RECLAMATION
Managing Water in the West

Site Management Plan
Oxbow Property, Umatilla River
Hermiston, OR

U.S. Department of the Interior
Bureau of Reclamation
Pacific Northwest Region
Lower Columbia Area Office

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MISSION STATEMENTS

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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1.1 BACKGROUND

The Bureau of Reclamation (Reclamation) purchased the Oxbow Property in 2000 under provisions of the Umatilla Basin Project Act of 1988 for mitigating losses to anadromous fishery resources and continuing water service to the water Districts. The 222-acre parcel with associated water rights for 932 acre-feet, is located on the Umatilla River in Hermiston, Oregon. It extends 1.5 river miles along the east bank from RM 6.6 to RM 8.1 (Figure 1).

Much interest has been expressed in this property and several entities have posed plans and ideas to Reclamation. Before Reclamation can make a decision on the future management of the property, it must complete a guiding management plan and National Environmental Policy Act (NEPA) compliance. The management plan under development will not be prescriptive, rather it will be a guiding document for incremental progress toward benefiting fisheries and other natural resources. As funding permits, data collection efforts will guide and clarify suggested future projects. An adaptive management approach will ensure data and information will be incorporated into future efforts.

Reclamation is seeking a managing partner for the Oxbow property who will assist Reclamation in meeting the provisions of the Umatilla Basin Act. In this document the term "managing partner" refers specifically to an organization that has a Memorandum of Agreement or other similar legal agreement with Reclamation to conduct day-to-day operations and perform site management according to the terms of the agreement. Reclamation would remain responsible for all its legal obligations whether performed by Reclamation staff or a managing partner. When a managing partner is not another federal agency Reclamation has the authority to cost-share for recreational improvements, resource management plans, and habitat improvement projects. Reclamation has inquired with local agencies but as yet none have expressed an interest in becoming a managing partner. As this plan will describe, Reclamation is also seeking other partnerships with local organizations with which to collaborate on natural resource enhancement and restoration projects and monitoring activities consistent with the goals of this plan. Where we can develop these mutual interest collaborations Reclamation will retain all operation and site management responsibilities utilizing this plan for guidance.

The Umatilla Basin Project Act (Act), Title II of Public Law 100-557 was enacted in 1988. The purchase of the Oxbow Property was part of a comprehensive anadromous fishery restoration program in the Umatilla Basin. This program implemented a series of water exchanges in which Columbia River water is pumped and delivered for use in the Umatilla Basin by irrigation districts in exchange for allowing natural Umatilla River flows to benefit both anadromous and resident salmonid fisheries. Section 209 of the Act established the Umatilla River Basin Water and Land Acquisition Program that authorized the Bureau of Reclamation to "acquire from willing parties land, water rights or interests therein for benefit of fishery resources consistent with the purpose of this

title," in accordance with applicable State law. The purchase of such land and water rights is to "provide for enhanced instream flows, flushing flows and other instream uses for anadromous fish in the Umatilla River and its tributaries (USBR 1999a).

Reclamation must manage the property in accordance with the Act that authorized the purchase of "lands, water rights, or interests therein acquired for the benefit of fishery resources." Any action that Reclamation takes or authorizes must be in the furtherance of this objective defined by the Act while at the same time meeting Reclamation's responsibilities under other applicable statutes, regulations, and Departmental and agency policies.

A restoration and management plan is necessary to unify the vision and goals for the site, coordinate present and future activities, and provide a framework with which to evaluate future requests for use of the site. The Oxbow Site Management Plan accomplishes the following purposes:

- Communicate Reclamation's objectives for the use and management of the property,
- Describe the existing condition of the site and current management activities,
- Describe Reclamation's proposed future site management. Consideration may be given to suggested habitat enhancement actions and other activities previously requested by other agencies, Tribes or organizations.
- Qualitatively describe the level of use and types of activities with which future requests can be evaluated for uniformity with the objectives for which the site was acquired.

2.1 RESOURCE OVERVIEW

The Umatilla River historically flowed over and through the current Oxbow property. The riparian vegetation along the upstream half of the property consists of a narrow strip of predominately native trees and shrubs. The riparian vegetation along the downstream half of the property consists of extensive stands of predominately Russian olive. The western portion of the property was built up over the years to protect from flooding and is now dry. This portion of the property remained dry during the floods of January 30, 1965 and February 10, 1996, while the rest of the property was inundated. The center section is crossed by remnant river channels that run southwest to northeast. These channels contain water which appear to be spring fed. This wetland area may also be supplemented by irrigation drain water and supports plants culturally important to CTUIR. The eastern section of the Oxbow property is a mix of pastureland and dense stands of mature Russian olive. The north-south running South Hermiston Drain is also located in the eastern section of the property. The far eastern side is elevated above the floodplain and is bordered by a residential community.

The property is composed of 3 parcels. The Shockman parcel is 54.21acres on the upstream third of the property; the 70 acre Zinter parcel is located in the center and the Gass parcel is 97.68 on the downstream third. While this property is referred to now as the "Oxbow property"; those individuals long familiar with the area still refer to parcels from the original landowners.

2.1.1 Climate

The Rocky Mountains partly shield the Umatilla Basin from strong arctic winds resulting in cold but not severe winters. The Cascade Range constrains summer winds from over the Pacific Ocean to the west, producing hot days, and fairly cool nights. Annual average temperatures in the lower Basin range from 50 to 55^{o} F. In winter the average temperature at Hermiston is 35^{o} F. The average Hermiston summer temperature is 71^{o} F (USDA 1988).

Annual precipitation is scant in summer except in mountainous areas. Total annual precipitation is 9 inches at Hermiston, up to 50 inches in the headwaters. Of this, 30 percent usually falls in April through September (USDA, 1988). Average seasonal snowfall is 11 inches at Hermiston ranging up to 146 inches in the headwaters. The most dramatic runoff events are associated with rain on frozen ground in the upper- and mid-Basin.

2.1.2 Topography and Geology

The Oxbow property lies in the flat alluvial plain that extends from Echo through Hermiston and on to the Columbia River. In the wider Umatilla Basin, the topography is mostly gently sloping. Broad plateaus, steppes and rolling hills are incised by the narrow and steep-walled valleys of the Umatilla River drainage.

The Miocene Columbia River Basalt group (14-17 million years old) comprises the dominant bedrock throughout the Umatilla Basin. The major structural features of the Basin created by bending and faulting are the Blue Mountains of the upper Basin and the northeast tending arch traversed by the Umatilla River mid Basin between Pendleton and Echo. These resistant highlands act as hydraulic controls that constrain deepening and widening of valleys and are slow to transmit groundwater recharge. A relatively thin layer of sedimentary deposits covers the basalt in much of the Basin. Alluvium deposited by modern rivers is common in valleys and floodplains. Coarse Pleistocene glacial-riverine deposits occur in the lower Basin below the town of Echo, related to the Pleistocene Missoula floods. Pleistocene and Holocene glacial and wind-blown silt and fine sand blanket much of the Basin often to a depth of 20 feet, such as in the Wildhorse Creek watershed, thinning southward (ODEQ 2001). Wildhorse Creek is a major source of sediment to the Umatilla River.

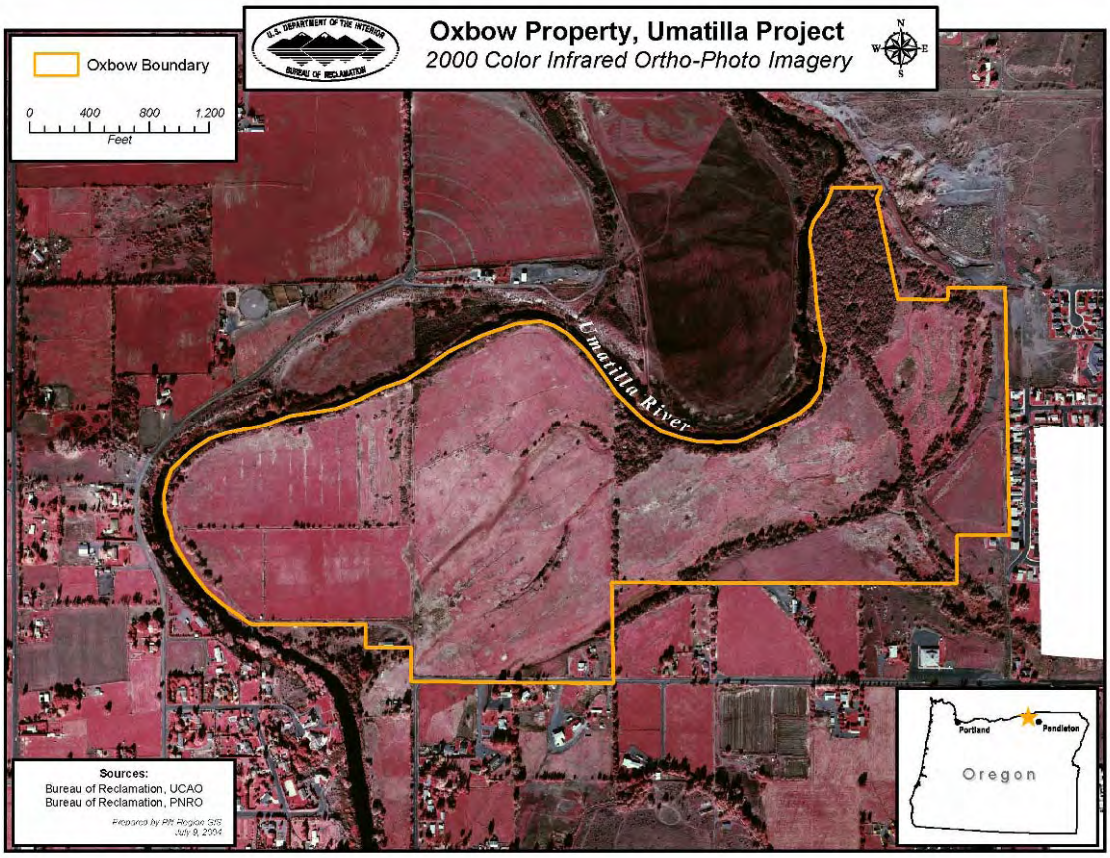

Figure 1. Map of the Oxbow Property.

2.1.3 Soils

There are 75 different soil types that have been mapped in Umatilla County. The lower elevation soils of the Columbia Basin formed in old alluvial deposits that have been reworked by wind. Their elevation ranges from 250 feet to approximately 1,500 feet. The soils of the Columbia Plateau are on hills, in gently sloping areas on terraces and on steep hill slopes that are mantled by windblown silt. These soils range in elevation from 500 to 3,100 feet (ODEQ 2001). Figure 2 is a soils map of the Oxbow property. Most of the soils present are classified as "xerofluvents". These are entisols (soils with recent origin) with very young sediments from frequent flooding that are saturated with water within 1.5 m of the surface during any period during most years.

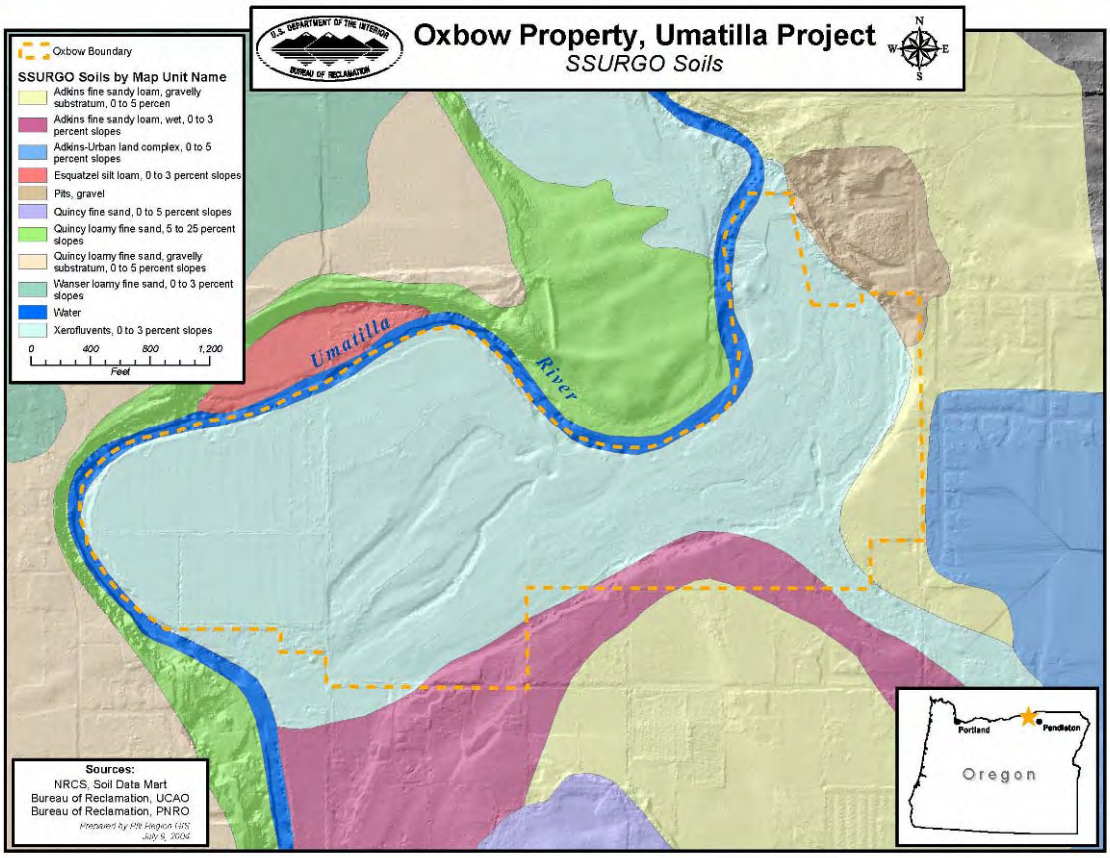

Figure 2. Soils on the Oxbow Property.

2.1.4 Water Resources

2.1.4.1 Hydrology and Water Resources

Stream flow in the Umatilla Basin is characterized by episodic hydrographs. High flow regularly occurs during rainstorms and melt conditions in winter and early spring, with peak flows usually occurring in April. Steep-sided canyons, relatively impervious basalt bedrock and diminished vegetation contribute to poor groundwater recharge and rapid runoff (CTUIR 1996). These conditions cause increased risk of flooding and a high sediment load in winter and early spring. The lowest flows, or baseflows, occur during summer and early fall with the lowest generally occurring in September. These low flows are due mostly to natural conditions, but are further worsened by water withdrawal from streams, floodplain modification and a loss of wetlands. Low flows contribute to the violation of temperature and other TMDL[1] standards, and underlie the disparity

[1] When ODEQ determines that water quality standards are not being met in a particular body of water, it calculates pollution load limits, known as Total Maximum Daily Loads (TMDLs) for each pollutant entering the water. TMDLs describe the amount of each pollutant a waterway can receive and still not violate water quality standards.

between water rights for irrigation and instream water rights for salmonid passage and rearing (NPPC 2004).

Figure 3 shows the hydrograph for the Umatilla River for 2005 and early 2006 for the gaging station downstream of the Oxbow Property near the City of Umatilla. While it generally represents conditions at Oxbow, it may not precisely show flow conditions that are influenced by inflows from Cold Springs Reservoir and potential withdrawals from Three Mile Dam at RM 3.2.

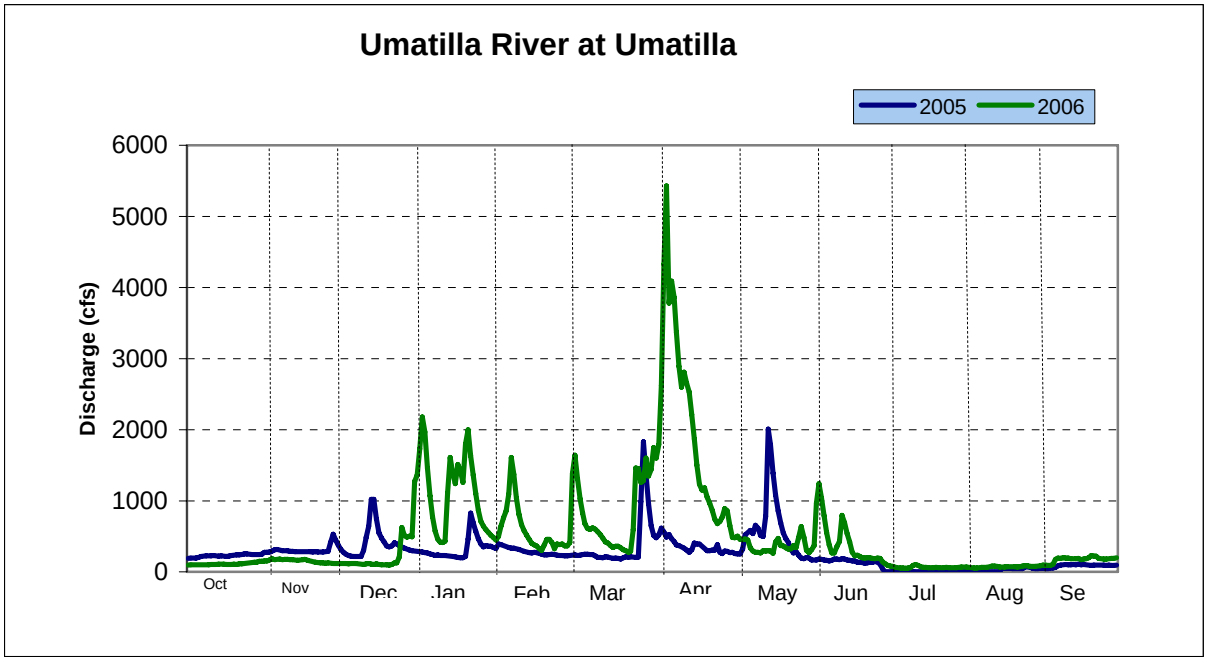

Figure 3. Hydrograph from the USGS gaging station at Umatilla, Oregon. The blue line is 2005 flow data and the green line represents 2006 data. (USGS 2007).

Several irrigation projects were completed in the early part of the 20th century which provided water for about 12,000 acres of arid sandy soils in the west part of Umatilla County (USDA 1988). Two major reservoirs store water in the Basin, McKay Reservoir, with a capacity of 73,800 af and Cold Springs Reservoir with a 50,000 af capacity. There are six major Bureau of Reclamation project irrigation diversions in the lower Basin. Irrigation acreage has expanded substantially since the early diversions. These projects resulted in flow insufficient for fish passage, often drying up the river completely in reaches below the town of Echo. Strategic releases from McKay Reservoir restore in-stream flow during irrigation diversion periods.

In the 1980s Reclamation conducted studies leading to the Umatilla Basin Project Act of 1988, which authorized a phased implementation approach to flow restoration. Phase I and II included construction of facilities and operations to improve stream flows for anadromous fish primarily through water exchange. Phase I of the project includes pumping 140 cfs from the Columbia River into the West Extension Irrigation District system to offset diversion of Umatilla River water. This has improved flows below the

Three Mile Dam (USBR 1998). Phase II similarly improves flow by pumping and conveyance exchanges 240 cfs Umatilla River for Columbia River water for Stanfield and Hermiston Irrigation Districts. The Stanfield Irrigation District historically diverted live flow and McKay Reservoir releases, which are now retained in-stream as needed to meet stream target flows for fish passage (USBR 1998). Phase II can offset diversion from the Umatilla River that would have occurred at and downstream from the Stanfield Dam at RM 32. Phase III feasibility study was initiated in 1997 to evaluate further potential for improving fish and salmon habitat through a water exchange with Westland Irrigation District (USBR 1999b). The Westland Main Canal diverts up to 220 cfs from the Umatilla River at approximately RM 28.

2.1.4.2 The Hyporheic Zone and Cold Water Resources

The Umatilla is an alluvial river. Ground and surface waters continuously circulate between the river channel and alluvial aquifer which underlies the river and floodplain (NPPC 2004). This bidirectional exchange creates a shallow groundwater flow network called the hyporheic zone. Since hyporheic flow circulates continuously, the potential for groundwater to influence stream temperature may be much higher in streams and rivers with substantial hyporheic flow (NPPC 2004). Hyporheic flow is driven by hydraulic gradients within the alluvial aquifer; underground, water flows only when hydraulic gradients are present and ground water always moves along these gradients. In alluvial aquifers, hydraulic gradients are created by interactions between channel geomorphology and river hydrology. The presence of geomorphic features such as pool-riffle sequences, meander bends, backwaters and side channels all create hydraulic gradients and therefore facilitate hyporheic flow.

It is likely that geomorphic complexity of a river channel as indicated by the frequency of pool-riffle sequences, meander bends, backwaters, plays an important role in regulating river temperature. This relatively novel idea has been the focus of a 3-year research effort by the CTUIR to test the hypothesis that the geomorphic structure of the Umatilla River controls the patterns of hyporheic flow within the river and therefore influences the river's temperature (NPPC 2004). Two major conclusions from this research are:

1. Like many rivers, the Umatilla becomes warmer as water flows from the headwaters downstream. However, areas where hydrologic modeling predicts high rates of hyporheic flux tend to be the same areas where the downstream warming trend is reduced or even reversed. Thus, high rates of hyporheic exchange are associated with cooler stream temperatures.

2. Channel engineering results in substantially simplified channel and floodplain morphology. Where major channel engineering projects have occurred, modeled rates of hyporheic exchange are noticeably reduced from similar areas where dredging and diking have not occurred. Thus, reduced hyporheic exchange associated with channel engineering provides a likely mechanism to explain the tendency for the river to warm rapidly as it flows through engineered reaches.

Understanding the role of the hyporheic zone in cooling river temperatures has broad implications for the Oxbow property. There are wetlands in the center section of the property, as well as several drains with flowing water. A cursory look at the outfall of these drains into the Umatilla River in November 2005 shows that water flows from the drains into the river. These drains are heavily vegetated, primarily with Russian olive, providing shade. It is likely that these flows are cooler than the river in summer and could be critical sources of cool water. It is very likely that these provide refugia from excessive temperatures for several lifestages of salmonids and other aquatic biota (Fig. 4). In addition to the presence of wetlands and shaded drains on the property, the geomorphology of the river through the Oxbow Property is likely to be conducive to the development of a substantial hyporheic zone in the river channel itself. There are several riffle-pool complexes present, as well as small backwaters (Fig. 5).

Figure 4. Dense vegetation surrounds one of the drain outfalls, providing shade as well as cover for rearing salmonids. There are also large rocks present which also provide cover.

2.1.4.2 Water Quality/Contaminants

The Umatilla River in the vicinity of the Oxbow Property is on the State's 303(d) list of impaired waters for the following standards: temperature, turbidity, ammonia (North South Hermiston Drain), bacteria and flow modification. Manganese, dissolved oxygen and iron were added to the list in 2002.

Figure 5. Complex geomorphology present in the Umatilla River in the Oxbow Property may facilitate development of an active hyporheic zone, which in turn may lead to cool water flows.

Temperature. Temperature is the most widespread water quality issue identified in the Umatilla Basin (ODEQ 2001). Along with increased flow and reduced erosion, temperature reduction is the most important improvement related to the most sensitive beneficial use – salmon and trout. Management practices that improve temperature tend to improve all other stream characteristics, to improve habitat and to reduce other pollutants. Strong emphasis is placed on the effective shade goal[2]. In order to meet this goal, vegetation must be taller and close to the bank and the channel must be narrower. Narrower channels are a normal result of healthy riparian vegetation, floodplain interaction and stable (often sinuous) channel form. The resultant bank stability is expected to achieve the TMDL streambank erosion reduction target. For temperature, the goals above can all be interpreted as increased vegetation and more space for natural stream process.

The incipient lethal temperature limit for salmonids is 70° F to 77° F. These temperatures cause the death of cold water fish species during exposure times lasting a few hours to a day. The sub-lethal temperature limit ranges from 64° F to 74° F. This results in conditions that cause decreased metabolic energy for feeding, growth or reproductive behavior, increases exposure to pathogens, decreases food supply and increases competition from warm water tolerant species. Temperatures in the Umatilla River regularly exceed the incipient lethal temperatures for salmonids. Three main causes of elevated summertime stream temperatures were identified (ODEQ 2001):

[2] The effective shade goal is expressed as the percent reduction in potential solar radiation loading delivered to the water surface (ODEQ 2001).

1. Near stream vegetation disturbance/removal reduces stream surface shading via decreased riparian vegetation height, width and /or density, thus increasing the amount of solar radiation reaching the stream surface. Riparian vegetation also plays an important role in shaping the channel morphology, resisting erosive high flows and maintaining floodplain roughness (decreases or lessens flooding).

2. Channel widening (increased width to depth ratios) increases the stream surface area exposed to solar radiation. In developing TMDLs, ODEQ developed a measure called the Near-Stream Disturbance Zone (NSDZ). The channel occupied by the stream is bounded by two banks with vegetation growing on each bank. The NSDZ is defined as the distance between these two walls of vegetation. Comparing two channels of equal width, a larger NSDZ allows more solar energy to reach the water than does a narrow NSDZ. Widening of this NSDZ decreases potential shading effectiveness of shade-producing near-stream vegetation. ODEQ (2001) measured this using digital orthophoto quads and found that the percentage of effective shade gradually decreased from the headwaters near RM 90 (about 60%) to roughly 20% in the lower 15 miles of the Umatilla River.

3. Reduced summer base flow results from stream withdrawals.

While there are two relatively wide areas of dense riparian vegetation along the Umatilla River in the Oxbow Property, some of the riparian corridor is very narrow because of clearing by the previous landowners. This area is beginning to recover (Figs. 6 & 7). Several tree planting efforts have been made, but have largely failed. Attempts were made to irrigate the newly planted trees, but the well providing irrigation water dried up in mid summer and most of the trees perished.

An overview of the Oxbow property taken from the west side of the river (Fig. 7) shows a well developed, but relatively narrow riparian stand along the upstream half of the property.

Sediment. Excessive suspended material and sedimentation threatens the survival of fish and other aquatic organisms. The effects of turbidity and suspended solids include: respiratory and feeding impairment, social disorganization. Excessive fine sedimentation in spawning grounds limits available oxygen and removal of metabolic wastes near incubating eggs and physically renders spawning sites less suitable (ODEQ 2001). Salmonid spawning is generally the most sensitive use relevant to sediment, and has been identified as a beneficial use from the Umatilla River at Mission (RM 61.5) downstream to the mouth from November 1 through April 30 and in the middle and upper Basin August 1 through June 30.

TMDLs and the Water Quality Management Plan Recommendations. Non-point source improvements that reduce temperature generally also reduce erosion. In the 2001 Umatilla River Basin Total Maximum Daily Load and Water Quality Management Plan ,

Figure 6. There are several relatively young, narrow stands of vegetation such as this sumac-red osier dogwood stand that lines part of the Umatilla River in the Oxbow property. While this young vegetation stabilizes the banks, it is inadequate to shade the river channel.

ODEQ (2001) calls for restoration/protection of riparian areas. This in turn will reduce stream bank erosion by increasing stream bank stability via rooting strength and near-stream roughness. Reducing the width of the Near Stream Disturbance Zone will allow passive stream narrowing via decreased stream bank erosion and increased naturally occurring stream bank building processes.

An assessment of Basin wetlands (mostly on the Umatilla River mainstem) by CTUIR (1997) and the EPA (Kagen et al. 2000) indicates a large loss of wetland acreage due to levee and dike construction for purposes of urban, residential area and farmland development. Additional losses are attributed to railroad and Interstate 84 construction. Removal of beaver from most of the watershed has also had a negative impact to wetland areas. Wetlands provide food and habitat for fish and wildlife; flood protection; shoreline erosion control; natural products for human use; water quality improvement and opportunities for recreation, education, research and cultural benefits. Wetlands often function like natural tubs or sponges, storing water (floodwater, or surface water that collects in isolated depressions) and slowly releasing it. Trees and other wetland vegetation help slow floodwaters. The combined action of storage and slowing can lower flood heights and reduce erosion.

Figure 7. This view from the west bank of the Umatilla River across to the Oxbow property shows a relatively narrow but well developed riparian area in the upstream half of the property.

The Umatilla River Basin Total Maximum Daily Load and Water Quality Management Plan (ODEQ 2001) recommends that existing wetlands be maintained in a functional status wherever possible. Historic or degraded wetlands and sinuosity should be restored wherever feasible.

2.1.5 Vegetation

Plant communities in the Oxbow Property have been modified from the original native composition by farming, construction of irrigation projects, recreation, livestock grazing and other human uses.

2.1.5.1 Riparian and Wetland Habitat Along the Umatilla River.

The river bank along the upstream ¾ mile of the Umatilla River on the Oxbow property consists of a narrow strip of riparian vegetation and native trees. The downstream ¾ mile of river bank is lined with a very dense, mature stand of predominantly Russian olive (Fig. 8).

2.1.5.2 Pastureland

There are extensive pasture areas throughout the Oxbow property. Grass and forbs are recovering from intensive grazing conducted for the past several decades. Grazing was eliminated in 2000. (Fig.9).

Figure 8. Dense overhanging vegetation along at least ¾ mile of the Oxbow property provides shading, cover for salmonids and other aquatic organisms as well as input of large woody debris.

Figure 9. Much of the Oxbow property consists of pasture land. Grazing was eliminated in 2000.

2.1.5.3 Russian Olive

Dense stands of predominantly Russian olive occur in the eastern third of the property and along several drains throughout the property (Fig. 10). This invasive species has eliminated native species and reduced overall habitat value. However Russian olive provides shade along the drains and river thus helping to maintain cooler water temperatures. It also provides habitat for a wide variety of species.

Figure 10. Drains on the Oxbow property are lined with dense stands of trees and brush.

2.1.5.4 Wetlands

A wetland area exists in the center of the property in the remnants of the old river channel that runs diagonally through the area. Efforts were made by the former property owner to eliminate the wetland and prevent flooding by filling in land on the upstream side of the property. (Fig 11).

2.1.5.5 Basin-wide Condition and Importance of Riparian Vegetation

Most of the riparian vegetation in the upper Basin is composed of narrow bands of hardwood and conifer species, while galleries of large mature cottonwoods exist in some areas of CTUIR land as well as in a few areas long the mainstem Umatilla River below Pendleton. Lower mainstem and tributary reaches have riparian vegetation types primarily composed of shrubs and grasses, with some scattered hardwood trees (NPPC

2004). In some cases where crop cultivation extends to the stream banks or where grazing pressure is high, woody or shade-producing riparian vegetation is sparse. Much of the lower mainstem is diked, and trees are actively prevented from growing on the dikes.

Figure 11. Wetland area in center portion of the Oxbow Property, November 2005.

Riparian vegetation on the mainstem Umatilla River and many tributaries is in poor condition, with approximately 70% of 422 miles inventoried identified as needing riparian improvements (NPPC 2004). Losses of riparian vegetation are particularly high in the lower basin; one study estimated those losses at greater than 95% as compared to pre-settlement conditions (c. 1850) (Kagan et al. 2000).

Riparian areas contain the most biologically diverse habitats in the basin because of their variety of structural features (including live and dead vegetation) and proximity to water. This combination of features provides a wide array of habitats that support more species than any other land cover type. Common deciduous trees and shrubs in riparian areas include cottonwood, alder, willow, red-osier dogwood, common chokecherry and black hawthorn (USFS and BLM 2000; Wooster and DeBano 2003).

Riparian areas can greatly decrease water temperatures by shading streams and enhancing the exchange of surface water and groundwater (NRC 2002). Riparian areas decrease water pollutants and sediment input by filtering overland flow that includes runoff from agricultural and urban lands that can be high in sediment and certain types of pollutants (Peterjohn and Correll 1984). Riparian areas also add greatly to the habitat complexity of stream reaches because they are the source of large woody debris (NRC 2002). Large woody debris adds to the habitat complexity of stream reaches by directly providing

cover for fish and other aquatic organisms and indirectly by influencing the channel width, stabilizing gravel bars, and creating pools (Bilby and Bisson 1998).

2.1.5.6 Exotic Species

Non-native or invasive plants are widespread in the Umatilla Basin as elsewhere in the state (NPPC 2004). Several species are particularly problematic in the Umatilla Basin. Knapweed and yellow starthistle, natives of the Mediterranean, are rapidly increasing the basin because of the similarities in climate between the two locations (Quigley and Arbelbide 1997). Both are widespread and rapidly invade areas that have been disturbed to replace native plant species. Other exotic species of serious concern include rush skeletonweed, spikeweed, medusahead and perennial pepperweed. Russian olive is a major problem in wet meadows and riparian areas to which it has escaped from residential plantings. Other widespread exotic species identified include desert false indigo, reed canarygrass, Himalayan blackberry and ripgut brome (Adamus et al. 2002).

Exotic weed invasions not only affect native plant species, but can also impact terrestrial wildlife in the Umatilla Basin. Loss of native plant cover can reduce the suitability of habitat available to wildlife (Quigley and Arbelbide 1997, Dobler et al. 1996). Exotic weeds may also affect aquatic food webs of streams. For example leaf litter derived from exotic plants is less palatable to aquatic invertebrate shredders than leaf litter derived from native plants (Schultz and Walker 1997).

2.1.6 Anadromous Fish

There are four species of anadromous fish in the Umatilla River: fall chinook, spring chinook, coho and the Middle Columbia River summer steelhead which is a federally listed threatened species. Table 1 summarizes the timing of life stages and highlights those life stages that are present on the Oxbow property. Table 2 summarizes the population status and restoration measures for all four species.

2.1.6.1 Key Anadromous Fish Habitats Present on the Oxbow Property

The Umatilla River in the Oxbow Property has several high quality habitat features that need to be recognized and protected.

Spawning Habitat. A November 29, 2005 cursory survey of upper ¾ mile reach of the river in the Oxbow property indicated the presence of at least 50 newly constructed redds, several spawning pairs of salmon and 7 carcasses of spawned out coho. Nearly every suitable area of clean, appropriately sized gravel had been utilized. These areas were located at the tailouts of several pools located in the upstream half of the property[3] While both fall chinook and coho may be present in this reach of the river in November, it was

[3] Note that the lower ¾ mile of river was not examined in November 2005 due to deep water and extremely brushy banks. Boat surveys should be completed as soon as possible during the planning process.

not possible to determine which species had made the redds. The carcasses present in the area were found to be coho. Figure 12 shows one of the areas numerous redds were observed and Figure 13 shows one of the spawned out carcasses found in this reach of river November 29, 2005.

Anadromous Fish Lifecycle Stages Occurring in the Umatilla River in the Oxbow Property					
Species	**Adult Migration**	**Spawning**	**Incubation**	**Rearing**	**Juvenile Outmigration**
Fall Chinook	Aug. thru Dec.	Early Nov. to mid-Dec.	Dec. to early April	April - May	May, peaks in late May and early July, complete by mid July
Coho	Mid-Sept. thru mid-Dec.	Late Oct. thru Dec., a few in Jan.	October – April	Rear 1 summer and 1 winter	April-May
Spring Chinook	Late March, peaks in May, mostly complete by June 30	Not present.	Not present.	Not present.	Early March, peaks in mid to late April, mostly complete by May 27
Summer Steelhead	Aug., peaks in March mostly complete May 1	Not present.	Not present.	Not present.	Begins in Oct., peaks early April to late May

Table 1. Timing of anadromous fish lifecycle stages in the Umatilla River. Yellow highlight shows life stages present on the Oxbow property.

Figure 12. Spawning area in the Umatilla River in the Oxbow property. Riffle in the center of photo is made from a pair of spawning salmon, November 29, 2005.

Rearing Habitat. Riparian vegetation through the Oxbow property is in general well developed and the banks of the river are stable. In many areas grass overhangs low velocity river edges, providing ideal rearing habitat for salmon and steelhead juveniles. Figure 12 provides an example of such habitat, as does Figure 3 on page 9. Overhanging trees and brush also provide excellent cover for juveniles as well as substrate for organisms that serve as food sources (Fig. 14).

Adult migratory habitat and holding cover. The Umatilla River through the Oxbow property contains a variety of habitats used by adult anadromous fish during their upstream spawning migration. (Fig. 16).

Status of Anadromous Fish in the Umatilla River				
Species	Extirpation Date & Causes	Restoration Measures Implemented & Current Limiting Factors	Current Population Status (Adults)	Distribution in the Umatilla River Basin
Fall Chinook	Extirpated in early 1900s due to habitat destruction, high water temperatures, reduced flows and the construction of Three Mile Falls Dam in 1914 which blocked passage during low flow periods.	Hatchery re-introductions, but limited by high sediment levels, high scouring flows and high summer water temperatures. Also cold flow releases from McKay reservoir may create thermal barrier.	Ranged from 91 in 1988 to 1,146 in 2001, average 493.	Mainstem mostly below RM 50.5
Coho	Same as fall chinook.	Hatchery re-introductions.	Ranged from 356 in 1992 to 22,792 in 2001, average 3,669.	Entire mainstem and major tributaries
Spring Chinook	Same as fall chinook.	Hatchery re-introductions, but still threatened by high water temperatures in mainstem below RM 85.	ranged from 13 in 1988 and 5,061 in 2002, average 1,968.	N. FK. Umatilla & Umatilla mainstem.
Summer Steelhead	Not extirpated, but major declines due to channelization and loss of in-stream habitat, decreased instream flows, increased water temperatures, increased sediment. Listed as Threatened in 1988.	Good marine conditions may have resulted in high returns in 2001-2002.	Ranged from 1,111 in 1991, to 5,520 in 2002, average 2,412.	Adults & juveniles use entire Umatilla River main-stem as migratory corridor. Spawn in upper basin tributaries.

Table 2. Summary of status and distribution of Umatilla River anadromous fish.

Priority Habitat for Protection and Restoration. The Northwest Power Planning Council in its 2004 Umatilla/Willow Subbasin Plan identified priority geographic areas of the Umatilla River for habitat protection and/or restoration using the Ecosystem Diagnostic & Treatment (EDT) modeling methodology. The Oxbow property lies within one of the priority geographic areas from Three Mile Dam to Butter Creek for the following species:

Steelhead Habitat Protection
Spring Chinook Habitat Restoration
Spring Chinook Habitat Protection
Fall Chinook Habitat Restoration

Figure 13. Spawned out carcass of a coho salmon observed in the Oxbow property, November 29, 2005.

Figure 14. Overhanging grass adjacent to relatively shallow, low velocity flows, found on the upstream half of the Oxbow property, provides excellent rearing habitat for anadromous fish.

Figure 15. Overhanging trees and brush provide excellent habitat for juvenile fish, as well as shade to cool the water.

Figure 16. Several deep pools on the Oxbow Property provide excellent holding cover for migrating adult salmon and steelhead.

The EPA (Kagen et al. 2000) developed the Lower Umatilla Basin Biodiversity Conservation Strategy. Nine sites in the Lower Umatilla Basin were identified which support critical elements of diversity in the basin. The Oxbow property is encompassed

within the "Umatilla River Corridor" site which extends from the Columbia River upstream to the Pendleton city limits. This site is critical for both fish and wildlife in the basin because it contains the only significant riparian remnants. This site is badly fragmented and provides only a fraction of the fish and wildlife habitat potential. It consists mostly of private and Tribal lands. EPA indicates in its conservation strategy that acquisition and restoration will be critical to connect the riparian remnants to form large blocks of habitat. The acquisition of the Oxbow property is one significant step toward fulfilling the conservation strategy and as such should be managed to protect and restore its resource values.

2.1.7 Wildlife

Wildlife is abundant on the 222 acre Oxbow property. Deer, fox, coyote, pheasant, quail and waterfowl have been observed on site visits of September 2004 and November 2005. Aquatic habitat and wildlife surveys were conducted in August 2007. Some habitat improvements have been conducted on the Oxbow property. The Boy Scouts constructed wood duck nest boxes, such as that shown in Figure 17. At least 20 wood ducks were observed to be using the drains in dense trees and brush in November 29, 2005 (Fig. 18).

There are productive wildlife habitats present in the Oxbow property. The juxtaposition of tree and brush covered drains next to grasslands provides excellent edge habitat (Fig. 19). Also the well-developed riparian habitat along the river corridor provides excellent habitat. Beavers were observed in November 2005 in the Umatilla River in the Oxbow property (Fig. 20).

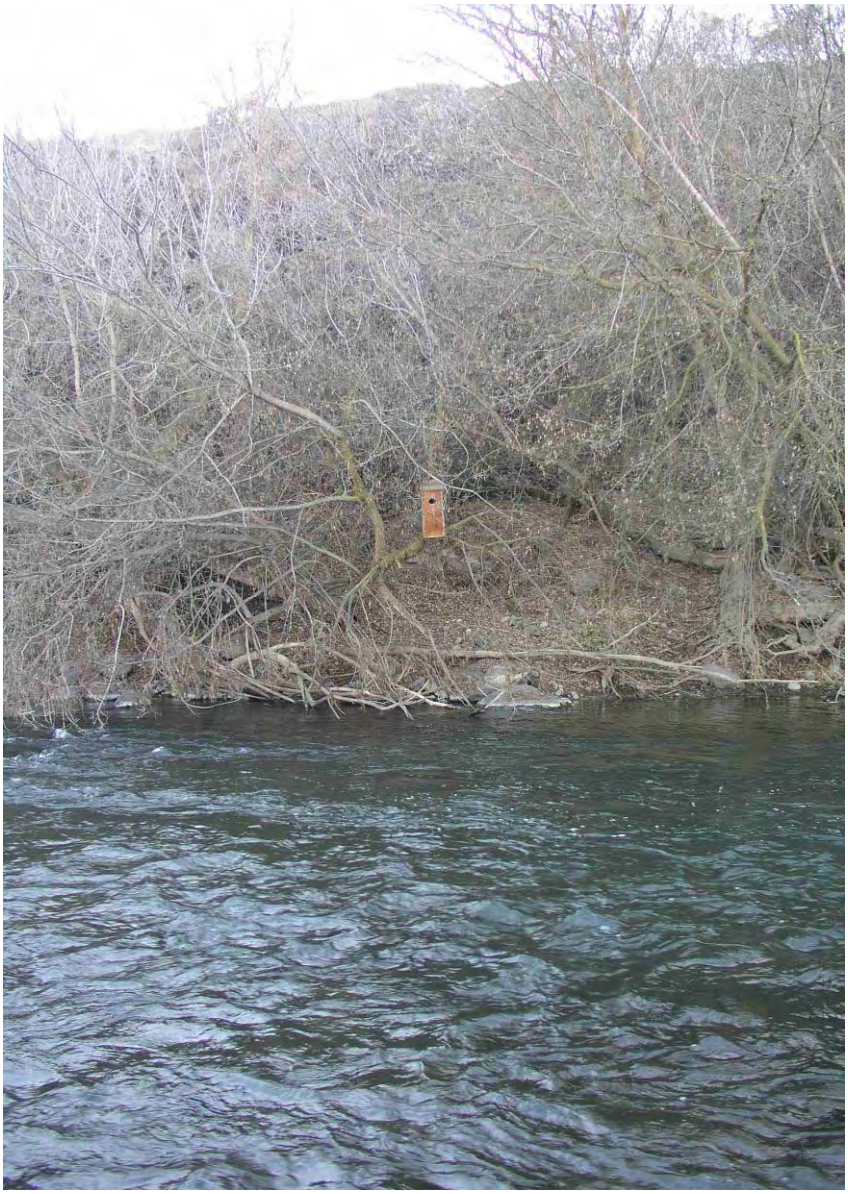

Figure 17. Boy scouts installed many wood duck boxes in and adjacent to the Oxbow property.

Figure 18. Dense vegetation along drains in the property provide ideal habitat for waterfowl. Numerous wood ducks were observed wintering in this drain area November 2005.

Figure 19. A mix of open grassland with stands of trees, such as this stand of trees growing along the South Hermiston Drain, provides excellent wildlife habitat.

Figure 20. Evidence of beaver on the Oxbow Property. Beavers are considered to be an excellent indicator of riparian health and function (ODEQ 2001).

2.1.8 Cultural and Historic Resources

The following is general information regarding the prehistory and history of the Hermiston area. Prehistoric information is largely adapted from Miller (2003); for a thorough analysis of the area ethnography, see Walker (1998). Historic information is largely abstracted from information complied by Ingle (2002).

2.1.8.1. Ethnographic Information and Historic Overview

The Oxbow property lies within the Plateau culture area. Walker (1998) identifies the *Weyíiletpuu* (Cayuse), *Imatalamláma* (Umatilla), and *Walúulapam* (Walla Walla) as having lived throughout the general area encompassing the Oxbow property. He provides ethnographic maps produced by Murdock, Driver and Massey, and Kroeber, which indicate that the Oxbow area was primarily used by the *Imatalamláma*. Ray (1938) also indicates that the *Imatalamláma* utilized the project area.

The *Weyíiletpuu*, *Imatalamláma*, and *Walúulapam* are described in the ethnographic literature as people who fished, gathered roots, berries, medicines, and other flora, and hunted on a seasonal round basis (see Ray 1938; Suphan 1974a, 1974b; Swindell 1942). Winter villages for those groups were located along the Columbia River and several of its

tributaries, including in the general study area the Umatilla River, Butter Creek, and McKay Creek. In the summer, the tribes headed up into the mountains to hunt, fish, and gather roots, berries, and other plants.

Beginning in the 1840s, numerous individuals traveled along the Oregon Trail over the Blue Mountains, into the Umatilla River Valley, and along the Umatilla and Columbia rivers on their way to the Willamette Valley. Some stopped and settled in the area rather than continuing westward. Incursion of the travelers and settlers into tribal lands caused conflicts. U.S. Government policy of the time was to negotiate treaties to establish reservations, in the belief that a reservation system was the best way to protect the interests of both Indians and non-Indians. Therefore, in June 1855 Isaac Stevens, Territorial Governor for Washington Territory, and Joel Palmer, Superintendent of Indian Affairs for Oregon Territory, negotiated treaties with tribes of the interior basin. On June 9, representatives of the *Weyíiletpuu*, *Imatalamláma*, and *Walúulapam* signed a treaty with the United States ceding 6,400,000 acres of land, and establishing a 512,000 acre reservation. The treaty specifically retained the rights to take fish "…at all other usual and accustomed stations in common with citizens of the United States, and of erecting suitable buildings for curing the same; the privilege of hunting, gathering roots and berries and pasturing their stock on unclaimed lands in common with citizens, is also secured to them." Thereafter, ceded lands were open for settlement. The Oxbow property is within the ceded lands of the *Weyíiletpuu*, *Imatalamláma*, and *Walúulapam.* Today, these three tribes are known as the Confederated Tribes of the Umatilla Indian Reservation (CTUIR).

Oregon became a State in 1859. In the study area, towns were established and most lands along streams were under agriculture well before the turn of the 20th century. Settlements and towns were established throughout the area. Historical records indicate that an overnight stage stop called Six Mile House was located in the Hermiston area along the wagon road between Umatilla and Boise to serve travelers and freighters arriving at Umatilla Landing (Oman 1998:15). By the 1900s Six Mile House no longer existed (Ingle 2002:10), but evidence of the location was visible decades later. A September 17, 1936, article in the Hermiston Herald states:

> When H. G. Newport began leveling his homestead land in the rear of his house where H.E. Hanby now lives, he found an old well curbed with lava rocks. Nearby was an old ox bow, and any number of ox and mule shoes. This was the site of the old Six Mile house. It was a hotel with a bar and brass rail; a feed barn where freighters and travelers often spent the night during the sixties and seventies.

Lands immediately along the Umatilla River were settled early, since farmers could directly divert water from the river to irrigate their fields or pasture. However, much of the land in the Hermiston vicinity could not be irrigated directly from the river, and so in the early 20th Century various companies began to build irrigation systems to serve lands above the floodplain. One of these enterprises was the Hinkle Ditch Company, which in

1903 began diverting water from the Umatilla River one-half mile above Echo to serve lands south and east of Hermiston. In time, the Hinkle Ditch Company was purchased by Western Land & Irrigation Company which improved the system by widening and extending the main and lateral canals.

Another enterprise, the Maxwell Land and Irrigation Company, established in 1903-1904 by J. F. McNaught, undertook development of a town that would become Hermiston and construction of an irrigation canal, the Maxwell Canal. Ingle (2002) cites a January 3, 1907 article in the East Oregonian that appears to have been written by McNaught, in which the author states:

> When I came to this place, three years ago this month, there was absolutely nothing here, save a 'passing track', a sign post and a name. That name was Maxwell. I undertook the reclamation of the Maxwell and Cold Springs valleys and organized a company for that purpose.

Ingle further discusses McNaught's activities and the development of Hermiston. NcNaught began to develop the town site in August 1904 by clearing the property of sagebrush and constructing office buildings and residences on the west side of the railroad tracks. According to Esther (Furnas) Parks, whose family came to the area in 1903, there were already three small buildings at the location west of the railroad track. McNaught originally thought to retain the name of Maxwell for the town, but there was already a Maxwell elsewhere in the state. He then settled on Hermiston for the town's name because one of the trustees of the Maxwell Land and Irrigation Company had just finished reading Robert Louis Stevenson's novel, Weir of Hermiston. The name was accepted and the post office opened in March 1905 with McNaught as postmaster. Also in 1904, two days prior to McNaught's filing, two other entrepreneurs named Newport and Skinner had filed a plat for a townsite east of the railroad tracks. Both towns used the name of Hermiston, and in 1907 incorporated as a single town.

In common with most western irrigation systems, private enterprise systems in the Hermiston area were largely able to construct diversion dams and canals that could serve relatively small areas. Efforts to create storage reservoirs were largely unsuccessful. By the 20th Century, it was clear that private enterprises would never be able to fully develop the irrigation potential of the West, in large part because they lacked the funding and engineering expertise to build storage reservoirs or large delivery systems. Therefore, in 1902, Congress passed the Reclamation Act, and established a program for Federal irrigation development west of the Mississippi. The U.S. Reclamation Service (Service), later renamed the Bureau of Reclamation, was created to implement the program. In 1903 and 1904, the Service surveyed the Umatilla River, its tributaries, and lands east of the Umatilla River to identify potential reservoir sites. In 1905, Congress approved construction of a Federal irrigation project to serve the area, named the Umatilla Project. In October 1905, the Reclamation Service acquired the Maxwell Land & Irrigation Company's existing system, subsequently rebuilding their diversion and expanding upon their canal system. In 1908 the Service completed Cold Springs Dam and followed with

McKay Dam in 1927. Completion of these storage reservoirs allowed water for full or supplemental irrigation sufficient to serve approximately 34,000 additional acres of farmland. Four irrigation districts operate and maintain the Umatilla Project facilities as follows: Hermiston, Westland, Westland Extension and Stanfield.

3.1 HABITAT FRAGMENTATION AND RECREATIONAL IMPACTS

Habitat fragmentation and recreational impacts are two significant issues affecting the productivity of the Oxbow property for fish and wildlife. These issues will become increasingly important to recognize, understand and manage as urbanization and recreational pressures increase in the Hermiston area. An understanding of the role of habitat patch size in providing for wildlife and fish species diversity, as well understanding the potential for adverse impacts from recreational activities is essential for designing a management plan that protects fish and wildlife resources and allows the rational development of recreational opportunities for the community.

3.1.1 Habitat Fragmentation

Habitat fragmentation is considered by many biologists as the single greatest threat to biological diversity. The construction of roads, trails, houses and commercial buildings have fragmented wildlife and fish habitat. Management practices such as logging, mining and livestock grazing; and the conversion of wildlands to agricultural fields also fragmented habitat. On the Oxbow property and other land along the Umatilla River, the original riparian forest was largely converted to pastureland and much of the native riparian cottonwood forests were lost (NPPC 2004). The EPA, in developing its Lower Umatilla Basin Biodiversity Conservation Strategy (Kagan et al. 2000), indicates that habitat fragmentation and habitat loss has been extensive through out the Lower Umatilla Basin due to agricultural land conversion and invasion by exotic species. The greatest percentages of habitat losses are in the riparian bottomland hardwood and willow communities (estimated to be greater than 95%).

Habitat fragmentation occurs when a large, fairly continuous tract of a vegetation type is converted to other vegetation types or land uses such that only scattered fragments of the original vegetation type remain. These remnants or fragments occupy less area of habitat than the initial condition; are of variable size, shape and location; and are separated by habitats that differ from the original condition. Island biogeography has provided the initial conceptual framework for describing the effects of fragmentation through MacArthur and Wilson's (1963 and 1967) early work. Songbirds, in particular, have to not only cope with habitat loss, but must also cope with changing microsite conditions, higher levels of nest predation and parasitism and competing bird species.

Habitat loss is the most obvious and direct effect of habitat fragmentation. Species directly affected by habitat loss through fragmentation include those with large home ranges or territories, those that depend on specific microsites and species with poor dispersal abilities. Recent research has demonstrated the positive relationship between habitat patch size and bird community complexity (Dickson et al. 1995; Blake 1986 and Galli et al. 1976). Dickson et al. (1995) found that as streamside habitat zones increased in width, bird abundance and variety increased.

Bird species richness and total numbers of neotropical migrant songbirds were found to be associated positively with bottomland hardwood stand width (Kilgo et al. (1998). Kilgo et al. found that though narrow riparian stands were extremely valuable avian habitat, greater than 500-m-wide stands are required for complete avian community characteristics. Others recommend that stands should be $\geq$ 100-m wide (Keller et al. 1993 and Hodges and Krementz 1996).

Research has also indicated that temperature and evaporation rates increased in openings and that such changes can extend up to 30 m into a temperate forest (Wilcove et al. 1986, Saunders and Hobbs 1991). These microhabitat changes can affect succession and habitat structure.

There is a good deal of evidence that predation rates by several species of mammalian and avian predators increases significantly within 50 m of the forest edge (Paton 1994). Gates and Gysel (1978) believed that edges may serve as "ecological traps" to some species by offering an enticing distribution of habitat characteristics, but exposes them to higher predation rates.

3.1.1.1 Habitat Management Tools

Faaborg et al. (1995) offers the following guidance to land managers:

Shape of Reserve.—The shape of a forest fragment strongly influences habitat quality since the reproductive success of many neotropical migrants is highest within the forest interior. Large round habitat patches are better than smaller patches; a small round habitat patch is better than several very small round areas tightly grouped; tightly grouped patches are better than sparsely distributed habitat patches; small connected patches were better than small disconnected patches, and a roundish habitat patch is better than a long narrow patch. Circular or square areas offer more interior than long narrow areas.

Maximize Area and Amount of Interior.—The forest area and interior are extremely important to wildlife.

- In general, minimize disturbance within the forest interior to avoid increasing fragmentation of existing habitat.

- Where possible, select areas for forestation that maximize the amount of forest interior. Place emphasis on creating large blocks of habitat, rather than a similar amount of acreage composed of small habitat blocks.

- Openings, including roads and powerlines, should be concentrated along existing habitat edges.

- The size of small fragments can be increased by allowing reforestation to occur either through natural regeneration or through planting trees and shrubs.

Maximize vertical density. In general species diversity increases with an increase in vertical density (MacArthur and MacArthur 1961, MacArthur et al. 1962. Vertical density can be enhanced by planting trees and shrubs and protecting them from livestock and deer grazing.

Several studies have shown the positive relationship between habitat patch size and bird community complexity (Dickson et al. 1995; Blake 1986 and Galli et al. 1976) Dickson et al. (1995) found that as streamside habitat zones increased in width, bird abundance and variety increased.

3.1.1.2 Management Implications for the Oxbow Property

Restoration of the riparian habitat in the Oxbow property is one of the long-term goals. Eventual widening of the existing riparian stands to at least 100 m of native tree and shrub species would greatly reduce habitat fragmentation that has occurred on the Oxbow property during its use as agricultural land.

Any newly constructed roads and trails should be sited to avoid fragmenting what intact habitat remains on the property and allow for the eventual restoration of broad riparian stand along the Umatilla River.

3.1.2 Recreational Impacts to Wildlife Communities

Recreational disturbance is one of the most important factors affecting wildlife communities. Projections indicate the frequency and extent of such disturbance will continue to increase (Gutzwiller 1995). Knight and Cole (1995) identify four primary routes that human activities impact wildlife: exploitation, disturbance, habitat modification and pollution. Exploitation is a direct impact resulting in death from hunting, trapping or collection. Disturbance can be intentional such as harassment, or unintentional from hiking, wildlife photography and bird watching. Indirect impacts include habitat modification and pollution. Recreation activities can modify vegetation, soil, water and microclimates which affect wildlife species dependent on these habitats.

Wildlife can be adversely affected by contaminants such as food scraps that attract predators, tangled fishing line or plastic six-pack tops (Knight and Cole 1995).

Many recreational pursuits that seem innocuous can alter animal behavior, reproduction, distribution and habitats. Nature viewing and environmental education has the potential to negatively affect wildlife. Wildlife viewers approach wildlife closely, encounters are often repeated and may last for extended time periods. An example of adverse impacts to migrating birds arising from viewing has occurred on the Platte River in central Nebraska during the sandhill crane migration (Norling et al. 1992). People approaching roosting or feeding cranes disturb the birds, causing them to flush. This expends critical body fat and reduces feeding time necessary to accumulate fat reserves for migration. Cranes are also directly injured or killed as they fly into powerlines. Anglers have been found to disturb breeding waterfowl, leading to a 90 percent decrease in population (Richholf 1976).

Uncontrolled pets in wildlands chase and kill wildlife. MacArthur et al. (1982) found that bighorn sheep heart rates increased the most when they were approached by humans with a dog. Hamerstrom et al. (1965) found that prairie chickens showed a stronger fear response to domestic dogs than to foxes. Ungulates habituated to predictable events such as highway traffic, but failed to habituate to the unpredictable disturbance of humans and dogs away from roads and trails (Geist 1978; Geist et al. 1985).

Physiological responses of wildlife to recreational disturbance has been documented by Gabrielsen and Smith (1995). The flight or fight response is referred to as active defense. Physical responses increase changes in heart rate, metabolism, blood sugar, body temperature, respiration rate and depth, oxygen consumption, and heart and brain blood flow. Conversely, blood flow to the gut, gut mobility and digestive secretions decrease. The passive defense response occurs when the animal is alerted to the presence of a potential threat or is remaining motionless to avoid detection by a predator or is “playing dead”. This response also involves profound physiological responses including decreased heart rate and oxygen consumption, body temperature drop, decreased metabolism and blood sugar and decreased brain and heart blood flow.

A number of researchers have found that several species of wildlife are very tolerant of aircraft, car, motorcycle and snowmobile noise at a distance of 1 to 2 km (Tyler 1991; MacArthur et al. 1979, 1982). However at shorter distances, the active defense response may be activated when animals are directly provoked by humans, with the magnitude of the response a function of the distance, movement pattern of the provoker and access to cover. Most animals tolerate disturbance better in woodland than in open terrain, and respond at a higher degree to unpredictable human movement compared to humans following a permanent path (Gabrielsen and Smith 1995).

Recreationist’s behavior can influence wildlife responses. Klein (1993) found that rapid movement directly toward wildlife frightens them, while movement away from or at an oblique angle to the animal is less disturbing. Slow-moving disturbances elicit a milder

response from wildlife. Humans slowly approaching roosting waterbirds flushed fewer birds than did those approaching rapidly (Burger 1981).

The timing of wildlife disturbance also affects the magnitude of wildlife response. The two most critical periods of vulnerability to human disturbance in wildlife is the immediate postnatal period in mammals and the breeding period in birds (Gabrielsen and Smith 1995). Winter periods can be critical for many resident species. Seasonal closures to human activity is a common management tool on state wildlife management properties. Closures begin in February or March and last through mid-July.

Increased edge habitat and associated human disturbance accompanying recreational trails adversely influence breeding bird communities (Miller and Knight 1995; Van der Zande and Vos 1984; and Wilcove and Robinson 1990). A study by Gutzwiller et al. (1994) indicated that human intrusion (walking through the area for 1 to 2 hours) in the subalpine zone in Wyoming reduced the incidence of singing in some songbird species. Because song is essential in territory defense, mate acquisition and other reproductive activities, levels of intrusion that alter normal singing behavior have the potential to lower reproductive fitness of males that are sensitive to this form of disturbance. Singing consistency on intruded sites was lower than on control sites for mountain chickadees, ruby-crowned kinglets, hermit thrushes, yellow-rumped warblers, Cassin's finches and yellow warblers. Singing consistency in these species decreased in spite of the low levels of intrusion involved.

In a study in the City of Boulder Open Space and Mountain Parks, Miller and Knight (1995) found a significant, positive relationship between nest survival and distance from trails in both generalist species and interior-nesting species in both grassland and forest ecosystems. Grassland species such as vesper sparrows, western meadowlarks and grasshopper sparrows; and forest species such as mountain chickadees, mourning doves, western bluebirds, Townsend's solitaires, great-horned owls, western-wood pewees, pygmy nuthatches, white-breasted nuthatches, and plumbeous vireos were sensitive to the presence of trails. Generalists such as black-billed magpies, American robins and house finches, were more numerous near trails.

The predator assemblage of an area appears to be a key factor affecting nesting predation rates (Miller and Knight 1995). Mammalian nest predators such as raccoons, skunks and coyotes are often associated with habitat edges and humans (Harris and Silva-Lopez 1992). Avian nest predators such as corvids (crows, ravens, magpies) typically concentrate their activities on edge habitats. Miller and Knight's (1995) work indicates that potential nest predators perceive trails as edges and concentrate predation activities there. This finding is supported by Hickman (1990) and Rich et al. (1994) who found that avian nest predators were attracted to nature trails and transmission-line corridors. Keith (1961) found that trails and tracks leading to nests and disturbance of nest cover caused predation on nests in Alberta wetlands.

Miller and Knight (1995) also found fewer nest sites near trails, indicating a decrease in nesting attempts. They speculated this reduction in the number of nests nearer trails may be due to birds avoiding establishing nesting sites near trails because of human disturbance or because predation rates were higher. Miller and Knight's (1995) work indicates that some avian species view trails as edges while other species do not. It is likely that this is due to both the physical presence of the trail as well as the associated human disturbance acting together.

Recreational effects on fish occur primarily through fishing (Clark et al 1985). The size and species composition of fish populations can be effected by harvesting or hooking and releasing, depending on the amount of fishing pressure. Recreational use can also affect riparian vegetation through proliferation of trails, trampling vegetation, disturbing redds or spawning fish. Recreational use can also increase the incidence of trampling of redds and harassment of spawning adults.

3.1.2.1 Management Tools

Four types of recreationist management are commonly used to protect wildlife include spatial, temporal, behavioral and visual (Knight and Temple 1995).

Spatial restrictions are the most common management technique used to reduce recreational disturbance. Closures and refuges are permanently set aside whereas buffer zones are temporary. Buffer zones focus on areas that are crucial to wildlife survival and reproduction including feeding, breeding, roosting and nursery areas (Knight and Temple 1995). Buffer zone widths are determined by the flushing responses and flight distances of the species being protected. This can vary widely from species to species and seasonally.

Temporal restrictions protect wildlife that use critical resources, such as wintering bald eagles in the Pacific Northwest.

Changing human behavior toward wildlife through educational outreach is a viable management approach. Klein (1993) believes that if the noise and movement of recreationists could be lessened, there would be an increased likelihood of coexistence and easing of restrictions.

Wildlife are often less affected by recreationists when visually shielded from human activities. It is preferable to locate screening vegetation nearer the source of the disturbance as opposed to near the animals (Knight and Temple 1995).

3.1.1.2 Management Implications for the Oxbow Property

The literature on recreational impacts to fish and wildlife habitat is abundant. It is likely that as recreational pressures are placed on the property, the risk for adverse impacts will increase unless lessons learned from other areas are applied in the management of the

Oxbow property. Proper siting of trails, protection of sensitive habitats and refuge areas, and enforcement of trail use will be essential to minimize adverse impacts from recreational use of the property.

3.1.3 Recreation Impacts on Historic Properties

Recreationists and their use of lands can often adversely affect historic properties. Damage can be an unintentional side-effect of recreational use. An example is when the trampling of vegetation causes erosion that destroys the soil matrix containing an archeological site. Damage can be done out of ignorance of the harm caused by their activity; the principal example here are "relic collectors" or "hobbyist looters" who may collect bottles from dumps or stone tools from prehistoric sites for personal pleasure. McAllister (1991:97) notes "both the sheer force of their numbers and the intensity of their activities cause the cumulative effect of hobbyist looting to be one of the most destructive factors affecting archaeological resources today." These collectors are differentiated from the looters discussed below in that they typically do not recognize the damage they cause.

A subset of the recreational community may set out to cause willful damage through systematic looting or vandalism of sites or buildings. The cause and motivation behind these deliberate damaging uses varies from person to person, and understanding the motives is essential to halting the damages. See Gramann and Vander Stoep1987; Vander Stoep and Gramann 1987; Des Jean 1991; King 1991; Nickens 1991 for analysis of motivation behind looting and vandalism of historic properties. All studies indicate that some people loot for the pleasure of obtaining the materials for their own use, others loot for profit, and a subset of individuals appear simply to be involved in malicious destruction without apparent larger purpose.

Important tools to reduce or prevent incidences of damage by those who do not intend to damage historic properties is to educate visitors about resource value, what actions cause damage, and that laws exist that protect historic properties. It is also desirable to encourage them to identify with the land manager's goals to protect those resources. Since many people engage in looting behavior without knowing they are both breaking the law and forever destroying valuable information about the past, these people will benefit from education programs about archeological resources. Such programs are a long-term prevention measure and they also enrich the lives of the people they reach. Law enforcement is needed in the events involving malicious vandalism or looting for profit.

4.1 CURRENT MANAGEMENT

The Oxbow Property was purchased to benefit fishery resources in accordance with the Umatilla Basin Project Act and is managed for that purpose today. The following management activities are ongoing for the Oxbow Property:

4.1.1 Habitat Protection

Anadromous fish spawning, rearing and migration habitat are being protected from habitat loss and degradation due to increasing urbanization and conversion of riparian habitat to agriculture.

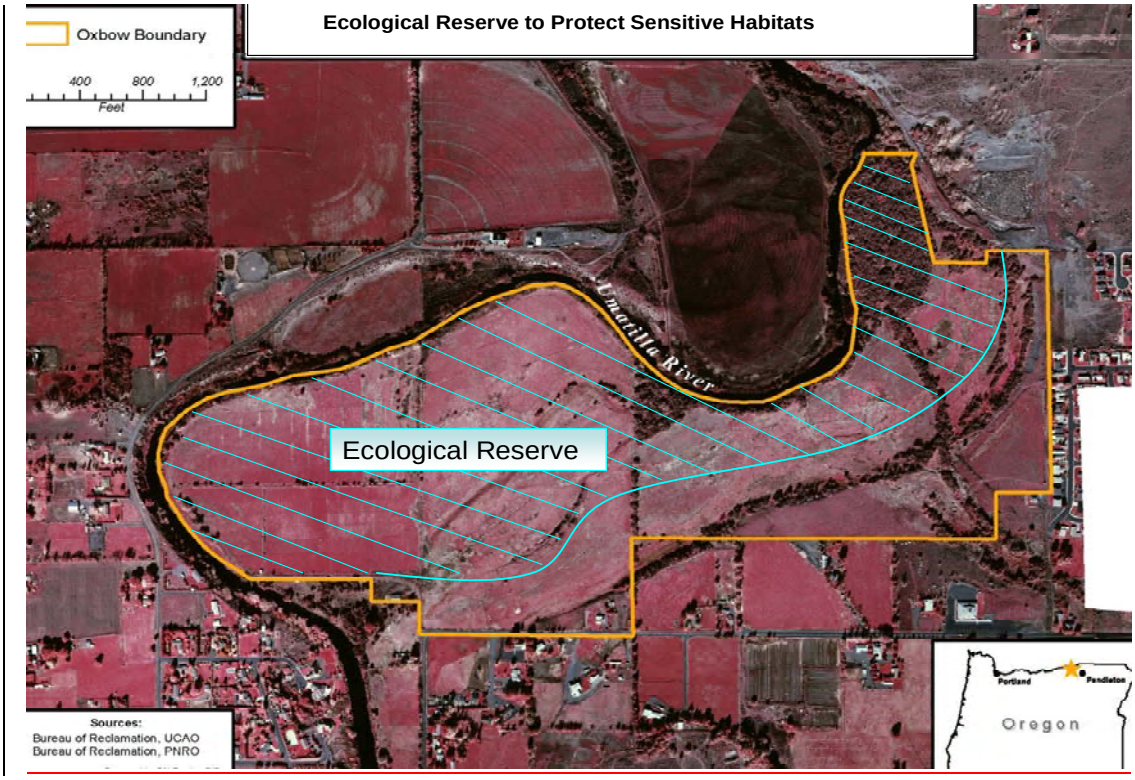

Figure 21. Ecological reserve is designed to protect the most sensitive habitats including the wetlands, meadow areas and riparian corridor. This area should be protected from further habitat fragmentation and recreational impacts. The goal for restoration is to extend the riparian habitat at least 100-m wide wherever possible.

4.1.2 Instream Flow and Cold Water Resource Enhancement

Water rights are currently used to supplement river flows and to enhance the wetland in the center of the property. As of June 2007 the HID is updating its water rights records to match OWRD records. The final result will be some adjustments to the acres for each of the 3 parcels on the Oxbow Property. Reclamation will pursue transferring water rights to temporary instream leases which would be renewed every 5 years. Table 3 summarizes water rights for the Oxbow properties.

Table 3. Water rights for the Oxbow property.

OWRD Issued Certificates				
Certificate #	Parcels	Acres	Purpose	Source
76761	Gass (Tax Lots 8701 & 8801)	61.3	Supplemental Irrigation	Drain ditch
36246	Shockman (Tax Lot 7300) Shockman (Tax Lot 101)	42.8 No water right	Primary Irrigation	42.2 ac. leased instream until 10/31/08
OWRD Draft Certificates (Hermiston Irrigation District water rights)				
-	Gass (Tax Lots 8701 & 8800	65.9	Primary Irrigation	Primary source is Maxwell Canal. Supple-mental source is Cold Springs Reservoir
-	Zinter (Tax Lot 8000)	64.5	Primary Irrigation	" " " "

Table 3. Water rights for the Oxbow properties.

4.1.3 Livestock Grazing

Livestock grazing was eliminated in 2000 to allow the pastureland to recover, as well as to promote the restoration of riparian vegetation.

4.1.4 Weed Control

Reclamation has a contract with Umatilla County for spraying of the Oxbow property noxious weeds. The spraying program should be scrutinized for adverse impacts to wetlands and riparian wildlife.

4.1.5 Vector Control

Vector Control of Umatilla County has been spraying the Zinter and Gass properties for several years. In 2005 Vector Control sprayed 173.5 acres on the downstream two-thirds of the Oxbow Property using 3 types of mosquito larvacides. They applied 854 lbs of VectoBac; 20 lbs of VectoLex and 23 gallons of GB1111 oil. Vector Control divided the property into 7 sections and inspected them and applied the larvacide periodically from May 5 through September 12. From 3 to 10 applications were made on each section depending on the results of inspections. Vector Control also applied an adult mosquito adulticide called Fyfanon on June 15 annually, applying 55 oz over 76 acres in 2005.

Larvacides. VectoBac consists of spores of a bacteria, *Bacillus thurengiensis israelensis* (Bti). When eaten by the larvae, the Bti release toxins which destroy the insect's gut wall. There is no evidence of acute or chronic toxicity of Bti to amphibians, fish or birds. It specifically targets species of mosquitos, blackflies, as well as some species of chironomids, tipulids, ceratopogonids and stratiomyids. This may have negative impacts on nesting ducks and their ducklings because chironomids make up a significant part of their diet. No adverse human health effects have been observed even after long-term exposure to spores. Bti is non-phytotoxic (doesn't kill plants) nor has it shown any effects on seed germination or plant vigor.

VectoLex is the trade name for a granular formulation of *Bacillus sphaericus* (Bs). Like Bti it produces a toxin that must be ingested and partially digested before it becomes activated in mosquito larvae. It is better than Bti for highly organic waters often favored by *Culex* mosquito species. It does not target black flies as Bti does. It remains viable for months in the field. Toxicity tests on mallards, bluegills and rainbow trout showed Bs to be extremely safe to animals. It is also non toxic to freshwater invertebrates. It is not phytotoxic.

GB-1111 (Golden Bear Oil) is a petroleum product that is used as a last-resort larvicide when larvae pupate before the site can be treated with other methods. Other larvicides are ineffective once the larvae have pupated. The oil works by forming a barrier at the air-water interface that suffocates air-breathing insects such as mosquito pupae (as well as larvae). GB-1111 may affect natural predators of mosquitoes such as predatory beetles and others.

The oil produces a thin oil slick on the water surface when applied. When viewed under some lighting conditions, the resulting unnatural appearance may be objectionable, precluding a widespread use of the oil in some areas. Research on the toxicity of GB-1111 on birds has indicated that hatching success of mallards was significantly reduced when treated at 3 and 10 times the maximum field application rates. Most mortalities occurred within a week of treatment. Hatching success of bobwhite was marginally reduced at 10 times the maximum field application rate. There was also a significant increase in abnormal embryos or hatchlings. The recommended maximum rate of field application of GB-1111 is unlikely to impair the survival or development of bobwhite embryos but is potentially toxic to mallard embryos under conditions of larvicide drift or spray overlap (Hoffman et al 2003). In addition the oil causes matting of feathers which can reduce the ability of ducklings to survive colder temperatures.

Adulticides. The active ingredient in Fyfanon is malathion. Because of the adverse effects to non target species, malathion has been replaced in most Mosquito Control Districts with permethrin or resmethrin. Malathion is an organophosphate insecticide that works by inhibiting the activity of neurotransmitters, eventually resulting in respiratory paralysis. Sub lethal effects include impaired reproduction through hormonal effects and reduced tolerance to cold stress. Malathion was found to impair ability of fish to maintain equilibrium, search for food and to avoid predation. Malathion has moderate to

slight acute oral toxicity to birds and there are no published reports of wildlife die-offs that can be attributed to the use of malathion. Its persistence and toxicity to birds is relatively low. (see www.mass.gov/agr/mosquito/geir_docs/GEIR_CURRENT_CONTROLS_AND_IMPACTS.pdf). EPA has concluded that malathion used in mosquito control does not pose a risk to humans or the environment because of the relatively low application rates and small droplet sizes used in these types of applications result in minimal exposure to people in the treated area. However it is highly toxic to insects, including beneficial insects such as honeybees. For that reason EPA has established specific precautions on the label to reduce risks. (see www.epa.gov/pesticides/health/mosquitoes/malation4mosquitoes.htm)

Site Visits. In 2005 Vector Control conducted from 8 to as many as 24 inspections on the Oxbow Property depending on the section. The total number of treatments ranged from 3 to 10 depending on the section. An adulticide is applied annually on June 15. Overall, this represents a significant source of disturbance to wildlife using the wetlands and drainage ditches on the Oxbow Property, particularly waterfowl, as well as deer, songbirds and other wildlife species.

An Integrated Pest Management Plan is being developed for the Oxbow Property. There is no written agreement with Umatilla County, nor is the spraying paid for at this time.

4.1.6 Shooting Control

In order to protect nearby homes, shooting has been eliminated from the Oxbow Property. The property is closed to hunting, and No Hunting and No Firearms signs have been posted on the property.

4.1.7 Evaluation of Geomorphology of Property

A site assessment of geomorphological features of the river and wetlands on the Oxbow Property was conducted in 2004.

4.1.8 Regulation of Recreational and Educational Use

Special use permits are issued for recreational and education use of the property. The Umatilla Morrow Education Service District has used the Oxbow properties for the past three years for their Watershed Field Days. This involves the busing of several hundred school children to the property to participate in the science and natural resource projects in a natural environment. In May 2006 they conducted a streambank stabilization project where, in collaboration with the Umatilla Soil and Water Conservation District, planted about 350 trees. The Boy Scouts of America visit the property annually for their Camporee. In past years they have constructed and placed wood duck boxes, songbird boxes and planted trees.

4.1.9 Law Enforcement

Limited law enforcement is provided through periodic patrols of the property, and cooperative efforts of the County Sheriff's Office and U.S. Fish & Wildlife Service conservation officers. Gates have been padlocked to keep unauthorized off road vehicles out of the property for resource protection.

4.1.10 Cultural Resources

Reclamation's actions to protect natural resources on the Oxbow property are also serving to protect historic properties. Closing the area to OHV's, eliminating grazing, and managing recreational use has limited potentially ground disturbing activities. This reduces the potential for inadvertent harm to historic properties, if such are present, as well as potential harm to culturally important plants. Any proposed new land use or activity must be implemented in a manner consistent with compliance requirements defined in Section 106 of the National Historic Preservation Act (NHPA). To ensure compliance, Reclamation staff involved in planning or implementing proposed actions are required to coordination with a Reclamation archeologist to ensure compliance with Section 106. If a management partner is identified in the future, than that partner's staff will be required to coordinate with a Reclamation archeologist. The coordination processes will be defined in the partnership agreement or its supporting materials. In addition to ensuring Section 106 compliance occurs, Reclamation also desires to implement actions consistent with Section 110 of NHPA. If historic properties are identified in the Oxbow property management area, pursuant to Section 110, Reclamation wishes to incorporate resource enhancement and protection measures into other actions implemented under this site management plan.

4.2.0 Facilitate Cooperative Efforts

Habitat enhancement and environmental education projects are facilitated with the Boy Scouts and other organizations.

5.1 SUMMARY OF ISSUES

Reclamation requested public input on the management of the Oxbow property in February 2004. The public was notified of the one month public comment period through letters to interested agencies and organizations, Tribal and governmental bodies, and local residents. Reclamation has also received several proposals and suggestions concerning management of the property. The following issues and recommendations were received.

5.1.1 Water Rights

- OWRD concerned that the current water right is for irrigation and therefore can not be used for wetland enhancement.

5.1.2 Requested Uses

- Trail
  - Considered by commenter to be a compatible use in the floodplain
  - Part of the City of Hermiston's Parks Master Plan which provides for ESA compliance, ongoing property maintenance including riparian vegetation management for fish and wildlife habitat, with oversight by CTUIR and other biologists.
  - Non-motorized multiple use trail
- Camping
- Equestrian use
- Fishing
- Education
  - FFA
  - Boy Scouts
  - Access for local schools
- Baseball fields
- Ensure management of property in compliance with the Umatilla Basin Act of 1988. Develop management plan pertinent to goals under which property was purchased.

5.1.3 Local Resident Concerns

- Promote fish/wildlife habitat. No structures, parking lots, restrooms, lighting, boat docks, education/research facilities, livestock.
- Increased use impacts the privacy of local landowners, may result in trespass problems, and degrades the rural character of the area
- Entrance to property should be from northeast where it can be monitored
- Promote fishing, dog walking, hiking, horseback riding and other quiet activities
- Needs more law enforcement

5.2 Related Planning Actions that Affect Management of the Oxbow Property

- Umatilla/Willow Subbasin Plan, 2004 Northwest Power Planning Council
- Umatilla River Basin Total Maximum Daily Load (TMDL) & Water Quality Management Plan (WQMP), Oregon DEQ
- Steelhead Park (riparian habitat improvements) & law enforcement issues
- Union Pacific Railroad Greenway Corridor Trail
- Umatilla Riverfront 16 acre park

5.3 Public Comment on the Draft Oxbow Property Site Management Plan

On November 20, 2006 Reclamation issued the Draft Oxbow Property Site Management Plan to Federal, State, Tribal, and local governmental agencies, and to local residents and interested organizations. The draft plan was also available on Reclamation's website at http://www.usbr.gov/pn. The deadline for comments was January 15, 2007. Reclamation received 9 letters in response to the draft Plan. On December 5, 2006 Reclamation staff met with the Confederated Tribes of the Umatilla Reservation's Water Commission to discuss the draft plan and Tribal concerns.

Reclamation received nine letters in response to the draft Plan including 4 letters from local residents, 2 letters from local organizations and 3 from governmental entities. The comments received are summarized here, are on file in Reclamation's Lower Columbia Area Office and are available upon request. We received comments that identified incorrect or unclear statements in the draft plan and made corrections as needed. Most of the substantive comments received can be categorized as either public use or resource protection concerns. In general, comments supported public use the site with limited or no developed recreational features. Excerpts from the comments letters are provided to as examples of the substantive concerns raised in the comments we received.

"Although lack of a 'partner' and funding will hamper achieving the above ten goals, the Oxbow Property can significantly contribute to meeting fish, wildlife & resource enhancement objectives."

"endorse use of the land for hiking, dog walking, horseback riding and other noiseless, nature-appreciation pursuits."

"with a trail system and subsequent regulations regarding its use, ventures off the trail and encroachment to a native habitat would be reduced."

"no more development of the South and West boundaries of the Oxbow property"

"management of the property must be directed at activities and projects that will assist in restoring the fishery"

"It was our observation last summer that there were an abundance of noxious weeds along the river and the meadows. With proper mechanical and chemical methods, these can and should be controlled."

"we have noticed a degrading of the property due mainly to non-native plants. We would like to see a return of native species."

"we would like to see the return of salmon and steelhead in the stream and continued water control."

6.1 SITE MANAGEMENT PLAN

Reclamation purchased the Oxbow property to benefit fishery resources in accordance with the Umatilla Basin Project Act. In a growing urban area, its undeveloped state becomes more and more valuable. While this is public land, project purposes may preclude many uses. The overarching vision for the Oxbow property is to protect the resource values currently present. This property has many unique and outstanding features that are of tremendous value to anadromous fish and wildlife. There are also unique opportunities to improve habitat and flow conditions.

Proposals that result in conversion of riparian vegetation and sensitive stream banks to moderate to heavy recreational use; or that result in construction of buildings for purposes other than anadromous fish and wildlife management are not appropriate uses of this mitigation property.

Many of the desires of various members of the public and local governments for recreation and education facilities close to the City of Hermiston can be met through low density recreation development that emphasizes habitat protection and enhancement. Educational needs can be met through special use permits. Many groups and organizations are interested in contributing to habitat management efforts. These projects can be conducted incrementally, building on past projects and on data collected. Public access is presently allowed on the Oxbow property for walking, fishing and nature watching. Large parties are regulated through special use permits obtained through the Umatilla Field Office.

Reclamation has identified eleven goals for the Oxbow property to serve as management guidelines for the site into the future (Table 4). Each goal is an integral part of Reclamation's public trust obligation to protect and enhance natural resources on this property. The current management meets many of these goals. Current and future

management actions, restoration projects and proposals for use of the site must not conflict with any of these goals.

Goal 1	Manage the Oxbow Property in accordance with the purposes established in the Umatilla Basin Project Act.
Goal 2	Protect currently existing habitat values and identify and implement strategies to improve habitats.
Goal 3	Protect and enhance cold water resources and instream flows.
Goal 4	Restore native riparian vegetation.
Goal 5	Collect baseline biological data for use in designing and implementing habitat enhancement and riparian restoration projects
Goal 6	Identify and protect sensitive habitats to avoid habitat fragmentation and recreational impacts.
Goal 7	Develop partnerships that protect and enhance fish and wildlife habitat.
Goal 8	Manage the Oxbow Property for a very light level of recreational use consistent with its primary goal of providing habitat for anadromous fish, as well as water quality.
Goal 9	Manage visual resources to retain the existing character of the landscape.
Goal 10	Manage weed control and vector control to reduce adverse impacts to fish and wildlife.
Goal 11	Protect and enhance historic properties.

Table 4. Goals for management of the Oxbow property.

6.1.1 Goal 1 – Manage the Oxbow property in accordance with the purposes established in the Umatilla Basin Project Act.

The primary requirement is to manage the property in furtherance of the Act's provisions to provide for enhanced instream flows, flushing flows and other instream uses for the benefit of anadromous fish in the Umatilla River. There are also several other major programs in the Umatilla Basin that provide complementary management protection and guidance. These include:

- TMDL & Water Quality Management Plan (ODEQ 2001)
- Umatilla/Willow Subbasin Plan (Northwest Power Planning Council 2004)
- Lower Umatilla Basin Biodiversity Conservation Strategy – EPA (Kagen et al. 2000)

6.1.2 Goal 2 – Protect the currently existing habitat values and identify and implement management strategies to improve habitats.

Readily implementable restoration should be targeted as soon as possible.

6.1.3 Goal 3 – Protect and enhance cold water resources and instream flows.

Cold water refugia should be protected and expanded. Groundwater flow can be an important source of stream cooling and can be enhanced through floodplain re-establishment, increased vegetation in the uplands and riparian area, increased sinuosity and other morphologic and hydrologic changes. The wetlands in the center of the property can be restored by reversing some of the damage caused by the previous landowner's efforts to drain the wetland. Vegetation that currently exists along the drains should not be removed. This vegetation, even though largely composed of Russian olive, shades the drains and ensures the water flowing into the river remains cool. As tree and brush planting continues, vegetation along the drains can gradually be converted to native species.

Data on the volume and temperature of the water in the drains should be collected throughout at least one year to document the contribution of these drains to providing thermal, and in many cases flow refugia, in this 1-1/2 mile reach of Umatilla River.

The Oxbow's instream flow right is currently being managed to supplement instream flows. Plans to renew a 5-year lease will continue.

6.1.4 Goal 4 – Restore native riparian vegetation throughout the Oxbow property.

In both the TMDL & Water Quality Management Plan (ODEQ 2001) and in the 2004 Umatilla/Willow Subbasin Plan (NPPC 2004), riparian area protection and restoration are considered high priority to restore the Umatilla River's water quality and anadromous fish populations. Both plans indicate that areas with high quality water and habitat should be protected wherever they are found. Restoration of riparian plant communities is the key to improving many of the water quality problems in the Umatilla basin. Root problems are often associated with management activities such as vegetation removal, channel straightening to gain floodplain space for development, roading, paving of watershed surfaces, etc. Consequences are often unstable streambanks, large deposits of bedload, channel braiding, rapid channel movements and high erosion rates. The fundamental concept here is to avoid activities that continue to compromise stream function and instream habitat values.

Some proposals suggest that Russian olive, an invasive, troublesome species, should be eliminated from the Oxbow property. However this species does provide good habitat value for wildlife as well as fish. It has stabilized the riverbanks, provides shading and cools this section of the river; it provides a source of large woody debris which improves habitat complexity; it provides cover for adult and juvenile anadromous fish and it provides good habitat for many species of wildlife. A more productive approach is to implement a successful tree and brush planting program. Efforts to date have largely failed due to lack of water and extremely dry conditions during mid to late-summer. Once trees have been successfully established in the riparian zone in the upstream half of the property, Russian olive stands can be removed gradually and replaced with native trees and brush species, by continuing the tree/brush planting program downstream.

The key to tree planting success is to locate new plantings closer to the river channel to ensure that newly established root systems reach ground water immediately. Locating plantings close to the river channel also ensures that shading will be provided as the plantings mature. Reclamation's assistance in providing supplemental water using a water truck to irrigate new plantings will greatly enhance efforts such as the Umatilla – Morrow Counties Education Service District (ESD) 2006 project to plant native species on the Oxbow property. As much as possible the CTUIR's Native Plant Nursery should be used as a source of plants for ongoing native revegetation efforts.

Several tasks are suggested:

- All tree and shrub plantings should be accompanied by the use of mulch and/or ground cloth that traps moisture and thus ensures survival during the critical late summer period. This design requirement should be implemented for all planting efforts whether they are volunteer or conducted by Reclamation or its managing partners.

- Plant surveys should be conducted as soon as possible to locate and delineate culturally important plants as well as special status and sensitive species.

- Develop a native vegetation restoration plan. The plan will consist of two components (1) eradication of exotic species and (2) planting with desired native species. The restoration plan will follow an incremental approach that steadily replaces exotic species, particularly Russian olive, with vigorous stands of native trees and shrubs.

6.1.5 Goal 5 – Collect baseline biological information on the Oxbow property. Data would be used to develop site-specific enhancement projects.

Important resource data can be collected relatively inexpensively, and effectively. This should be done as soon as possible so that information can be incorporated into developing an implementation plan for the Oxbow Property. Some suggested data includes the following:

- Place water temperature loggers in the drains to collect temperature data to document their value as cold water resources. Temperature loggers can also be placed in springs located along the river bank (not necessarily associated with the drain outfalls); as well as along the river.

- Grab samples can be taken of South Hermiston Drain water during periods of high runoff and tested for various pollutants (some concern with water quality from point and non-point sources originating in the City of Hermiston).

- Snorkel or electrofishing surveys to document juvenile anadromous fish rearing on the Oxbow property

- Walking/boat surveys of river during November/December to enumerate redds and carcasses of fall chinook and coho.

- Habitat surveys using protocols established by ODFW of the Umatilla River through the Oxbow property.

- Timed area searches to enumerate bird use of the habitats during the peak breeding season (May/June). Mammals can also be documented during area searches.

- Acoustic bat surveys to document bat use of property – can be conducted concurrently with area searches. Bats are excellent indicators of habitat quality. In addition, many bat species are declining, or are special status, and an understanding of bat species and abundance present on the Oxbow property will help guide enhancement projects.

- Macroinvertebrate surveys to establish baseline conditions in the Umatilla River. Macroinvertebrates are excellent indicators of stream health.

6.1.6 Goal 6 – Avoid habitat fragmentation and adverse impacts from recreational impacts by using the management tools discussed in section 3.1.1.1 and section 3.1.2.1. Trails, if ultimately allowed to be located on the Oxbow Property should be located away from the riparian areas and wetlands. Roads used for vector control and weed control should be assessed for potential habitat fragmentation and disturbance to wildlife. Seasonal closures and relocation in some cases may be necessary to avoid adverse impacts.

6.1.7 Goal 7 – Develop partnerships that protect and enhance fish habitat.

Explore possible partnerships with CTUIR, watershed councils, ODFW and others.

6.1.8 Goal 8 – Manage recreation use consistent with a "Rural Natural Recreation Opportunity Setting (ROS)" as defined below.

The Recreation Opportunity Spectrum (ROS) is a framework originally developed by the Forest Service for inventorying, planning and managing recreation settings. Research has shown that people choose a specific recreation setting in order to realize a desired recreation experience. As it is not practical to manage all areas for all activities, a broad look is taken to provide a range of recreation opportunities over a larger geographic area.

The ROS has been divided into six major classes for use: Urban, Rural, Roaded Natural, Semiprimitive Motorized, Semiprimitive Non-Motorized, and Primitive. Small sites, such as the Oxbow site, are best managed to fill a niche, or component, of the larger spectrum of recreation opportunities. Reclamation will use the ROS guidelines for "Rural Natural" recreational setting because it is consistent with protecting the site for

fish habitat enhancement. The Rural Natural setting evolved as a combination of the Rural and Roaded Natural settings.

Direction consistent with a Rural Natural recreation setting includes:

-Settings should provide an opportunity to relieve stress and to get away from a human-built environment.

-Preferred activities should be resource dependent (ie, wildlife viewing, nature study, hiking) with opportunities to see, hear, and smell natural resources.

-Development, human activity, and natural resource modifications should be occasional and infrequent.

-Management presence should be limited and unobtrusive.

-Presence of others is expected and tolerated, however encounters should be relatively low.

-Settings should offer a sense of independence and freedom over comfort and convenience.

This provides for a very light level of recreational use for the Oxbow property consistent with its primary goal of providing habitat for anadromous fish, as well as water quality. The definition of "very light level of recreational use" includes permissible activities such as walking, bicycling, and bird watching. Excluded activities include shooting and OHV use. All dogs should be leashed.

6.1.9 Goal 9 – Manage visual resources to retain the existing character of the landscape.

The level of change to the characteristic landscape should be low. Management activities may be seen but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

6.1.10 Goal 10 – Manage weed control and vector control to minimize adverse impacts to fish and wildlife.

In general the activities associated with vector control and weed control pose some adverse impacts to the Oxbow Property, both in terms of the pesticides being applied, as well as the direct effects of the trucks and personnel driving onto the property numerous times throughout the spring and summer. Weed control and vector control activities need to be brought under the control and supervision of the Bureau of Reclamation.

The total number of trips onto the Oxbow Property should be reduced to a maximum of three for vector control and one for weed control. Any trips in excess of these levels should be approved of in advance from the Bureau of Reclamation.

Only the safest chemicals available that have little or no impact to non target organisms should be applied with due diligence. The use of mosquito larvacides and adulticides should be restricted to the safest, least environmentally toxic products currently available. The use of VectoBac and VectoLex appears to be compatible with the goals of the property in that the risk of adverse impacts to non-target species is very low. GB-1111 while generally safe does pose adverse impacts to duckling survival in cases where the insecticide drifts or overlaps and should be eliminated.

The adulticide Fyfanon which contains malathion should be eliminated from use on the Oxbow Property because of its potentially adverse impacts to fish and other non-target species. Other products such as permethrin or resmethrin should be substituted.

6.1.11 Goal 11 – Protect and enhance historic properties.

Section 106 of the NHPA requires that adverse effects to historic properties be addressed prior to implementing potentially disturbing actions. Section 110 of NHPA requires that historic properties on Federal lands be managed with the objective of protecting and preserving them for future generations. "Historic properties" are defined in NHPA as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria." [36 C.F.R. § 800.16(l)(1), providing elaboration on the statutory definition codified at 16 U.S.C. § 470w(5).] 36 C.F.R. § 800 also defines a consultative process for decision-making for historic property management under Section 106 and Section 110. Consultation must occur with the State Historic Preservation Office (SHPO), and with interested Indian tribes if the resource has the potential to be of religious or cultural significance to an Indian tribe.

No systematic investigations to identify historic properties have occurred to date within the Oxbow property management area. However, knowledge of the prehistoric and historic era uses of the general area demonstrates that there is the potential for a variety of types of historic properties to be present representing the prehistoric through early 20th Century use of the area. Irrigation features on the property may also be of an historic nature. Further research is needed to determine if historic properties actually are present within the boundaries of the management area. Also, in 2004 Reclamation learned that at least one plant species may be present that has cultural importance to the CTUIR. Since actions to identify and manage for culturally important plants are integrated under Goal 4 actions, it will not be further addressed under Goal 11.

Management of the Oxbow site for the benefit of anadromous fish is compatible with protection of historic properties, if such are present. Actions already taken to halt grazing and OHV use and to manage recreational uses will aid in protection of any historic properties. However, there are activities or land uses contemplated for implementation under the Plan that have the potential to be damaging to historic properties that might be present.

Requirements to address Section 106 NHPA requirements are defined in 36 C.F.R. § 800.2 through 800.6. Processes to ensure proper implementation of those requirements are briefly outlined below. If a management partner is found, those processes will be defined in greater detail in a separate statement.

Briefly, during the early phases of planning for any restoration, improvement, or development action, or when a request for recreational or other use of the property is being considered, the implementing office or management partner shall notify a Reclamation archeologist so that the archeologist can determine if the action is an undertaking that has the potential to effect historic properties. Notification of Reclamation's archeologist must occur early in the process so that, if there is the potential to effect historic properties, data can be gathered and used as an integral part of planning and decision-making.

In those cases where the undertaking has the potential to effect historic properties, Reclamation or another party designated by Reclamation will complete investigations to determine if historic properties are present. The scope of investigations will be determined for each proposed action, and will be commensurate to the magnitude and nature of that action and the nature and extent of the potential effects to historic properties. Typically, these investigations would occur in all locations where soils will be disturbed when implementing the proposed action. If sites or resources are found during the inventory phase of investigation, then their historic significance would be assessed. If any were found to be eligible to the National Register, then means to avoid or minimize the adverse effects to those properties would be considered. It is Reclamation's policy to avoid adverse effects to National Register eligible properties when ever possible. Actions to mitigate unavoidable adverse effects would be required.

If Reclamation determines a proposed action is an undertaking with the potential to effect historic properties, then consultations would occur with the SHPO and the CTUIR consistent with 36 C.F.R. §800.4 through 800.6. Although a schedule for consultation and implementation will be developed for each project action, Reclamation will typically allow consulting parties 30 calendar days from the date of receipt of a written request for consultation to respond to that request. Failure to comment within the timeframe allows the agency to proceed to the next step of planning or implementation.

Resource Management Objectives:

1. If, over time, restoration actions, land uses, or other actions implemented under this plan are anticipated to affect a large portion of the Oxbow property management area, then it would be cost effective and efficient to systematically investigate all areas with potential for historic properties. If sites found, it would likewise be most efficient to complete investigations to assess if they are eligible to the National Register.

2. If historic properties are identified that are determined to be eligible to the National Register, the objective is to implement restoration or other actions in a manner that will not be harmful to the historic property.

3. Public uses of the land should be designed and managed to avoid inadvertent damage to any National Register eligible historic properties that may be identified in the future. This would likely involve retaining and enforce closure to OHV's. Intensive recreational uses should not occur on or near eligible properties.

4. If historic properties are identified, monitor them no less than annually to assess condition and determine if damage is occurring from natural effects, land use, or other factors. If damage is noted, assess the cause and act to halt the damage. The monitoring processes would be defined in a treatment plan specific to the individual property or groups of properties. Until a management partner is identified, if properties were identified, Reclamation would be responsible for monitoring.

5. Incorporate into public educational activities information about the history and prehistory of the area, use of natural resources for cultural purposes, and the need to protect historic properties for the enjoyment and benefit of future generations.

7.1 IMPLEMENTATION

7.1.1 Funding

Funding is of continuing concern for the management of the Oxbow Property, particularly in an era of reduced federal funding for many domestic programs. Reclamation intends to submit annual budget proposals as a part its program to provide a base level of funding for the ongoing management of the property. Reclamation will also continue to develop and maintain partnerships. For example, Reclamation will collaborate with the CTUIR in conducting some of the biological and water quality baseline studies; as well as fund the City of Hermiston to provide some level of law enforcement. These will be the subject of continuing discussions.

7.1.2. Development of a Proactive Implementation Process

Immediate Measures. Funding has been secured from Reclamation's Recreation, Fish & Wildlife Program to conduct the following activities for fiscal years 2007 and 2008 on the Oxbow Property:

1. Identify the distribution and abundance of cold water sources on the Oxbow Property and document whether these coldwater sources lower stream temperatures during critical low flow and elevated temperature periods. Develop recommendations for cold water refugia enhancement and protection.

2. Identify and quantify rearing juvenile salmonid use of suitable habitats in the Umatilla River through the Oxbow Property during the most stressful period of late summer low flows.

3. Quantify stream shade and canopy cover to develop baseline conditions. Changes in shade that result from management or restoration activities can then me monitored in subsequent years.

4. Determine the amount of spawning occurring on the Oxbow Property for fall chinook and coho salmon through redd counts and carcass counts. Quantify spawning habitat.

5. Develop partnership with local entities to continue riparian plantings at the Oxbow Property. Provide materials, plants and labor to supplement local efforts.

Reclamation is working closely with the City of Hermiston to develop a trail that would provide recreational opportunities while protecting sensitive resources. The City would provide law enforcement to reduce the incidence of illegal OHV use, dumping and other criminal activities. Reclamation is also working closely with HID and OWRD to secure water rights for the property for the long term.

Long-Term Measures. As funding is secured through the annual O&M budget process or through application to special programs, Reclamation will develop and implement projects designed to accomplish the goals established in this site management plan.

7.1.3 Special Use Permit Requests

Reclamation's Umatilla Field Office will be the continuing point of contact for issues related to management of the Oxbow Property including the issuance of recreational permits for large groups; negotiations with the City of Hermiston concerning the design and placement of a recreational trail and subsequent law enforcement activities. The Lower Columbia Area Office will provide necessary support as required, including the provision of oversight for biological surveys and resource implementation plans.

7.1.4 Managing Partner

Reclamation has the authority to establish management partnerships through legal agreement that designate responsibility for specific on-site maintenance and management tasks to a non-federal public entity. Examples of management partnerships with non-federal entities at other Reclamation reservoirs in Oregon include Oregon Parks and Recreation Department, Jackson County Parks, and Washington County Parks Department. If Reclamation finds an interested and qualified potential managing partner it would negotiate a legal agreement. This plan would remain in effect; however, direct responsibility for some activities may be transferred to or shared with the managing partner.

7.1.5. Cultural Resources

Priority Actions to Address Section 106 NHPA requirements are as follow:

1. Complete investigations to determine if archeological sites, TCP's, or other types of historic properties are present in all locations where potentially damaging actions are proposed. In general, this includes all locations where soils will be disturbed when implementing tree plantings, wetland restoration, restoration of river sinuosity, or other actions to restore native riparian vegetation. The types of investigations needed would include archeological survey and consultations with the CTUIR.

2. Prior to any weed control spraying, determine if there would be harmful effect to the culturally important plant species.

3. Before approving any land use (developed or undeveloped recreational use or other uses that may be proposed), the field and/or area office shall consult with Reclamation's archeologist and the CTUIR's Cultural Resource Protection Program. Notification to those parties should occur during the early phases of planning or considering an action so that historic properties data can be gathered and used as an integral part of planning and decision-making.

Resource Management Objectives:

1. If, over time, restoration actions or public land uses are anticipated to affect a large portion of the Oxbow management area, then it would be cost effective and efficient to systematically investigate all areas with potential for historic properties. This would include archeological surveys and consultations to determine if TCP's are present.

2. If historic properties are identified, design restoration actions or other land uses to avoid those locations or implement only actions that will not be harmful to the historic property. Public uses of the land should be designed and managed to avoid inadvertent

damage to historic properties. Retain and enforce closure to OHV's. Intensive recreational uses should not occur on or near resource areas.

3. Incorporate education about the history and prehistory of the area and Indian use of the land and resources into public educational activities.

4. Monitor sites no less than annually to assess condition and determine if damage is occurring from natural effects, land use, or other factors. If damage is noted, assess the cause and act to halt the damage.

7.1.6 Changes to this Plan

This plan is adaptive and suggested projects, site management, and special use requests will be evaluated and carried out in a manner consistent with the goals described above. As new information and monitoring data are gathered changes in management that will improve upon the current methods and which support the goals will be implemented without changing this document. Although not anticipated, if Reclamation decides that it may be appropriate to make changes to its management of the Oxbow property that are not in accordance with the goals and vision described in this document it would notify the public of those changes prior to implementation in compliance with the National Environmental Policy Act.

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