

# LAND USE, FLOOD CONTROL AND HABITAT ENHANCEMENT GUIDELINES FOR THE CONFLUENCE AREA OF THE MCKENZIE AND WILLAMETTE RIVERS

McKenzie-Willamette Confluence Project Steering  
Committee

November 2001

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## **Purpose**

This document contains a set of parameters identified by landowners, regulatory agency officials and interested members of the public that can be used to guide land use, flood control and habitat enhancement activities in the vicinity of the confluence of the Willamette and McKenzie rivers near Eugene, Oregon. The guidelines are based on a comprehensive hydrologic analysis and biological evaluation of the two rivers and their associated fish and wildlife habitats. They reflect the historic, present and potential future dynamics of the river system, and recognize changing uses of adjacent land. The guidelines are intended to provide the basis for evaluating proposals pertaining to the protection, utilization or enhancement of the natural resources located in the Confluence Area.

## **Confluence Area**

The Confluence Area encompasses both the Willamette and McKenzie River and surrounding floodplain habitats. The area includes the Willamette River downstream of river mile 178.2 (Beltline Road Bridge) to river mile 171.5 and the McKenzie River from its confluence with the Willamette River to the Interstate-Highway 5 bridge (about 4 miles long). Included are the main channels of both rivers and off-channel areas that have connection to the main channels at any time. For purposes of the wildlife habitat, the area includes land and water bodies within the historic flood areas of the two rivers. (See Figure A: Confluence Planning Area, and Figure B: Air Photo of the Confluence Area.)

Today a variety of land uses are found in the Confluence Area (See Figure C: Land Use Plan Designations). Highway bridges cross both rivers at the upper reaches of the confluence area. Adjacent to the north bank of the McKenzie River the major land uses are farming, sand and gravel mining and rural residential development. On the south side are found a regional park, a youth camp and sand and gravel operations. Urban development, including sand and gravel operations, governmental and business offices, and a golf course characterize the east side of the Willamette River. The west side of the Willamette is occupied by sand and gravel mining and semi-rural to urban residential development. Interspersed among these land uses are remnants of the natural ecosystem that continue to provide habitat to numerous species, as well as enjoyment to the general public.

## **Background**

Through geologic time, dynamic channels and seasonal flooding created a diverse array of natural resources at the confluence of the Willamette and McKenzie Rivers. Flooding and meandering developed a riverine ecosystem characterized by a broad floodplain with braided streams, sloughs, wetlands, and multicanopied woods. Deep deposits of sand and

gravel were overlain by fertile soil, and a variety of vegetation formed habitat for numerous species of fish and wildlife.

Pioneer settlers began transforming this natural setting by the mid-1800's. Stands of trees were cut down, and sloughs were filled to open land for farming. Drift logs and snags were removed from the rivers, and side channels were blocked to aid navigation. In some areas, the riverbanks were reveted with riprap to stop erosion, and dikes were installed to control flooding. Sand and gravel was mined to meet the demands of growing communities. Further upstream, dams and reservoirs were constructed to regulate the seasonal fluctuations of river flows.

All of this human activity during the past 150 years contributed to changes in the natural environment of the area. In terms of the impact this has had on the river system, it has been estimated that the total length of side channels in the confluence area has been reduced by as much as 50 percent, and the main flow of the rivers has been confined to comparatively narrow channels.

The impetus for the development of the guidelines found in this document is twofold. First, in 1996 the area experienced high water flows that resulted in the need to address significant stream bank erosion and flooding of sand and gravel operations and other urban and rural development. Second, in 1998 and 2000 bull trout and spring Chinook salmon, fish that populate the Upper Willamette River Basin, were listed as "threatened" species according to the Endangered Species Act.

Recognizing that a comprehensive review of the interaction between natural and human activity was needed, landowners, governmental officials and the McKenzie Watershed Council agreed to work toward the identification of a set of guiding principles that would address economic, social and environmental concerns associated with the natural resources found in the Confluence Area.

Through a consensus-oriented approach, the group was able to identify commonly held values and mutually beneficial solutions to diverse and complex problems. The guidelines contained herein are the result of that effort, and are intended to form the basis for evaluating proposed land use, flood control, and habitat enhancement projects in the Confluence Area.

### **Flood Characteristics**

In 1996 the Confluence Area experienced two extraordinary high water flows, the first in February, and the second in November. In addition to sweeping across riparian and agricultural land, the floodwaters inundated a large sand and gravel mine, and came within inches of flowing into other mines and flooding residential and commercial properties. After the danger passed, riparian property owners sought permission from regulatory agencies to develop flood management measures.

In order to obtain a comprehensive understanding of the locations vulnerable to future flooding, a hydrologic analysis was conducted. The hydrologic analysis estimates the 100-year instantaneous peak flow for the McKenzie River to be 89,900 cubic feet per second. The discharge estimated for the Willamette River at the confluence is 74,600 cubic feet per second. Using the hydraulic computer model UNET (Unsteady NETWORK) an estimate was made of the flood-water surface profiles along the planning reaches of both rivers.

The analysis concludes that along most of the McKenzie River within the Confluence Area, the main channel in its current state is nearly large enough to contain the 100-year regulated flood. The Willamette River presents more challenges in terms of developing flood protection measures. Lateral erosion of the riverbanks will continue to be a problem for landowners along river reaches within the Confluence Area. (See Figure D: Map of Revetment and Bank Erosion Inventory.)

### **Habitat Characteristics**

The confluence area includes some of the least altered and some of the most altered fish and wildlife habitat in the Willamette valley. Some alterations are local and some are a result of activities far upstream. Average annual peak flows are only 60% of normal for the McKenzie River and 30% of normal for the Willamette River due to upstream reservoirs. Decreased peak flows reduces the ability of a river to meander and create (or modify) off-channel features such as side channels, alcoves, and ponds. These off-channel features provide unique habitat for certain species of fish and wildlife.

Portions of the confluence area have also been intentionally channelized. What was previously a wide flood plain with multiple channels in the lower McKenzie River has been engineered into a single channel along the northern edge of the old flood plain. The area of channels and islands in the Willamette River from the McKenzie River confluence to Harrisburg is now only 20% of what existed in 1850. Large wood that choked the two rivers prior to European settlement is now mostly absent. About 20% of river banks in the confluence area are rip-rapped, further keeping the rivers from meandering

Both rivers are cool during the summer due to intensive groundwater inputs and flow supplementation from reservoirs. Neither river has any obvious water quality problems; nutrients are tightly cycled and man-made organic compounds and toxins are mostly absent. However, the Willamette River upstream of the McKenzie River suffers some chronic turbidity in spring and fall due to clay entrainment at a reservoir.

Fish sampling of highly altered and minimally altered habitat in the confluence area suggests fish communities are variable and change with the season. Rainbow and cutthroat trout caught in the McKenzie River and lower Willamette River were abundant along natural banks but mostly absent along rip-rapped banks that had fast-moving water. Rock barbs extending at right angles to rip-rapped banks mitigated the negative effects of

rip-rapping and were particularly attractive to large rainbow trout in the fall and juvenile chinook salmon in the spring. Mountain whitefish were the most abundant salmonid in the spring and preferred the main channel where there was no riprap or barbs. Most mountain whitefish were gone in the fall and were presumed to have moved upstream in both rivers.

Alcoves and natural ponds attracted cutthroat trout and juvenile chinook salmon during the spring but were not used much by salmonids during the fall. The slack water of alcoves and ponds probably provide these fish a place of refuge during high flows and an early-season supply of food. The alcoves were not too warm for salmonids in the summer but they probably lacked the high-quality food available in the main channel at that time of year.

Salmonids trapped within low-lying gravel pits during winter high flows did not survive through the summer, probably due to a combination of predation by the abundant largemouth bass and warm water temperature. However, salmonids did survive the summer in natural ponds.

Salmonids were notably less abundant in the Willamette River upstream of the McKenzie River than elsewhere in the confluence area during both spring and fall. The reasons were not obvious, although the chronic turbidity in the upper Willamette River may retard aquatic insect productivity. Also, the upper Willamette River suffers more than the McKenzie River from reduced peak flows. The gravel bed of the upper Willamette River seems more embedded with fines and therefore may be less capable of supporting high populations of aquatic insects. The low abundance of salmonids extends upstream of the City of Eugene so it is unlikely that degraded water quality in the city is the primary cause.

Native fish other than salmonids were abundant throughout the confluence area except where banks were rip-rapped and had fast-moving water. Alcoves were particularly attractive to a wide variety of native fish, especially those less than 6 inches in length. Larger fish also used alcoves, but mostly at night. Alcoves seem to be the nurseries of native fish (except for salmonids) in the two rivers. Young-of-the-year fish were present in large numbers within alcoves but not within the main channel. When present in the main channel, small fish were found mostly along slow-moving margins.

Largescale sucker were the most common fish found in main channel and off-channel features in the two rivers. Osprey are common in the area and feed almost exclusively on largescale sucker less than 12 inches in length. Two bald eagle pairs inhabit the confluence area and rely, in part, on largescale suckers stolen from osprey. Small largescale sucker and other native fish are a main food component of the ubiquitous great blue heron.

Introduced fish were notably scarce in the confluence area except in gravel ponds. A few introduced fish were found in alcoves during the fall but their numbers may be kept in control by large northern pikeminnow (up to 24 inches long) that make forays into

alcoves at night. In contrast, northern pikeminnow have no access to introduced fish in the gravel ponds during low water where introduced fish are quite abundant. Bluegill and largemouth bass dominate the fish community in gravel ponds.

The bird community in the confluence area was monitored from January through May and found to be unusually diverse. The mosaic of human-influenced and natural habitat features supported 128 species. In June 2000 75 species of birds used the confluence area for nesting. Habitat types that were particularly attractive to birds were riparian woodlands, alcoves and ponds, inactive gravel mining areas, and shrubland.

Bare river substrate, now scarce due to the lack of high peak flows that would normally scour vegetation from the river's edge, is supplemented by bare areas at gravel operations and within seasonally-pond portions of grass-seed fields. Wading birds are particularly attracted to these areas without vegetation.

Adult western pond turtles have been found at many of the natural ponds and gravel ponds in the confluence area. However, we observed no younger turtles. Reproduction failure is suspected to be a major cause of western pond turtle decline in the Willamette valley. Raccoons, skunks, and small mammals raiding turtle nest sites probably contribute most to reproductive failure. Turtles usually nest at elevated sites supporting only sparse and short vegetation. However, introduced vegetation such as blackberry, grasses, and weeds have created a scarcity of such settings. (See Figure E: Map of Vegetation / habitat types.)

### **Desired Future Condition**

In a most general sense, the underlying long-term vision (50 years and more) for the Confluence Area is one in which the Willamette and McKenzie rivers and their environs retain what presently remains of the natural ecosystem, recapture or emulate where practical the natural biological and geological properties that have been lost, and fulfill the needs and enjoyment of future generations of people who live, work, recreate, or otherwise depend on the natural resources found in the area. This will only be possible through long-term collaborative and cumulative actions.

Returning the river and the surrounding floodplain to the condition that predates pioneer settlement of the area is problematic. Given the significant change that has occurred in more than a century of population growth, achievement of this condition would require an unprecedented effort, including removal of agricultural, residential, recreational, commercial, industrial, and public works structures. The resulting social and economic implications would be significant and, coupled with attendant financial costs and legal and political ramifications, make this alternative unrealistic. Furthermore, activities occurring both up and down stream beyond the Confluence Area have consequences that make a full return to pre-settlement condition difficult to obtain.

While some habitat conditions are irretrievable, and while a growing urban population will continue to exert pressure on the area's natural resources, significant opportunities exist to protect and enhance the geologic and biologic attributes that define the Confluence Area. Reasoned use of the rivers and adjacent floodplains and uplands can continue to satisfy human needs while maintaining a richly diverse environment where native species of plants and animals can thrive.

This vision acknowledges that there are historic fish and wildlife habitat-forming processes that may not fully recover. Similarly, not all land use practices will be compatible with the goal of improving habitat conditions. Some habitat alterations will probably be present in the future. As sand and gravel mines are mined out and reclaimed, and as other land uses change through time, the intent of the vision is to work within social constraints and opportunities to enhance key ecological processes and, where practical, to restore lost habitat richness to the Confluence Area.

Vestiges of the naturally functioning river system still exist. To the extent that these features contribute to the hydrologic dynamic and biological diversity of the confluence ecosystem, they should be preserved, restored, enhanced or emulated. Toward this end, hallmarks of the desired future condition include the following habitat types and habitat-creating processes:

- A dynamic connection between the river and the floodplain, with flood events that alter the course of the river to create new habitats, including islands, side channels and alcoves;
- A broad floodplain, with diverse aquatic (ponds, active and inactive side channels) and terrestrial (areas of vegetation and openings) habitat types;
- Multiple "braided" channels that change through time;
- The presence and creation of islands;
- Diverse channel composition including riffles, deep and shallow pools, backwaters, and gravel bars;
- Variety of bank and edge conditions varying from very gentle gradient, shallows, pools, undercut banks above pools reinforced by massive root structures;
- Variety of substrates from fines to heavy cobbles;
- Presence of large aquatic (side channels, ponds and other areas) woody debris, particularly large cottonwood and conifer (>2' diameter), in combinations of jams and individual trees, providing velocity breaks, shelter, backwater refuge and vegetation succession;
- Terrestrial (island and mainland) vegetation, particularly trees, in a broad variety of age (emergent to old growth) and indigenous species classes;
- A tree canopy that is, in areas, thousands of feet wide;
- Areas of freshly disturbed bare ground at or near the water level, loam to cobble, produced by recent flooding, providing the new conditions for the next generation of vegetation succession; and
- Connected habitats that possess the historic features described above.

At the same time it remains necessary to recognize the importance of the agricultural, residential, recreational, commercial, industrial and public works land use activities occurring in the Confluence Area. Their continuation and protection from stream bank erosion and flooding should be taken into account when making decisions and setting policy for the area.

The guidelines contained in this document are intended to address both private ownership rights and broad public interests. As with the river system itself, the guidelines are dynamic in nature, recognizing that the scientific knowledge, social values and stakeholder interests that exist today will change with future generations. Therefore, this vision of the Confluence Area is intended as a direction, not as a destination. The planning timeframe considers actions over the short-term (one to six years), the transition period (six to 50 years) the long term (50 or more years).

## **Guidelines**

A broad range of sometimes contradictory public and private interests are involved with human activity at the confluence of the Willamette and McKenzie rivers. The manner in which these interests are balanced, prioritized and regulated affects the condition of the natural environment, the livelihood of landowners, the economy of the local area, and the livability of the community in general.

It is important to keep in mind that time and timing are important elements regarding all aspects of conservation and development in the Confluence Area. In the short-term (from the present to 6 years from now) steps can be taken to preserve significant habitat, or to restore, enhance or emulate natural riverine conditions. Conversely, it is possible for development to occur on adjacent land, perhaps at the expense of certain habitat, with anticipation that in the long-term (6 to 50 or more years from now) the natural environment can be enhanced. Although care should be taken to avoid the inadvertent diminution or elimination of one habitat type for the sake of another, it may be necessary to prioritize habitat improvements that benefit one species over another. Consideration should be given to the values that deliberate change may create.

### **1) Improving Ecosystem Conditions**

In regard to efforts aimed at improving the condition of the riverine and terrestrial ecosystem, the following protection and restoration actions will be studied for possible implementation:

- **Increase the width of the active river channels.** Historically the Willamette and McKenzie rivers flowed freely across comparatively wider and shallower channels than that to which they are confined today. While established rural and urban development constrains the expanse of the channel area available to river flows, portions of former channels remain undeveloped. The value and ramifications of integrating these abandoned channels with the active channel should be explored.

- **Establish additional alcoves and side channels.** The purposeful elimination of these features in the past, coupled with the reduced ability of the rivers to create new ones as a result of peak flow dampening by dams, have significantly reduced refuge areas used by fish and wildlife. Experimental construction of these features has proven successful in other areas, and should be explored.
- **Protect or establish stands of native vegetation close to river channels and off-channel features.** Large trees and native plants serve a variety of functions that contribute to the vitality of the riverine ecosystem. They should be allowed to flourish, and the elimination of competing exotic vegetation should be explored. Habitat on rip-raped banks can be enhanced through the establishment of native vegetation.
- **Provide year-round / seasonal connection of gravel ponds to the main channel where appropriate.** Such connections can provide refuge areas for fish and wildlife, and control the promulgation of exotic species. Excavated sand and gravel deposits located within the main river channels are likely to lend themselves to integration with the river system. The value and ramifications of such connections to gravel pits that are separated from the ordinary high water flows of active channels should be evaluated during the development of long-term reclamation plans.
- **Where riprap is needed to protect property from stream bank erosion or flooding, incorporate “fish barbs”.** Stream bank stability is important in protecting both riparian vegetation and adjacent land uses, and in some cases the use of riprap is the only practical option. Fish barbs are rock structures that protrude into the river channel from the bank and create slack water areas good for fish habitat.
- **Control and reduce invasive weeds.** Invasive weeds, such as reed canary grass, scotch broom, blackberries, compete with native vegetation, simplify habitats, and limit opportunities to establish high-quality riparian trees and shrubs. There are opportunities to replace these exotic species with native vegetation.
- **Enhance and create pond habitat.** The Confluence Area is a stronghold for pond turtles. There are opportunities to create new pond turtle habitat in areas excavated for gravel extraction or by creating ponds. Creating logs and other resting areas in ponds and creating nesting habitat can enhance existing habitat.

## 2) Sand and Gravel Mining

Due to the abundance of natural sand and gravel deposits, mining is a major land use activity in the Confluence Area. Due to the industry’s importance to the community and its potential impact on the river system, the following actions are recommended.

- **Excavate sand and gravel from deposits located below the ordinary high water lines of active river channels in a manner that does not exceed the depth of the river channels, and that results in conditions reflecting the historical character of the rivers.** The value and ramifications of reestablishing water flow into or through abandoned channels should also be explored, as well as should the creation of new side channels and alcoves.
- **Excavate sand and gravel deposits located above the ordinary high water lines of river channels to depths that fully utilize the available resource.** Sand and gravel excavations should be setback from the high water lines a minimum of 75 feet. Specific setbacks should be determined on a case-by-case basis, taking into consideration the following:
  - Floodway boundaries;
  - Historic river channel meander patterns;
  - Extent of riparian vegetation;
  - Stream bank stability;
  - Wildlife corridor connectivity;
  - Large wood recruitment potential;
  - Prevention of river channel capture; and
  - Reclamation opportunities
- **Excavate sand and gravel in a manner that does not adversely affect the quality or quantity of water in the rivers and associated aquifers.** Pit dewatering, storm water runoff, process water, sedimentation and turbidity are elements that should be controlled to avoid adversely impacting the biological and hydraulic character of the rivers, riverine habitat, and associated ground water.
- **Protect sand and gravel operations from stream bank erosion, flooding and river avulsion.** Where it is necessary to stabilize eroded stream banks, riprap revetments and bioengineering techniques should complement adjacent riparian conditions. Berms or dikes should be constructed in a manner that does not adversely affect water levels in river floodways.
- **Reclamation of sand and gravel pits should incorporate features that provide fish and wildlife habitat.** Mined-out pits can be designed to create a complementary diverse and complex mix of habitat types for a variety of species. The hydrologic and biologic potential for, as well as the legal liabilities associated with integrating reclaimed sand and gravel pits into the riverine ecosystem should be explored. Opportunities as well as risks associated with connecting river flows to mined-out pits should be addressed.

### 3) Continued Agricultural Land Uses

Agriculture is, and will continue to be, a major land use activity in the Confluence Area. The productive agricultural lands in the area support farm incomes and provide high quality habitat for fish and wildlife. Oregon Senate Bill 1010 establishes a process for the development of agricultural water quality management plans. A plan is under

development for the southern Willamette Valley. The focus of agricultural water quality management plans is on education and incentives to promote voluntary actions to protect and improve water quality and habitat. Many of the voluntary actions outlined in water quality management plans focus on riparian vegetation management. Consistent with the intent of these plans to emphasize voluntary actions, the following actions are recommended (adapted from the *Molalla-Pudding-French Prairie-North Santiam Subbasins Area Plan*).

- Establish and maintain riparian vegetation such as grasses, shrubs and trees appropriate to the site.
- Provide adequate riparian vegetation to trap sediment, prevent flood debris from depositing on fields, and protect farmland from bank erosion.
- It is recommended that native plants be used to provide a variety of riparian functions.
- Landowners are encouraged to replant or restore riparian vegetation damaged or degraded by agricultural practices to an adequate cover as soon as possible.

#### 4) Aesthetics and Recreation

Recreationalists currently are using the Confluence Area in growing numbers. Given the expanding population of the Eugene Springfield metropolitan community, the Confluence Area will become even more important as the other nearby natural areas are converted to residential and industrial uses and more people seek a natural experience close to home. Enhancing that natural experience for recreationalists should be a major criterion for any proposed changes in the Confluence Area.

Currently, the boating access in the Area is very limited. While jet boats can put in and take out at Armitage Park, non-motorized craft must float far past the confluence and experience long automotive transfers to enjoy the area. Though in the rest of McKenzie River corridor public agencies have established a policy of providing a boat landing and public access every three miles, this should not be a template for the Confluence Area. If the main criterion for the Confluence Area is to enhance the user's natural experience, that standard is not applicable. The following actions are recommended.

- **Maintain limited boat ramp access to the river.** While boat ramps are traditionally spaced for river access, the Confluence Area offers a unique opportunity to provide a natural area with limited boater access.
- **Improve current pedestrian access areas to the river at existing sites.** Pedestrians may gain access to the river at Armitage Park and at the abutments of the Coburg Road and Beltline bridges. Improving access at those points should be explored.
- **Enhance aesthetic qualities.** To provide a more natural experience for recreationalists, approaches should be pursued to enhance the natural riparian character of the banks, maintain and restore native riparian vegetation, and minimize the addition of impervious surfaces along the river.

## 5) Other Land Use Activities

As has been the case for the last 150 years, human activity will continue to influence the character of the Confluence Area. During the next 50 years the populations of Eugene, Springfield and Coburg are expected to continue to grow, increasing the interest in both preserving and converting natural areas and farmland. Similarly, community growth will generate demand for the sand and gravel deposited in the area, and as the resource is mined out, the gravel pits will be reclaimed for other uses. To address the evolution of land use in the Confluence Area, and direct it toward the stated vision, the following action is recommended.

- **Future development should incorporate the natural aspects of the rivers and their environs in a manner that protects and enhances their quality.** Built-up development such as houses, roads or other structures probably represents the most serious impediment to the long term function and recovery of the area, with the most significant consequences being the alteration of native vegetation, disturbance of wildlife habitat, hard surfacing of riverbanks to protect property, indiscriminate use of chemicals, and dumping of refuse into waterways. As existing land uses change to reflect future economic and social circumstances, consideration should be given to the environmental conditions that define this area.

## 6) Monitoring and Adaptive Management.

Because conditions in the Confluence Area will change over time, and because some of the actions recommended are experimental, it is important to monitor projects to evaluate whether they are achieving the desired future condition envisioned for the area. Furthermore, the proposed actions will be subject to revision as monitoring or other new information becomes available. Therefore the following is recommended.

- **Establish a system to monitor conditions in the Confluence Area, and evaluate the successes of projects designed to control floods and enhance habitat.** Seasonal surveys of fish and wildlife and bank erosion are encouraged, and a general review of these guidelines every five years or as changing conditions warrant, is appropriate.

## 7) The Role of Government Agencies

Local, state and federal agencies contribute to the achievement of the principles outlined in these guidelines. The ongoing partnership between Confluence Area landowners, the McKenzie Watershed Council, and state and federal agencies, has great potential to provide an innovative approach to collaborative natural resource problem solving. These agencies have an interest in improving interagency data collection and review, enhancing communication and collaboration, and in reducing duplication of effort to develop and implement a land use, flood control, and habitat enhancement plan that adheres with the spirit of the Oregon Plan for Salmon and Watersheds.

It is in the mutual interest of all government agencies to:

- **Encourage a working relationship that is mutually respectful, acknowledges and values commonalities and differences, builds trust, and reflects a willingness to work collaboratively with all partners.**
- **Facilitate understanding about the values, needs and desires of all constituents associated with future planning and implementation efforts.**
- **Support a learning environment where new science-based information is integrated into the existing economic and environmental circumstances.**
- **Recognize that the authorities and responsibilities of each of the agencies are different and that specific laws and regulations guide each.**
- **Provide adequate staff resources for project meetings and other communication, work product review, and other activities associated with the project.**
- **Support coordinated data collection and analysis.**

## **Conclusion**

The McKenzie watershed supports a broad range of natural and human activity. Forests and farms, cities and towns, mines and hydroelectric facilities, boaters and anglers, and fish and wildlife all depend upon the dynamic functions of the watershed. As in many other parts of the northwestern United States and across the nation, people are trying to find a way to satisfy the myriad demands placed on our land and water resources that have been all but taken for granted.

The location where the McKenzie River joins the Willamette River epitomizes many of the potentially conflicting uses and interests that characterize the reliance and impact of society on natural resources. Human activity has had both deliberate and unintended consequences on the environment of the confluence, and a growing population will continue to create pressure to both preserve and develop the resources that are found there.

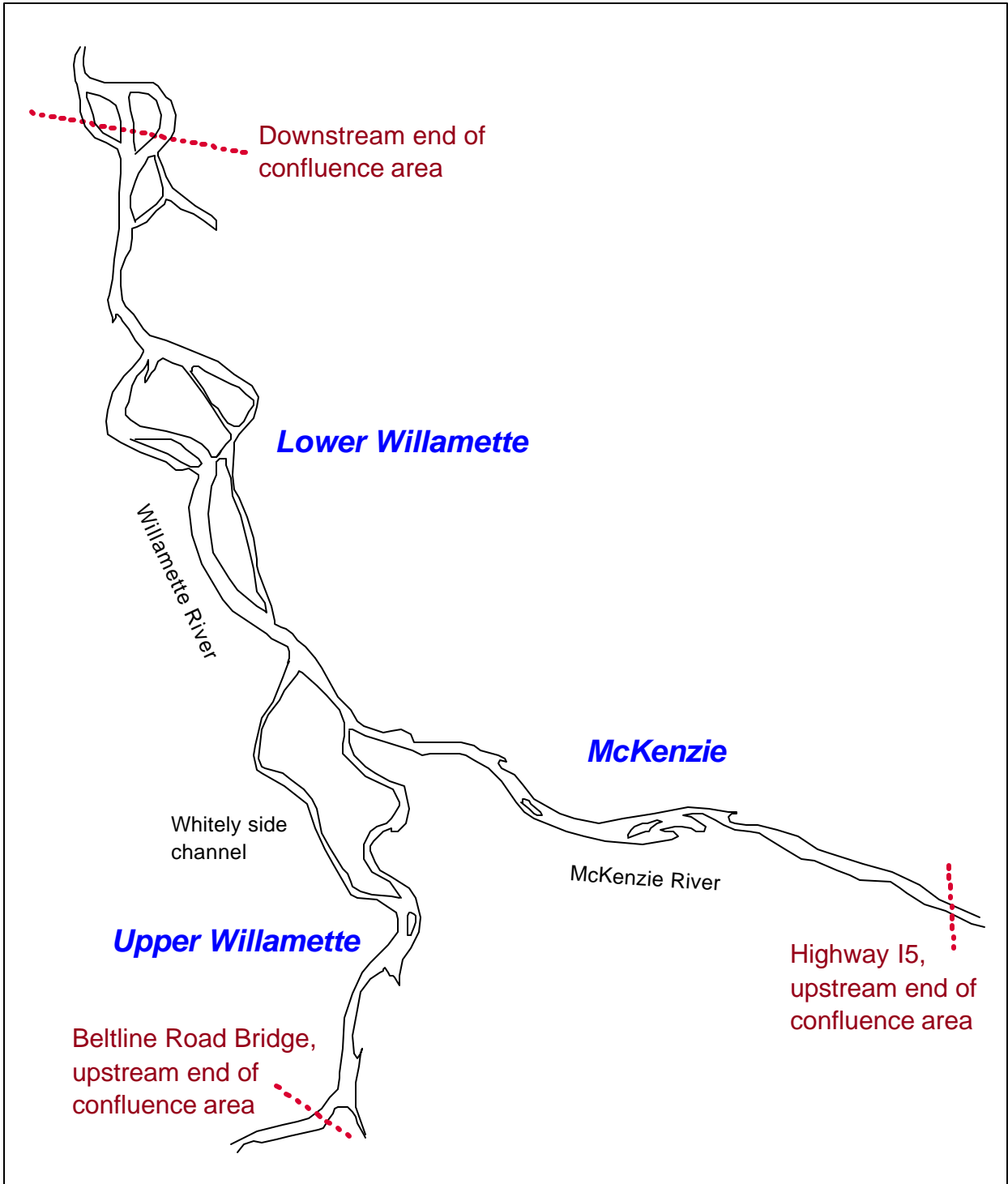
The guidelines contained in this document are an attempt to direct current and future human activity in a manner that recognizes and accommodates the requisite demands of the community and sustainment of the natural environment. By evaluating proposed land use, flood control and habitat enhancement projects within the framework of these guidelines, results that are mutually beneficial to private, public and natural interests can be achieved. A number of those possibilities are identified for both the short and long terms.

(See Attachments F and G: Maps of Short- and Long-Term Habitat Improvement Possibilities.)

**Figures**

- A. Confluence Planning Area
- B. Air Photo of the Confluence Area
- C. Map of Land Use Plan Designations
- D. Map of Revetment and Bank Erosion Inventory
- E. Map of Vegetation / Habitat Types
- F. Map of Proposed Short Term Habitat Enhancement Actions
- G. Map of Short- and Long-Term Habitat Enhancement Opportunities

Figure A: Confluence Planning Area



*Figure B: Air Photo of the Confluence Area*

*Figure C: Map of Land Use Plan Designations*

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*Figure E: Map of Vegetation / Habitat Types*

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*Figure G: Map of Proposed Short- and Long-Term Habitat Enhancement Opportunities*

## **Appendix A: Oregon Plan Prescription**

Prescription:

*Seek the truth, learn, and adapt*

*Be humble*

*Start by obeying the law and living up to our commitments*

*Then, act voluntarily – the law may not be enough*

*Respect people – respect nature*

*Be patient*

*Build partnerships, make friends, and strengthen community*

*Strive to let rivers be rivers, and un-tame – a little – our watersheds*

*Share information – share the power to make decisions – share the responsibility to act*

*Consider our children's needs – salmon and human*

*Never give up hope*

*From: Year 2000 Update on the Oregon Plan for Salmon and Watersheds*

## **Appendix B: Project Participants**

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