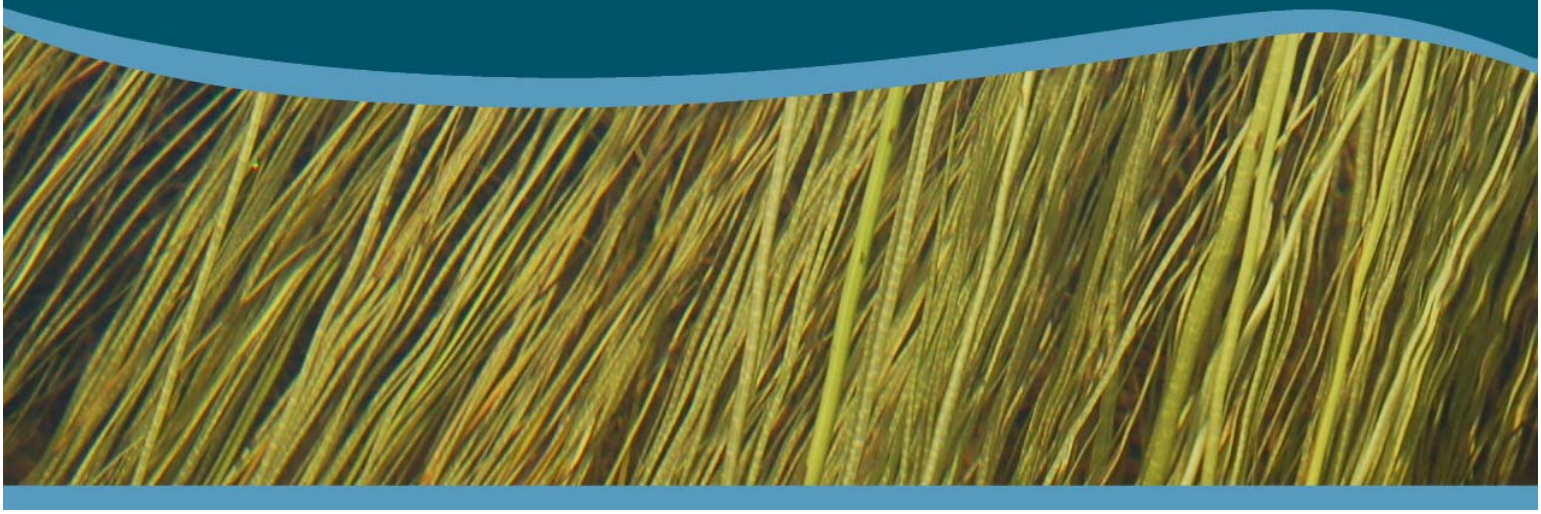
REPORT



INITIAL ACQUISITION AND RESTORATION ASSESSMENT OF THE SMITH RANCH

Prepared for

Cities of Lacey, Olympia, and Yelm

Prepared by

Anchor QEA, LLC

Under Contract to

WestWater Research, LLC

October 2010

FINAL

INITIAL ACQUISITION AND RESTORATION ASSESSMENT OF THE SMITH RANCH DESCHUTES RIVER WATERSHED

Prepared for

Cities of Lacey, Olympia, and Yelm

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1 INTRODUCTION

This initial acquisition and restoration assessment of the Smith Ranch property—located in the Deschutes River watershed of Thurston County, Washington—has been prepared to support) water rights applications by the Cities of Olympia, Yelm, and Lacey (the Cities). The Cities have filed applications to the Washington State Department of Ecology (Ecology) for multiple groundwater withdrawal sites in the Nisqually River watershed. Because modeling analyses of the water withdrawals indicate effects on surface water flows in the Deschutes River, the Cities will need to mitigate for these impacts and the Smith Ranch has been identified as a property that can be part of a mitigation plan (or plans). Pending Ecology's approval of a mitigation plan, the Cities have an agreement in place to purchase approximately 185 acres of the Smith Ranch.

The Smith Ranch is situated along the mainstem Deschutes River at river mile 28.8 and is currently used for sheep farming. Previously, cattle and chickens had been raised on the Smith Ranch. In order to support the farming operations, maintenance activities on the property have included digging ditches to transport water from multiple springs off an adjacent hillside. These ditches reduce inundation of the fields and accelerate the transport of water across the site and into the river. The outlet tributary from Lake Lawrence runs across the Smith Ranch property, and its confluence with the mainstem is on the Smith Ranch.

This assessment characterizes the suitability of the Smith Ranch to provide mitigation value for the water rights applications. In addition, this assessment describes a suite of restoration actions that could be completed on the property to meet mitigation needs for the water rights applications, as well as more long-term restoration actions to improve salmon habitat and watershed conditions. To support the Cities' development of a comprehensive mitigation plan, the types of benefits and magnitude of benefits for each restoration action, as well as preliminary conceptual level costs, are provided.

This assessment focuses on three types of project benefits: water quantity, water quality, and fish habitat. Water quantity is of particular importance to Ecology, because the impact that requires mitigation is a predicted depletion of surface flow depletion. The Cities propose to

offset these predicted depletions with a combination of both flow and non-flow strategies, with the overall goal of offsetting summer depletions with flow and winter depletions with non-flow actions. The Cities are in the final stages of acquiring water rights in the Deschutes River basin; however, other flow-related benefits from restoration of the Smith Ranch will also be included as flow-related actions. Water quality and fish habitat improvements are goals for the non-flow-related strategies outlined in this report.

The report is organized as follows:

- **Section 2:** Provides overview of conditions in the Deschutes River watershed; provides a broader context of limiting factors in the basin
- **Section 3:** Describes the existing conditions at the Smith Ranch with particular consideration of how the property functions in terms of the watershed's habitat limiting factors
- **Section 4:** Identifies a suite of potential restoration actions that could be completed on the Smith Ranch, including some that may be appropriate to offset predicted depletions and others that may be more suitable for long-term salmon habitat and ecosystem restoration; the costs and benefits are presented
- **Section 5:** Presents sub-set of actions recommended to offset predicted depletions
- **Section 6:** Presents recommended sequence and timeframe for completing the mitigation actions.
- **Section 7:** Describes the recommended sequence for implementing additional restoration actions
- **Section 8**: Identifies additional data needs for restoration design
- **Section 9:** Provides a summary of the conclusions of this assessment
- **Section 10:** Provides bibliographic citations for cited references

2 DESCHUTES RIVER CONDITIONS AND LIMITING FACTORS

The Deschutes River watershed in Thurston County, Washington, encompasses approximately 166 square miles. The river originates on Cougar Mountain (3,870 feet) in the Snoqualmie National Forest and flows in a northwesterly directions for 52 miles. The river empties into Capitol Lake then drains into Budd Inlet in south Puget Sound. The following description of watershed conditions is from Haring and Konovsky (1999). The upper extent of the river has a moderately steep gradient. The river drops rapidly over Deschutes Falls at river mile 41. The lower 41 miles of drainage consists of a broad prairie-type valley floor that flows mostly through open farmland interspersed with dense stands of mixed deciduous and coniferous growth.

Below the Deschutes Falls, most of the river flows through unconsolidated silt, sand, and gravel deposited by the last glaciation. Consequently, the watershed is only about 12,000 years old and is still in the process of building its floodplain by undercutting glacial terraces that exist throughout the middle and lower basin (Collins 1994). As a result, even with well developed, mature riparian stands, it is thought that channel erosion along the mainstem would be common due to the Deschutes being a geologically "young" watershed (Cramer 1997; Collins 1994). Land use in the watershed can generally be described in the following three different regions of the watershed:

- Commercial timber production in the upper third of the watershed
- Rural commercial and non-commercial agriculture production in middle third, including Smith Ranch
- Mostly urban development in the lower third

Historically, a natural barrier at the mouth of the river prevented anadromous salmonids from entering the river system. In 1951, the lower 2 miles of the river were impounded to create Capitol Lake in the City of Olympia. In 1954, a fish ladder was completed at the natural barrier (named Tumwater Falls) at the head of Capitol Lake. The fish ladder allowed anadromous salmonid populations to use the Deschutes River and its tributaries. The upper extent of anadromous salmonid distribution in the river is Deschutes Falls at river mile 41.

The anadromous salmon that persistently use the Deschutes River include coho salmon (*Oncorhynchus kisutch*), Chinook salmon (*O. tshawytscha*), and steelhead (*O. mykiss*). Anadromous salmon gained access to the river with the completion of the fish ladder at Tumwater Falls, and the distribution of all three species extends as far up the mainstem as the Deschutes Falls. Coho in the Deschutes River are non-native in origin with wild production. Coho have traditionally had the largest salmon run returns each year, although in recent decades their numbers have declined considerably and there are concerns about the long-term viability of the population (Dickison 1999; Anchor 2008). In 2002, the stock status was downgraded to critical by the Washington Department of Fish and Wildlife (WDFW) due to the short-term severe decline. Coho in Puget Sound were listed as a candidate species for federal Endangered Species Act (ESA) protection in 2004.

Chinook and steelhead in the Deschutes River are non-native in origin. According to Haring and Konovsky (1999), some adult Chinook have been allowed passage above the hatchery rack at Tumwater Falls, but the purpose of their passage was not to develop or encourage natural production. Similarly, few steelhead access the river and WDFW does not expect the river to support any significant natural production. Haring and Konovsky (1999) reported that WDFW biologists in 1999 reported evidence of recent significant declines.

Cutthroat trout are also present throughout the Deschutes River basin (WDFW 2000). Sullivan and others. (1987) report that cutthroat trout are most common headwaters and tributaries of the watershed. In addition to the salmon and trout species, WDFW's Priority Habitats and Species List (WDFW 2008) also identifies Olympic mudminnow (*Novumbra hubbsi*) and Pacific lamprey (*Lampreta tridentata*) as priority species occurring in the Deschutes River watershed. Olympic mudminnows are endemic to Washington. Their distribution is limited to the lower Deschutes River basin, the southern and western lowlands of the Olympic Peninsula, the Chehalis River basin, and the Puget Sound lowlands west of the Nisqually River (Mongillo and Hallock 1999). In the Deschutes River, the Olympic mudminnow have only been identified in swampy areas far downstream (approximately river mile 10 and lower) from the Smith Ranch (Mongillo and Hallock 1999). The fish require slow moving streams and wetland ponds. Pacific lamprey are anadromous species with similar habitat requirements to salmon (PSMFC 1997).

In the 1975 Washington Stream Catalog, Williams et al. (1975) identified sedimentation, flooding, water quality, low flows, channel manipulation, and gravel removal as actions in the Deschutes River that have adversely impacted salmon habitat. These conditions have persisted over the ensuing 35 years. In a 1999 report, Haring and Konovsky identified the habitat limiting factors in the Deschutes River watershed as they pertain to the sustainability of salmon populations. Given the diverse uses and habitat requirements of the multiple life history stages of salmon that occur in the river, the habitat limiting factors for salmon can be considered as constraints on the overall ecological health of the watershed. Haring and Konovsky (1999) identified the following limiting factors for Deschutes River mainstem upstream of Capitol Lake:

- **Excessive fine sediment**: Fine sediment (less than 0.85 millimeter) levels in the stream gravels regularly exceed the 12 percent threshold identified by the Timber Fish and Wildlife program (Schuett-Hames et al. 1999) as representing suitable spawning habitat
- **Lack of off-channel habitat**: 72 percent of the 343 reaches surveyed in 40 miles below the Deschutes Falls had little or no off-channel rearing habitat and only 11 percent of the reaches ranked high for off-channel habitat availability
- **Streambank stability**: Bank erosion and channel migration are prominent issues in the geologically "young" watershed where naturally high rates of erosion have been exacerbated by the loss of streambank and riparian integrity and alteration of natural hydrology
- **Lack of large woody debris:** Insufficient quantities of large woody debris (LWD in streams, particularly larger key pieces that are critical to developing pools, log jams, and other habitat components important to salmonids
- **Insufficient number and size of pools:** Lack of adequate pool frequency and lack of large, deep pools that are important to rearing juvenile salmonids and adult salmonids on their upstream migration
- **Riparian buffer vegetation**: Loss of riparian function due to removal/alteration of natural riparian vegetation, which affects water quality, lateral erosion, streambank stability, and instream habitat conditions.
- **Water quality impairments:** The Deschutes River is identified by Ecology as impaired for high fecal coliform, high fine sediment loads, high temperature, and low dissolved

oxygen; Lake Lawrence is impaired for high total phosphorus; and the Lake Lawrence outlet tributary is impaired for low dissolved oxygen

- **Altered instream flows**: Low instream flows during late summer months do not meet established instream flow rule requirements (Chapter 173-513 WAC 1980) and the natural hydrology of the river has been altered such that the peak flows occur more frequently and are higher than historically occurred.

These limiting factors reflect substantial constraints to anadromous salmon population viability and general ecological health. An analysis of coho salmon production related to recent historical habitat and projected future conditions—performed by Anchor QEA, formerly Anchor Environmental, in 2008—indicates that the combination of poor freshwater habitat conditions, coupled with cycles of low marine survival, create a real risk of extinction. Furthermore, that analysis also forecasts extinction of all but the largest annual return cycle of coho if marine survival rates remain low and there is not extensive freshwater habitat restoration in the watershed (Anchor 2008).

3 EXISTING CONDITIONS AT THE SMITH RANCH

3.1 Overview of Limiting Factors at Smith Ranch

Existing conditions at the Smith Ranch contributed to many of the limiting factor constraints Haring and Konovsky (1999) described for the entire watershed. The agriculture-related modifications to the site appear to have negatively impacted the aquatic habitats through:

- Water quality impairment
- Elimination of the site's potential to contribute to natural water filtration that could occur
- Increased bank erosion
- Accelerated water discharge from the site

These impacts have occurred through the construction of a network of straight deep ditches to convey water off site as quickly as possible, the removal of vegetation, and the ranching of sheep and other animals. Further explanation of the Smith Ranch features contributing to these limiting factors are described in the following site assessment.

3.2 Site Assessment

3.2.1 General

The Smith Ranch is located at river mile 28.8 of the Deschutes River. To the northeast of the ranch is Lake Lawrence, a 330-acre lake that drains a 3.4 square mile watershed (Smith and Rector 1997). The lake condition is of importance in describing the Smith Ranch conditions because the lake outlet tributary flows across the Smith Ranch and drains into the Deschutes River. The lake was formed by the construction of an earthen dam in the early 1900s, when Olympic Light and Power used the lake as a reservoir to supplement the Tumwater Power Plant (KCM 1991). The dam and fish screen block fish passage to the lake.

Lake Lawrence has a maximum depth of 26 feet and a mean depth of 12.5 feet (EnviroVision 2004). Lake water spills into the outlet tributary when lake levels are elevated above the outlet opening, thus the water in the outlet tributary is from the surface of the lake water column. The lake flows intermittently or seasonally into the outlet tributary (EnviroVision 2004) and is eutrophic, which means that the lake has high nutrient and algae levels and low

water clarity. Due to high phosphorus concentrations, Lake Lawrence is listed by the Ecology as having impaired water quality. The lake warms to greater than 68 degrees Fahrenheit in the summer (20 degrees Celsius; Smith and Rector 2007; Thurston County 2010). The lake supports a warm water fish community and is also stocked with rainbow trout and brown trout.

The Smith Ranch property is located predominantly on the 100-year floodplain of the Deschutes River (Figure 1). Generally, the site drains to the southwest in the same direction of the river valley. During a March 3, 2010 site visit, the water surface on the river was approximately 10 feet below the top of bank elevation of the floodplain, with the exception of the southwest most corner of the property, which was about 5 feet above the water level. The southwest corner of the property appears to be the natural drain back to the river from the floodplain. Despite the high banks, there are anecdotal reports that winter flooding has occurred and has been extensive enough to be problematic for the ranching activities. Such flooding has likely occurred due to the Deschutes River flows backing up into the tributary rather than overtopping the banks at the upstream end of the property. Overtopping of the banks on the downstream end is more likely than at the upstream end.

Much of the ranch has been cleared of woody vegetation in order to support ranching activities. A narrow corridor of riparian vegetation occurs along the mainstem Deschutes River, but along the water courses that flow across the property, nearly all riparian vegetation has been removed.

Water courses on the Smith Ranch have been significantly altered in ways that accelerate the outflow of water away from the site and into the Deschutes River. The Lake Lawrence outlet tributary is a straight, deep channel with steep banks. Numerous straight and deep ditches have been excavated from the adjacent land and drain into the Lake Lawrence outlet. Another ditch occurs along the toe of the hillside slope on the eastern portion of the site. The ditch originates outside of the Smith Ranch, but continues in a straight line through the Smith Ranch property. The ditch likely intercepts groundwater from the hill to the north and dewaters the agricultural lands on a portion of the Smith Ranch, as well as properties upstream.

These ditches contribute to rapid runoff from the site during storm events and transport of fines to the river rather than allowing surface storage and infiltration to groundwater that moves to the river over a longer period. Consequently, runoff from the site has greater peak rates over a shorter duration, which contributes to higher winter peaks and lower summer flows in the Deschutes River and contributes to the factors limiting the fishery.

National Wetland Inventory (NWI) maps show a large freshwater emergent marsh in the center of the project site that spans both sides of the Lake Lawrence outlet tributary (see Figure 1). The NWI maps were developed using remote assessment techniques and imagery. Many of the NWI wetland boundaries were developed using imagery from the 1980s and 1990s (USFWS 2010) and have not been updated. Of note, an off-channel habitat inventory completed by the Squaxin Island Tribe (Taylor 1999) did not identify a wetland on the property (Figure 2). Field surveys suggest that some wetland characteristics were observed on the site in the vicinity of the NWI wetland boundary. Although no formal wetland delineation was completed, results from the field survey suggest that the existing wetland is not as large as that shown on the NWI map. Although many of the ditches were likely in place by the time the NWI maps were developed, the ditches have converted much of the area to upland conditions that are more conducive for agricultural operations. Ditching likely reduced the existing wetland size, limited the establishment of wetland vegetation, and reduced any beneficial wetland functions currently being provided. Existing wetlands in the vicinity of the areas identified on the NWI maps are likely inundated by backwater from the Deschutes River during high flow events more frequently than the rest of the site.

The Natural Resources Conservation Service (NRCS) Thurston County Soil Survey indicates that the soils are predominantly silt to clay loams of alluvial origin. The soil survey also indicates that these soils may also be hydric, indicating that they may have wetland hydrology. During Anchor QEA's March 3, 2010 site investigation, several holes were hand-augured in the southwest portion of the site and encountered silt loam with groundwater at about 2 feet below ground surface. This site investigation confirmed the fine soil texture and noted that there were layers of coarser alluvial materials exposed in the excavated drainage ditches, which may lead to toe erosion and bank failure. Given the current land use practices, the project area likely contributes fine sediments to the Deschutes River from surface runoff and from erosion of the drainage ditches, which contributes to the factors limiting the fishery.

Existing conditions at the Smith Ranch degrade the conditions of several water quality parameters. As indicated earlier, the Lake Lawrence outlet tributary is listed as impaired for low dissolved oxygen. The water entering the Smith Ranch from Lake Lawrence is likely high in total phosphorus because the lake is listed as impaired for that nutrient. The straightened ditches and absence of wetland and riparian vegetation have likely contributed to higher summer water temperatures, the input of excessive amounts of fine sediments, and input of storm runoff from the fields that contain animal wastes and fecal coliform. These alterations also contribute to a lost opportunity at the ranch to improve water quality in the Lake Lawrence outlet. The existing conditions do not allow for the natural filtering and treatment of the water by trapping sediment and associated nutrients through longer residence times. In contrast to conditions in the Lake Lawrence outlet tributary, the main spring from the north appears to provide a steady input of clean cool water.

Some juvenile fish have been observed in the main spring channel at the Smith Ranch. Although not confirmed, juvenile coho salmon appeared to be among the three or more fish species observed during Anchor QEA's March 3, 2010 site investigation. Although the main spring channel provides some habitat during the spring, there is no riparian cover to provide shade during the summer months and the channels are simple trapezoids that lack any habitat structure or variability.

3.2.2 Fine Sediments and Bank Erosion

A recent analysis of bank erosion along the mainstem Deschutes River identified six erosion locations along the Smith Ranch property (Raines 2005). Each of the six locations was estimated to have on the order of 87 percent fine sediment. During a March 3, 2010 site investigation, two significant bank failures were observed at the upstream end of the project site. Several hundred feet of bank was nearly vertical and lacking any vegetation. Review of aerial photographs from 2006 and 2009 show that the bank has eroded back approximately 50 feet of the floodplain terrace (Figure 3). The bank exposed about 6 feet of silt loam soil over a gravelly layer near the water surface. It would be expected that these gravels are more susceptible to erosion than the fine textured bank materials, and high flows would likely result in the bank continuing to be undercut, falling into the river, and contributing

significant quantities of fine sediments that contribute to the factors limiting the fishery. The loss of vegetation also contributes to the thermal input to the river.

3.2.3 Noxious Weeds

Four weeds listed as noxious by the Washington State Noxious Weed Control Board (Chapter 16-750 WAC) occur on or in the immediate vicinity of the Smith Ranch area proposed for acquisition (Figure 4). One of these weeds, slenderflower thistle (*Carduus tenuiflorus*), occurs in the acquisition area and is a Class A noxious weed. As defined in the Washington Administrative Code:

> **Class A** noxious weeds are generally new to Washington. They are often found in only a few places in the state. Eradication of these species is mandatory. The goal is to eliminate all plants before these invasive weeds gain a foothold. There are many success stories in early detection and eradication of Class A weeds.

There are also three Class B noxious weeds in the immediate vicinity of the property: poison hemlock (*Conium maculatum*), tansy ragwort (*Senecio jacobaea*), and common fennel (*Foeniculum vulgare*). As defined in the Washington Administrative Code:

> **Class B** noxious weeds are abundant in some areas of the state, but absent or rare in others. The goal for Class B weeds is to contain infestations where they are already abundant, and to prevent them from spreading to parts of the state where they are rare or absent. Class B noxious weeds are "designated" for control in areas where they are rare or absent, and landowners are required to control and prevent the spread of these invasive plants. "Control" means that landowners must prevent them from going to seed or propagating by spreading roots, bulbs, or other plant parts. The NWCB defines where Class B noxious weeds are designated for control at the state level.

A third class of noxious weeds is defined in the state, but none are present on the Smith Ranch. As defined in the Washington Administrative Code:

> **Class C** noxious weeds are already so widespread that there is no realistic hope of eradicating them, but counties may choose to require landowners to control them to prevent their spread into sensitive areas such as wetlands or designated natural areas, or to protect farms or livestock.

According to the Thurston County Noxious Weed Control Board, Mr. Smith has been participating in an effort to eradicate the slenderflower thistle from the property. Restoration actions will need to be careful to not inadvertently spread any of the four of the noxious weeds, but particularly the slenderflower thistle.

4 RESTORATION OPPORTUNITIES AT THE SMITH RANCH

4.1 Description of Restoration Areas and Actions

The Smith Ranch property provides opportunity to address many of the key habitat limiting factors identified in the Deschutes River watershed by Haring and Konovsky (1999). Anchor QEA has identified restoration concepts for five discrete portions of the project site and a sixth area that encompasses the remaining upland areas[1] (Figure 5). Within each area, specific restoration features are identified and labeled (e.g., 1A, 1B) to facilitate comparison between figures and text, but these labels do not reflect a prioritization of actions or a sequence of steps.

The restoration concepts were developed based on site visits, a review of the topography, and an understanding of limiting factors for fisheries. The potential restoration actions are illustrated in Figure 6 and are briefly described in the following sections, along with identification of potential benefits, constraints, and other design considerations.

4.1.1 Restoration Area 1 – Lake Lawrence Outlet and Hillside Springs

Water draining from Lake Lawrence and into the outlet tributary flowing across the Smith Ranch is listed as impaired for total phosphorus. In addition, the lake delivers water in the summer that is warmer than optimal for juvenile salmon rearing. A 1994 water quality assessment by Ecology documented August water temperatures higher than 68 degrees Fahrenheit throughout the upper 11 feet of the lake (Smith and Rector 1997). The lake's outlet is an overflow, such that water draining is likely the warmest water from the lake and consequently is likely to have lower dissolved oxygen concentrations. The lake water flowing into the Lake Lawrence outlet tributary is also likely to have a high nutrient load that contributes to the lower dissolved oxygen. The water also has high iron content as evidenced by the iron oxidizing bacteria in the outlet channel.

The restoration concept for this area is to restore and enhance the existing wetland complex that has been altered by excavation of drainage ditches to provide additional opportunity for

1 Restoration actions to improve fish habitat in the mainstem Deschutes River (e.g., engineered log jams) were not included because those actions affect the property owners across the river. This assessment focused on actions on the Smith Ranch property.

water quality treatment and infiltration. This concept is illustrated on Figure 6 and includes the following restoration actions.

1A – Re-establish Wetland Near Lake Lawrence Outlet: This restoration action would re-establish an approximately 4-acre area with some wetland characteristics by capturing water originating from Lake Lawrence. As described in Section 3.2, some wetland characteristics are present in the 4-acre area but very limited water quality and hydrology benefits are currently being provided. The wetland would be re-established by adding a grade control structure at the downstream end to increase residence time of overflows from the lake. In addition, ditches in the area will be filled to promote sheet flow of Lake Lawrence outlet tributary and hillside springs to further support the water quality functions described in 1A. The wetland will increase residence time of overflows from the lake, resulting in wetland functional improvements for water quality by trapping fine sediments and nutrients, reduction of frequency and magnitude of peak flows, and improving base flows during low flow periods. Water draining from the wetland would cascade over the grade control structure to increase dissolved oxygen content.

1B – Create New Channel from Hillside Springs: This restoration action is to fill a straight ditch though which hillside springs currently flow (see Figure 5) and create a more natural sinuous channel with riparian buffer. As shown in Figure 6, the channel would be approximately 1,600 linear feet and drain into a proposed wetland area downstream of the wetland (as described for restoration action 1A). The second proposed wetland is described in the following section as restoration action 2D and would be designed to provide enhanced fish habitat with a channel and wide shallow swale. The new channel would also support emergent wetland species, as well as riparian trees and shrubs.

4.1.2 Restoration Area 2 – Main Spring and Smaller Springs

The existing main spring channel was excavated though a large wetland complex to lower the groundwater levels and allow agricultural activities. The channel is maintained as a straight trapezoidal channel with steep banks and minimal instream habitat structure. The main spring channel currently provides a continuous source of cool water to the Deschutes River. Coho juveniles have been observed using the channel. Several additional ditches

have been excavated upstream of the main channel. Any spring water sources associated with these other ditches appear to be much smaller volumes of water.

The restoration concept for this area is to raise the groundwater levels to enhance and expand two wetland areas separated by the road berm, reshape the main spring channel to establish a freshwater marsh fringe, and increase the area of available aquatic habitat. Riparian vegetation would be established to provide shade and minimize heat gain, and installation of LWD and excavation of pools would increase habitat structure and variability. This concept is illustrated on Figure 6 and includes the following restoration actions.

2A – Reshape Existing Channel from Main Spring: Reshaping and realigning the channel of the main spring would improve aquatic habitat quality and support emergent marsh fringe and riparian vegetation. Riparian buffer vegetation will be included between the acquired portion of the Smith Ranch and those properties to the north that remain in Mr. Smith's possession. The reshaped channel will include excavated pools and LWD to provide aquatic habitat structure and variability.

If this action is not constructed simultaneously with action 2c (Re-establish Wetland around Main Sprint), then action 2A will include enhancement of the headwater wetland at the spring and planting of a 25-foot riparian buffer. The riparian buffer would be an interim action to provide riparian benefits with the expectation that action 2C would be constructed in the future. The riparian plantings would be compatible with future wetland re-establishment.

2B – Create New Channel from Small Springs: This restoration action would fill drainage ditches and possibly create 1,000 feet of new wide channel though the wetland complex. This channel would support additional wetland habitat.

2C – Re-establish Wetland around Main Spring: Installing a grade control structure and filling in the smaller ditches other than the main spring channel would re-establish the wetland around main spring. Riparian buffer vegetation will be included between the acquired portion of the Smith Ranch and those properties to the north that remain in Mr. Smith's possession. The grade control structure is needed to increase groundwater levels and

reduce the amount of excavation would be needed to reshape the main spring channel (as described for restoration action 2A).

2D – Re-establish Wetland around Smaller Springs: Fill ditches, regrade, and add grade control structure to re-establish wetland in the central portion of the ranch. This restoration area encompasses most of the area that has been mapped as wetland as part of the NWI. This wetland would be the second wetland area that water from the Lake Lawrence outlet would drain into. This would include filling the ditch from the small spring across Ron Smith's property to the Cities' property. The grade control structure would raise groundwater levels, detain runoff, and encourage infiltration. This action would also improve base flows and reduce peak flows. Riparian buffer vegetation will be included between the acquired portion of the Smith Ranch and those properties to the north that remain in Mr. Smith's possession.

2E – Create New Channel from Re-established Wetland: Creating a new channel would convey overflow water from the second wetland area (see restoration action 2D) to the main tributary channel.

4.1.3 Restoration Area 3 – Bank Stabilization on the Mainstem Deschutes River

This portion of channel bank has recently been eroded by the Deschutes River. The bank lacks deep rooted vegetation and is subject to additional erosion. This bank erosion contributes to the factors that are limiting to the fishery because eroding fine grained materials increase the embeddedness of the streambed. The lack of riparian cover also contributes to heating of the water and decreased dissolved oxygen concentrations.

The restoration concept for this area is to stabilize the bank with a bioengineered revetment that will support riparian vegetation. A bioengineered revetment is a bank stabilization structure that incorporates natural materials such as large woody debris and live trees. This concept is illustrated on Figure 6 and includes the following restoration actions.

3A – Construct Live Cribwall Along Two Eroding Reaches: Live log cribwalls constructed along two stretches of bank on the mainstem Deschutes River would stabilize eroding banks

and restore riparian vegetation along the upriver end of the property. The cribwall would use large logs to form an elongated box along the shoreline that stabilizes the bank. The spaces between the logs will be backfilled and planted with vegetation to create a live cribwall. The eroding areas addressed by this action are described in Section 3.2 and shown in Figure 3.

4.1.4 Restoration Area 4 – Riparian Buffer of Mainstem Deschutes River

Much of the riparian forest along the Deschutes River has been cleared and converted to agricultural uses. The remaining forest area is a relatively thin band along the river that provides some shade and limited bank re-enforcement, as evidenced by the rapid bank erosion in Restoration Area 3.

The restoration concept for this area would be to replant a 200-foot wide band with upper terrace woody riparian species that would ultimately provide shade (thereby reducing water temperatures and improving dissolved oxygen levels), increased bank stability and sources for LWD. This concept is illustrated on Figure 6 and includes the following restoration actions.

4A – Replant 50-foot wide Riparian Buffer and Install Buffer Fence: Replant a 50-foot buffer (approximately 8.5 acres, based on length of shoreline and width of buffer) of riparian vegetation along the entire length of mainstem Deschutes River bordering the property and the lower portion of the Lake Lawrence outlet tributary. The riparian vegetation will improve water quality by adding shade, reducing direct runoff, providing LWD recruitment potential, and stabilizing the banks. This action includes placing a fence along the 200-foot buffer to keep sheep from the area until the end of 2012 when sheep will no longer be grazing on the lowlands.

4B – Replant Riparian Buffer between 50 and 200 feet from Deschutes River: Replant a buffer (approximately 18.5 acres) of riparian vegetation along the north side of the entire length of mainstem Deschutes River bordering the property to improve water quality by shading to reduce water temperatures, adding LWD recruitment potential, and enhancing the riparian corridor for wildlife.

4.1.5 Restoration Area 5 – Off-channel Habitat from Mainstem Deschutes River

This restoration area is the lowest lying area on the Smith Ranch and includes an off-channel that conveys overbank flows originating upstream from the Deschutes River back to the river upstream of Vail Road as flood waters recede. During smaller flood events on the Deschutes River, the channel is the pathway for backwater flooding of portions of the Smith Ranch and consequently provides refugia from high flows, which has been identified as a limiting factor to the fishery.

The restoration concept in this area would be to improve (lengthen and deepen) the drain back channel to the Deschutes River, which would improve the connection to the floodplain, provide off-channel refugia under more frequent flood events, increase the area of the refugia, and increase storage during high flow events, further mitigating peak flows in the Deschutes River. In addition the concept would allow naturally-colonizing woody tree species to become established adjacent to the channel and in the areas with shallow groundwater as well as selected planting of conifers. This concept is illustrated on Figure 6 and includes the following restoration actions.

5A – Enhance Off-channel Connection: The existing off-channel habitat will be enhanced and expanded to provide additional high flow refuge habitat.

5B – Create Highflow Side Channel: From the outlet of the tributary to the head of the enhanced off-channel (described in restoration 5A), a shallow side channel would be excavated to include deep LWD pools that will be activated during high flow events. This reconnects the floodplain and provide refuge to juvenile salmon.

5C – Replant Riparian Forest Along Enhanced Off-channel: Add woody vegetation to the floodplain areas around the off-channel and highflow channels described for restoration actions 5A and 5B, respectively.

4.1.6 Restoration Area 6 – Upland Restoration

This restoration area is the balance of the upland portions of the project site (see Figure 5; not represented on Figure 6). These areas are generally removed from surface water and shallow groundwater and the soils are somewhat droughty, and less able to support vegetation than other portions of the ranch. Stormwater runoff from these areas contributes fine sediments and animal wastes to the on-site drainage ditches and, ultimately, the Deschutes River.

The restoration concept for these areas would be to be to re-establish native ground cover and manage invasive species primarily for wildlife habitat. It may be possible to establish oaks or other drought-tolerant woody species without supplemental irrigation.

- 6A – Plant drought tolerant native upland trees, shrubs, and grasses across the site
- 6B – Install fence at property line between Cities' acquired parcels and parcels remaining in Ron Smith's ownership to keep his remaining sheep off the Cities' property

Potential restoration actions in Area 6 are not included in the remainder of this restoration assessment. The revegetation of the remaining upland areas (6A) comprising Area 6 would occur after the restoration work in other areas. Costs and timing of work in Area 6 will be determined after restoration in the other areas is underway.

4.2 Costs Associated with Restoration Actions

Costs were estimated based on assumptions about material quantities. Associated costs for engineering design (20 percent of material costs) and contingency (30 percent of material costs) were included in the calculation. These costs may change as more information becomes available in later design stages. Costs for each restoration action are estimated in Table 1. These are organized by type of action.

Table 1
Estimated Costs for Restoration Actions

Restoration Action	Estimated Cost Range
Side Channel/Off-channel Creation or Restoration	

Restoration Action	Estimated Cost Range
1B – Create New Channel from Hillside Springs	$300,000 to $350,000
2A – Reshape Existing Channel from Main Spring	$350,000 to $575,000
2B – Create New Channel from Small Springs	$150,000 to $200,000
2E – Create New Channel from Re-established Wetland	$150,000 to $200,000
5A – Enhance Off-Channel Connection	$50,000 to $75,000
5B – Create Highflow Side Channel	$150,000 to $200,000
Wetland Restoration	
1A – Re-establish Wetland Near Lake Lawrence Outlet	$100,000 to $200,000
2C – Re-establish Wetland Around Main Spring	$200,000 to $300,000
2D – Re-establish Wetland Around Smaller Springs	$250,000 to $350,000
Riparian Restoration	
4A – Replant 50-foot Riparian Buffer and Install Buffer Fence	$50,000 to $580,000
4B – Replant Riparian Buffer 50 to 200 feet from Deschutes River	$50,000 to $990,000
5C – Replant Riparian Forest Along Enhanced Off-Channel	$50,000 to $100,000
Bank Stabilization	
3A–Construct Live Cribwall Along Two Eroding Reaches of Deschutes River	$175,000 to $225,000
Total Costs	$2,025,000 to $4,345,000

For the riparian restoration costs, the wide range of costs is due to the range of options for plant density, planting techniques, and use of hired labor or volunteers. Table 2 presents the assumptions considered for estimating the range of costs associated with riparian planting. In all scenarios, the riparian plantings are assumed to be a mix of Douglas fir (*Pseudotsuga menziesii*), red alder (*Alnus rubra*), red twig dogwood (*Cornus alba*), Indian plum (*Oemleria cerasiformis*), red-flowering currant (*Ribes sanguineum*), and sitka willow (*Salix sitchensis*).

Table 2
Riparian Planting Details Used in Estimating Costs

Riparian Detail	Low Cost	Moderate Cost	High Cost
Plant Density	1,600 plants per acre	1,600 plants per acre	3,600 plants per acre
Plant Sources	Donated	Purchased from nursery	Purchased from nursery
Site Preparation	Minimal use of soil amendments, mulch, and other materials	Minimal use of soil amendments, mulch, and other materials	Full use of soil amendments, mulches/weed barriers, and planting tubes
Labor for Planting and Maintenance	Volunteer	Volunteer	Contractor

Fencing	Multi-strand barbed wire	Woven field fence	Woven field fence
Design	Conceptual landscape plan	Complete plans and specifications	Complete plans and specifications

4.3 Assessment of Benefits of Restoration Actions

In this section, the assessment of benefits of the Smith Ranch acquisition and restoration are described qualitatively and quantitatively. A qualitative description of benefits allows for a more complete explanation of the suitability of the Smith Ranch to meet desired outcomes for mitigation.

4.3.1 Qualitative Description of Benefits

4.3.1.1 Mitigation Benefits

This initial assessment confirms that the Smith Ranch is a suitable property to acquire to address desired outcomes for mitigation. The Smith Ranch is an ideal location to provide mitigation for predicted flow depletions to all the downstream segments of the river because of its location at the upper boundary of the modeled segments of the Deschutes River and at the confluence of the Lake Lawrence outlet and the Deschutes River (Riley 2008). The acquisition of the Smith Ranch would cease ongoing severe degradation associated with ranching activities and would create the opportunity to actively restore ecological conditions. The acquisition will end agricultural practices, including ditching and draining fields, water use, removal of woody riparian vegetation, exposed bare earth due to extensive grazing and trampling, animal wastes, and chemical herbicide applications. The restoration actions would address agriculture-related land modifications that have impacted the flow of water over and through the property, water quality, sediment quantities input to the river, and fish habitat in the tributary and mainstem. The acquisition of the Smith Ranch for conservation and restoration certainly provides value, particularly given that large portions of the land are shifting from intensive agriculture to conservation and preservation.

4.3.1.2 Water Flow Benefits

The multiple water courses flowing across the ranch, including the Lake Lawrence outlet and multiple spring channels, provide excellent opportunities to improve the rate and timing of

water to the river, enhance water quality for parameters formally listed as impaired by Ecology, and restore fish habitat to support salmon rearing. The flow-related benefits afforded by the restoration actions described cannot be quantified in the absence of lake and spring flow data and the preliminary conceptual stage of designs. The enhancement and expansion of wetlands on the property can be expected to reduce peak flows and potentially support base flow conditions (Sheldon et al. 2005). The wetlands will store water and drain more slowly than the existing ditches at the site.

4.3.1.3 Water Quality Benefits

The wetlands and other restoration actions will also improve water quality. The reduction in peak flows will lessen the volume of water in the mainstem, thus reducing the streambank erosion of the river. This contributes to reducing fine sediment inputs to the river, which is particularly beneficial because the Deschutes River is listed as impaired due to excessive quantities of fine sediment. Wetlands and the riparian buffers can remove phosphorus from the water and remove contaminants such as chemicals applied to Lake Lawrence to control summer algae growth. The removal of phosphorus from the outflow from Lake Lawrence is especially beneficial because the lake is listed as impaired due to high phosphorus concentrations. The restoration actions can also improve water temperature and dissolved oxygen conditions, both of which are impaired parameters in the mainstem Deschutes River. Dissolved oxygen is also listed as impaired in the Lake Lawrence outlet channel. The restored wetlands and riparian vegetation will reduce the heat load in the water and provide shade to limit solar heating. The grade control structures at the outlet of the streams are intended to aerate the water as it crosses over a cascade.

4.3.1.4 Fish Habitat Benefits

The Smith Ranch restoration actions provide significant opportunities to improve fish habitat for rearing salmon. The new stream channels and reconfigured stream channels with associated riparian vegetation and instream structure from LWD and pools can be expected to provide habitat that produces more prey items, enhanced refuge areas, and high-flow/over-wintering habitat for juvenile salmon. The off-channel restoration described addresses a habitat feature that has been the focus for restoration practitioners working in the watershed (Leischner 2000, Taylor 1999). Juvenile coho from spawning locations further

upstream in the mainstem river and from upstream tributaries can be expected to migrate into the restored Smith Ranch tributary and rear. The Smith Ranch will not provide spawning gravel for adult salmon, but could provide holding areas for upstream migrating adults. The proposed grade control structures would provide partial or potentially full access to juvenile and adult salmon.

4.3.2 Quantitative Description of Benefits

This section describes a points-based analysis of potential benefits associated with the restoration actions. The water resources implementation plan developed for Lewis and Salmon-Washougal watersheds (Ecology 2008) provides a framework for characterizing habitat benefits associated with various restoration actions in order to quantify mitigation credits relative to similarly calculated flow-impact depletion points (HDR and LCFRB 2008). The mitigation credits and depletion points are unitless because they are based on best professional judgment of contributors to the *Integrated Strategy for Implementing Water-Right Reservations – Grays-Elochoman and Cowlitz River Basins (WRIAs 25-26) and Salmon-Washougal and Lewis River Basins (WRIAs 27-28)* (HDR and LCFRB 2008); the assessment of benefits presented in this section has also been adapted from that document.

In this assessment, Anchor QEA used best professional judgment to apply an adaptation of this methodology to conditions in the Deschutes basin, including consideration of the habitat limiting factors and the types of potential restoration actions. The scoring system used was developed to characterize the contribution of the restoration actions in providing ecological functions, particularly those identified as habitat limiting factors in the Deschutes River watershed (see Section 2). Even though depletions are predicted in all reaches of the river, this evaluation focused on applying all mitigation strategies to the Smith Ranch property because of its unique and important location in the watershed, as well as the significant need for restoration at this location.

The restoration actions described for the Smith property include:

- Termination of intensive agricultural practices
- Side channel/off-channel habitat restoration
- Wetland restoration

- Riparian restoration, including fencing off the riparian buffer
- Bank stabilization to reduce fine sediment inputs

The points assigned to each restoration action incorporate the action's contribution to fish habitat and water quality. Anchor QEA used a point scoring system that is consistent with the methodology in HDR, Inc., and Lower Columbia River Fish Recovery Board's (LCFRB) report (2008), where higher points are given when there is a direct benefit to fisheries.

The acquisition of the property and termination of intensive agricultural practices were included as restoration actions because these actions address how the property has been detrimentally contributing to ecological conditions both at the site and downstream of the site. As previously described, the types of agricultural practices that the acquisition will end includes ditching and draining fields, water use, removal of woody riparian vegetation, exposed bare earth due to extensive grazing and trampling, animal wastes, and chemical herbicide applications. In this assessment, the score for termination of intensive agricultural practices addresses only the inputs of animal wastes, sediment inputs resulting from exposed bare earth, and chemical herbicide applications. The other impacts related to the agricultural practices are addressed in other restoration actions, or in the case of water use not included in this assessment.

To calculate the benefits for these actions, the size of each action needed to be estimated (shown on Figure 5). The calculated benefits for these actions are organized by type of action and presented in Table 3.

Table 3

Restoration Actions Benefits Calculation

Restoration Action	Size of Action at the Smith Ranch	Scoring System for Mitigation Points	Mitigation Points
Termination of Intensive Agricultural Practices			
Acquire Smith Ranch Property and Terminate Input to Animal Wastes and Eroded Sediment due to Ranching Activities	185 acres	5 points per acre	925
Side Channel/Off-channel Creation or Restoration			
1B – Create New Channel from Hillside Springs	1,626 feet long, 6 feet wide (9,756 square feet)	15 points per 100 square feet	1,463
2A – Reshape Existing Channel from Main Spring	1,938 feet long, 8 feet wide (15,504 square feet)		2,326
2B – Create New Channel from Small Springs	965 feet long, 4 feet wide (3,860 square feet)		579
2E – Create New Channel from Re-established Wetland	871 feet long, 6 feet wide (5,226 square feet)		784
5A – Enhance Off-Channel Connection	297 feet long, 6 feet wide (1,782 square feet)		267
5B – Create Highflow Side Channel	1,172 feet long, 8 feet wide (9,376 square feet)	5 points per 100 square feet	469
Wetland Restoration			
1A – Re-establish Wetland Near Lake Lawrence Outlet	4.0 acres	40 points per acre	160
2C – Re-establish Wetland Around Main Spring	14.8 acres		592
2D – Re-establish Wetland Around Smaller Springs	21.7 acres		868
Riparian Restoration			
4A – Replant 50-foot Riparian Buffer and Install Buffer Fence	8.5 acres	10 points per acre	85
4B – Replant Riparian Buffer 50 to 200 feet from Deschutes River	18.5 acres	5 points per acre	93
5C – Replant Riparian Forest Along Enhanced Off-Channel	5 acres		25
Bank Stabilization			
3A – Construct Live Cribwall Along Two Eroding Reaches of Deschutes River	444 feet of shoreline (approximately 148 feet for lower section and 296 for upper section)	20 points per 100 feet	89
		Total Points	**8,725**

5 RECOMMENDED RESTORATION ACTIONS TO INCLUDE AS MITIGATION

In order to identify a recommended set of restoration actions to include as mitigation, the magnitude of impacts to the Deschutes River watershed stemming from the proposed water withdrawals were estimated using the framework outlined in HDR and LCFRB's report (2008).

The framework uses an impact accounting system similar to that used to calculate mitigation credits. The output is an estimate of depletion points that are unitless. The scoring system depends on the relative importance of the location to salmon recovery, as well as whether the surface water instream flows in the impact area is an ecological limiting factor, which is the case in the Deschutes River. In this situation, depletion points are calculated for all reaches, but the mitigation points are applied to one restoration site.

The scoring system assigns depletion points based on the flow depletion rate (in cubic feet per second [cfs]) and the river length (in miles) that encounters the depleted flows. For the analysis, 10 depletion points were assigned for every mile of river with 0.1 cfs depletion. Flow depletion was calculated separately for each of the four reaches in the Deschutes River watershed in which flow depletion rates were calculated. The flow depletion formula used for each reach was:

$$\text{Reach Flow Depletion Points} = L \times (FD/0.1\ \text{cfs}) \times 10$$

L = Reach length in miles
FD = Cumulative flow depletion rate (cfs) in reach

The total flow depletion points for the Deschutes River were calculated by summing the individual reach calculations. The river length was estimated using the assessment reach map provided for the analysis of flow impacts in "McAllister Groundwater Model Updates. Prepared for the City of Yelm" (Golder 2007). The flow depletion rates and the "predicted maximum values" of flow depletion for each reach as reported by Golder Associates (2008),

S.D. Thomas (2008a, 2008b, and 2008c), M. Riley (2008), and the City of Olympia and Nisqually Indian Tribe (2008) were used in the calculation.

Because the benefits from the restoration activities on site are year-round benefits—even though the maximum impacts occur in different reaches during different months of the year—this approach to applying depletion points is inherently conservative and adaptive. To provide a conservative estimate of winter depletion impacts, these maximum values were summed across reaches, although the maximum impacts occur in different reaches during different months of the year. As shown in Table 4, the total estimated winter flow depletion impact is 1,880 depletion points. It should be noted that the U.S. Geologic Survey flow data document that Deschutes River flows do not meet the established minimum instream flows (Ecology 1980) during 30 percent of the winter time period. During the remainder of the winter, the predicted flow depletions would not cause additional time below the minimum instream flows.

Taking a conservative approach, the Cities have not reduced the depletion points shown in Table 4 to reflect the historical winter in-stream flow conditions. This approach is also inherently adaptive to future possible changes in winter in-stream flow patterns and will provide year-round habitat benefits.

Table 4
Winter Flow Depletion Impact Calculation

River Reach	Reach Length	Predicted Maximum Winter Impacts Flow Depletion[1]		Scoring System for Depletion Points per 0.1 cfs-mile	Depletion Points
		Incremental Depletion in Reach	Cumulative Depletion		
Upper Deschutes	8.8 miles	0.39 cfs	0.39 cfs	10	343
Middle Deschutes	7.0 miles	0.14 cfs	0.53 cfs		371
Lower Deschutes	11.0 miles	0.53 cfs	1.06 cfs		1,166
Total to Mitigate for Winter Flow Depletions					1,880

Notes:

1 Flow depletion sources: Golder 2008; Thomas 2008a, 2008b, and 2008c; Riley 2008; and City of Olympia and Nisqually Indian Tribe 2008. The depletions listed in the table are the cumulative predicted depletions for the following water right applications:

- **City of Lacey** – New water right applications G2-29165 (Madrona Wellfield), G2-29304 (Evergreen Estates), G2-30248 (Hawks Prairie #2), G2-30249 (Betti Well), G2-30250 (Meridian Campus), and G2-30251 (Marvin Road)
- **City of Olympia and Nisqually Indian Tribe** – Water right change applications for Certificate Nos. 8030 and S2-001105C (McAllister Springs) and Permit No. 10191 (Abbott Springs)
- **City of Yelm** – Phases I and II of new water right applications G2-29084, G2-29085, and G2-29086 (SW Yelm Wellfield)

2 Updated flow depletion modeling results may become available due to ongoing modeling by the City of Yelm. The numbers in Table 4 represent the worst-case impact scenario.

Recommendations for restoration actions to include in the mitigation proposal to Ecology were identified based on the contributions of the restoration actions to addressing the habitat limiting factors of the watershed and on the calculation of mitigation credits and depletion points. In making recommendations, the costs of the actions were not considered. The following restoration actions (described in Section 4) are recommended to offset the predicted depletions in the Deschutes River:

- Acquire Smith Ranch Property and Terminate Input to Animal Wastes and Eroded Sediment due to Ranching Activities
- 2A – Reshape Existing Channel from Main Spring
- 2D – Re-establish Wetland around Smaller Springs
- 3A – Construct Live Cribwall Along One of the Eroding Reaches Along Mainstem
- 4A – Replant High Density 50-foot wide Riparian Buffer and Install Buffer Fence
- 4B – Replant Low Density 50- to 200-foot wide Riparian Buffer

The recommended reshaping of the main spring channel (2A) includes enhancement of the headwater wetland at the spring and the establishment of a 25-foot wide buffer on either side of the channel. The 25-foot wide riparian vegetation corridor will be planted from the headwater wetland and downstream to the 50-foot riparian buffer along the mainstem Deschutes. In this way, the riparian corridor included in action 2A will include a portion of the Lake Lawrence outlet tributary. The riparian buffer would provide ecological benefits including shade, bank stability, organic inputs, terrestrial insect production, and long-term wood recruitment. The inclusion of the riparian buffer is an interim measure to enhance the function of the restored main spring channel prior to the larger wetland around the spring (action 2C) being constructed. The 25-foot buffer will provide the functional benefits of a riparian corridor, while not precluding the future wetland re-establishment planned in action 2C. The riparian corridor along the main spring channel would include plant species that could continue to grow if/when restoration of the larger wetland around the main spring (2C) is constructed.

The recommended bank erosion action is for the downstream of two eroding banks near the upstream margin of the Smith Property. This partial action is necessary because the other eroding bank is partially contained on property owned by an adjacent landowner. Restoration of the bank may be possible in future restoration efforts, but is not included in the initial phase of restoration that is recommended as mitigation.

As reflected in the list of recommended restoration actions, it is recommended that the initial mitigation proposal focus on restoring the main spring channel, enhancing wetlands using water from the smaller springs and ditches, adding a 200-foot wide corridor of riparian vegetation along the Deschutes River, and addressing bank erosion along the upstream end of the site. In particular, the wetland enhancements are a key aspect of converting the Smith Ranch from the existing agricultural configuration into a higher functioning area. The wetlands provide some benefits to the hydrology of the site, i.e., reduce peak flows and prolong the duration of outflows after storm events, improve water quality for several parameters, and in doing so provide better fish habitat within the wetland areas as well as in downstream areas influenced by the water quality and hydrology of the area.

The recommended actions address the following habitat limiting factors in the watershed:

- Excessive fine sediment
- Streambank stability
- Lack of LWD
- Riparian buffer vegetation
- Water quality impairments

The estimated costs of these actions, excluding property acquisition, are $1,390,000 to $1,740,000. The recommended restoration actions would provide 4,327 mitigation points. Table 5 presents the costs and mitigation points for the recommended restoration actions. The costs and mitigation points are consistent with those presented for all restoration actions in Tables 1 and 2, respectively.

Table 5
Estimated Costs and Mitigation Points for Recommended Restoration Actions

Restoration Action	Estimated Cost Range	Mitigation Points
Property acquisition and termination of input to animal wastes and eroded sediment due to ranching activities	NA	925
2A – Reshape Existing Channel from Main Spring	$350,000 to $575,000	2,326
2D – Re-establish Wetland Around Smaller Springs	$250,000 to $350,000	868
3A – Live Cribwall Along One Eroding Reach of Deschutes River	$50,000 to $75,000	30
4A – Replant High Density 50-foot Riparian Buffer and Install Buffer Fence	$580,000	85
4B – Replant Low Density 50- to 200-foot wide Riparian Buffer	$160,000	93
Total s	**$1,390,000 to $1,740,000**	**4,327**

The recommended suite of restoration actions more than doubles the calculated depletion points required (4,327 versus 1,880). This conservative approach to identifying restoration actions beyond the calculation mitigation need is recommended because each recommended actions would make significant contributions to address the habitat limiting factors, immediately address some of the most impactful alterations resulting from the intensive agricultural practices, and set the stage for future restoration at the site. The five recommended actions to be implemented—after the property is acquired—include three relatively low scoring actions (3A, 4A, and 4B) and two large actions (2A and 2D). Although

only action 2A would be necessary to exceed the calculated depletion points, the full suite of five restoration actions is included as recommended actions because they are considered key elements of transforming the ranch from agricultural to more natural habitats to benefit the site and watershed.

6 RECOMMENDED TIMEFRAME FOR MITIGATION IMPLEMENTATION

The following recommended sequence of actions on the Smith Ranch is based on consideration of the land purchase agreement, the timeframe to achieving benefits after an action is completed, and the inter-related nature of the actions. The recommended sequence of actions assuming water rights decisions are made in 2010 is summarized in Table 6 and described below.

Table 6

Recommended Sequence of Actions

Action	Timeframe[1]
Complete property acquisition	2011
4A (partial) – Install Buffer Fence 200 feet from Deschutes River and along mouth of Lake Lawrence outlet	2011
4A (partial) – Replant High Density 50-foot Riparian Buffer	2011 to 2013
3A – Construct Live Cribwall Along One Eroding Reach of Deschutes River	2013 to 2015
2A – Reshape Existing Channel from Main Spring	2013 to 2015
2D – Re-establish Wetland Around Smaller Springs	2013 to 2015
4B – Replant Low Density 50- to 200-foot wide Riparian Buffer	2014 to 2016

Note:
1 Time frame assumes water rights decisions are made in the first half of 2011.

Assuming water right decisions are made in 2010, the Cities' land purchase agreement with Ron Smith (the owner of the Smith Ranch Property) can proceed in 2010 and must be completed by April 2011. The purchase agreement allows sheep to graze throughout the property, excluding the 200-foot buffer along the Deschutes River, until November 2012. Sheep will be excluded from the river buffer through the installation of a fence (4A). This fence installation should be the first action taken and should occur as soon as possible after property acquisition.

In 2011 to 2013, the 50-foot riparian buffer (4A) should be planted because it will take several years to realize the benefits. This is a large project along more than one mile of the river bank. In 2013 to 2015, the live cribwall (3A) is recommended to be constructed. This is important to construct given the recent rapid pace of erosion along the Deschutes River.

Addressing bank erosion will immediately address the introduction of fine sediments which impacts habitats over an extended downstream area. Also in 2013 to 2015, the main spring channel (2A) and the smaller springs wetland (2D) are recommended to be constructed. Restoring the main spring channel (2A) and the smaller springs wetland (2D) at the same time could provide some construction efficiencies. The wetlands will cut off road access through the property, although other four-wheel drive access from Vail Road could be established, if desired. The last recommended mitigation action is the planting of the riparian buffer from 50 to 200 feet from the river during 2014 to 2016.

7 RECOMMENDED IMPLEMENTATION SEQUENCE OF ADDITIONAL RESTORATION ACTIONS

After the construction of the restoration actions completed as mitigation (described in Section 6), the following sequence of additional restoration actions is recommended. Monitoring of the initial mitigation actions may provide information to refine the sequencing and design of these additional restoration actions.

The next focus of restoration should be the re-establishment of the Lake Lawrence Outlet Wetland (1A) as well as restoration of the off-channel near the downstream end of the property (5A). Depending on the performance of the smaller springs wetland (2D) constructed as wetland, a new outflow channel (2G) could be constructed.

After the recommended restoration actions are constructed, it is recommended that additional restoration occur near the main spring and along the downstream end of the Smith Ranch. Near the main spring, the adjacent ditches would be filled and a more sinuous channel (2B) and wetland (2C) constructed. Along the downstream end of the property, create a highflow side channel (5B) and replant the riparian forest (5C). As previously described, need for and design of these restoration actions can benefit from monitoring of restoration actions constructed in preceding phases.

The last restoration action recommended to construct is the new channel near the hillside springs (1B). As mentioned in Section 4, replanting of woody vegetation in the upland Area 6 would occur after other restoration of the site has been completed.

8 DATA NEEDS AND SITE STEWARDSHIP

Future steps in designing the enhancement and expansion of wetlands will require additional data on the quantity of water coming from Lake Lawrence, the main spring, hillside spring, and perhaps other smaller springs present at the Smith Ranch. It is recommended that a year-round monitoring effort be conducted for these surface water sources, as well as ground water elevations. At least one full year of flow and groundwater level data collection is recommended to provide a better understanding of the certainty of success in restoring the habitat as planned. A wetland delineation on the Smith Ranch is also recommended. This will clarify the extent to which the NWI maps of wetlands may be an over-estimate of current wetlands.

The Smith Ranch property will require stewardship before and after restoration actions are conducted. When the riparian buffer fence is installed (4A) after the Cities take ownership of the Smith Ranch property, controlling invasive vegetation along the mainstem river corridor will become necessary. However, the continued presence of sheep elsewhere on the ranch until November 2012 will control invasive vegetation growth on the remainder of the property.

It is recommended that a Stewardship Plan be prepared for the Smith Ranch property. A Stewardship Plan can describe the monitoring and maintenance to be done in the riparian, wetland, and creek habitats and can also describe performance goals for the site, including those associated with the restoration actions. In addition, the plan can identify adaptive management decision-points and activities that can be conducted to address areas where performance goals are not achieved. In this way, a Stewardship Plan can serve as an "owners' manual" for the Cities by describing what monitoring or maintenance work needs to be completed, when the work needs to be completed, and how to respond if the site is not performing as anticipated.

9 CONCLUSIONS

The Smith Ranch property is an appropriate site to acquire in order to meet desired outcomes for mitigation associated with the Cities' proposed water rights applications. The Smith Ranch is an ideal location to provide mitigation for predicted flow depletions to all the downstream segments of the river. In this way, the benefits derived from property acquisition, cessation of intensive agricultural land practices, and recommended restoration actions will benefit the full extent of the watershed that is predicted to be impacted by the water withdrawals.

Based on this initial assessment, it is recommended that the following initial habitat restoration actions are included in the mitigation proposal to Ecology:

- 2A – Reshape the main spring channel
- 2B – Re-establish the wetland around smaller springs on the ranch
- 3A – Construct a live cribwall to address erosion along the Deschutes River
- 4A – Replant a high density 50-foot riparian buffer and install buffer fence along the river
- 4B – Replant a low density 50- to 200-foot riparian buffer

These recommended actions were selected because each action make significant contributions to address the habitat limiting factors, immediately address some of the most impactful alterations resulting from the intensive agricultural practices, and set the stage for future restoration. The benefits of these actions would extend far beyond the boundaries of the property, thereby significantly contributing the restoration of the Deschutes River watershed.

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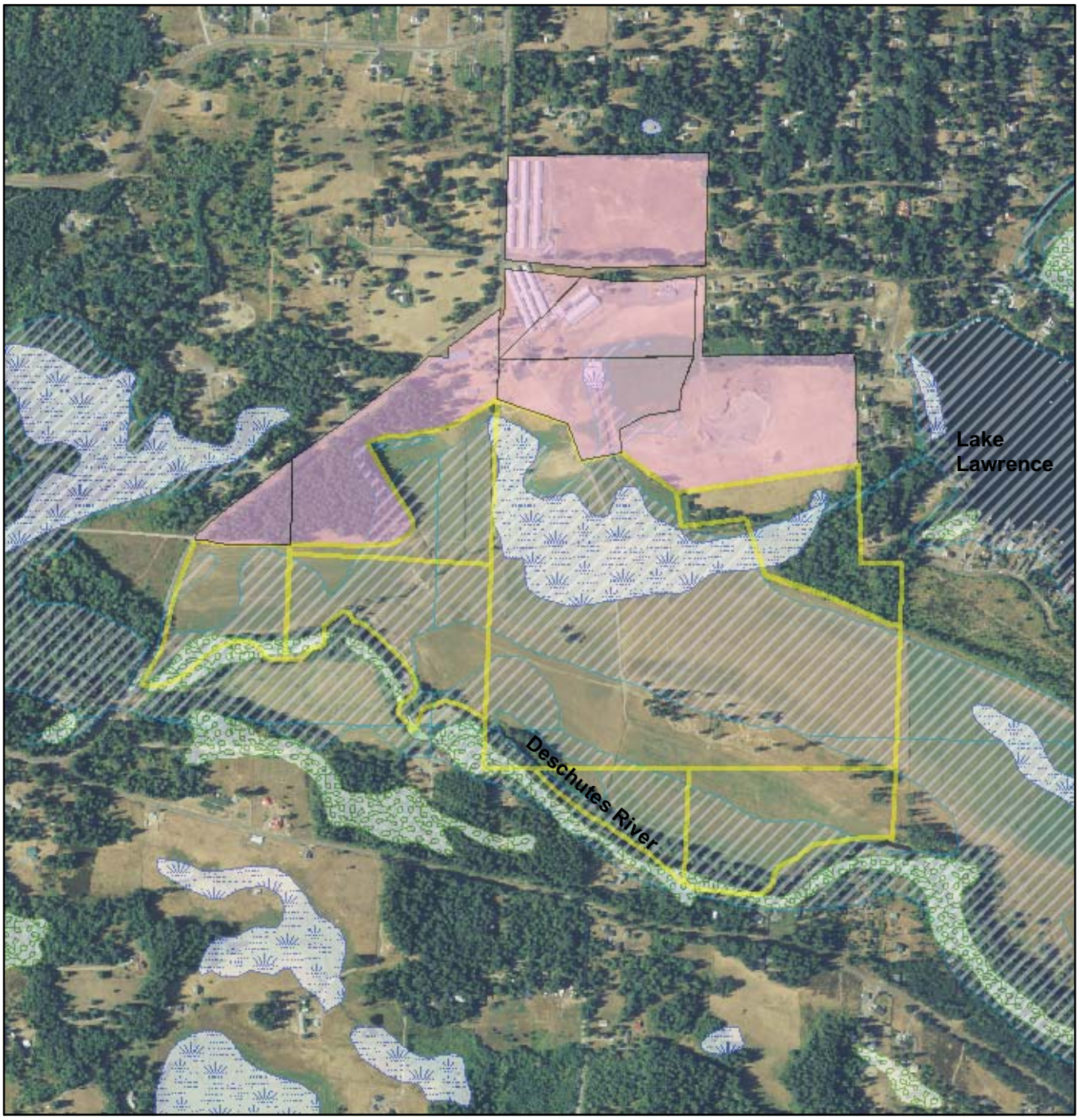
FIGURES



Sources:

Aerial Photo Base: 2009 NAIP
FEMA Q3 Data for Thurston County
NWI Wetland Mapping for Thurston County

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Riverine
- 100-yr Floodplain
- Land to be Purchased
- Land Retained by Mr. Smith

ANCHOR QEA

Figure 1
Smith Ranch Proximity to 100-year Floodplain and Wetlands
Initial Acquisition and Restoration Assessment of the Smith Ranch

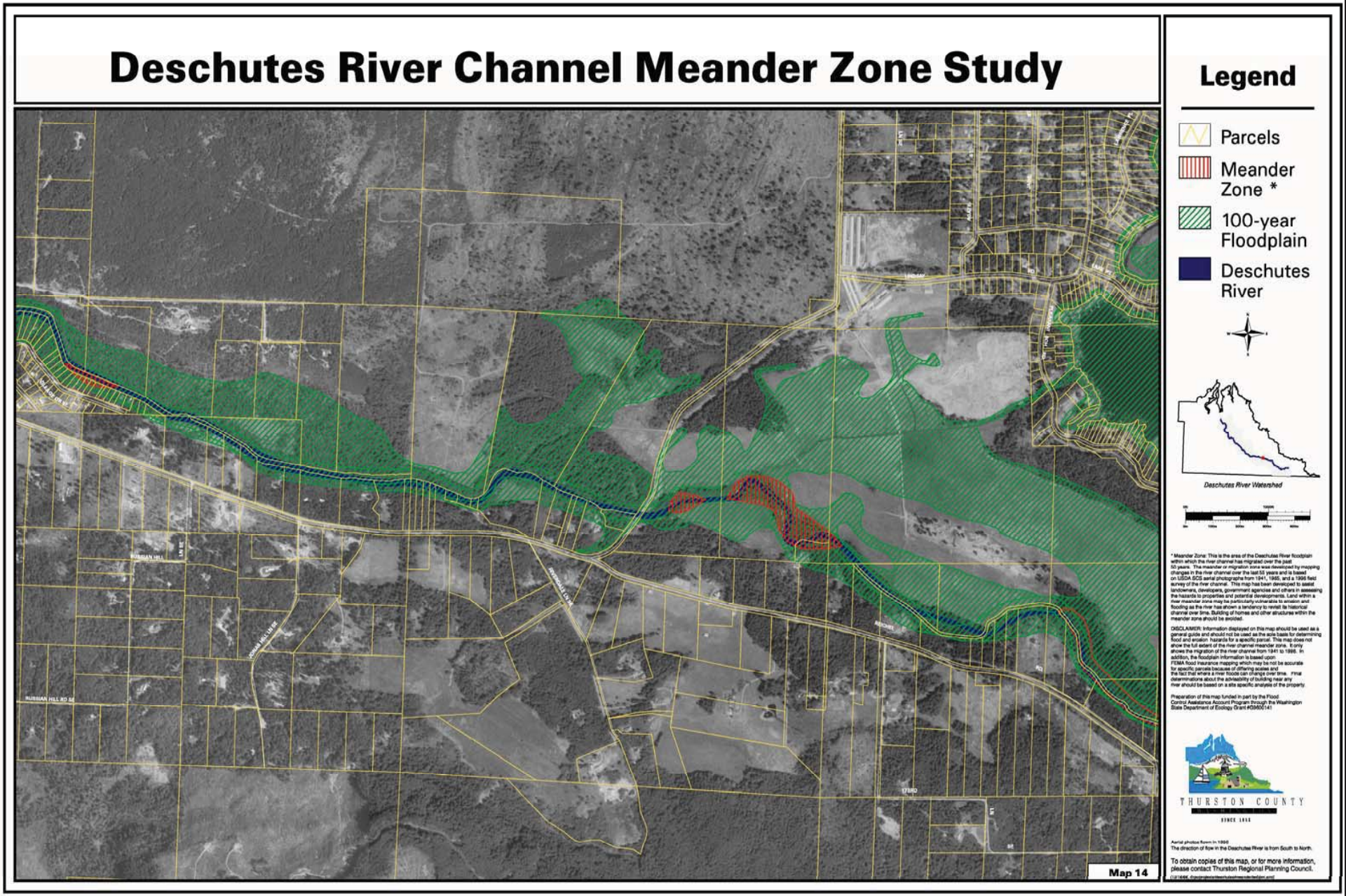
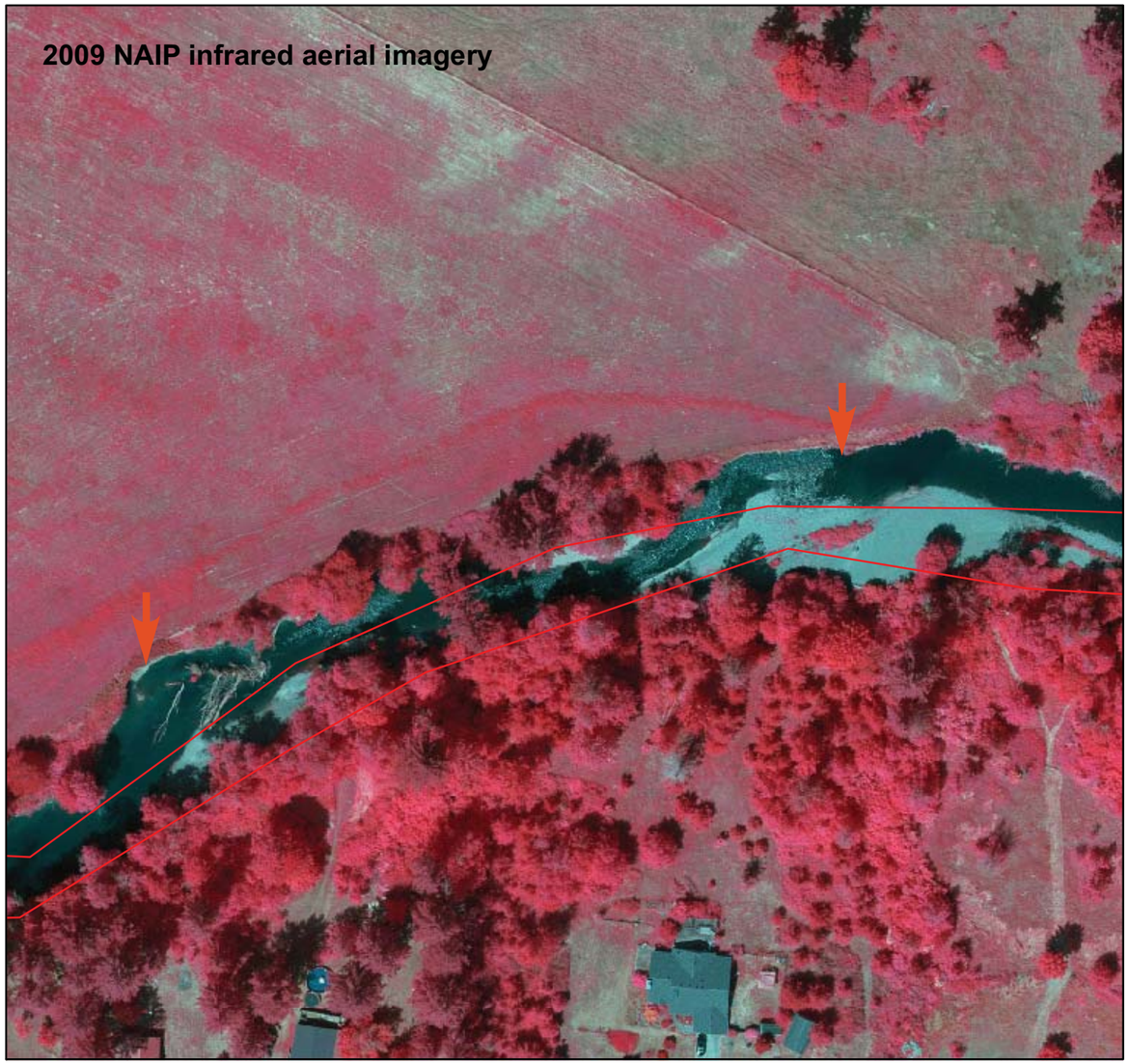


Figure 2

Taylor (1999) Depiction of Wetlands in Vicinity of Smith Ranch

Initial Acquisition and Restoration Assessment of the Smith Ranch

ANCHOR QEA



Sources:

Aerial Photo Base: 2006 NAIP and 2009 NAIP IR

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100 50 0 100 Feet

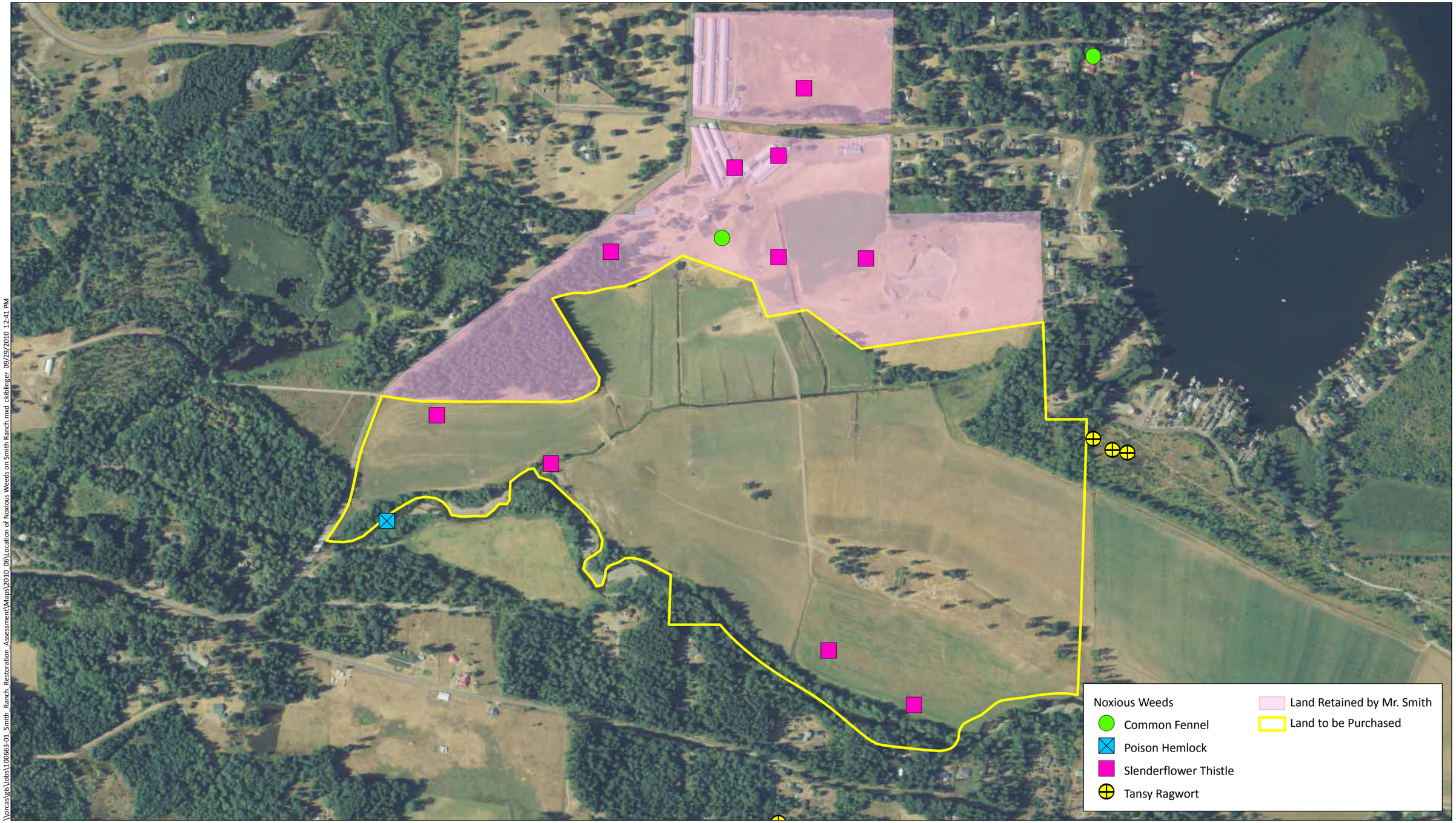
Active Erosion Sites

1992 Riverbank

ANCHOR QEA

Figure 3

Bank Erosion along the Deschutes River at Upstream End of Smith Ranch
Initial Acquisition and Restoration Assessment of the Smith Ranch



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ANCHOR QEA

NOTES
Aerial Photo: NAIP 2009.
Noxious Weeds Data Source: 2010 Noxious Weeds in Thurston County Map, available at http://www.co.thurston.wa.us/tcweeds/noxious_weeds.htm (locations are approximate).

Feet
0 300 600 900 1,200

Figure 4
Location of Noxious Weeds on Smith Ranch
Initial Acquisition and Restoration Assessment of the Smith Ranch

Restoration Areas

1: Lake Lawrence Outlet and Hillside Springs

2: Main Spring and Smaller Springs

3: Bank Stabilization

4: Riparian Buffer

5: Off-Channel Habitat

6: Uplands

LAKE LAWRENCE

Main Spring

2

Lake Lawrence Outlet Tributary

1

5

6

Hillside Springs Channel

4

DESCHUTES RIVER

3

\\orcas\gis\Jobs\100663-01_Smith_Ranch_Restoration_Assessment\Maps\2010_06\Restoration Areas at Smith Ranch.mxd ckiblinger 10/07/2010 2:45 PM

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Aerial Photo: NAIP 2009.

Feet

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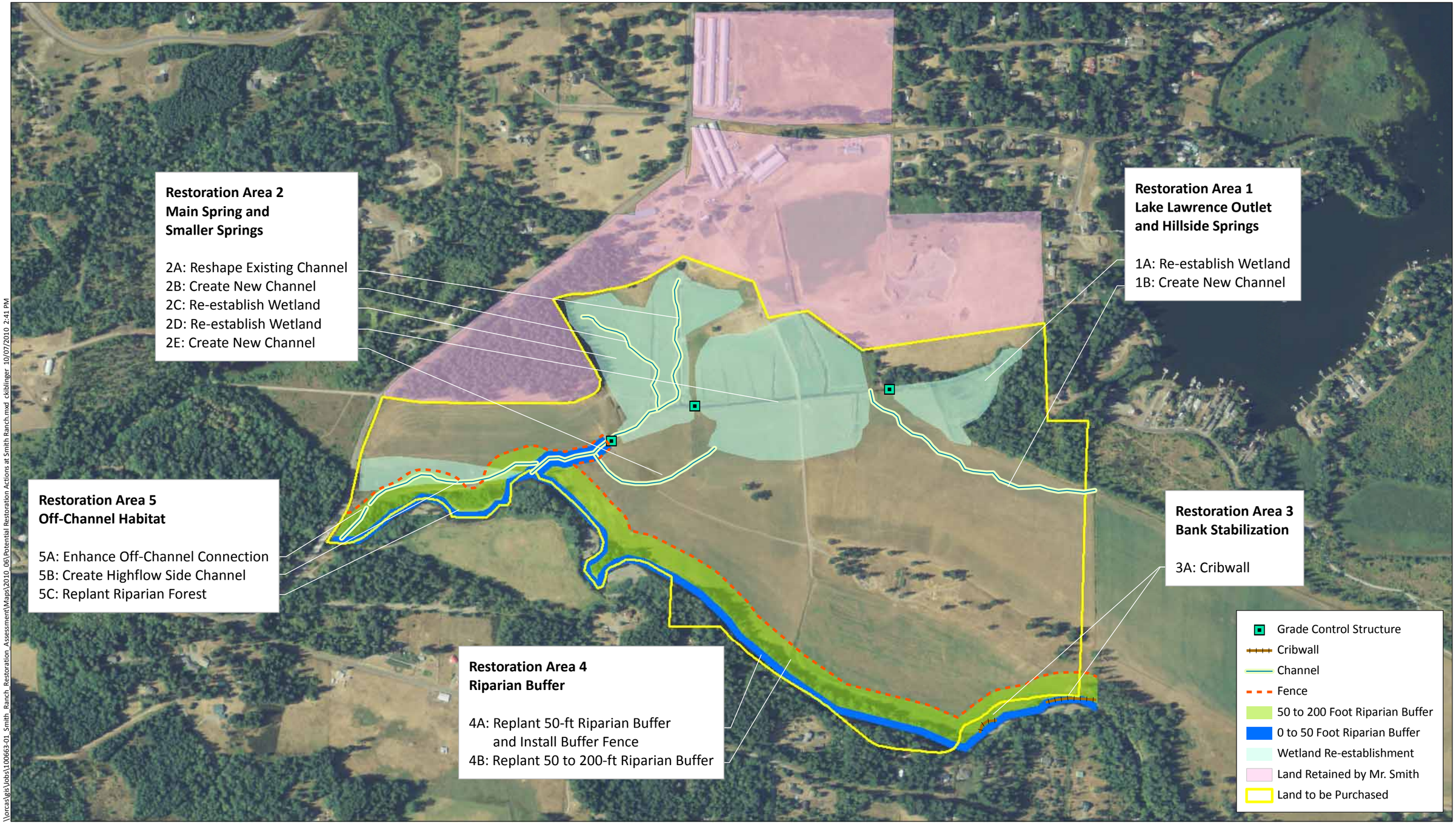
Figure 5

Restoration Areas at Smith Ranch

Initial Acquisition and Restoration Assessment of the Smith Ranch



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Aerial Photo: NAIP 2009.

Feet
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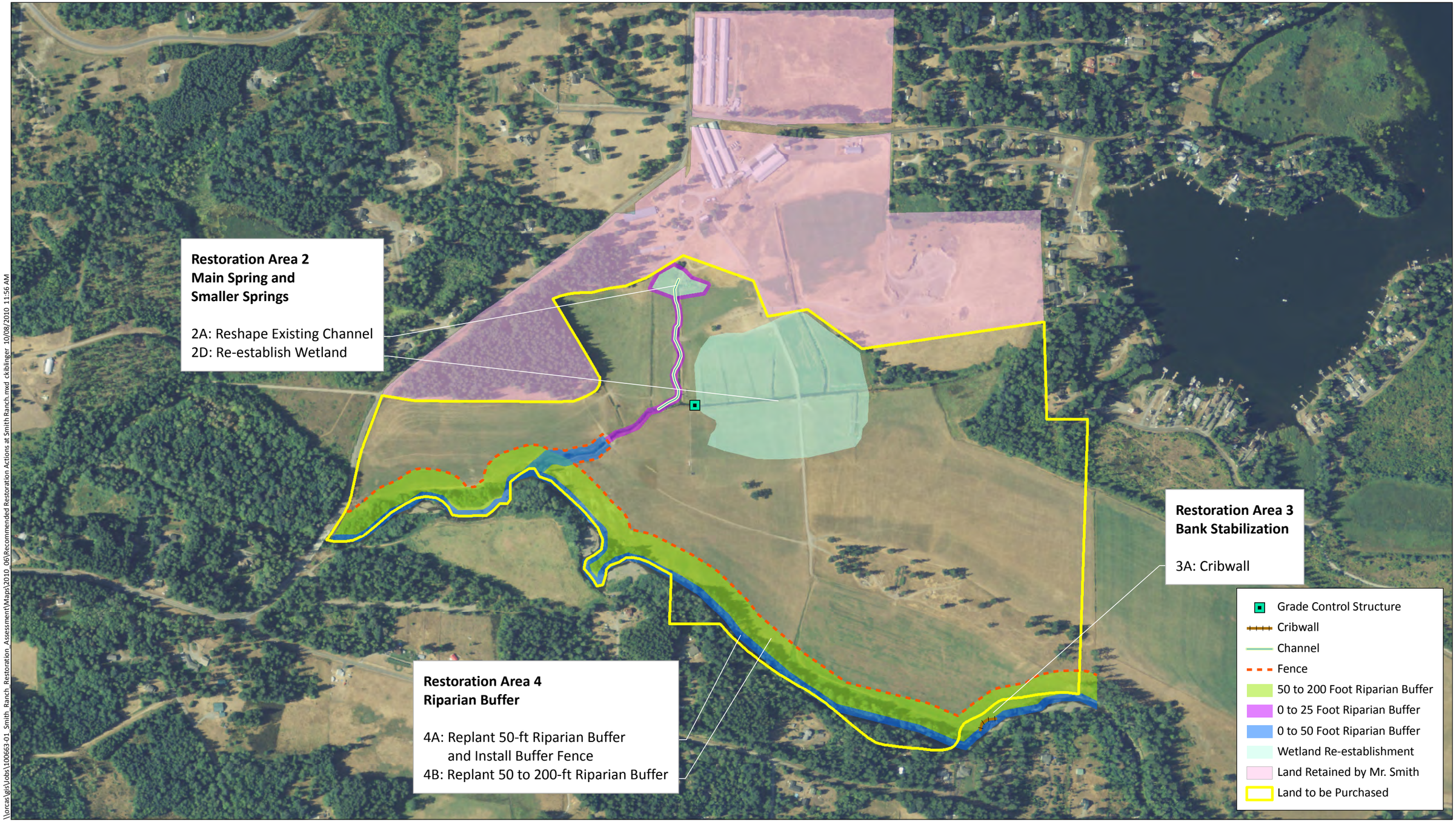
Figure 6
Potential Restoration Actions at Smith Ranch
Initial Acquisition and Restoration Assessment of the Smith Ranch



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Aerial Photo: NAIP 2009.

Feet
0 300 600 900 1,200

Figure 7
Recommended Restoration Actions at Smith Ranch
Initial Acquisition and Restoration Assessment of the Smith Ranch