

**Oregon Watershed Enhancement
Focused Investment Partnership
Proposed Priority**

Upper Deschutes: Conserving a Unique Spring-Fed River System

Prepared by Deschutes River Conservancy

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1. Proposed Priority Description

- a) *What is the native fish or wildlife habitat to be conserved or other natural resource issue to be addressed?*

The proposed priority is to restore instream and riparian conditions in the Deschutes River and its tributaries between Wickiup Reservoir and the City of Bend (the Upper Deschutes), conserving one of the most unique spring-fed river systems in the western United States.

- b) *What are the specific expected ecological outcome(s) to be achieved after this priority is addressed?*

After this priority is addressed, the Upper Deschutes will provide the stream structure and function necessary to support a robust redband trout population that is resilient to both natural and anthropogenic disturbance. It will expand and support some of the only remaining high quality breeding habitat for the Oregon spotted frog (recently listed as threatened under the Endangered Species Act).

- c) *What is the defined geographic location within which this proposed priority can be successfully addressed?*

The Deschutes River begins at Little Lava Lake in the Cascades, runs from north to south through Crane Prairie Reservoir, east through Wickiup Reservoir, north through the City of Bend to Lake Billy Chinook, and on 120 miles to its mouth at the Columbia River. This priority focuses on the 61 miles of the Deschutes River and its tributaries between Wickiup Reservoir (river mile 226) and the City of Bend (river mile 165). Tributaries in this priority area include the Fall River, the Little Deschutes River, Crescent Creek, and the Spring River.

2. Significance to the State

- a) *Why is this proposed priority of ecological significance to the state, even though it may not be present everywhere in the state?*

Even in its current degraded condition, the Upper Deschutes is valued state-wide as a recreational, aesthetic and hydrologic treasure; the Deschutes River in this proposed priority area has earned both Federal Wild and Scenic River and State Scenic Waterway designations.

80% of the mean annual flow in the upper Deschutes River comes from groundwater, making the river historically one of the most remarkably stable and uniform rivers in the United States. In 1905, early geographer Israel Russell noted that, "...the Deschutes is of especial interest to geographers, as it exhibits certain peculiarities not commonly met with." Almost 100 years later, the series of scientific papers collated for the textbook, *A Peculiar River*:

Geology, Geomorphology, and Hydrology of the Deschutes River, Oregon (O'Connor and Grant, Eds. 2003), underline the uniqueness of this groundwater-fed system.

The unique geomorphology of the upper Deschutes River suggests that the river is more resilient to the impacts of being dammed, providing a real opportunity to restore a functioning system with multiple water demands. This groundwater dominated system will likely be more resilient to climate change than other rivers in the state, elevating its importance as a potential refuge.

Concurrently, the Upper Deschutes contains some of the most important remaining habitat for the Oregon spotted frog. The United States Fish and Wildlife Service recently listed this species as threatened under the Endangered Species Act. The restoration of this system will be critical to recovering this species.

- b) *Are there any social and/or economic considerations that the Board should understand regarding this proposed priority?*

As described below, restoring the upper Deschutes River and its tributaries has emerged as a priority for the surrounding community. The primary agricultural producers in the region rely on water stored and released from Wickiup Reservoir, and the listing of the Oregon spotted frog could have divided this community. Instead, diverse stakeholders have started to come together to forge a long-term plan to restore the upper Deschutes River. When successful, this effort will exemplify how restoration can strengthen communities by simultaneously benefitting farmers, growing cities, and recreation and tourism.

- c) *In addition to its significance to the state, identify how the proposed priority fits within regional & local ecological priorities.*

The Upper Deschutes consistently emerges as a regional and local ecological priority. It has emerged at the center of two different basin-scale planning processes. The Deschutes Basin Habitat Conservation Plan process, a regulatory driven process, has prioritized the Upper Deschutes as critical to maintaining Oregon spotted frog populations. The Deschutes Water Planning Initiative, a voluntary, collaborative process that includes all water-related stakeholders in the region, has prioritized the restoration of stream flows to support redband trout in the Upper Deschutes. These two processes, described in a later section, emphasize the ecological importance of this unique system.

3. Limiting Factors

- a) *What ecological limiting factors exist that relate to the proposed priority identified? Limiting factors are the physical, biological, or chemical conditions and associated ecological processes and interactions (e.g., population size, habitat connectivity, water quality, water quantity, etc.) experienced by the habitat that may influence viable population parameters (i.e. abundance, productivity, spatial structure, and diversity).*

Irrigation districts store water in Crescent Lake, Crane Prairie Reservoir, and Wickiup Reservoir during the winter and release it for irrigation use in the spring, summer and fall. Reservoir operations greatly reduce winter stream flows and greatly increase spring, summer and fall stream flows. The altered flow regime in the upper Deschutes River impacts both the geomorphology and the biological integrity of the river.

During the winter, low stream flows expose the channel bed and stream banks. These low flows reduce available fish habitat, expose spawning gravels, and can accelerate freezing along the channel bed, furthering reducing available habitat. Low flows also severely limit riparian vegetation along the stream channel and riparian areas, contributing to channel instability. Frost action loosens the exposed channel and bank material, compounding this instability.

Reduced habitat associated with low winter stream flow increases competition between fish populations, which often favor non-native brown trout over native redband trout. Reduced habitat availability can concentrate fish populations and increase susceptibility to predation and disease.

When water is released from Wickiup Reservoir in the spring, sedimentation and turbidity increase due to erosion associated with winter freeze and thaw action on the exposed stream banks. Water quality monitoring by the Oregon Department of Environmental Quality, Deschutes National Forest, and the Upper Deschutes Watershed Council indicate that two water quality parameters, turbidity and dissolved oxygen, do not consistently meet state standards on the upper Deschutes River. Turbidity, a measure of water clarity, is largely a result of the large fluctuation in flow levels. Bank erosion also occurs from the increased shear stress associated with high flows, and it is compounded by lack of riparian vegetation.

The timing of high flows in the spring and the increased mobility of substrate can impact the spawning success of native redband trout. Redband trout spawning coincides with the onset of high flows out of Wickiup Reservoir, limiting the species' spawning success. Turbidity adversely impacts aquatic invertebrates and newly emerged trout fry by interfering with their food supply and ability to feed efficiently. Gravel that houses trout eggs can become plugged with fine sediment, suffocating the eggs or forming a sediment cap over redds which can prevent trout from emerging. Increased sediment and bedload also inundate complex habitat (bedrock and wood formed pools) used for foraging and holding.

During the summer irrigation season, the reservoirs contribute to mid and late-season turbidity by enhancing the growth of micro-organisms that ultimately get washed down the river. Increased levels of primary producers can lead to decreased water quality, including low dissolved oxygen. High concentrations of dissolved oxygen (DO) in the water column are essential to support fish species. Dissolved oxygen is important to a stream's biological community and to the breakdown of organic material.

The range of stream flow fluctuation in the upper Deschutes River across the year, results in an increased rate of change in channel morphology characterized by steep unstable cutbanks on the outside of bends, rapid creation of point bars on the inside of bends, and rapid creation of meander cut-offs.

The United States Fish and Wildlife Service is still evaluating the impacts of reservoir operations on the Oregon spotted frog. This species requires the year-round inundation of side channel habitat, something that is now absent in many of the streams and rivers encompassed by the Upper Deschutes in most years. Preliminary evaluations suggest that

strong groundwater connections also play an important role in maintaining the limited habitat currently available.

b) Reference any framework(s) that exist.

The following local, state, regional and federal plans and assessments provide the initial framework for the restoration and conservation of the Upper Deschutes.

- State Instream Water Right (Oregon Water Resources Department 1983)
- Upper Deschutes Wild and Scenic River and State Scenic Waterway Comprehensive Management Plan (USDA Forest Service and Oregon Department of Fish and Wildlife 1996).
- Upper Deschutes River Basin Water Conservation Study (Reclamation 1997)
- Upper Deschutes Subbasin Assessment (UDWC 2003)
- Deschutes Subbasin Plan (NPCC 2004)
- Upper Deschutes River Subbasin Fish Management Plan (ODFW 1996)
- Upper Deschutes River Restoration Strategy (ODFW, UDWC, DRC 2008)
- Draft Upper Deschutes Roadmap to Restoration Project (Deschutes National Forest 2012)

In addition to these plans and assessments, the Deschutes Water Planning Initiative has provided the initial framework for restoring stream flows in the Upper Deschutes while meeting the needs of all water users. Current Deschutes Water Planning Initiative documents are available online here: <http://www.deschutesriver.org/resources/deschutes-water-planning-initiative/>. Later sections provide additional data on this collaborative effort.

4. Threats and Benefits

a) *What overall threats exist to the proposed priority identified? Threats are the human actions (e.g., fishing, development, road building, etc.) or natural (e.g., flood, drought, volcano, tsunami, etc.) events that cause or contribute-to limiting factors. Threats may be associated with one or more specific life cycle stages and may occur in the past, present, or future.*

As described earlier, reservoir operations are the primary threat to the long-term watershed health of the upper Deschutes River and its tributaries. Five irrigation districts store water for irrigation in three reservoirs along these waterways. The resulting altered flow regime, characterized by high summer and low winter flow extremes, impacts both the geomorphology and the biological integrity of the river. There is a consensus amongst resources agencies that habitat restoration will not be successful in the Deschutes River and some of its tributaries, such as Crescent Creek, until a more natural hydrograph is restored. This system has been in place for the last 62 years. Continuing to manage the river system this way is the primary threat to a healthy upper Deschutes River.

c) *What will happen if the threats aren't addressed?*

If the threats described above are not addressed, the altered flow regime in the Deschutes River will continue to impair structure and function of the river and will limit fish and frog populations. Bank instability will continue to threaten riparian landowners' properties, leading them to continue to apply short-term fixes that protect their property but worsen reach-level issues. The spring-fed rivers of the Upper Deschutes will remain shadows of

their former selves.

- d) *Describe the economic, social, iconic and cultural benefits of addressing the outcome and impacts of not addressing it.*

The streams and rivers encompassed by the Upper Deschutes priority area support the heart of Central Oregon, leading from the Cascade Mountains through Sunriver, LaPine, and Bend. These formerly timber-dependent economies now rely, to a larger extent, on tourism, outdoor recreation and rural lifestyles to draw visitors and residents. Addressing the challenges identified for the Upper Deschutes will yield fully-functioning rivers that support robust redband trout populations while maintaining agricultural communities. Outdoor recreation will thrive in and along restored rivers, irrigation interests will be insulated from the threat of litigation associated with the Oregon spotted frog, and a unique groundwater-fed system will realize its historic potential once again.

Not addressing the challenges identified for the Upper Deschutes will lead to the continued degradation of the rivers and streams encompassed by this priority. Stream flow extremes along this historically stable system will continue to limit fish populations, reduce outdoor recreation opportunities, threaten riparian properties, and reduce the resilience of this iconic groundwater-fed system. Failing to address the challenges associated with Oregon spotted frog populations will likely lead to litigation that threatens agricultural livelihoods, divides local communities, and deadlocks existing collaborative restoration efforts.

- e) *Briefly summarize how much has been done already, how much is remaining.*

The Deschutes Basin has a long history of collaboration around water management that has resulted in over 200 cfs restored in-stream in the Deschutes River and its tributaries downstream from the City of Bend. Little tangible progress, however, has been made in the Upper Deschutes due to the complexity of operating three reservoirs to supply water to five irrigation districts and the accompanying tangle of federal and state authorities.

In 2012, agricultural, municipal, and environmental stakeholders initiated the collaborative Deschutes Water Planning Initiative with the recognition that restoring the Upper Deschutes will take a large-scale coordinated planning effort that packages multiple actions together to restore the river while meeting other needs. The Deschutes Water Planning Initiative has focused on identifying water needs, identifying options to meet those needs, and developing high level packages of options for implementation. Partners capitalized on this initial effort to form the Basin Study Work Group to apply for and secure a Bureau of Reclamation Basin Study. This study will leverage \$1.5 million of federal and state money to continue this analysis and provide the information necessary to understand which options will achieve the necessary flow restoration. At the end of the Basin Study, partners will have many of the pieces required to develop a long-term water management agreement and to begin to secure investments for implementing that agreement. Once flows start being restored, other conservation partners can come enhance this with physical habitat projects.

- f) *What is your best estimate of cost to address the priority, and as a result, how economically feasible do you believe it is to address this priority over time?*

The Deschutes Water Planning Initiative estimated that it will cost roughly \$50 million to achieve restoration goals in the Upper Deschutes over the next -15 years. Partners believe

that this is a feasible level of investment because the solutions being developed can be implemented incrementally over time. Initial progress can be made at a very low cost, with incremental progress at an increasing cost over time. These solutions can be financed incrementally and over the projected 15-year restoration timeline. Similar kinds of incremental investments have already been made in other parts of the basin such as Whychus Creek, where restoration funders have invested over \$20 million over the last decade. Restoration partners in the Deschutes Basin have an excellent track record of leveraging resources from federal, state, mitigation, and private sources to achieve the greatest possible outcome.

5. Opportunities

a) Ecological:

- i) What are the measures of ecological success? What's the likelihood of ecological success in the short- (6-year), medium- and long-term?

Short-term (6-year) output indicators will include measures of specific restoration action output, including:

- Rates and volumes of instream flow restored, and
- Acres of floodplain or side channels seasonally re-watered.

Medium (10-year) and long-term (15-year-plus) outcome indicators will focus on evaluating the ecological integrity of the systems, as well as the status of the redband trout and Oregon spotted frog populations. These may include:

- Water quality that meets or moves closer to meeting state criteria,
- Macroinvertebrate and fish habitat indices/models that reflect the role of temperature and sediment that indicate adequate conditions through the priority reaches,
- Redband trout population targets meet established benchmarks,
- Oregon spotted frog population targets meet established benchmarks, and
- Channel pattern, dimension and profile move closer to desired conditions.

Given that local stakeholders have already prioritized and started to invest in developing solutions to address challenges in the Upper Deschutes, restoration partners have high expectations for achieving long-term ecological outcomes. With the appropriate incremental investments, partners expect that they can improve conditions in the short-term while moving the system towards medium- and long-term goals.

- ii) What types of voluntary conservation actions could be undertaken to address the proposed priority?

Collaborative efforts have already identified voluntary restoration and conservation actions that could restore conditions in the Upper Deschutes. These actions focus on restoring the hydrograph in the Deschutes River and its tributaries while maintaining the viability of existing water users. The Deschutes Water Planning Initiative identified broad categories of water supply and movement actions that focus on sharing water and reducing water supply risks between senior agricultural and junior agricultural/environmental water users.

Generally, these potential actions include increasing efficiencies, improving infrastructure, moving existing water rights instream, and entering into multi-party management agreements to meet agricultural, municipal, and environmental needs. Once these actions have established a more natural hydrograph, conservation actions will include channel restoration, stream bank restoration, and floodplain reconnection.

- iii) Should the proposed priority be divided into geographic areas that are appropriate for partners to address?

The Upper Deschutes represents a hydrologically discrete geography that is appropriate for partners to address. Conservation actions in the Upper Deschutes will coordinate with similar actions being developed and implemented in other areas such as the Deschutes River downstream from the City of Bend, Tumalo Creek, and the lower Crooked River. This coordination will allow for the greatest possible outcomes at the lowest possible costs in these discrete geographic areas.

b) Social

- i) Do partnerships exist to address the proposed priority? If so, briefly describe. If not, note why this proposed priority is important enough that partnerships may form to address it. Local, state, and federal agencies and organizations have undergone three intensive years of partnership-building around restoring the upper Deschutes River and its tributaries, and partners see this as a primary strength of this priority area. All major interests have become intimately involved and committed to this issue through the Deschutes Water Planning Initiative and the Basin Study Work Group. Please find a list of these partners in Question #8.

Although partners have coalesced around the Upper Deschutes, relationships between these partners are dynamic and continue to develop. With any nascent partnership, these relationships need to be consistently reinforced and revised. Existing relationships will form the basis for developing solutions, and partners expect that implementing these solutions will require strengthening these relationships and creating new institutional arrangements.

- ii) What social opportunities exist to address the proposed priority? Is there momentum built?

Significant momentum has been built through the Deschutes Water Planning Initiative and the Basin Study Work Group, and commitment by all parties is high. The Basin Study is now underway and will continue over the next three years, providing local partners with much of the information needed to develop a long-term water management plan that will restore stream flows in this system. Commitment by all parties is high. Other factors contributing to the momentum are increased public concern after a fish kill associated with stream flow ramp-downs in 2013, increased interest in fishing and recreational opportunities on streams and rivers encompassed by the Upper Deschutes priority area as Central Oregon continues to grow as a destination, and the listing of the Oregon spotted frog as threatened under the Endangered Species Act.

iii) Describe educational benefits, if any.

Many educational opportunities exist to engage the community and the schools. The Children's Forest Partnership, for example, a partnership between the Forest Service and the Upper Deschutes Watershed Council, already use sites on the Upper Deschutes for environmental education.

iv) Summarize the social, community, political, regulatory or other factors that will help lead to the success of this proposed priority.

The Central Oregon community is increasingly dissatisfied with the impacts of the current flow management regime on the Deschutes River and its tributaries, particularly after a fish kill in a side channel of the Deschutes River as flows dropped at the end of the 2013 irrigation season. Water users are increasingly motivated to help address flow-related challenges, both to be good neighbors as well as to reduce their regulatory risks under the Endangered Species Act related to the Oregon spotted frog. Municipalities recognize that they can also get their long-term water needs met while addressing these flow-related challenges. All partners have been participating in and are strongly-committed to a multi-stakeholder collaborative process to solve the problem, which has now garnered \$1.5 million in state and federal funding through a Bureau of Reclamation Basin Study. These factors provide the basis for identifying solutions and create a foundation for developing the partnerships needed to finance and implement those solutions

v) What can be leveraged to address the proposed priority (funding, acreage impacts, other resources)?

Local, state, regional and federal partners have already invested in developing high-level solutions to address challenges in the Upper Deschutes. These partners include but are not limited to the follow entities.

- Tribes: Confederated Tribes of the Warm Springs Reservation
- Funders: Oregon Watershed Enhancement Board, National Fish and Wildlife Foundation, Bonneville Environmental Foundation, Bella Vista Foundation, and Oregon Community Foundation.
- State and federal agencies: Oregon Department of Fish and Wildlife, United States Fish and Wildlife Services, Deschutes National Forest
- Non-profit organizations: Upper Deschutes Watershed Council, Deschutes River Conservancy, Deschutes Land Trust, Upper Deschutes River Coalition
- Water users: Central Oregon Irrigation District, Swalley Irrigation District, North Unit Irrigation District, Tumalo Irrigation District, Arnold Irrigation District, City of Bend, Avion Water Company

In addition, the Deschutes Basin Board of Control and the Deschutes Partnership recently submitted a Regional Conservation Partnership Program proposal to the Natural Resources Conservation Service. These initial investments will provide a catalyst for but will not be sufficient to implement restoration actions in the Upper Deschutes.

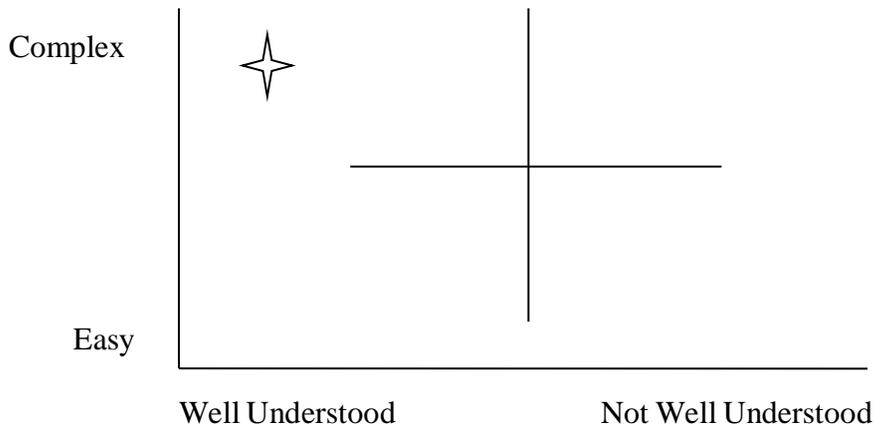
c) *Economic Benefits*

- i) Describe the economic benefits of addressing the ecological proposed priority, including ecosystem services

Restoring a redband trout fishery and enhancing the scenic and aesthetic qualities of the Upper Deschutes will increase opportunities for outdoor recreation in Central Oregon, strengthening the region's economy. The conservation actions proposed for the Upper Deschutes will also support and enhance the agricultural community, particularly the production farmers near Culver and Madras who rely on water diverted from the Deschutes River. In addition, the solutions will provide water security for growing Central Oregon cities, enabling continued economic development.

6. Matrix

The limiting factors and needed restoration in the Upper Deschutes River are well-understood. Remaining questions regarding specific flow-ecology relationships will be answered as part of the ongoing Basin Study. The restoration solutions—a broad suite of water management actions—are also fairly well understood and articulated. The Basin Study will provide additional analysis on these solutions. The solutions, however, are necessarily interconnected and complex, involving many parties and suites of actions.



7. Other Information

The identification of the Upper Deschutes River as an OWEB priority could leverage the partnerships developed with all stakeholders through the current Deschutes Special Investment Partnership, which focuses on anadromous fish reintroduction in reaches downstream from those encompassed by proposed Upper Deschutes priority area.

8. Supporting Partners

The following agencies and organizations are participating in current regulatory or voluntary restoration efforts related to the restoration of the Upper Deschutes system

Irrigation Districts

Arnold Irrigation District
Central Oregon Irrigation District
Lone Pine Irrigation District
North Unit Irrigation District
Swalley Irrigation District
Three Sisters Irrigation District
Tumalo Irrigation District

Water Providers

Avion Water Company
Terrebonne Domestic Water District

Organizations

Bend Paddle Trail Alliance
Central Oregon Flyfishers
Deschutes River Conservancy
Economic Development for Central Oregon
Native Reintroduction Network
Portland General Electric
Trout Unlimited
Upper Deschutes River Coalition
Upper Deschutes Watershed Council
Water for Life
WaterWatch of Oregon

Tribal Governments

Confederated Tribes of Warm Springs

Federal Agencies

National Marine Fisheries Service
U.S. Forest Service
U.S. Fish and Wildlife Service
U.S. Bureau of Reclamation

State Agencies

Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
Oregon Water Resources Department

Local Governments

Central Oregon Cities Organization
City of Bend
City of Redmond
Deschutes County