UPPER DESCHUTES WATERSHED COUNCIL

Upper Deschutes Subbasin Action Plan

September 2003

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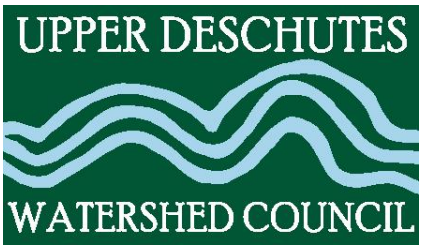

Enhancing and protecting the Upper Deschutes River watershed through collaborative projects in watershed stewardship, habitat enhancement, and community awareness.

INTRODUCTION

The Upper Deschutes Subbasin Action Plan presents the goals, objectives, and proposed action items for the protection and enhancement of watershed resources in the upper Deschutes subbasin. This action plan is based on the watershed assessment findings in the Upper Deschutes Watershed Council's *Upper Deschutes Subbasin Assessment.* The process for developing the subbasin assessment was one of voluntary collaboration among many stakeholder groups in the area and *The Upper Deschutes Subbasin Action Plan* reflects the same spirit of collaboration. Using the assessment's findings, the Action Plan outlines possible actions for the Upper Deschutes Watershed Council, other resource managers, and landowners to undertake to protect and enhance the river, streams, lakes, and surrounding wildlife habitat within the upper Deschutes subbasin.

Just as the natural resources within a watershed are related and interconnected, many of the primary issues of concern within the upper Deschutes subbasin are very closely linked. Water quantity and quality, channel modifications, fish habitat conditions, land and water use, and fire and fire management inherently affect and are affected by each other in ways that are important for watershed managers to understand. The conditions that have contributed toward impacting watershed resources are interwoven throughout *The Upper Deschutes Subbasin Action Plan;* therefore, action items may appear in multiple sections when issues of concern impact a variety of watershed resources.

UPPER DESCHUTES SUBBASIN ASSESSMENT: SUMMARY

The purpose of *The Upper Deschutes Subbasin Assessment* was to gather together existing data and information on all the historic and current conditions that play a role in impacting the watershed health of the subbasin. The details, recommendations, and data gaps discussed within the assessment will assist the Upper Deschutes Watershed Council

and other natural resource managers in the area identify key restoration projects and opportunities to protect and enhance fish and wildlife habitat and water quality in the subbasin.

By combining all of the existing available information on watershed resources into the *Upper Deschutes Subbasin Assessment*, the Upper Deschutes Watershed Council hopes to raise community awareness about the interconnections and impacts within the whole upper Deschutes subbasin system. The key findings and recommendations within the assessment identify and prioritize opportunities that are directed toward improving fish and wildlife habitat and water quality. The key findings and recommendations within the assessment act as the foundation for the voluntary action items within *The Upper Deschutes Subbasin Action Plan*.

A summary of the key findings within *The Upper Deschutes Subbasin Assessment* is as follows:

Water Quantity

The current stream flow regime in the upper Deschutes River is substantially different than it was prior to the management of Deschutes water for widespread irrigation purposes. Winter flows below Wickiup Reservoir are much lower than they were prior to the construction and operation of the reservoir and summer flows below the City of Bend are much lower then they were before irrigation diversions were put in place. As irrigation season begins in the spring, high water releases out of Wickiup can scour sediment from stream banks that have been dewatered and exposed to freeze/thaw action throughout the winter.

Groundwater

In the upper Deschutes subbasin, groundwater and surface water are directly linked as groundwater eventually discharges to surface water either within the subbasin or into adjacent subbasins. Therefore, groundwater withdrawals affect surface flows and surface water use affects groundwater recharge both within the upper Deschutes subbasin and in neighboring subbasins.

Due to the porous geology of the upper Deschutes subbasin, unpiped or unlined canals may leak approximately 50% of their water. Therefore, canals are a conveyance mechanism in which surface water is converted back to groundwater. This groundwater is then discharged in significant quantities above and into the Lake Billy Chinook area.

Channel Modifications

The construction and operation of Wickiup Reservoir has lead to modified flows on the Deschutes River that contribute to conditions that have degraded water quality, fish habitat conditions, and riparian zone conditions. Specifically, the stream banks between Wickiup Reservoir and the City of Bend are eroding and the channel shape is changing.

Sediment Sources

The stream banks on the upper Deschutes River between Wickiup Reservoir and the City of Bend are eroding heavily. The volcanic soils of the banks are dewatered in the winter and are consequently exposed to freeze/thaw conditions that make them exceptionally vulnerable to erosion. Following winter flows as low as 20 cfs, river flows as high as 2280 cfs are released out of Wickiup Reservoir in the spring and sediment is washed downstream. The stream banks in this area are a significant source of sediment to the river system.

Water Quality

There are many sections of the upper Deschutes River that do not meet the Oregon Department of Environmental Quality's water quality standards for either temperature, pH, dissolved oxygen, sedimentation, turbidity, or chlorophyll a. Water quality conditions in the upper Deschutes subbasin are inextricably linked to water quantity and flow levels. Temperature, dissolved oxygen, and pH are affected by low flow conditions in the subbasin.

Fish

Low winter flows below Wickiup Reservoir and low summer flows in the Deschutes River below the City of Bend contribute to poor water quality conditions that are inhospitable for fish. Dewatered in the winter, part of the streambed and the stream banks below Wickiup are exposed to the effects of freezing and thawing. Weathered stream banks are vulnerable to erosion when the flows increase in the spring. The erosion from streambanks contributes sediment into the river. Elevated levels of sediment can reduce water quality and habitat conditions for fish.

Downstream from multiple irrigation diversions, the upper Deschutes River has low flows below the City of Bend which impact fish habitat and water quality in the summer months. At the time of the summer low flows, water temperatures downstream from Bend exceed the state's temperature standard during the summer salmonid rearing period.

Bull trout are currently listed as a Threatened species. Indigenous to the upper Deschutes subbasin, numbers of bull trout declined following the construction and operation of Wickiup and Crane Prairie Reservoirs. The United States Fish and Wildlife Service has proposed to designate sections of the Deschutes River and Odell Lake as critical habitat for bull trout.

Riparian Areas

The stream banks between Wickiup Reservoir and the City of Bend are eroding at a rapid rate. Many of these banks are lacking adequate riparian vegetation and there has been substantial lateral erosion of the stream banks. Stream bank erosion can cause channel instability, land loss, diminished water quality, and riparian habitat loss. Similarly, due to

the dramatic fluctuation of water levels in this area, successfully revegetating bare banks on the upper Deschutes has proved to be problematic.

Land Use

Deschutes has been the fastest growing county in Oregon since 1989. Almost 90% of the county population growth between 1990 and 2000 was due to new individuals and families moving into the area. New residents moving to the area are frequently unfamiliar with the specific watershed issues, history, and concerns of the upper Deschutes subbasin.

One of the most distinctive characteristics drawing growth to the subbasin is the Deschutes River system and its aquatic life. The health of the river will be threatened by the growth that is drawn to it unless proactive steps to raise community awareness about watershed issues are taken. Similarly, actions to protect and enhance watershed resources must be undertaken by community members, resource agencies, landowners, and regulators.

Vegetation

Due to past introductions, soil disturbances, land use practices, and increased access, noxious weeds are invading the upper Deschutes subbasin. Weeds and weed seeds are most commonly introduced into new areas by automobiles, hikers, cyclists, or through water transport. Specifically along roads, trails, the Deschutes River, irrigation canals, in vacant lots, and in recreation areas, weeds continue to crowd out native plants and exacerbate erosion problems.

Wildlife

The upper Deschutes subbasin provides valuable habitat for a variety of wildlife species. Specifically, there are two key elk habitats adjacent to the upper Deschutes River. In this area, the Deschutes River provides a reliable water supply, valuable food sources, and secure calving areas for elk. This habitat for elk and other wildlife is vulnerable to fragmentation from land development and land management activities.

Fire

Fire plays an important role in the natural disturbance and recovery patterns of native species and ecosystems in the upper Deschutes subbasin. Fire suppression activities have altered the historic frequency and intensity of fires in the upper Deschutes subbasin.

Wetlands

There is no comprehensive inventory of all of the wetlands and wetland conditions in the upper Deschutes subbasin. Without an inventory of past and current wetland conditions, there can be no analysis of status and trends.

OPPORTUNITIES TO IMPROVE WATERSHED CONDITIONS

The Upper Deschutes Watershed Council (UDWC) is committed to fostering stewardship of the upper Deschutes subbasin through cooperative, voluntary efforts. Specifically, UDWC supports action items that meet the following objectives:

Assessment: To evaluate current health of the watershed and its relevance to the social, economic, and environmental resources of the region.

Awareness: To create awareness and understanding of the value of healthy watersheds and ways in which people and groups can contribute to their well being.

Enhancement: To lead efforts that enhance, restore, and protect the in-stream water quality and quantity, fish and wildlife habitat, and ecosystem function.

As methods and means for meeting the above objectives and thereby protecting and enhancing watershed conditions in the upper Deschutes subbasin, the Upper Deschutes Watershed Council seeks to:

- Collaborate with local stakeholders to restore, protect and enhance watershed resources.
- Achieve a balance between environmental, cultural and economic well being through science-based watershed stewardship.
- Provide educational and learning opportunities for those interested in restoring and protecting watershed health.
- Facilitate dialogue about watershed resource issues by providing a neutral, balanced and non-advocacy forum for discussion.

Whether undertaken by UDWC or other resource managers in the upper Deschutes subbasin, the action items presented in this Action Plan are focused on protecting or enhancing watershed health through opportunities utilizing Assessment, Awareness, or Enhancement methods.

The following issue statements and action items are categorized by topics that correspond to the categories presented in *The Upper Deschutes Subbasin Assessment.* These categories are: Water Quantity, Groundwater, Channel Modifications, Sediment Sources, Water Quality, Fisheries and Aquatic Habitat, Riparian Zones, Land Use, Vegetation, Wildlife, Fire, and Wetlands. Action items are presented in response to issue statements within each category. Action items will focus on a wide range of appropriate projects and methods. These might include on-the-ground restoration projects, recommendations for additional assessment, analysis, monitoring, or education and outreach activities.

WATER QUANTITY

1) ISSUE STATEMENT:

Low wintertime stream flow levels play a major role in impacting the resource conditions of the upper Deschutes River between Wickiup Reservoir and the City of Bend by dewatering the streambed and banks, thereby exposing fish habitat and stream banks to the erosive impacts of weathering and freeze/thaw action.

ACTION ITEMS:

- Use predictive models to forecast river channel morphology based on current flow regime and potential flow regime after significant conservation measures are in place. Use comparison as a guide for future courses of action.
- Initiate a program that will work to improve and increase minimum wintertime flow levels as identified by the Oregon Department of Fish and Wildlife in the upper Deschutes River between Wickiup Reservoir and the City of Bend.
- Research connections between water conservation measures and water storage in Wickiup Reservoir.
- Lead wintertime hikes and tours to the Deschutes River between Wickiup and Fall River to raise community awareness about impacts to fish habitat and stream bank conditions.

2) ISSUE STATEMENT:

High water releases out of Wickiup Reservoir in the spring can scour sediment from loose stream banks to increase the turbidity and sediment levels in the river.

ACTION ITEMS:

- Develop a volunteer monitoring program such as Streamwalk to support USFS upper Deschutes cross-sectional data with a measurable visual assessment of the status of key stream banks before and after water releases in the spring.
- Work with water users and water managers to initiate a program that will work to improve and increase minimum wintertime flow levels and moderate the rate at which the water releases are ramped up in the spring.
- Raise awareness among riverfront landowners about the conditions (i.e. loose volcanic soils, freeze/thaw action, high water releases, lack of vegetation) that contribute to stream bank erosion.
- Collaborate with riverfront landowners to revegetate and stabilize bare and eroding stream banks.
- Monitor the impacts and effects of the Oregon Water Resources Department's implementation of the recommendations within the Upper Deschutes Wild and Scenic River Adaptive Flow Management Plan.

3) ISSUE STATEMENT:

Low summertime flow levels play a major role in impacting the water quality and aquatic resource conditions of the Deschutes River between the City of Bend and Lake Billy Chinook by dewatering fish habitat and contributing to increased stream temperatures.

ACTION ITEMS:

- Initiate river mitigation programs to assist the cities of Deschutes County in obtaining future municipal groundwater supplies and maintain minimum summertime flow levels in the middle Deschutes river below the City of Bend that are consistent with the levels identified by the Oregon Department of Fish and Wildlife as necessary to protect fish and wildlife habitat.
- Support current and future methods to improve the efficiency of water delivery systems. Support canal piping projects that comply with Oregon's conserved water statute.
- Continue to increase public understanding of the connections between water quantity and water quality conditions through Community Rivers projects and Riverfest presentations.

GROUNDWATER

1) ISSUE STATEMENT:

In the upper Deschutes subbasin, groundwater and surface water are directly linked as groundwater eventually discharges to surface water either within the subbasin or into adjacent subbasins.

ACTION ITEMS:

- Raise awareness among community members about the interconnections between groundwater and surface water in order to promote the conservation of both.

2) ISSUE STATEMENT:

Groundwater withdrawals affect surface flows both within the subbasin and in neighboring subbasins. However, these effects are difficult to detect due to inherent complexity and measurement error and the large amount of natural variability in groundwater discharge compared to current groundwater withdrawal.

ACTION ITEMS:

- Conduct analysis and ongoing monitoring of the effects of groundwater pumping on the flows of nearby stream reaches.
- Through Community Rivers and Riverfest events, lead workshops and presentations geared toward raising awareness among policy makers about the connections between groundwater and surface water.

3) ISSUE STATEMENT:

Due to the porous geology of the upper Deschutes subbasin, unpiped or unlined canals may leak approximately 50% of their water. Therefore, canals are a conveyance mechanism in which surface water is converted back to groundwater. This groundwater is then discharged in significant quantities above and into the Lake Billy Chinook area.

ACTION ITEMS:

- Complete synoptic measurements at a finer spatial resolution to identify losses in canals. Combine this with other existing information on flow and loss data for streams and canals.
- Use the existing USGS groundwater model to identify the specific recharge and discharge values in the upper Deschutes subbasin.
- Support water conservation projects that comply with Oregon's conserved water statute through the piping of irrigation canals in the upper Deschutes subbasin.
- Produce accurate, yet brief educational materials that summarize the hydrogeologic conditions of the upper Deschutes subbasin. Distribute information to community residents, landowners, and policy makers.

4) ISSUE STATEMENT:

The City of Bend's current Urban Growth Boundary and the corresponding 20-year water supply plan will require additional water resources to meet growing urban needs.

ACTION ITEMS:

- Use surface water conservation and mitigation projects to increase groundwater use availability.

CHANNEL MODIFICATIONS

1) ISSUE STATEMENT:

The construction and operation of Wickiup Reservoir has lead to modified river flows that have seriously degraded watershed resources such as water quality, fish habitat conditions, and riparian zone conditions.

ACTION ITEMS:

- Continue to monitor stream bank erosion of the stream banks between Wickiup and the City of Bend with community programs such as Streamwalk.
- Initiate consistent water quality monitoring programs to track sediment, turbidity, temperature, pH, nutrients, and dissolved oxygen levels.
- Model the potential success for native fish populations between Wickiup Reservoir and the City of Bend with stable annual water levels.
- Through consistent assessment and monitoring of conditions, develop a better understanding of the impacts that the modified flow releases out of Wickiup Reservoir have on the bank stability and water quality issues in the Upper Deschutes.
- Monitor turbidity levels immediately before, during, and after the release of high water flows out of Wickiup in the spring.
- Participate in collaborative projects with water users, water managers, and irrigation districts to collectively explore ways to return the flows of the upper Deschutes River to flows that more closely resemble the quantity and timing of the historic stable hydrograph.

2) ISSUE STATEMENT:

As revealed through channel cross-sections completed by the Deschutes National Forest and the Upper Deschutes Watershed Council's *Upper Deschutes River Bank Characterization*, the stream banks between Wickiup Reservoir and the City of Bend are eroding and the channel shape is changing.

ACTION ITEMS:

- Work with USFS to complete cross sectional profiles of the remaining key reaches on the upper Deschutes below Wickiup Reservoir.
- Use data from channel cross-sections to locate and quantify levels of sediment transport.
- Collaborate with riverfront property owners to coordinate on-the-ground restoration projects to revegetate bare and eroding banks.

3) ISSUE STATEMENT:

Tumalo Creek's current channel is unstable following the Bridge Creek fire and the post-fire removal of almost all instream and stream bank large woody material. The wood that had previously acted as stabilizing features for the channel was removed. Channel instability has resulted in substantial loss of fish habitat in Tumalo Creek.

ACTION ITEMS:

- Survey reference reaches on Tumalo Creek and Bridge Creek. Survey areas for the presence of large woody material to help guide effective channel restoration projects.
- Participate in stream bank restoration projects on Tumalo Creek.
- Use the restoration of Tumalo Creek as an opportunity to raise awareness among community members about the impacts that channel modifications and land management activities can have on water quality, fish and fish habitat, and riparian zone conditions.
- Use modeling strategies to develop a complete understanding of the dimension and profile of the Tumalo Creek channel that existed prior to the Bridge Creek fire and subsequent fire management activities.

SEDIMENT SOURCES

1) ISSUE STATEMENT:

Between Wickiup Reservoir and the City of Bend, the Deschutes River is on the Department of Environmental Quality's (DEQ) 2002 303(d) list for both turbidity and sedimentation. DEQ's 2001 Draft Upper and Little Deschutes TMDL Water Quality Monitoring Study identifies stream bank erosion as the primary cause for increased sedimentation along this reach. Turbidity, one parameter used to measure water quality, has increased with increased erosion and sediment release.

ACTION ITEMS:

- Apply existing information toward completing further calculations and analyses of sediment source locations to quantify sediment loss.
- Support and initiate programs to monitor the status and trends of water quality concerns such as turbidity and sedimentation.

2) ISSUE STATEMENT:

The stream banks on the upper Deschutes River between Wickiup Reservoir and the City of Bend are eroding heavily. The volcanic soils of the banks are dewatered in the winter and are consequently exposed to freeze/thaw conditions that make them exceptionally vulnerable to erosion. Following winter flows as low as 20 cfs, river flows as high as 2280 cfs are released out of Wickiup Reservoir in the spring and sediment is washed downstream. The stream banks in this area are a significant source of sediment to the river system.

ACTION ITEMS:

- Additional examination and research should be directed toward modeling stream bank stabilization and riparian restoration methods appropriate and effective within the modified flow regime of the upper Deschutes River.
- A demonstration restoration project applying methodology specific to the upper Deschutes flow regime will be researched, implemented, and monitored for effectiveness and success. As there are currently very few, if any, models for stabilization and restoration projects in systems with channel types, bank materials, and flow regimes such as in the Upper Deschutes, it should be a priority for resource managers in the area to pioneer a pilot project that accurately represents the unique characteristics at work. The demonstration project can stand as a model for future stabilization and restoration projects on the upper Deschutes River.
- The *Upper Deschutes River Bank Stability Characterization* map can be used by resource and land managers as an informative tool for identifying and prioritizing stream bank restoration project sites.
- Resource managers coordinating stream bank restoration projects along the upper Deschutes River must collaborate and coordinate with other interested groups and agencies doing restoration work in the watershed.
- Stream bank restoration projects should be prioritized based on the impact and benefit to the stream system as a whole.
- Stream bank stabilization and restoration projects should be consistently monitored to determine project effectiveness and downstream impact.

WATER QUALITY

1) ISSUE STATEMENT:

Water quality conditions in the upper Deschutes subbasin are inextricably linked to water quantity and flow levels. The water quality parameters monitored by the Oregon Department of Environmental Quality including temperature, dissolved oxygen (DO), and pH are affected by low flow conditions in the subbasin.

ACTION ITEMS:

- Monitor water quality parameters including: temperature, nutrients, DO, pH, turbidity, bacteria, nutrients, sedimentation, and chlorophyll a, as a way to improve understanding of changes and impacts on water quality.
- Support and initiate interagency water quality monitoring activities such as the Upper Deschutes Watershed Council's effort to implement the regional coordinated water quality monitoring plan.
- Present information on current water quality issues and concerns in the upper Deschutes subbasin at Riverfest events in order to raise community awareness about the role that humans play in the overall health of the watershed.

- Publish a watershed-based summary of current water quality conditions to reach a wide and diverse audience with the annual Riverfest publication.

2) ISSUE STATEMENT:

Sedimentation and turbidity levels in the upper Deschutes River do not meet the Oregon water quality standard. Elevated levels of sedimentation and turbidity in the Deschutes between Wickiup Reservoir and the City of Bend have been linked to channel erosion, the flow release schedule, and summer algae productivity in Wickiup Reservoir

ACTION ITEMS:

- Research and model the location of erosion and sedimentation in the upper Deschutes River between Wickiup and Bend.
- Complete analysis to quantify the amount of sediment loss and the sediment bedload levels.
- Use predictive models to forecast river channel morphology based on current flow regime and potential flow regime. Use modeling methods to determine whether or not sedimentation and turbidity levels are decreased in sections of the upper Deschutes River between Wickiup Reservoir and the City of Bend when target winter minimum flow levels of 300 cfs are maintained.
- Evaluate the impacts and effects of the application of ramping rates for springtime water releases out of Wickiup Reservoir that are consistent with the Upper Deschutes Wild and Scenic River Adaptive Flow Management Plan.

3) ISSUE STATEMENT:

Between Steelhead Falls and the City of Bend, the Deschutes River does not meet the Oregon water quality standard for pH. This section of the Deschutes is also listed for exceeding the temperature criterion for salmonid spawning and rearing.

ACTION ITEMS:

- Support and initiate water quality monitoring projects downstream from the City of Bend.
- Improve water quality between the City of Bend and Steelhead Falls by maintaining higher summer flows.

FISHERIES AND AQUATIC HABITAT

1) ISSUE STATEMENT:

Introductions of non-native fish species have competed with native fish populations for resources in the subbasin.

ACTION ITEMS:

- Initiate and participate in monitoring activities as a way to understand the limiting factors affecting native fish populations in the subbasin.
- Support fish species that are wild and native to the upper Deschutes Subbasin by minimizing the impacts of hatchery trout.
- Initiate collaborative and interagency enhancement and restoration projects that seek to improve both water quality and fish habitat conditions for native fish such as redband trout in the subbasin.

2) ISSUE STATEMENT:

The remnant population of bull trout in Odell Lake is the only resident non-reservoir adfluvial population remaining in Oregon.

ACTION ITEMS:

- Collaborate with the Odell Lake Bull Trout Working Group and to develop a bull trout recovery plan for Odell Lake.
- Develop outreach materials to raise awareness and community support for the protection and enhancement of fish habitat conditions in Odell Lake.
- Continue to support USFS and ODFW bull trout habitat restoration project on Trapper Creek.

3) ISSUE STATEMENT:

Fish habitat conditions and successful fish spawning on the upper Deschutes River have been impacted by the construction and operation of Wickiup Reservoir.

ACTION ITEMS:

- Initiate and support efforts such as fine sediment bedload sampling projects to monitor and address the changing habitat conditions on the mainstem of the Deschutes.
- Inform community members about the characteristics of healthy fish habitat and raise awareness about specific habitat enhancement opportunities on private lands.

4) ISSUE STATEMENT:

The Oregon Department of Fish and Wildlife has stated that fish screens, minimum flow releases, and modifications to flow release timing at Wickiup and Crane Prairie reservoirs are necessary to improve downstream conditions for fish and other aquatic species.

ACTION ITEMS:

- Promote improved water quantity and quality for fish and other aquatic species.
- Improve water quality and habitat conditions for fisheries below Bend by increasing minimum summer flows.
- Improve water quality and habitat conditions for fisheries between Wickiup reservoir and the City of Bend by increasing minimum winter flows.
- Evaluate the effects of current springtime ramping rates out of Wickiup Reservoir on downstream fish and fish habitat conditions.
- Support ongoing monitoring of fish habitat restoration and enhancement projects on the upper Deschutes River.
- Work with the Bureau of Reclamation to evaluate the feasibility of installing fish screens at Wickiup and Crane Prairie reservoirs.

5) ISSUE STATEMENT:

Three dams within the City of Bend's Urban Growth Boundary have no fish passage facilities. With the exception of some downstream movement, these barriers may have created four potentially isolated groups of fish.

ACTION ITEMS:

- Develop Riverfest activities and presentations that raise awareness about factors limiting and impacting fish habitat within the City of Bend's urban growth boundary.
- Work with dam owners to develop fish passage facilities.

RIPARIAN ZONES

1) ISSUE STATEMENT:

The artificially high summer river flows and the low winter river flows that result from the release schedule of water out of Wickiup Reservoir accelerate lateral erosion of the river banks on the Upper Deschutes River between Wickiup Reservoir and the City of Bend.

ACTION ITEMS:

- Initiate a multi-partner program to evaluate the current impacts of the Wickiup Reservoir release schedule.
- Determine timing and quantity of water releases that would result in desirable stream bank conditions in order to protect and enhance fish and wildlife habitat conditions between Wickiup and Bend.
- Pursue increased wintertime flows below Wickiup Reservoir through voluntary cooperative programs among irrigation districts and entities whose focus is streamflow restoration.

2) ISSUE STATEMENT:

An issue of concern in the upper Deschutes subbasin is the rapid rate at which the upper Deschutes River banks are eroding. Stream bank erosion causes channel instability, land loss, diminished water quality, and riparian/aquatic habitat loss.

ACTION ITEMS:

- Take aerial photos of current riparian plant zone conditions between Wickiup Reservoir and Lake Billy Chinook.
- Use the photo repository of riparian conditions in the upper Deschutes subbasin to provide a point of comparison for future riparian zone conditions.
- Monitor aquatic/riparian habitat conditions during both high and low flows.
- Through Streamwalk and other volunteer programs, raise awareness among community members about the impacts of flow modification on riparian zones in order to promote a better understanding of the ways in which water conservation can improve river conditions.
- Collaboratively research opportunities to revegetate bare and eroding banks on both private and public lands between Wickiup and the City of Bend.
- Use programs such as Community Rivers to work with private landowners on the upper Deschutes. Assist private landowners in revegetating bare stream banks with native riparian vegetation.
- Lead community hikes during Riverfest to raise awareness about the conditions of the riparian zones along the upper Deschutes River.

3) ISSUE STATEMENT:

Riparian vegetation is very difficult to restore on the upper Deschutes River between Wickiup Reservoir and the City of Bend due to the current managed flow levels that have significantly altered the natural hydrograph. Riparian vegetation that is planted to reach

the water source in the summer is dewatered in the winter, and riparian vegetation that is planted to reach the water source in the winter is drowned in the summer.

ACTION ITEMS:

- Research and model alternative riparian restoration and enhancement treatments that effectively reduce exacerbated erosion rates given the modified flow regime.
- Assist landowners with projects that replace nonnative vegetation with native riparian plants.
- Initiate a pilot project that applies alternative riparian restoration methods to a demonstration site between Wickiup Reservoir and Fall River.

4) ISSUE STATEMENT:

Wildlife species that live in the riparian zones within the upper Deschutes subbasin are sensitive to the effects of modified streamflows.

ACTION ITEMS:

- Support an inventory and analysis of riparian habitat conditions on the upper Deschutes River at different streamflow levels.

5) ISSUE STATEMENT:

The riparian zone conditions between the City of Bend and Lake Billy Chinook have not been comprehensively inventoried or characterized.

ACTION ITEMS:

- Organize an internship project with OSU-Cascades students to complete an inventory of the current riparian zone conditions between the City of Bend and Lake Billy Chinook.

LAND USE

1) ISSUE STATEMENT:

Deschutes has been the fastest growing county in Oregon since 1989. Almost 90% of the county population growth between 1990 and 2000 was due to new individuals and families moving into the area. New residents moving to the area are frequently unfamiliar with the specific watershed issues, history, and concerns of the upper Deschutes subbasin. One of the most distinctive characteristics drawing growth to the subbasin is the Deschutes River system and its aquatic life. The health of the river will continue to be threatened by the growth that is drawn to it unless proactive steps to protect watershed

resources are taken by community members, resource agencies, landowners, and regulators.

ACTION ITEMS:

- Participate in community gatherings such as Earth Day, Riverfest, and the River Rendezvous to raise awareness about the impact of past, present, and future land use decisions on watershed resources.
- Respond to the rapid influx of new residents to the area by initiating outreach programs such as the Community Rivers project to raise awareness among land owners and other community members about watershed health and current watershed concerns such as water quantity and water quality for fish, wildlife, and human use. Use outreach programs to apply citizen involvement toward monitoring watershed and stream health conditions.
- Present watershed resource information at educational events. As a way to raise student and community awareness about watershed issues, participate in teaching watershed education at existing outreach programs such as Make A Splash, the Kokannee Karnival, and Salmon Watch.
- The rapid growth in urban centers will impact watershed resources in cities as well as in downstream rural areas. Initiate informational meetings with policy makers to promote a watershed-based understanding of urban issues and emphasize the watershed benefits of aligning zoning decisions with the Land Conservation and Development Commission's natural resource goals.
- Print an annual watershed commentary for widespread publication during Riverfest. Use this publication as way to raise awareness about human impacts to watershed health to a wide audience.
- Develop a Streamside Stewards guide that addresses watershed issues of concern specific to the upper Deschutes subbasin. Distribute the guide to riverside landowners to inform their stewardship of riparian zones.
- Initiate a long-term community stewardship program along ½ mile of the Deschutes River within the urban growth boundary of the City of Bend.
- Provide press releases on watershed information during Riverfest.

2) ISSUE STATEMENT:

Outdoor recreation and natural resource-based tourism are rapidly growing to be some of the primary industries providing jobs and attracting both visitors and new residents to the area.

ACTION ITEMS:

- Collaborate with recreation-based organizations and companies to foster the informed use of watershed resources; thereby reducing negative impacts on the watershed during recreation activities. Lead informational presentations on low impact ways to utilize and enjoy watershed resources to recreation companies

such as Sun Country Tours, the Inn of the Seventh Mountain, Wanderlust Tours, and fly-fishing companies.
- Lead community watershed events to increase experiential awareness about the unique geologic, hydrologic, and ecologic place that is the upper Deschutes subbasin.

VEGETATION

1) ISSUE STATEMENT:

Combined with density and structural changes, species composition of vegetation throughout the higher elevation portions of the subbasin has shifted from being dominated by fire climax species of large ponderosa pines to predominantly shade tolerant true fir species. Primarily the result of fire suppression and selection harvesting, this shift has caused an increase in overall canopy cover above that which occurred historically.

ACTION ITEMS:

- Support programs that raise awareness about the impacts of land management activities on vegetation throughout the subbasin.
- Make information on historic and native vegetation types widely available to the public.

2) ISSUE STATEMENT:

Due to past introductions, soil disturbances, land use practices, and increased access, noxious weeds are invading the upper Deschutes subbasin. Weeds and weed seeds are most commonly introduced into new areas by automobiles, hikers, cyclists, or through water transport. Specifically along roads, trails, the Deschutes River, irrigation canals, and in recreation areas, weeds continue to crowd out native plants and exacerbate erosion problems.

ACTION ITEMS:

- Raise awareness among local community members and landowners about the causes of weed invasions and the impacts of noxious weeds on watershed resources.
- Support and collaborate with the existing weed programs of the Deschutes National Forest, BLM, and Deschutes and Jefferson Counties to manage volunteer groups in large-scale weed pulls.

- Continue to support organized outreach events such as Riverfest as a way to increase widespread awareness of noxious weed problems in the upper Deschutes subbasin.
- Lead annual weed pulls along major roads infested with noxious weeds such as the Cascade Lakes highway.
- Assist with weed pulls along the First Street Rapids trail.
- Address hikers, bikers, and walkers using high use recreation areas such as the Deschutes River trail in order to raise awareness about types and impacts of noxious weeds.
- Collaborate with river user groups such as Sun Country Tours and the Inn of the Seventh Mountain to coordinate and implement annual weed pulls along the Deschutes River trail in high use areas between Aspen Camp and Big Eddy.
- Use the Community Rivers project to provide information to riverfront landowners about healthy weed control methods.

3) ISSUE STATEMENT:

Many effective groups have formed in response to the increasing noxious weed problem in the upper Deschutes subbasin. Including the Deschutes County Weed Board, BLM and Deschutes National Forest weed programs, the Deschutes County Soil and Water Conservation District, From the Ground Up, and the Upper Deschutes Watershed Council, many organizations have coordinated weed pulls and have provided some limited weed mapping, but no comprehensive map has been created.

ACTION ITEMS:

- Share and combine weed data from natural resource agencies and organizations and create a comprehensive noxious weed map of the upper Deschutes subbasin.

WILDLIFE

1) ISSUE STATEMENT:

The upper Deschutes subbasin provides valuable habitat for a variety of wildlife species. Specifically, there are two key elk habitats adjacent to the upper Deschutes River. The Fall River elk area is between Fall River and Pringle Falls, and the Ryan Ranch Elk Habitat extends from Sunriver to the Inn at the Seventh Mountain resort. The upper Deschutes river corridor provides a reliable water supply, important food sources, and secure calving areas for elk.

ACTION ITEMS:

- Raise awareness and provide landowners with information about the impacts on elk habitat conditions between Fall River and the Inn at the Seventh Mountain.
- Collaborate with local agencies to inventory and assess wildlife habitat conditions in the upper Deschutes subbasin.

2) ISSUE STATEMENT:

Water quality conditions and the quality of fish habitat are compromised in the upper Deschutes River. As water quality and habitat conditions impact the fishery, they also play a role in limiting the food source for wildlife such as river otters, mink, bald eagles, osprey, and kingfishers that feed on fish.

ACTION ITEMS:

- Research connections between flows in the upper and middle Deschutes River and the fish populations as a food source for osprey, eagles, and other wildlife in those sections.
- Raise awareness among community members and recreation user groups about the connections between water quantity and quality, fisheries, and wildlife.
- Lead hikes during months of low water to raise awareness about wildlife habitat conditions.

FIRE

1) ISSUE STATEMENT:

Fire plays an important role in the natural disturbance and recovery patterns of native species and ecosystems. The upper Deschutes subbasin has evolved with and in response to wildfire. The widespread public has limited access to information regarding the natural role that wildfire plays in the upper Deschutes subbasin.

ACTION ITEMS:

- Raise community awareness in both rural and urban areas about the roles that fire, fire suppression, and forest harvesting play in the upper Deschutes subbasin.
- Support efforts of the Deschutes Basin Fire Learning Network to inform community residents about the role and impacts of wildland fire.

2) ISSUE STATEMENT:

Fire suppression has altered the historic frequency and intensity of fires in the upper Deschutes subbasin. Fire suppression activities can lead to modified forest structures including: increased stand densities, increased crown closure, altered vegetative composition, smaller stand diameter, decreased percentage of undergrowth, increased forest litter, higher quantities of woody debris, and higher fuel loads.

ACTION ITEMS;

- Support programs that continue to research the effects of fire management activities on watershed resources.
- Support and initiate monitoring projects that track unintended consequences from fire management and incorporate implementation and effectiveness monitoring.
- Research the effects of salvage logging in sensitive areas of the upper Deschutes subbasin. Make existing information widely available to the public.
- Raise awareness among landowners regarding the importance of fire resistant plant species in wildland/urban interface areas.

3) ISSUE STATEMENT:

Although a large body of information exists on the erosion and sedimentation impacts of forest roads and new road construction in post-burn areas, little data has been compiled or published regarding the impacts of roads in the upper Deschutes subbasin.

ACTION ITEMS:

- A predictive model for forest activities, erosion, and sedimentation has been developed by the research arm of the U.S. Forest Service. This model, the Water Erosion Prediction Project (WEPP), should be used on the Deschutes National Forest to predict impacts from forest and fire management activities.
- Apply analyses from regions with similar geology and hydrology documenting the general impacts of forest roads and new road construction on the sedimentation of spawning habitat to future fire suppression, fire prevention treatments, and thinning or logging in the upper Deschutes subbasin.
- Support fire management activities that seek to protect soil integrity, avoid new road construction in sensitive areas, and reduce the sedimentation effects from existing roads.

WETLANDS

1) ISSUE STATEMENT:

Wetlands are very important in maintaining and improving water quality.

ACTION ITEMS:

- Work with local agencies and partners to increase local and State wetland protection and restoration programs.
- Support programs that raise awareness among community members about the valuable roles that wetlands play within the watershed system.
- Research the impacts that wildland fires have on wetlands. Initiate analyses to examine the impacts of fire suppression on the health and productivity of wetlands in the upper Deschutes subbasin.

2) ISSUE STATEMENT:

There is no comprehensive inventory of wetlands and wetland conditions in the upper Deschutes subbasin. Without an inventory of past and current wetland conditions, there can be no analysis of status and trends.

ACTION ITEMS:

- Initiate collaboration among resource managers to collect, synthesize, and share wetlands data.
- Consolidate existing data and map the locations of wetlands in the upper Deschutes subbasin.
- Work with local partners such as the Deschutes Resources Conservancy to complete an inventory of the current conditions of wetlands in the upper Deschutes subbasin.
- Analyze the status and trends of current wetlands' conditions in the upper Deschutes subbasin.