
		6-A-2. Promote and implement community outreach and involvement activities through a variety of approaches	Action: Community Watershed Outreach Program: Provide education and outreach on the salmonid life cycle and habitat needs, water quality status, and other factors that impact watershed health. Produce: 6 public general meetings/year; 6 electronic newsletters; and create Council website and engage in other social media	Action: Willow Creek Canyon Volunteer Clean Up Day – Clean up historic vehicle hulks, trash, and metal on BLM property approximately 2.0 miles south to the RR bridge.	
		6-A-3. Develop and fund a demonstration program with a set of irrigators willing to adopt and use a state-of-the-art irrigation systems	Focus Area: Willow Creek and Trout Creek Watersheds		
		6-A-4. Host a series of field tours to convince other landowners to adopt water use efficiency practices	Focus Area: Willow Creek and Trout Creek Watersheds		
	Strategy 6-B: Provide landowners with information on Best Management Practices and watershed health issues	6-B-1. Prevent invasion of new noxious weeds through education, reporting and quick response	Focus Area: Willow Creek and Trout Creek Watersheds		
		6-B-2. Develop educational materials for landowners	Focus Area: Willow Creek and Trout Creek Watersheds		

Goals	Strategies	Action Descriptions	Middle Deschutes Watershed Council Focus Areas	Willow Creek Watershed Action Areas and Actions	Trout Creek Watershed Action Areas and Actions
		6-B-3. Promote uplands fuel management	Focus Area: Willow Creek and Trout Creek Watersheds		
		6-B-4. Promote off-stream water storage for irrigation and sediment control	Focus Area: Willow Creek and Trout Creek Watersheds		
		6-B-5. Develop and distribute noxious weed “wanted” posters, encouraging people to contact the weed master's office if they see the species of concern	Focus Area: Willow Creek and Trout Creek Watersheds		
		6-B-6. Actively promote the CREP and CRP programs	Focus Area: Willow Creek and Trout Creek Watersheds		
	Strategy 6-C: Provide educational materials, workshops, and other forms of outreach and collaboration with landowners and organizations	6-C-1. Provide education opportunities and workshops for landowners on methods to improve ecological health of range lands / forest lands, BMPs, and restoration approaches	Action: Middle Deschutes Watershed Tours and Workshops -- Hold at least two tours and workshops in the Middle Deschutes Watershed Council area focusing on the on-going and recently completed projects and best management practices for a variety of land uses in the Watershed. Workshops to focus on proper juniper cutting techniques and training on prescribed burning.	Focus Area: Willow Creek Watershed Action: Provide landowner trainings on juniper thinning and prescribed burning.	Focus Area: Throughout Trout Creek Watershed Action: Provide landowner trainings on juniper thinning and prescribed burning.
		6-C-2. Educate City of Madras Residents about the benefits of healthy riparian habitats and methods for maintaining them	Focus Area: Willow Creek Watershed		

Goals	Strategies	Action Descriptions	Middle Deschutes Watershed Council Focus Areas	Willow Creek Watershed Action Areas and Actions	Trout Creek Watershed Action Areas and Actions
		6-C-4. Cooperate with teachers and school systems to provide watershed education to students and involve students in stream restoration planning, implementation, and monitoring	<p>Focus Area: Willow Creek and Trout Creek Watersheds</p> <p>Action: Watershed Education Programming in Central Oregon: engage local students with stewardship projects and participating in a regional watershed summit where they present their projects to other local students.</p>	<p>Focus Area: Upper Willow Creek / McMeen Creek / National Grasslands</p> <p>Action: Follow up on photo point and areas where PFC was completed in 2005 for sections of stream/riparian areas in upper Willow Creek above the National Grasslands. Engage students in reassessing the sites after the 10-year period since the last PFC assessment.</p> <p>Action: Youth Watershed Council / Restoration Team: Culver High School. Engage students in the field with stream restoration activities from initial project planning, implementation, and post-project effectiveness monitoring.</p>	<p>Focus Area: Trout Creek (PGE) Ranch / Redband Ranch</p> <p>Action: Middle Deschutes Outdoor School: Through collaborative partnerships develop and implement a local two-day, one-night Outdoor School, targeting 5th and 6th graders.</p>
Goal 7: Organize the Watershed Council and the Board of Directors to support full implementation of the Action Plan, increase organizational capacity, and improve and expand partnerships to support healthy fish and wildlife populations, enhance watershed health, create a sustainable economy and agricultural production, and foster thriving communities	Strategy 7-A: Improve the Council's and Board's capacity to implement the Action Plan	7-A-1. Foster technical review of restoration project proposals by appropriate, local, state, and federal agencies	<p>Focus Area: Willow Creek and Trout Creek Watersheds</p>		
		7-A-2. Evaluate Councils' staffing and budgeting to foster effective implementation of the Action Plan and adjust staff levels if necessary	<p>Focus Area: Willow Creek and Trout Creek Watersheds</p>		
		7-A-3. Improve the Council Board structure and involvement and the Councils' organizational and fiscal structure to improve implementation of the Action Plan and adjust organizational structure if necessary	<p>Action: Facilitate all Council members to gain knowledge of the By-Laws, Council and Board job descriptions, and participate in trainings, workshops, and presentations. Encourage Board and Council members to learn about their watershed. 1 outside training/year attended by at least one Council member; 2 trainings/materials provided to board/council per year; 1 non-</p>		

Goals	Strategies	Action Descriptions	Middle Deschutes Watershed Council Focus Areas	Willow Creek Watershed Action Areas and Actions	Trout Creek Watershed Action Areas and Actions
			working fun even (e.g., BBQ) every year		
		7-A-4. Evaluate Councils' funding sources and explore alternative sources of funds to improve Councils capacity and implementation of the Action Plan	Focus Area: Willow Creek and Trout Creek Watersheds		
	Strategy 7-B: Improve the Council's capacity to implement the Action Plan through partnerships and collaboration	7-B-1. Strengthen existing partnerships by defining roles for the implementation of the Action Plan and seek new partnerships where there are gaps	Focus Area: Willow Creek and Trout Creek Watersheds		
		7-B-2.Explore partnerships that assist with the implementation of the Lower Deschutes River Focused Investment Partnership (FIP)	Focus Area: Willow Creek and Trout Creek Watersheds		

Goals	Strategies	Action Descriptions	Middle Deschutes Watershed Council Focus Areas	Willow Creek Watershed Action Areas and Actions	Trout Creek Watershed Action Areas and Actions
		7-B-3. Forster partnerships that assist with the establishment implementation of restoration actions on the National Grasslands	Focus Area: Willow Creek Watershed		
		7-B-4. Foster partnerships that assist with monitoring and assessment		Focus Area: Willow Creek Watershed and Deschutes Tributaries Action: Middle Deschutes Water Quality Project: Identify key partners, and suitable locations to establish baseline water quality data possibly through a variety of approaches, including the Pesticide Stewardship Partnership (PSP).	
Goal 8: Track and examine watershed conditions and evaluate restoration outcomes through monitoring and assessment to determine if activities are achieving the goal of supporting healthy fish and wildlife populations, enhancing watershed health, creating a sustainable economy and agricultural production, and fostering thriving communities	Strategy 8-A: Assess, track, and report on watershed conditions, including surface and groundwater water quality and quantity, fish populations, stream habitat, and riparian vegetation over time	8-A-1. Monitor and track aquatic and riparian habitat conditions, stream connectivity, and populations of fish and other aquatic organisms	Focus Area: Willow Creek and Trout Creek Watersheds	Focus Area: Willow Creek Action: Inventory and assess stream and riparian habitat and fish passage barriers through Willow Creek Watershed. Prioritize and implement actions based on the inventory.	Focus Area: Lower Trout Creek Action: Repeat DEQ macroinvertebrate monitoring to assess trends in conditions over time.
		8-A-2. Monitor and track stream flows	Focus Area: Willow Creek and Trout Creek Watersheds		
		8-A-3. Assess fish screens on water diversion structures to assure they meet appropriate standards	Focus Area: Willow Creek and Trout Creek Watersheds	Focus Area: Willow Creek Action: Assess fish screens throughout Willow Creek to assure that they meet fish screen criteria and address those that do not.	
		8-A-4. Monitor and track groundwater levels and quality	Focus Area: Agency Plains		

Goals	Strategies	Action Descriptions	Middle Deschutes Watershed Council Focus Areas	Willow Creek Watershed Action Areas and Actions	Trout Creek Watershed Action Areas and Actions
		8-A-5. Monitor and track water quality parameters, including pesticides and water temperatures	Focus Area: Willow Creek and Trout Creek Watersheds Action: Middle Deschutes Water Quality Project: Identify key partners, and suitable locations to establish baseline water quality data possibly through a variety of approaches, including the Pesticide Stewardship Program (PSP)		
	Strategy 8-B: Evaluate restoration projects and programs	8-B-1. Monitor the effectiveness of restoration actions and programs	Focus Area: Willow Creek and Trout Creek Watersheds Action: Monitoring Existing Projects within the Middle Deschutes Watershed Council Area: methods include photo points and other approaches. Report results		
		8-B-2. Establish photo point monitoring stations at a subset of riparian and channel restoration projects to track success	Focus Area: Willow Creek and Trout Creek Watersheds	Focus Area: Upper Willow Creek Action: Follow up on photo point and areas where PFC was completed in 2005 for sections of stream/riparian areas in upper Willow Creek above the National Grasslands.	
		8-B-3. Continue to monitor for E.coli to implement and evaluate management practices	Focus Area: Willow Creek and Trout Creek Watersheds		
	Strategy 8-C: Report on watershed monitoring results and restoration activities	8-C-1. Produce periodic “state of the watersheds” report that documents projects and synthesizes water quality and quantity, habitat, and fish population status and trends	Focus Area: Willow Creek and Trout Creek Watersheds		

Goals	Strategies	Action Descriptions	Middle Deschutes Watershed Council Focus Areas	Willow Creek Watershed Action Areas and Actions	Trout Creek Watershed Action Areas and Actions
		8-C-2. Track project implementation and monitoring activities in a comprehensive spatial database	<u>Focus Area:</u> Willow Creek and Trout Creek Watersheds		

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Appendix A:

ODFW/Jefferson County SWCD: Trout Creek Watershed Accomplishments

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Actions / Year(s)	Trout Creek	Other Trout Creek Tributaries
Replace barriers blocking passage including dams, road culverts and irrigation structures		
2003-14	Replaced 2 irrigation push-up dam diversion structures with Infiltration Galleries or pump screens.	Antelope Creek: Replaced 2 irrigation push up dam diversion structures with Infiltration Galleries or pump screens.
		Confluence of Trout and Antelope Creeks: Replaced 1 irrigation push-up dam diversion structures with Infiltration Galleries or pump screens.
2009	Lower Trout Creek: Removed concrete diversion structure that was a fish passage barrier.	
Maintain and restore floodplain connectivity and function		
2013	Upper Trout Creek: Floodplain shaping and log structure for habitat and bank protection.	
	Trout Creek near Ashwood: Floodplain shaping and log structure for habitat and bank protection.	
Reconnect floodplains to channels		
2004	Lower Trout Creek: Created 0.6 acres off-channel wetlands.	
2004	Upper Trout Creek: Created 6.2 acres off-channel wetlands.	
2006	Upper Trout Creek: Created 2.8 acres off-channel wetlands.	
Reconnect floodplains to channels		
2004-6	Lower Trout Creek: Removed flood control berms to reconnect floodplain to creek on 4 miles of stream channel.	
2004-6	Upper Trout Creek: Removed flood control berms to reconnect floodplain to creek on 4 miles of stream channel.	
2008		Lower Antelope Creek: Removed flood control berms to reconnect floodplain to creek on 0.78 miles of stream channel.
Reconnect floodplains to channels		
2008		Lower Antelope Creek near Willowdale: 14.71 acres floodplain shaping.
Reconnect side channels and off-channel habitats to stream channels		
2004-6	Lower Trout Creek: constructed 4 off-channel alcove.	
2005	Upper Trout Creek: constructed 1 off-channel alcove.	
2010	Upper Trout Creek: constructed 1 side channel (420 feet long).	
	Mud Springs Creek: Reconnected water from side canyon to the Creek, increasing flows.	
2011		Mud Springs Creek: Reconnected water from side canyon to the Creek, increasing flows.
2013	Upper Trout Creek: constructed 1 off-channel alcove.	Mud Springs Creek: Installed pipe to move irrigation water and spring water from ponds, and installed perforated pipe to collect water seeping below dam and route it to creek.
Restore degraded channel and maintain properly functioning channel structure and complexity		
2010	Upper Trout Creek: Reshaped and excavated historic stream channel and filled existing stream channel that had formed during a storm event and was undercutting a road.	
Restore Natural Channel Form		
2004	Upper Trout Creek: Meandered existing creek (added 3,015 of stream length) total length constructed 10,399 feet	Board Hollow Creek: Meandered and raised existing creek (added 233 of stream length) to match up with new Trout Creek Channel.
	Lower Trout Creek: Meandered existing creek (added 672 feet stream length) Total stream length constructed 2636 feet.	
2004-2006	Upper Trout Creek: Added 50 Pool/riffle complexes.	
2004-2006	Lower Trout Creek: Added 48 Pool/riffle complexes.	
2005	Upper Trout Creek: Meandered existing creek (added 662' of stream length) total length	

Actions / Year(s)	Trout Creek	Other Trout Creek Tributaries
	constructed 4573 feet.	
	Lower Trout Creek: Meandered existing creek (added 1242 feet stream length) Total stream length constructed 8505 feet.	
2006	Lower Trout Creek: Meandered existing creek (added 44 feet stream length) Total stream length constructed 10,648 feet.	
	Upper Trout Creek: Meandered existing creek (added 180 of stream length) total length constructed 9637 feet.	
2008		Antelope Creek Near Willowdale: 0.9 miles channel reconstruction. Added 18 pool complexes.
2011		Antelope Creek: Restored section of stream directly upstream of HWY 293 bridge in Willowdale (re-excavated channel and added large wood to repair and reinforce banks).
Increase role and abundance of wood and large organic debris in streambeds and stabilize stream banks		
2010	Upper Trout Creek: Installed large wood to stabilize channel banks.	Antelope Creek: Restored section of stream directly upstream of HWY 293 bridge in Willowdale-added large wood to repair and reinforce banks.
2011	Trout Creek near Ashwood: Installed rootwads / log structure to stabilize banks.	
2013	Upper Trout Creek: installed rootwads to stabilize banks.	
	Trout Creek near Ashwood: Installed juniper log / rootwad jam structure in and along eroding banks.	
Restore natural riparian vegetative communities including vegetative planting AND Restore native upland plants and remove noxious weeds		
2004 -07	Lower Trout Creek: Native Grass seeding on 83 acres with 2080lbs of native seed.	Board Hollow Creek: 6.2 acres riparian restoration.
	Upper Trout Creek: Native Grass seeding on 66 acres with 1650lbs of native seed.	
2005 -07	Lower Trout Creek: Planted 32140 native trees and shrubs on 83 acres of riparian buffer.	
	Upper Trout Creek: Planted 32540 native trees and shrubs on 161 acres of riparian buffer.	
2008	Upper Trout Creek: off-site watering facility: grass seeding, tree planting.	Lower Antelope Creek: Planted grasses and 20,000 native trees and shrubs on 58 acres of riparian buffer.
	Lower Trout Creek: grass seeding, tree planting.	
	Trout Creek near Ashwood: grass seeding, tree planting.	
2009	Lower Trout Creek: Riparian planting and seeding at removed irrigation diversion structure.	
	Upper Trout Creek: off-site watering facility: grass seeding.	
2010	Upper Trout Creek: Planted disturbed area with trees, shrubs, grasses, and forbs.	Ward Creek: Seeded riparian areas disturbed / uprooted by feral swine (20 acres total).
2011	Upper Trout Creek: Planted trees and shrubs and seeded at site where channel was reconstructed to protect highway.	Amity Creek: Planted trees and shrubs and grasses at site disturbed by feral swine (25 acres total).
2013	Trout Creek near Ashwood: Planted trees, shrubs, grasses and forbs.	
	Upper Trout Creek: planted trees, shrubs, grasses, and forbs.	
	Trout Creek near Ashwood: planted trees, shrubs, grasses, and forbs.	
2014	Trout Creek near Ashwood: Installed native trees, shrubs, grasses at bank stabilization project site.	
Restore natural riparian vegetative communities including vegetative planting and AND Restore native upland plants and remove noxious weeds (Trout Creek Vegetation Improvement)		
2010	Planted trees, shrubs, grasses, and forbs as at sites throughout watershed.	
2011	Planted trees, shrubs, grasses, and forbs as at sites throughout watershed.	
2012	Planted treestrees, shrubs, grasses, and forbsas at sites throughout watershed.	
Install/maintain fencing to exclude livestock from riparian areas		

Actions / Year(s)	Trout Creek	Other Trout Creek Tributaries
2003-14	Maintained 87 miles of riparian fence to exclude livestock.	Antelope Creek: Maintained 10 miles of riparian fence to exclude livestock.
		Ward Creek: Maintained 20 miles of riparian fence to exclude livestock.
		Mud Springs Creek: 3 miles of riparian fence to exclude livestock.
2009	Upper Trout Creek: off-site watering facility: Installed fencing at spring to exclude livestock.	
Implement agricultural water conservation measures		
2011-12	Trout Creek, 1 mile upstream of Ashwood Bridge: Installed buried mainline, above-ground mainline, and sprinklers to replace open ditch irrigation.	
Improve irrigation conveyance and efficiency		
2007-08		Antelope Creek: Replaced 1 gravel push-up dam with new low velocity pump screen and installed one new pump.
		Confluence of Trout and Antelope Creeks: Installed 2600' of gravity pipe to replace open irrigation ditch and installed infiltration gallery to eliminate need for gravel push-up dam.
2011		Ward Creek: Off-site water facility: Installed collection and delivery pipes for troughs.
2008	Upper Trout Creek: off-site water facility: Installed collection and delivery pipes for troughs.	Moved pump on another Lower Antelope Creek site to eliminate need for gravel push-up dam. Retained screen but installed more efficient pump and buried mainline.
		Amity Creek: Off-site water facility: Installed collection and delivery pipes for troughs.
2011-2012	Trout Creek, 1 mile upstream of Ashwood Bridge: Installed pump station and consolidated diversions into one, to eliminate need for gravel push-up dam.	
	Trout Creek, 3 miles downstream of the Ashwood Bridge, at head of Degner Canyon: Eliminated need for gravel push-up dam by installing shallow well, power poles, sprinkler improvements, and pump repairs.	
2013	Trout Creek near Ashwood: Changed delivery system for irrigation water to prevent erosion	
Remove noxious weeds		
2009	Lower Trout Creek: Noxious weed control at removed ODFW structure.	
2010		Noxious weed treatment (6 acres Scotch thistle).
Restore native upland plants and remove noxious weeds (Trout Creek Noxious Weed Program) <u>Note:</u> Number of acres below reflects the amount of area spot sprayed. The total acres covered or surveyed for noxious weeds is much higher		
2010	Sprayed 313 acres invasive plants throughout Trout Creek Watershed.	
2011	Sprayed 339 acres (65 riparian, 274 upland) invasive plants throughout Trout Creek Watershed.	
	Planted trees, shrubs, grasses, and forbs as at sites throughout watershed.	
2012	Trout Creek Noxious Weed Program - Sprayed 76ac riparian, 475 upland acres.	
2013	Sprayed 6 riparian, 185 upland acres of invasive plants throughout Trout Creek Watershed.	
Remove junipers		
2010	Upper Trout Creek: Harvested juniper trees to use as large wood.	
2011	Trout Creek near Ashwood: Harvested juniper trees to use as in-stream large wood.	
2013	Upper Trout Creek: Harvested juniper trees to use as large wood.	
	Trout Creek near Ashwood: Harvested juniper trees to use as in-stream large wood.	
2003-2014	Removed Junipers throughout the Trout Creek basin within the riparian enclosure fencing.	