Dragonfly Bend

Cary Kerst

widow skimmer

Prepared for

City of Eugene • Parks and Open Space Division •

Wetlands and Open Waterways Section

Prepared by

Lane Council of Governments

June 12, 2003

Mitigation Improvement Plan

Dragonfly Bend

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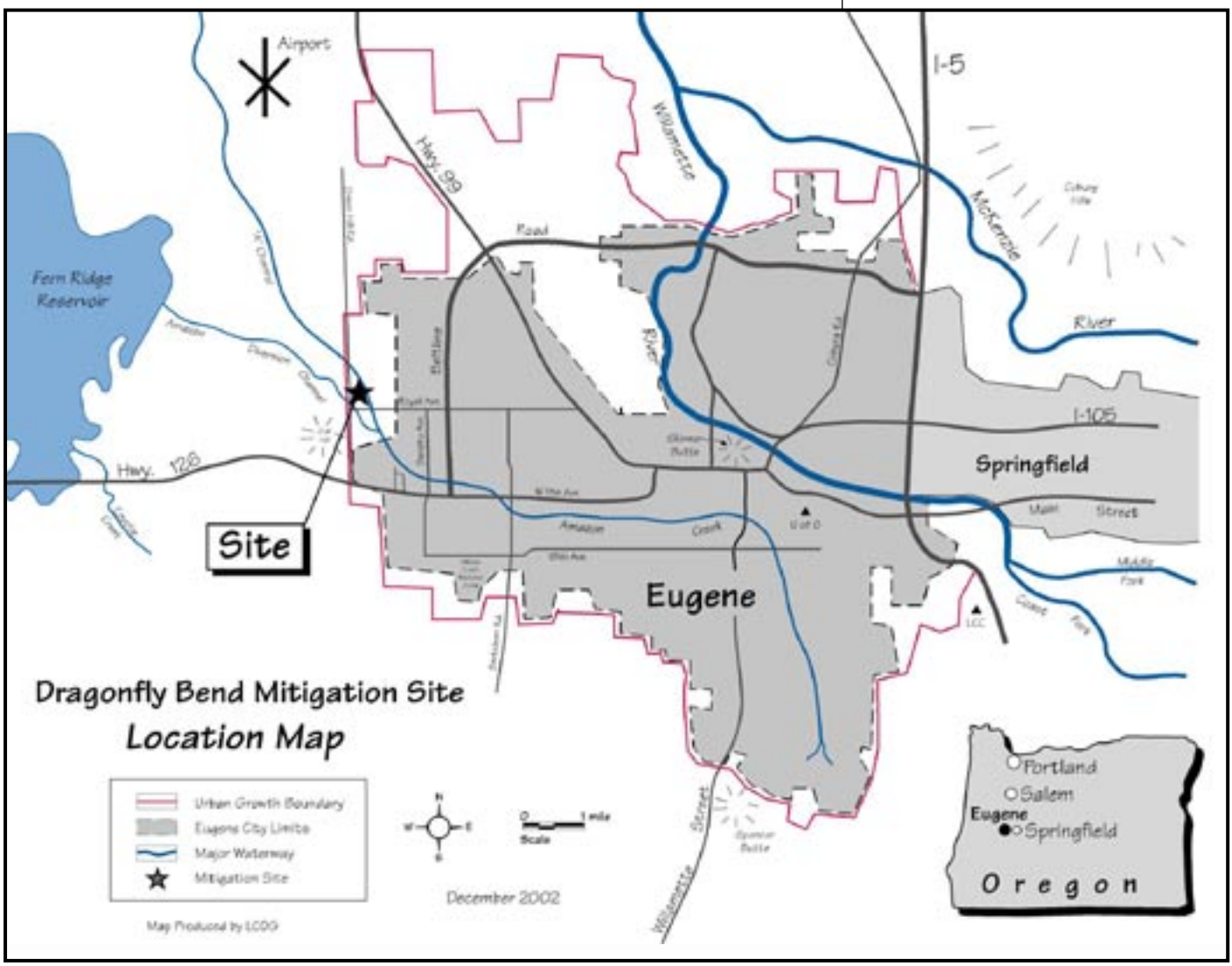
Introduction

General Project Description

The 76.8-acre Dragonfly Bend wetland mitigation site is located in the Amazon Creek drainage to the northeast of the intersection of Royal Avenue and Green Hill Road in west Eugene. This site includes approximately 69.7 acres recently purchased by the City of Eugene (City), plus an additional 7.1 acres of City-owned property along the Amazon Diversion Channel. The Lane County Department of Assessment and Taxation identifies the property as tax lots 1901, 2000, and 2100 located on map 17-04-20-00. 67.8 acres were purchased by the City from Steven Lee (Napa Valley Limited Partnership) and Marvin Wells in July 2002 for $1,960,000 using a combination of funds received from the Oregon Watershed Enhancement Board ($500,000), the North American Wetlands Conservation Act ($530,000), and the City Stormwater Management Fund ($250,000). An additional 1.9 acres at the northern end of the site along Amazon Creek were conveyed to the City in May 2003. The U.S. Bureau of Land Management (BLM) purchased a conservation easement on 23.44 acres located in the southern portion of the site ($680,000).



Much of the site has been in agricultural use for several decades, and in recent years used to grow annual ryegrass.

The areas proposed for restoration and enhancement on the Dragonfly Bend site were likely historically wetland prairie, intermixed with shallow swales and meanders of Amazon Creek and the associated emergent and riparian communities. This prairie has been displaced by agricultural uses since at least the 1930s and was planted in annual ryegrass in recent years. The site was acquired in July 2002 for the specific purpose of wetland and floodplain restoration by the west Eugene wetland partnership. The southern half of the site is identified in the *West Eugene Wetland Plan* (1992) as site B8 and designated as *wetlands to be enhanced for mitigation credit*. The entire area is within the urban growth boundary (UGB), which runs north-south along Green Hill Road.

The Action Plan proposed for the site proposes restoration of 40.4 ares of wetland prairie, 5.5 acres of vernal pool/emergent wetland, and 5.9 acres of upland prairie along with 0.5 acres of wet prairie enhancement. The wetland restoration and enhancement will ultimately result in the creation of approximately 46 mitigation credits under the West Eugene Wetland Mitigation Bank.

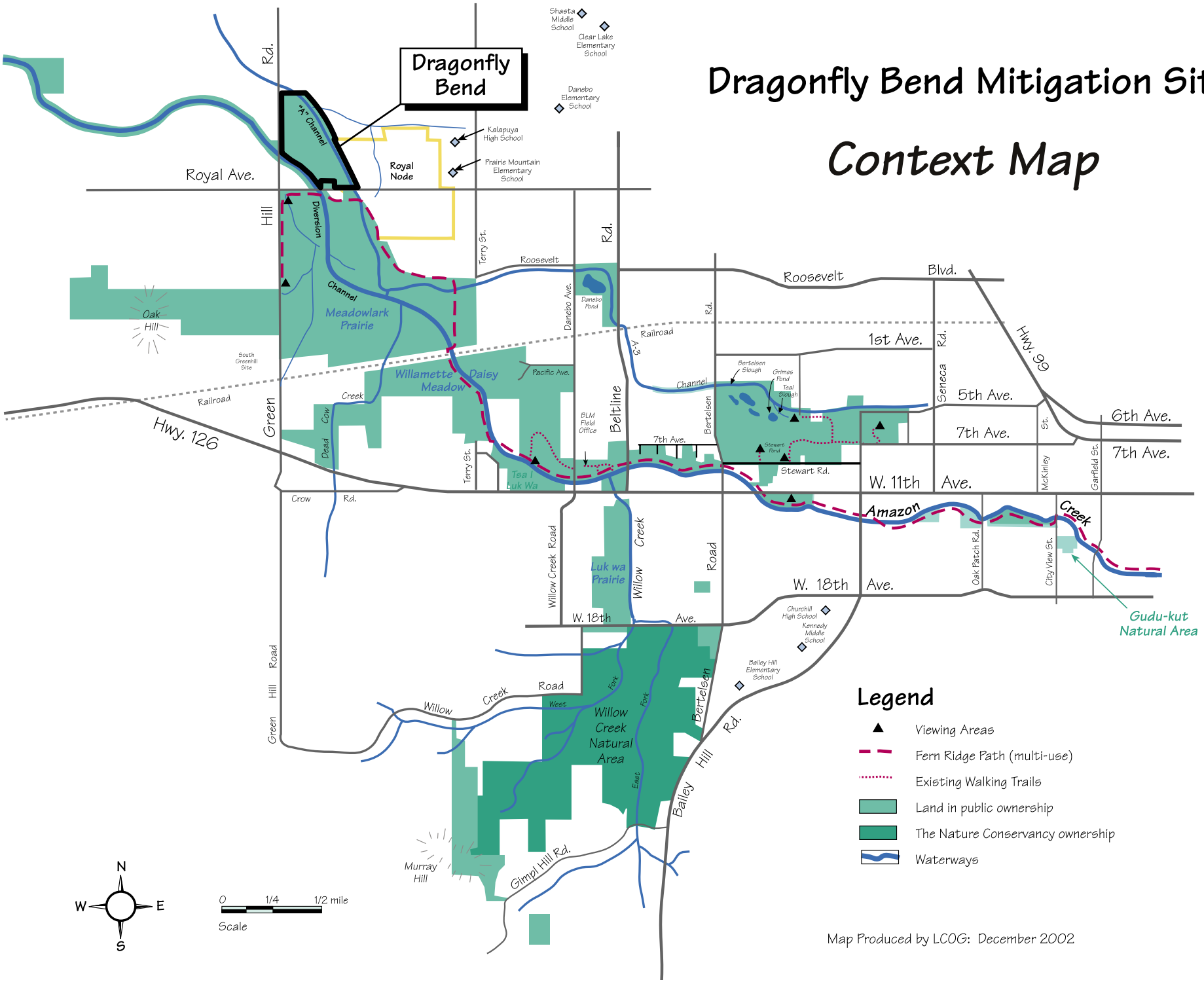
Site Context

The site is bound on the north, east, and west by agricultural uses and the south by wetlands in public ownership, a few scattered houses, and a metal plating shop. (See Context Aerial Photo and Existing Conditions Map.)

The site viewed from the south (2000).

Dragonfly Bend Mitigation Site

Context Map



Legend

- Viewing Areas
- Fern Ridge Path (multi-use)
- Existing Walking Trails
- Land in public ownership
- The Nature Conservancy ownership
- Waterways

Map Produced by LCOG: December 2002

Royal Avenue runs east-west along the southern edge of the site. To the south of Royal Avenue sits the 390-acre Meadowlark Prairie wetland (formerly known as the *Lower Amazon Restoration Site* or the *1135 Project*). Extensive floodplain and wetland restoration has occurred on this site over the past three years including the removal of levees along the Diversion Channel, Amazon Creek, Dead Cow Creek, and the A-3 Channel. In addition, numerous recreational facilities have been completed including the two-mile extension of the Fern Ridge Bike Path to the corner of Royal Avenue and Green Hill Road.

The agricultural lands to the west of the site will likely remain in that use in the near future, as this land lies outside of the UGB and is constrained for large-scale development due to its proximity to the airport. The agricultural lands to the north and east will likely develop in residential uses within the next several years. This includes a portion of *the Royal Nodal Development Area* to the east, which may contain slightly higher residential densities, some small-scale commercial uses, and the associated road network.

The site is also in close proximity to the newly constructed Bethel Park and Meadowlark Elementary School to the north, and the recently constructed Kalapuya High School and Prairie Mountain Elementary School to the east. These schools will likely use the west Eugene wetlands and the associated waterways as an educational resource in the future.

Project Authority

This Mitigation Improvement Plan (MIP) will generate mitigation credit for the West Eugene Wetlands Mitigation Banking Program under the authority of a Memorandum of Agreement (MOA) between the U.S. Army Corps of Engineers (Corps), U.S. Environmental Protection Agency, Oregon Department of Environmental Quality, Oregon Division of State Lands, BLM, and the City. The Agreement, signed in 1995, activated the Mitigation Bank, which represents one product of a unique partnership between the City, The Nature Conservancy (TNC), the BLM, the Corps, Oregon Youth Conservation Corps, and the U.S. Fish and Wildlife Service. The partnership originated in 1992 with adoption of the *West Eugene Wetlands Plan* (WEWP) and the implementation of the Mitigation Bank as one of the Plan's goals.

Federal Environmental Assessment

Although the BLM holds a conservation easement on 23.44 acres of the site, it has been determined that the BLM is not required to complete an Environmental Assessment (EA) for this area. This is based on the specific wording of the easement and on the fact that it had been determined in the past that the EA process is typically only required for those sites on which the BLM holds the fee title, not conservation easements.

Site History and Existing Conditions

Site History

Based on interpretation of the Soil Survey of Lane County (SCS, 1987) and historic vegetation mapping (Christy et al. 1999 based on the General Land Office surveys of the 1850s), the site was most likely historically dominated by a wetland prairie plant community with some riparian and emergent vegetation likely present along Amazon Creek. Survey notes taken in January 1853 read: *Land nearly level prairie. Soil 1st rate clay loam, portions of it is sometimes inundated from 1 to 3 feet deep by flood water from the Willamette River - January 4*.

Amazon Creek, which flowed through this area in a series of poorly defined meandering channels, likely flooded this area on a seasonal basis. Around the turn of the century, the site, along with most of the surrounding landscape, was converted to agricultural uses and stayed in that condition until its purchase in 2002. Prior to 2002, minor drainage improvements were made throughout this area to improve the land for agricultural uses (see Surface Hydrology section starting on page 9).

Aerial Photo Observations

1940

The site is primarily in agricultural use, with much of the site recently hayed or harvested. The Calapooyia geomorphic surface (mound-swale topography) is evident on the site. Amazon Creek meanders along the eastern edge of the site and appears to be generally in its historic location. Both Royal Avenue and Green Hill Road are present. The remainder of the site is devoid of any visible trees or shrubs. Meadowlark Swale has also been straightened and runs along the ditch on the east side of Green Hill Road as it does today. A rail line running from Eugene to Junction City cuts through the southern edge of the site. Adjacent uses are agricultural, with a few widely scattered houses present along Green Hill Road and Royal Avenue.

1940 Aerial Photo

1957

The site continues to be in agricultural use. The Amazon Diversion Channel has recently been constructed (1952) and cuts across the southern edge of the site. Amazon Creek has been straightened and is in its current location, with abandoned channel remnants still visible to the east. The abandoned meanders

1968 Aerial Photo

are generally lined with woody vegetation. Meadowlark Swale continues to flow toward Amazon Creek along Green Hill Road after flowing under the Diversion Channel via a box culvert. The BPA/EWEB transmission lines are now apparent on the site.

1963
Few changes have occurred since 1957. The abandoned rail line is still apparent, but is beginning to fade from view.

1968
Few changes have occurred since 1963 except that some additional woody vegetation is located along the Diversion Channel and Amazon Creek.

May 2002
The site is in annual ryegrass production. Some woody vegetation is present along Amazon Creek and the Diversion Channel, with a larger pocket evident along Meadowlark Swale before it flows into the roadside ditch along Green Hill Road. Two home sites and a metal plating shop are located to the south along Royal Avenue.

Geomorphology and Soils

Dragonfly Bend is situated on the Calapooyia geomorphic surface, which is characterized by low relief, a very poorly defined drainage pattern, slow drainage of surface water, and hummocky (mound-swale) microtopography. The native soil types on the site are mapped in the *Soil Survey of Lane County* (1987) as Dayton silt loam on the southern half of the site and Natroy silty clay loam on the northern half of the site (see Soils Map). Based on findings elsewhere in west Eugene, the boundary between the Natroy and Dayton soils may not be precisely mapped, but both are common soil types along the Amazon Creek corridor, and both are classified as a hydric, or wetland, soil.

Dayton silt loam is a deep, poorly drained soil that formed in stratified, clayey, and silty mixed alluvium and lacustrine material. Typically, the surface layer is dark gray silt loam about 7 inches thick with a subsurface layer of gray silt loam and silty clay loam about 9 inches thick. The subsoil is gray clay about 29 inches thick, which results in a perched water table during the wet season. Natroy silty clay loam is a deep, poorly drained soil generally associated with drainageways and other depressional areas. It formed in mixed, fine-textured alluvium. Generally, the surface layer is very dark grayish brown silty clay loam about 5 inches thick. The next layer is very dark gray clay about 21 inches thick,

Dragonfly Bend

Existing Conditions Map

June 2003

Key:

- 2-foot contour (1999)*
- Tax Lot Line
- Mitigation Site Boundary
- Existing Wetland
- Waterway or Drainage Trench

N
W E
S

0 125 250 feet

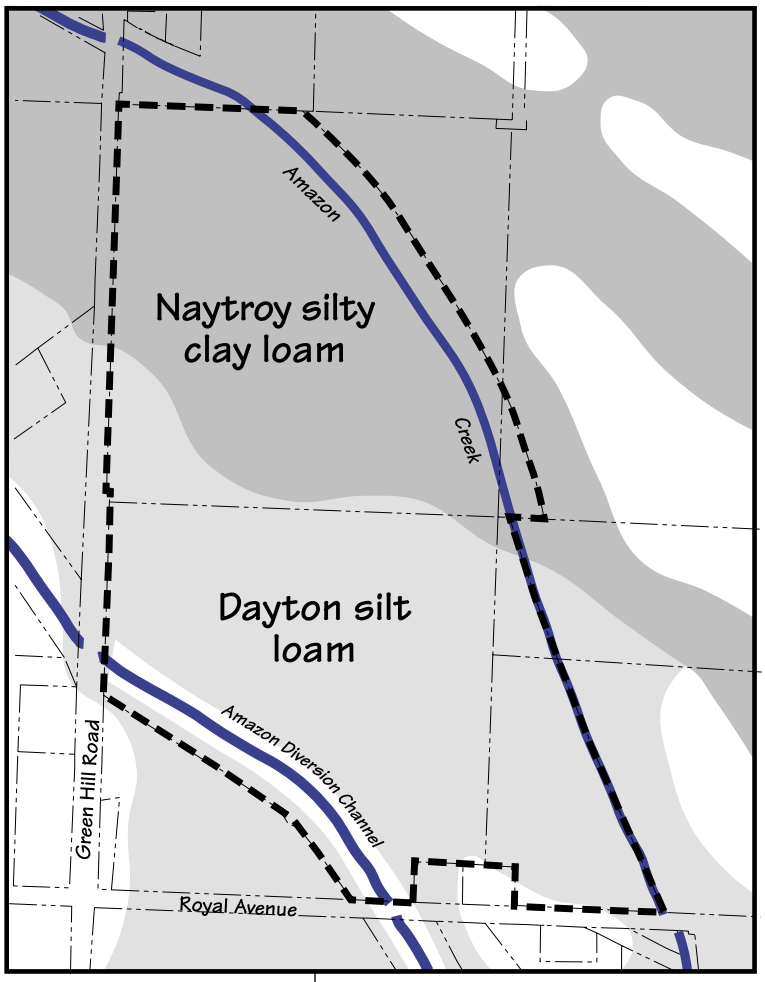
Scale

Aerial Photo: May 2002

*topography is based on aerial photo interpretation and is not precise.

with a substratum to a depth of 60 inches or more of dark grayish gravelly clay. Both Natroy and Dayton soils are know to include some inclusions of upland soils. The two wetland delineation reports produced for this area (Scoles Associates, 1997 and Scott Craig, 1996), confirm the presence of these soil types.

Annual plowing and disking over the years has likely disturbed the "A" soil horizon across the site. This artificial "fluffing" of the soil surface has created a more uniform topography and has likely increased permeability of the soil slightly. Discontinuation of disking will allow the natural process of soil compaction and settling to occur and may make the minor topographic variation more visible.



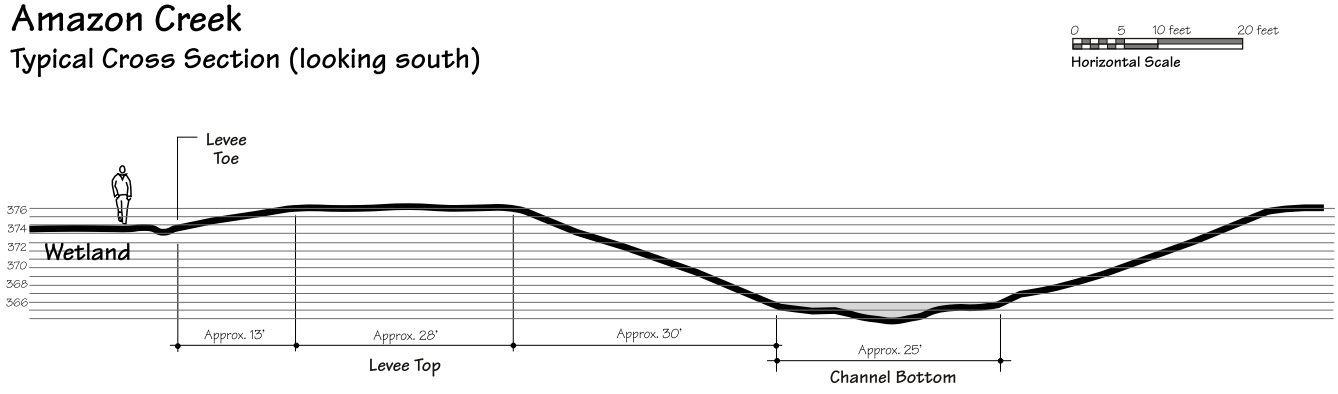
Soils Map

Surface Hydrology

Two major waterways flow through, or immediately adjacent to, the site and the entire site falls within the mapped 100-year floodplain. Amazon Creek (also known as the "A" Channel) flows along 3,025 feet of the northeast portion of the site. Based on historic aerial photo interpretation, Amazon Creek was straightened, and likely deepened, in the years following 1940 to improve agricultural drainage in the area. Approximately two-thirds of this historic flow of Amazon Creek in this area is now diverted to Fern Ridge

Amazon Creek

Typical Cross Section (looking south)



Note: This cross section is typical of Amazon Creek on the site, although there is noticeable variation in the levee height and bank slope along its length. The levee has also been breached in several locations. The cross section is based on existing two-foot contour information and measurements taken at a single point along the channel. The cross section will be refined prior to any proposed modifications.

Amazon Creek

Reservoir via the Amazon Diversion Channel, which was constructed by the Corps in the mid-1950s. In 1965, the SCS proposed a watershed plan for lower Amazon Creek. Under this plan, Amazon Creek, between the Diversion Channel and Clear Lake, was further channelized and cleared of woody vegetation to improve flow. A relatively low levee (spoils from deepening) lines each side of the channel and is between one and two feet higher than the grade of the adjacent field (See cross section on page 9). This levee is breached in two locations, so does not effectively hold water in the channel during high water. The low water level of the channel is approximately 6-8 feet below the adjacent topography. During low flow periods, a flow of approximately one cubic foot per second passes through the weir located just to the south of Royal Avenue. A remnant of a former Amazon Creek meander enters the channel from the east and can clearly be seen on the 1940 aerial photo. This remnant channel is lined with mature trees and is very shallow, likely reminiscent of the historic creek.

Amazon Diversion Channel

The Amazon Diversion Channel flows along approximately 1,275 feet of the southwest edge of the site and is bordered by substantial Corps-constructed levees, which rise approximately seven feet above the adjacent topography and approximately nine feet above the Channel at low water. The Diversion Channel was constructed to reduce flooding along the lower Amazon Creek in the vicinity of Junction City. Based on the available topographic data, the low water level of the Diversion Channel is approximately six feet higher than the low water level of Amazon Creek on the opposite end of the site. This is important to note because any levee removal along the Diversion Channel would likely divert much of the peak flow from the Diversion Channel and back into Amazon

Dragonfly Bend

Existing Surface Hydrology

January 3, 2003

Surface hydrology: based on field observations taken on January 3, 2003 following a prolonged period of steady precipitation. During the month of December, 12.05 inches of rain was recorded at the Eugene airport.

Key:

- 1-foot contour (1999)
- Tax Lot Line
- Site Boundary
- Wetland Boundary

Site Drainage

- Waterway
- Visibly Flowing Water
- Generalized Sheet Flow

Surface Moisture

- **Emergent Area** - significant areas of standing or flowing water more than 6" in depth
- **Surface Inundation** - significant areas of standing and flowing water generally less than 6" in depth
- **Saturated Soils** - surface saturation with some standing water up to 1" in depth
- **Little Surface Saturation** - no standing or flowing water

Creek, causing significant flooding problems downstream. The banks of the Diversion Channel are trapezoidal and relatively steep at approximately a 1:1 slope.

Meadowlark Swale

In addition to the two major waterways, the smaller Meadowlark Swale also comes onto the site near Royal Avenue, before flowing into the ditch along Green Hill Road. Much of the flow of Meadowlark Swale is now regulated by a water control structure (water gate) that was recently installed within the new levee adjacent Royal Avenue. The gate on this structure has been closed, or partially closed, in recent years during the winter and spring months to provide waterfowl and wading bird habitat on Meadowlark Prairie. A modification to the water control structure is planned for summer 2003 and will allow better control of flow. From this structure, the water flows across the private property located in the northeast corner of the Green Hill Road and Royal Avenue intersection, and then, in an unusual hydrologic phenomenon, flows under the Diversion Channel through two 2x6-foot concrete box culverts . The Corps installed this pipe during the Diversion Channel construction to avoid having to breach the levee to pick up the flow from Meadowlark Swale. Meadowlark Swale also receives some flow from roadside ditches along Green Hill Road and Royal Avenue, so even when the water control structure is shut, some flow is present during the wet season.

Typical Drainage Trench

As is standard in agricultural fields in west Eugene, a number of drainage trenches, approximately one-foot in depth, have been cut throughout the site to improve drainage, but are only marginally effective due to their small size and the relatively flat topography of the site. No subsurface drainage tiles or pipes are present on the site.

Despite the presence of Amazon Creek, the Diversion Channel, and numerous agricultural trenches, the water table across the site likely remains high due to the relatively flat topography and heavy clay soils (Scoles, 1996). However, the deepened Amazon Creek, with only about one third of its historic flow, does not flood onto the site nearly as frequently as it once did.

Winter surface hydrology varies across the site from saturated soils to standing water up to one foot deep as shown above.

As is shown on the *Surface Hydrology Map*, the site drains generally from south to north with the topography dropping gradually from an elevation of approximately 376 feet to 372 feet over 2,800 linear feet–a grade of approximately 0.14 percent. Microtopographical variations, which are typical of the Calapooyia geomorphic surface (mound-swale topography), are reduced on the site because it has been smoothed as part of agricultural modifications. The site tends to be wetter on the western half, with a very subtle ridge running parallel to Amazon Creek. Even this slightly elevated area has saturated soils and standing water and should easily support wetland vegetation, especially with the removal of the agricultural drainage trenches. The source of surface water on site is typically rainfall, with water occasionally flooding onto the site from Amazon Creek and Meadowlark Swale during heavy rainfall.

Vegetation

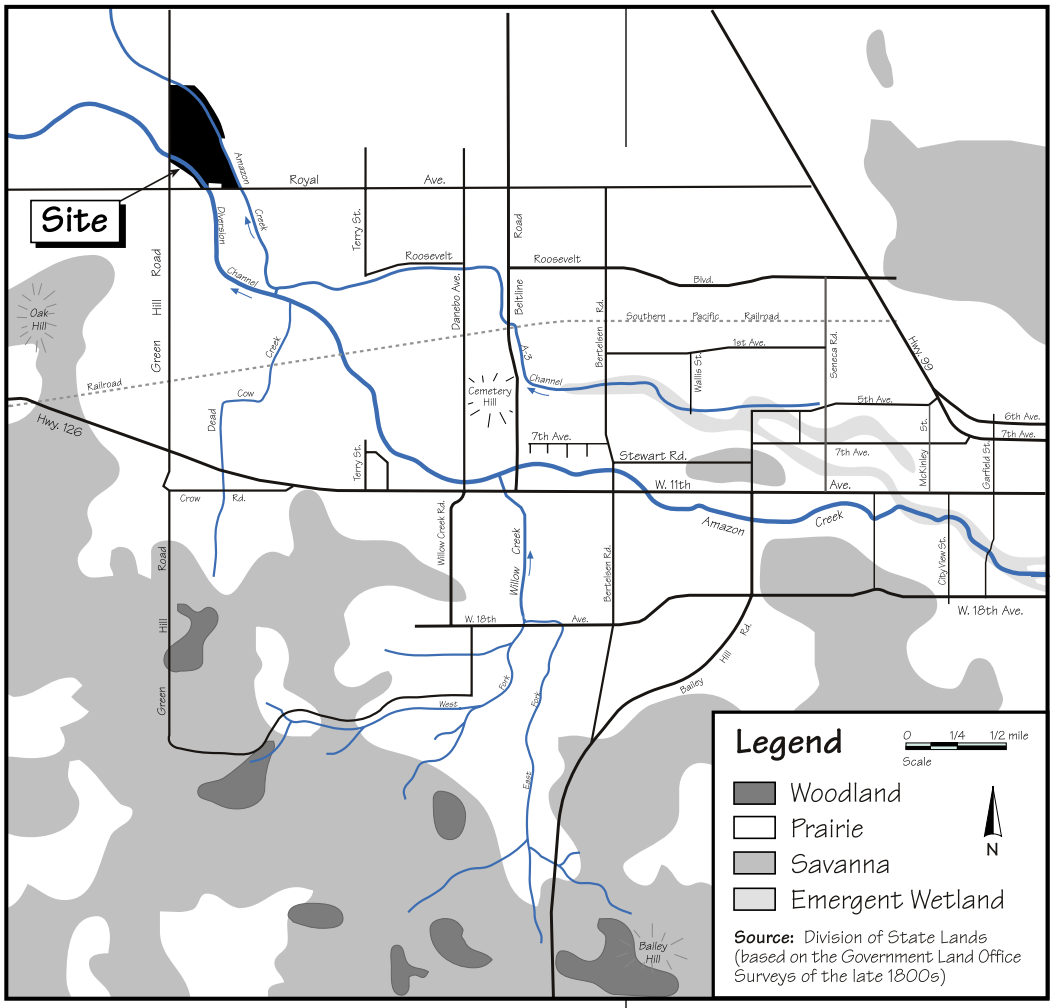
Since 1985, when the Food Security Act became law and began keeping a record of crops planted, most of the site has been under annual ryegrass cultivation (Scoles) and as a result the majority of the site is now dominated with annual ryegrass (*Lolium multiflorum*). The former agricultural fields which make up the bulk of the site also have small scattered pockets of native wetland vegetation such as western marsh cudweed (*Gnaphalium palustre*), tall wooly-heads (*Psilocarphus elatior*), American sloughgrass (*Beckmannia syzigachne*), meadow barley (*Hordeum brachyantherum*), and ovate spikerush (*Eleocharis ovata*), which would indicate that suitable wetland hydrology is present on the site.

The majority of the site is currently planted in annual ryegrass.

The levees along Amazon Creek contain a mix of native and non-native grasses and forbs, but are dominated by tall fescue (*Festuca arundinacea*) along with large pockets of

common exotics such as Himalayan blackberry (*Rubus armeniacus*), teasel (*Dipsacus fullonum*), and reed canarygrass (*Phalaris arundinacea*). Very little woody vegetation is present along the creek.

The levees of the Diversion Channel are heavily maintained and mowed with the exception of the outer edge of the north levee facing onto the site, which includes some large tree and shrub species. Several large black cottonwood (*Populus balsamifera var. trichocarpa*), Oregon ash (*Fraxinus latifolia*), hawthorn (*Crataegus* sp.), and a single large incense cedar (*Calocedrus decurrens*) are located along the levee base along with Himalayan blackberry, teasel (*Dipsacus fullonum*), and reed canarygrass (*Phalaris arundinacea*).



Historic Vegetation Map

Reed canarygrass, teasel, blackberry, and tall fescue are common along the levees and channel fringes.

The mapped triangular shaped wetland area along the south edge of the site contains some Oregon ash, but is dominated with reed canarygrass (*Phalaris arundinacea*) and teasel (*Dipsacus fullonum*), both very invasive exotic species. The two mapped areas of farmed wetland contain vegetation similar to that found in the adjacent fields, but are slightly wetter than the surrounding area.

The highest quality wetland currently found on the site is located in the southwest corner of the site along Meadowlark Swale, and is slightly over one acre in size. This wetland is generally

Forested wetland in the southwest corner of the site adjacent to Meadowlark Swale

forested with Oregon ash, willow (*Salix* sp.), and hawthorn, with an understory containing tufted hairgrass (*Deschamsia cespitosa*), soft rush (*Juncus effusus*), and spreading rush (*juncus patens*). Also present are pockets of blackberry and reed canarygrass (*Phalaris arundinacea*), but these are relatively widely scattered indicating that this wetland has had little disturbance. Meadowlark Swale backs up in this area, forming an emergent wetland up to approximately 15 feet in width. A lineal upland patch on its west side, apparently the spoils left from when the channel was cut, borders the channel. Beaver work is evident throughout this area.

Vegetation present along the ditch, which runs along Green Hill Road (Meadowlark Swale) contains a mix of native and non-native wetland species including willow (*Salix* sp.), pennyroyal (*Mentha pulegium*), reed canarygrass (*Phalaris arundinacea*), cattail (*Typha latifolia*), and rush (*Juncus* sp.).

Rare Plants and Animals

There are currently no known or documented rare plant or animal populations on the site. However, the Western pond turtle (Federal endangered species status: *species of concern* and State endangered species status: *critical*) is known to travel along both the Amazon and Diversion Channels and therefore, likely pass through the site on occasion. The Western meadowlark (State endangered species status: *critical*) and the a Kincaid's lupine (*Lupinus sulphureus* var. *kincaidii*) population (Federal endangered species status: *threatened* and State endangered species status: *threatened*) are known to inhabit the Meadowlark Prairie wetland just to the south.

The half acre wetland located adjacent to the levee is relatively low quality and dominated by exotic plant species.

A rare plant survey currently underway across the site including both sides of the Amazon Creek channel and will be completed by summer 2003.

Wetland

Prior to introduction of agricultural uses, the entire site was likely wetland. This is based on the existing soil data (SCS, 1987), topography, and proximity to Amazon Creek.

Two wetland delineations were prepared for portions of the site. In 1996, Scott Craig prepared delineation for the southern half of the site (formerly the Lee property) in preparation for proposed residential development. This delineation found 0.47 acres of *wetland* adjacent to the Diversion Channel on the southern edge of the site and 0.06 acres of *farmed wetland* adjacent to Amazon Creek. The remainder of the area was found to be *prior-converted cropland,* which is not considered jurisdictional wetland.

In February 1997, a delineation was done by Scoles Associates for the northern half of the site (formerly the Marvin property), also in preparation for proposed residential development. The delineation found one small 0.06 acre-pocket of *farmed wetland* on the northern edge of the property, along with another small lineal pocket of *wetland* just to the east of Amazon Creek in the location of the historic Amazon Creek Channel. The remainder of the area was found to be *prior-converted cropland.*

The delineations also determined the channel bottoms to be wetland, and the levee slopes and tops to be upland.

No wetland delineation has been done for the southwest corner of the site where Meadowlark Swale flows, but based on mapped soil type, hydrology, and existing vegetation community, it is likely wetland (approximately 1.2 acres). This area is primarily forested with patches of prairie and emergent wetland and is by far the highest quality wetland found on the site.

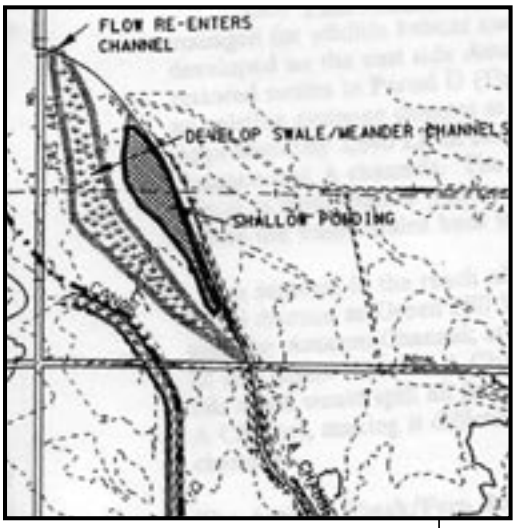
Under the Hydrogeomorphic Method (HGM) of wetland classification, the agricultural lands would be included in the *Valley Flats* subclass and the channels and floodplains would be included in the *Riverine Flow-through* subclass.

Previous Site Planning Efforts

Lower Amazon Restoration Study (1993)

In November 1993, the Corps completed the *Amazon Creek Environmental Restoration Study*, which produced an analysis of opportunities to modify the existing *Amazon Creek Flood Protection Project* to restore the hydrologic interchange with surrounding wetlands. The Dragonfly Bend site was one area studied and a schematic alternative developed. Ultimately, this study lead to the *Lower Amazon Restoration Project* (now Meadowlark Prairie) just to the south of the site.

The alternative developed for the site determined that levee removal along the Diversion Channel would not be feasible due to the difference in elevation between the “A” Channel (Amazon

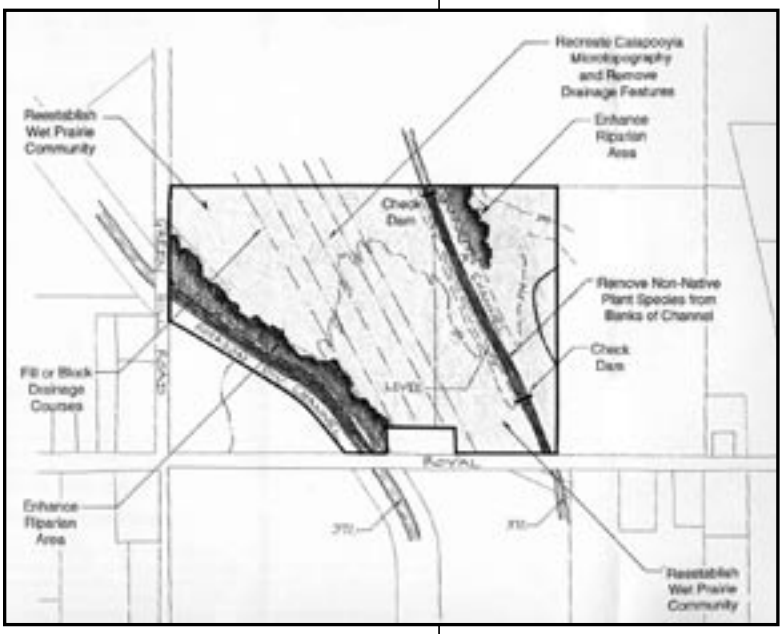


Concept from the 1993 *Lower Amazon Restoration Study*

Creek) and the Diversion Channel. The alternative did look at placing a weir within Amazon Creek just north of Royal Avenue to divert a controlled flow of water from the channel and across the site. This flow would move through approximately 2,640 lineal feet of constructed meander channel. The diverted flow could also be used to create a shallow seasonal pond along the west side of the levee of Amazon Creek. This diverted water would ultimately flow back into Amazon Creek near Green Hill Road. The scenario also showed the extension of the Fern Ridge Bike Path following the north side of the Diversion Channel levee on the site. No further study or design development was conducted on this alternative.

Mitigation Options for Eight Sites in West Eugene (1993)
This study developed conceptual mitigation proposals for eight sites in west Eugene, many of which were not yet in public ownership. This study included a proposal for the southern half of the Dragonfly Bend site (formerly the Lee property) and the City-owned property along the Diversion Channel.

A summary of options included:
- Discontinue plowing the site and enhance with minor mechanical contouring to restore the Calapooyia surface on the site;
- Fill or re-contour the drainage trenches found on the site;
- Plant the majority of the site to native wet prairie plant species;
- Remove invasive plant species from the existing woodland pockets and expand these areas through plantings of wetland tree species; and
- Enhance the "A" Channel (Amazon Creek) by creating check dams or reintroducing channel meander through the appropriate placement of rocks to create water deflection. Non-native species should be removed and native species planted on the levee top and sides. The "A" Channel could be widened from its current width of about 30 feet to about 80-100 feet, and the grade of the channel levee lowered. Widening the channel would increase opportunities to recreate meander and help diversity wetland types on the site.



Concept for the lower half of the site from the 1993 *Eight Mitigation Options for Sites in West Eugene*

West Eugene Wetlands Plan Concept Map (1992)
The concept map developed for the WEWP (1992) calls for the conversion of the ryegrass field on the site to native wet prairie habitat, the creation of a deep-water pool along the middle of the site, and a forested strip along the Amazon Creek Channel.

Project Actions

The mitigation improvement plan for this 76.8-acre site proposes restoration and enhancement for a mix of habitat types including wetland and upland prairie, vernal pool, forested wetland, and riparian/scrub-shrub. The dominant habitat proposed for the site is wetland prairie, which will ultimately cover the majority of the site. Intermixed within the expanse of wetland prairie will be a series of vernal pools along with patches of upland prairie, which will closely replicate the historic mound-swale topography. The existing wetland along the south edge of the site will be enhanced and the forested wetland along Meadowlark Swale will be maintained to control the spread exotic vegetation. The area along Amazon Creek and the Diversion Channel will include a mix of riparian/scrub-shrub and upland prairie communities, with future channel enhancement along Amazon Creek likely to be implemented in summer 2004 using $707,000 of recently acquired BLM Cooperative Conservation Initiative funds. Design development and engineering for the channel enhancement will begin in summer 2003 and will be closely coordinated with Dragonfly Bend restoration and enhancement activities. The end result will be a mosaic of wetland and upland habitats that mimic the historic site conditions and that will be an extension of the habitats found within the 380-acre Meadowlark Prairie restoration area to the south.

Mitigation bank credits will be requested for the areas of proposed wetland restoration and enhancement. This will include a total of 40.36 acres of wet prairie restoration, 5.53 acres of vernal pool/emergent wetland restoration, and 0.47 acres of wet prairie enhancement. An additional 5.85 acres of upland prairie restoration, 1.20 acres of forested wetland enhancement, and 3,000 lineal feet of riparian enhancement are proposed in the Action Plan, but mitigation credits will not be requested for these areas.

Implementation of the interim management actions proposed in this MIP will begin in spring 2003, followed by wetland prairie, vernal pool, and upland prairie restoration, likely beginning in summer 2004. This restoration may be phased over several years depending on availability of seed and mitigation bank funds. The proposed restoration of the Amazon Creek corridor will likely occur starting in summer 2004 and the earthwork on the channel may potentially be done in conjunction with the proposed grading on Meadowlark Prairie.

Restoration and Enhancement Goals

Habitat

- Re-establish a mosaic of wetland and upland prairie that likely existed in this area prior to agricultural conversion.
- Establish a mix of upland prairie and riparian forest and shrub/scrub communities along Amazon Creek and the Amazon Diversion Channel.
- Provide suitable habitat for the endangered Fender's blue butterfly (*Icaricia icarioides fenderi*) and its host plant Kincaid's lupine (*Lupinus sulphurus* spp. *kincaidii*) in the drier prairie areas to be restored.
- Enhance habitat conditions for native wildlife species associated with upland and wetland prairie habitats. This would include species such as western meadowlark, short-eared owl, harrier, camas pocket gopher, gray-tailed vole, chorus frog, garter snake, gopher snake, and Fender's blue butterfly.
- Provide habitat suitable for the life-cycle of dragonflies in conjunction with waterway enhancements.
- Provide suitable Western pond turtle habitat areas along and adjacent to Amazon Creek.

Access

- Provide access to the site for ongoing maintenance activities and monitoring of mitigation areas.
- Provide continued access to the power lines for EWEB and BPA as indicated in existing access agreements.
- Limit formal public site access to the Amazon Diversion Channel levee top (planned Fern Ridge Bike Path extension) and to the east side of Amazon Creek (Royal Node) to minimize habitat disruption.
- Prevent unauthorized motor vehicle access onto the site by installing gates at all access points.
- Retain maintenance access along the top of the Amazon Diversion Channel levee.

Hydrology

- Reestablish a hydrologic connection between the waterways on the site (Amazon Creek and Meadowlark Swale) and the adjacent wetlands where possible. Consider hydrologic impacts to the Greenhill Tributary to the east.
- Replicate the historic mound-swale topography on site by creating a mix of deeper vernal pool areas and drier upland prairie within the larger expanse of wetland prairie.
- Eliminate the agricultural drainage features present across the site to better retain wetland hydrology.

Interim Maintenance

- Control invasive exotic plant species along the fringes of the site to prevent their spread into the areas proposed for restoration and enhancement.
- Over the short term minimize buildup of annual ryegrass seed-bank on the site.

Implementation

- Phase the proposed prairie and riparian restoration in a way that does not preclude potential future Amazon Creek Channel widening (coordinate with the *Corps Metropolitan Waterways Restoration Study*, now underway).

Dragonfly Bend

Proposed Action Plan

Split flow between two outlets

Retain Fence

Swale

Swale

Swale

Amazon Creek

Area reserved for future channel enhancement: Possible channel widening, side channels, and riparian restoration. Future study and engineering is needed (see Appendix B for concept).

Greenhill Tributary

Maintain bank to keep free from woody vegetation to better facilitate turtle and butterfly passage between the creek and upland prairie

Wetland Prairie Restoration

Create shallow swales connecting vernal pools

Upland Prairie Restoration

BPA and EWEB Easement (100' wide)

Maintain driveway and gate

Historic Amazon Creek Channel Remnant

Potential future diversion of water onto site (future study)

Wetland Prairie Restoration

Area reserved for future channel enhancement: Possible channel widening, side channels, and riparian restoration. Future study and engineering is needed (see Appendix B for concept).

Planned Fern Ridge Multi-use Path Extension

Pipe

Future Viewpoint

Control exotic species in existing forested wetland including blackberry, teasel, pear, and reed canarygrass.

Amazon Diversion Channel

Levee

Future Channel Enhancement Area

Upland Prairie Restoration

Greenhill Road

Metal Plating Shop

Meadowlark Swale

Potential Future Acquisition

House

Retain native trees and shrubs along levee

Potential Future Acquisition

Royal Avenue

Fern Ridge Bike Path

Water Control Structure

Enhance existing wetland (Remove exotics and re-seed with wet prairie species)

Butterfly migration corridor (to be kept clear of woody vegetation)

Install Gate

Key:

- 2-foot contour (1999)
- Tax Lot Line
- Mitigation Site Boundary
- Proposed Amazon Creek Enhancement Area
- Wet Prairie Restoration
- Vernal Pool Restoration
- Upland Prairie Restoration (non mitigation)
- Wetland Enhancement
- Riparian Enhancement (non mitigation)
- Drainageways to be Removed
- Maintenance Access Points (gated)
- Direction of flow

N W E S

0 125 250 feet

Scale

June 2003

Aerial Photo: May 2002

Wetland Restoration

The majority of the Dragonfly Bend mitigation site (approximately 53 acres) is currently planted in annual ryegrass and has been in agricultural production for many decades. Agricultural practices, over time, have considerably flattened the site, and little remains of the historic mound-swale topography or native plant community once present.

Typical surface hydrology in the area proposed for wet prairie restoration (April 2003)

The concept behind the proposed restoration of this area, is to recreate this historic mound-swale topography, ultimately producing a wetland prairie dominated landscape, mixed with patches of dryer upland prairie and wetter vernal pools. To accomplish this, some of the wetter existing areas of the site (see *Surface Hydrology Map*) will be deepened slightly (approximately 6 to 9 inches) to create conditions that will support a vernal pool/emergent wetland plant community. These areas were selected based on the current wet season ponding conditions found on site (see *Surface Hydrology Map*). The soil removed from these areas will be re-graded onto two of the drier portions of the site to make those areas better suited to support an upland prairie plant community. The elevation of the upland patches will be raised by between 6 and 18 inches. Based on available floodplain information, this additional elevation will likely be sufficient to keep these areas from being inundated during a 100-year flood event and therefore creating more viable Fender's blue butterfly habitat.

One of the areas proposed for vernal pool restoration

This subtle reconfiguration of the site's topography will produce more diversity of habitat and will ultimately result in approximately 40.36 acres of wetland prairie, 5.53 acres of vernal pool/ emergent wetland, and 5.85 acres of upland prairie. A shallow meandering swale will be placed between vernal pools on the west side of the site and may eventually carry water diverted from Meadowlark Swale, keeping these pools wet later

A shallow meandering swale would link the vernal pool areas on the western edge of the site. It would look similar to this swale at the *Willow Creek Natural Area*. The flow could eventually be supplemented by diverting water from Meadowlark Swale before it enters the roadside ditch.

into the dry season. The swale will be constructed to prevent inadvertently draining the surrounding wetland prairie. Additional study and engineering will be needed before the Meadowlark Swale diversion could be implemented.

Following the site re-contouring, the annual ryegrass community will be eliminated in preparation for planting. The exact technique for eradicating the ryegrass community has not yet been determined and will be based in part on the preliminary results of site preparation research and experimentation, which is now funded through an Environmental Protection Agency grant and scheduled begin in summer 2003. The range of techniques that will be considered for use on the site include the application of herbicides, sod removal, disking or other agricultural techniques, and burning at extreme heat with the newly purchased *Sunburst* infrared burner.

Upon completion of the site preparation, the area will be planted with a mix of native wet prairie, vernal pool/emergent, and upland prairie species (see Proposed Planting List) in late September of the year. BLM and City botanists will supervise the planting, which will likely employ both a seed drill and backpack seed blower. The distribution of seed mix will be based on the estimated hydrologic conditions. Additional species may be added in the form of plugs to the vernal pool areas, depending on local availability.

Because the area proposed for restoration is relatively large, it is likely that the restoration will be phased over several years, beginning in summer 2004.

Enhancement of Existing Wetland Prairie

An existing delineated wetland, approximately 0.47 acres in size, is located along the southern edge of the site, adjacent to a portion of the Diversion Channel levee and private property with an associated mobile home, vehicles, tires, and other debris. This wetland is of poor quality and heavily choked with invasive exotic species such as teasel (*Dipsacus fullonum*), meadow foxtail (*Alopecurus pratensis*) and reed canarygrass (*Phalaris*

arundinacea). Some small, and likely declining, pockets of tufted hairgrass (*Deschampsia cespitosa*) are also present along with two small Oregon ash (*Fraxinus latifolia*).

Because this area is a weed source for the remainder of the site, short term management strategies will focus on controlling the exotics to prevent their spread through early season mowing to prevent seeds from maturing (see *Maintenance* section below). Ultimately, this area will be treated with the same prescription as will be used on the adjacent ryegrass field to eliminate the existing plant community at the time of the restoration. Once that has been done this area will be re-seeded as is described in the *Restoration* section above. Enhancement mitigation credits will be requested for this area.

Upland Prairie Restoration

Two areas of upland prairie restoration are proposed on the site. These two patches are located in the dryer portions of the agricultural field and are approximately 4 acres and 2 acres in size. Additional soil will be graded onto these areas to raise the elevation by 6 to 18 inches to ensure the hydrology will be well suited for upland prairie and to lift these patches out of the approximate 100-year floodplain to make it a more viable Fender's blue butterfly habitat. The soil to be graded onto the upland prairie area will be taken from adjacent areas on site that are designated for vernal pool restoration. This minor regrading of the site will result in a landscape more closely replicating the historic mound-swale topography once present on the site. It is possible that the site grading can be done in conjunction with adjacent Amazon Creek Enhancements scheduled for summer 2004.

The approximate area proposed for upland prairie restoration is indicated within the dashed line above.

Depending on the final Amazon Creek enhancement concept, some additional upland prairie may be established along the top of the channel. If this is proposed, site preparation along this section will likely involve the removal of the top 6 to 9 inches of levee to eliminate the exotic plant species and associated seed bank. The soil will be hauled off-site. The somewhat steep transition that currently exists between the levee and the adjacent field would be smoothed during the site preparation to provide a

The existing forested wetland area will be maintained to prevent the spread of exotics.

more gradual transition between the upland and wetland, which will better facilitate long-term mowing and maintenance.

Following the site preparation described above, the areas will be fine-graded and seeded with a native upland prairie seed mix (see *Planting List*). In addition, some plugs, bulbs, and cuttings will be used to further supplement the seeding, including species such as Romer's fescue (*festuca idahoensis* var. *roemeri*), cat's ear (*Calochortus tolmiei*), and pine bluegrass (*Poa scabrella*), as local supplies allow.

Forested Wetland

The 1.2 acre forested wetland patch adjacent to the Diversion Channel and Green Hill Road is by far, the highest quality wetland on the site. The forest is comprised mainly of Oregon ash (*fraxinus latifolia*) and willow (*salix* spp.) with an understory including good native composition. However some small isolated patches of exotics including teasel, blackberry, and reed canarygrass are currently present along with some scattered Pear (*pyrus* spp.) and English hawthorn (*Crataegus douglasii*). To prevent the further spread, these exotics will be selectively removed from this area. This will be achieved through mowing of blackberry and teasel along the accessible eastern edge and by hand weeding and cutting within the forested area. No mitigation credits will be requested for the work.

Riparian Enhancement

A riparian plant community will be established along the length of Amazon Creek in conjunction with proposed channel enhancement and on the lower two thirds of the bank of the Diversion Channel (see *Action Plan*). The woody riparian vegetation will provide habitat and cover for wildlife and shade portions of the channel. Some native riparian vegetation will naturally establish in these areas in some cases, but will be supplemented by plantings of bear-root trees and shrubs and cuttings (see *Plant List*).

Fender's Blue Butterfly Habitat

The endangered Fender's Blue Butterfly is not known to currently inhabit this site, but one of the habitat goals is to *"Provide suitable*

habitat for the Fender's blue butterfly (Icaricia icarioides fenderi) and its host plant Kincaid's lupine (Lupinus sulphureus spp. *kincaidii) in the drier prairie areas to be restored."* The Dragonfly Bend site is strategically located along the "flyway" between established butterfly populations at the Willow Creek Natural Area, Fir Butte, and the north edge of Fern Ridge Reservoir, and is therefore an excellent candidate site for establishing additional butterfly habitat. It is envisioned that a corridor containing additional butterfly habitat will be established between these two areas to help maintain viable populations of the species.

The two patches of restored upland prairie along with the areas of upland prairie along Amazon Creek will total approximately 5.85 acres. Based on research published by Cheryl Schultz (2003), establishing new habitats requires consideration of both patch size and location. The research concludes that, assuming there are other established populations of butterflies within about one kilometer of the new site, a minimum upland patch size of between one and two hectares (2.5 and 5.0 acres) is needed. She also states that the eliminating barriers between habitat patches is a key factor for determining the viability of the butterfly habitat.

To minimize the risk of flooding to these upland prairie areas, the elevation of the upland patches will be raised by between 6 and 18 inches during site preparation. Based on available floodplain information, this additional elevation will likely be sufficient to keep these areas from being inundated during a 100-year flood event and therefore create more viable Fender's blue butterfly habitat.

In addition to creating a native upland prairie community, the eventual establishment of Kincaid's lupine (*Lupinus sulphureus kincaidii)*, the host plant of the Fender's blue butterfly, and nectar producing species such as cat's ear (*Calochortus tolmiei*), great camas (*Camassia leichtlinii* var. *suksdorfii*), and wooly sunflower (*Eriophyllum lanatum*) will be key for successfully establishing suitable habitat on the site. To further facilitate potential butterfly migration between the site and Meadowlark Prairie to the south, the southern edge of the site along Royal Avenue should be kept clear of trees, shrubs, and other potential barriers to flight. An open area, largely free of woody vegetation between, will also be maintained between the larger prairie patch and Amazon Creek to provide easy access for both the butterfly and Western pond turtle.

Public Access

To minimize disruption to wildlife and plant communities, formalized public access to the site will be limited to the northern levee of the Diversion Channel. The long planned Fern Ridge multi-use path will likely be constructed on this levee top in the coming years. A portion of the levee bank should be kept clear of woody vegetation in this section to provide vistas onto the site from the path. Public access will also likely be provided to Amazon Creek from the planned Royal Node neighborhood, but will be limited to the east side of the creek to minimize direct disturbance to the site.

Maintenance

Interim Maintenance

In preparation of implementation of the proposed restoration and enhancement prescriptions, the following interim maintenance will be done:

- To minimize the buildup of the annual ryegrass seed-bank, the site will be hayed early in the year starting in spring 2003, before the seed heads are able to mature. The hay will be removed from the site. This haying will also serve to reduce the bio-mass and fertility of the site, which have artificially been elevated over the years for ryegrass production. A low fertility soil will ultimately favor the establishment of native species.
- Control invasive exotic plant species along the fringes of the site to prevent their spread into the areas proposed for restoration and enhancement. Particular attention will be paid to the edge of the forested wetland, the toe of the Diversion Channel Levee, and the low levee along Amazon Creek.
- Install gates at the two currently un-gated entries to the site along Royal Avenue and Greenhill Road.

Long Term Maintenance

Once the proposed restoration and enhancement prescriptions are implemented, the following long-term site maintenance actions will be required.

- To replicate the burning cycle that was once common in the valley, and to keep the prairie areas from converting to forest, the upland and wetland prairie areas will be mowed once annually between mid-August and late-September. Late season mowing will also help reduce loss of wildlife. Burning may not be an option on this site due to its close proximity to a rapidly urbanizing landscape to the north and east.

- Control exotic invasive plant species throughout the site to prevent their spread. Particular attention will be given to reed canarygrass (*Phalaris arundinacea*), and pennyroyal (*Mentha pulegium*), in upland areas, all of which have potential to spread quickly across the site if not kept in check.
- Maintenance access along the top of the Amazon Diversion Channel levee will be retained and channel maintenance will be done as documented in the City of Eugene's *Open Waterway Maintenance Plan* (February 2003). The maintenance objectives outlined in the plan call for selective retention of native vegetation on the lower 2/3 of the channel banks. This would include shrub species such as willow (*Salix* sp.), snowberry (*Symphorocarus albus*), and hardhack (*Spiraea douglassii*), which would anchor the banks with their root system. The upper one-third of the bank and bank tops will continue to be mowed once annually. Invasive species will be aggressively repressed and replaced with native species. Tolerance thresholds will be defined for well established invasive species and eradication or control measures taken if thresholds are exceeded. Maintenance in the channel bottom will be limited to field crews and hand tools and will focus on maintaining conveyance capacity and control of exotics.
- In the areas designated for riparian/scrub-shrub restoration along the bank of Amazon Creek, initial maintenance activities will focus on controlling non-native species such as Himalayan blackberry (*Rubus armeniacus*) that may overtake newly planted native shrub and tree species planted on the bank. Once the native shrub and tree species are established, maintenance activities in the riparian areas may be reduced.

Weeds along the levee fringes will be controlled to prevent their spread onto the rest of the site.

Other Long Term Enhancement Opportunities

Amazon Creek Channel Widening

An opportunity exists to enhance Amazon Creek along the entire eastern edge of the site by removing the levee and laying back the channel banks. This treatment could be similar to channel enhancement done elsewhere on Amazon Creek as part of the *Amazon Creek Enhancement Project* (1996) and *the Oak Patch Channel Enhancement Project* (2002). Channel widening would allow for the establishment of a wetland bench immediately adjacent to the creek and would provide the opportunity to create a series of side channels parallel to the main channel. These quiet backwaters of Amazon Creek would provide excellent habitat for wildlife species dependant on a year-round water supply such as dragonflies, beaver, and the Western pond turtle.

In May 2003, $707,000 of *Cooperative Conservation Initiative* funds became available to the BLM to enhance Amazon Creek adjacent to the Dragonfly Bend site. Design development and engineering will take place beginning summer 2003 and will be headed by the City of Eugene. Approximately 3,000 lineal feet of channel will be studied for enhancement opportunities and construction to implement the concept will begin in summer 2004. Channel enhancement design and implementation will be closely coordinated with Dragonfly Bend restoration and enhancement activities.

Additional study will look at the feasibility of widening and enhancing Amazon Creek as it passes through the site. The example above shows a recently enhanced area of Amazon Creek near Oak Patch Road.

The installation of a weir on Amazon Creek below the widened channel will be considered as one way to raise the water elevation in the channel and therefore reduce the depth of excavation needed for creation of a wetland bench and side channels. In addition, potential impacts to channel capacity at the Royal Avenue bridge crossing must be assessed, especially if a weir is placed along Amazon Creek.

A conceptual diagram of channel enhancements for this stretch of Amazon Creek has been included in *Appendix B* of this report as a starting point for further concept refinement.

Meadowlark Swale

Currently, Meadowlark Swale flows onto the site adjacent to the Diversion Channel and passes through the forested wetland area before entering the roadside ditch along Green Hill Road. It is likely feasible that a portion of this flow could be diverted onto prairie portion of the site, flowing through a swale network that would connect several of the proposed vernal pool areas. In order to divert water from Meadowlark Swale, a weir or other water control structure would be placed along Meadowlark swale to raise the water level sufficiently to enter the site. A shallow swale would be cut through the berm that parallels Meadowlark Swale to help the water flow onto the site. This proposal would require additional engineering study to determine how the weir would affect the flow of Meadowlark Swale adjacent to the private property located upstream and would likely not be implemented until the completion of the proposed wet prairie/vernal pool restoration. Mitigation credits will not be requested for this work.

Other Habitat Enhancements

Reptile and Amphibian Habitat

To provide habitat for reptiles and amphibians, several small rock piles could be placed in upland prairie and riparian portions of the site. Reptiles such as common garter snake, northwest garter snake, and gopher snake use rock piles as shelter from predators and for basking because solar energy is stored in the thermal mass of rocks. Amphibians such as Pacific tree frogs, Northwestern salamander, and red-legged frog use rock piles in mostly shadier sites, where they offer cover and a moist microclimate. Small mammals also use rock piles for shelter and food storage. Large basalt chunks are ideal for this and piles should be a minimum of four feet in diameter and tall enough to be easily spotted by mowers. Placement of rock piles should be closely coordinated with maintenance crews to minimize conflicts with mowing.

Bird Habitat

The wide-open nature of the site will provide excellent habitat for prairie bird species such as Western meadowlark and Northern Harrier. In addition, bird habitat for species such as tree swallows, violet green-swallows, black-capped chickadees, Bewick's wren, red-winged blackbird, and downy woodpecker would be provided in the riparian vegetation along the channels and in the form of habitat snags. Habitat snags could be added to the prairie areas, as has been done and elsewhere in west Eugene, without significantly diminishing the openness of the prairie. The snags would be similar to those located at the BLM field office, which are logs that have been drilled and cut to provide nesting cavities. The logs are brought onto the site and set upright in a preferred location, much the way that a telephone pole would be positioned.

Wet Prairie Wetland*

	Scientific Name	Common Name	Indicator Status
Dominant species; approximately 60% to 70% of the seedling will be with the following:			
Graminoids	Agrostis exarata	spike bentgrass	FACW
	Carex unilateralis	one-sided sedge	FACW
	Deschampsia cespitosa	tufted hairgrass	FACW
	Juncus nevadensis	Sierra rush	FACW
	Juncus tenuis	slender rush	FAC
Forbs	Aster hallii	Hall's aster	FAC
	Camassia quamash	common camas	FACW
	Gratiola ebracteata	bractless hedge-hyssop	
	Microseris laciniata	cut-leaf microseris	NOL
	Potentilla gracilis	slender cinquefoil	FAC
	Prunella vulgaris ssp. lanceolata	self-heal	CU
	Ranunculus orthorhynchus	straightbeak buttercup	FACW-
Smaller amounts of the following will be seeded as available:			
Graminoids	Beckmannia syzigachne	American slough grass	OBL
	Carex lanuginosa	woolly sedge	OBL
	Danthonia californica	California oat-grass	FACU-
	Eriophyllum lanatum	wooly sunflower	NOL
	Luzula campestris var. multiflora	field woodrush	FACU
	Panicum occidentale	western panic-grass	FACW
Forbs	Boisduvalia densiflora	dense spike-primrose	FACW-
	Grindelia integrifolia	gumweed	FACW
	Lomatium nudicaule	barestem lomatium	NOL
	Lotus formosissimus	seaside trefoil	FACW+
	Lotus purshianus	Spanish-clover	NOL
	Montia linearis	narrow-leafed montia	NOL
	Orthocarpus bracteosus	rosy owl-clover	NOL
	Perideridia gairdneri	Gairdner's yampah	FACU
	Ranunculus occidentalis	western buttercup	FACW
	Saxifraga oregana	Oregon saxifrage	FACW+
	Sidalcea cusickii	Cusick's checkermallow	NOL
	Sisyrinchium idahoense	blue-eyed grass	FACW
	Wyethia angustifolia	narrow-leaf muleears	FACU
	Zigadenus venenosus	death camas	FAC

* *The proposed planting lists above will likely be reassessed and fine tuned by City, BLM, and TNC Botanists to fit actual site conditions and seed availability once earth work is complete. Much of the seed is hand collected in the vicinity and availability can greatly vary from year to year.*

Vernal Pool/Emergent Wetland*

	Scientific Name	Common Name	Indicator Status
Dominant species; approximately 60% to 70% of the seedling will be with the following:			
Graminoids	*Beckmannia syzigachne*	Slough grass	OBL
	Hordeum brachyantherum	meadow barley	FACW
	Carex densa	dense sedge	OBL
	Carex unilateralis	one-side sedges	FACW
Forbs	*Downingia elegans*	common downingia	OBL
	Eryngium petiolatum	coyote thistle	OBL
	Myosotis laxa	Small-flowered forget-me-not	OBL
	Plagiobothrys figuratus	fragrant popcorn-flower	FACW
Smaller amounts of the following will be seeded as available:			
Graminoids	*Aristida oligantha*	prairie threeawn	NOL
	Deschampsia danthonioides	annual hairgrass	FACW-
	Glyceria occidentalis	northwestern mannagrass	OBL
	Juncus nevadensis	Sierra rush	FACW
	Juncus oxymeris	pointed rush	FACW+
Forbs	*Gratiola ebracteata*	bractless hedge-hyssop	OBL
	Lasthenia glaberrima	smooth lasthenia	OBL
	Rumex salicifolius	willow dock	FACW
	Veronica scutellata	marsh speedwell	OBL

***** *The proposed planting list above will likely be reassessed and fine tuned by City, BLM, and TNC Botanists to fit actual site conditions and seed availability once earth work is complete. Much of the seed is hand collected in the vicinity and availability can greatly vary from year to year.*

Riparian*

	Scientific Name	Common Name	Form
Trees	*Crataegus suksdorfii*	Suksdorf's hawthorn	BR
	Salix lucida ssp. lasiandra	Pacific willow	C, BR
	Salix piperi	Piper's willow	C
	Salix sitchensis	Sitka willow	C
Shrubs	*Cornus sericea*	creek dogwood	BR
	Physocarpus capitatus	Pacific ninebark	BR
	Rosa nutkana	nootka rose	BR
	Spiraea douglasi	hardhack	BR
	Symphorocarus albus	snowberry	BR

BR = Bare root C = Cuttings or stakes

**This list will be refined based on species availability and input from Eugene Parks and Open Space Maintenance staff at the time of planting.*

Upland Prairie

Common Name	Botanical Name	Collection Date	Propagation Method
yarrow	*Achillea millefolium*	August	seed
slim-leaf onion*	*Allium amplectens*	early July	seed
red columbine	*Aquilegia formosa*	late June	seed
Hall's aster	*Aster hallii*	mid Oct.	seed
deltoid balsamroot	*Balsamorhiza deltoidea*	June	seed
compact harvest lily	*Brodiaea congesta*	early July	seed
harvest lily	*Brodiaea coronaria*	late July	seed
hyacinth brodiaea	*Brodiaea hyacinthina*	July	seed
California brome	*Bromus carinatus/sitchensis*	early July	seed
red maids	*Calandrinia ciliata*	June	seed
cat's ear*	*Calochortus tolmiei*	late June	bulbs
great camas*	*Camassia leichtlinii* var. *suksdorfii*	early May	seed
one-sided sedge	*Carex tumulicola*	July-Sept.	seed
purple godetia	*Clarkia quadrivulnera*	August	seed
California oatgrass	*Danthonia californica*	early July	seed
Menzie's larkspurt	*Delphinium menziesii*	late June	seed
wooly sunflower*	*Eriophyllum lanatum*	July	seed
Romer's fescue	*Festuca idahoensis var roemeri*	early July	seed, plugs
Western geranium	*Geranium oreganum*	May	plugs
Oregon iris	*Iris tenax*	early July	seed
slender rush	*Juncus tenuis*	late June	seed
fine-leaved desert parsley	*Lomatium utriculatum*	July	seed
Kincaid's lupine	*Lupinus sulphurus* spp. *kincaidii*	early July	seed
elegant tarweed	*Madia elegans*	August	seed
cut-leaf microseris	*Microseris laciniata*	July	seed
pale baby blue-eyes	*Nemophila menziesii* var. *atomaria*	June	seed
sea blush	*Plectritis congesta*	late June	seed
Pine bluegrass	*Poa scabrella*	early July	seed
Northwest cinquefoil	*Potentilla gracilis*	late July	seed
Northwest self-heal	*Prunella vulgaris lanceolata*	August	seed
western buttercup	**Ranunculus occidentalis**	June	seed
Pink checkermallow	*Sidalcea virgata*	late June	seed, cuttings
narrow-leaf blue-eyed grass	*Sisyrinchium idahoense*	early July	seed
yellow montane violet	*Viola praemorsa*	late June	seed
death camas	*Zigadenus venenosus*	July	seed

***** Know nectar species for the Fender's blue butterfly.
****** Kincaid's lupine is the larval food plant for the Fender's blue butterfly.

Note: *The proposed planting lists above will likely be reassessed and fine tuned by City, BLM, and TNC Botanists to fit actual site conditions and seed availability once sie preparation is complete. Much of the seed is hand collected in the vicinity and availability can greatly vary from year to year.*

Mitigation Credits

West Eugene Wetland Mitigation Bank Authority

The Dragonfly Bend MIP is proposed to generate mitigation credit for the West Eugene Wetland Mitigation Banking Program under the authority of the Memorandum of Agreement (MOA) between the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Oregon Department of Environmental Quality, Oregon Division of State Lands, U.S. Bureau of Land Management, and the City of Eugene. The Agreement, signed in 1995, activated the West Eugene Wetlands Mitigation Bank which represents one product of a unique partnership between the City of Eugene, The Nature Conservancy (TNC), and the U.S. Department of Interior, Bureau of Land Management (BLM). The partnership originated in 1992 with adoption of the West Eugene Wetlands Plan (WEWP) and implementation of the mitigation bank as on of the Plan's goals.

WEW Mitigation Bank Credits

Under the proposed actions included in this MIP, a total of 45.89 acres of wetland restoration and 0.47 acres of wetland enhancement are proposed for compensatory wetland mitigation. Credits are not being requested for the upland priarie restoration, riparian restoration, or the forested wetland enhancement that are prescribed in the Action Plan.

WEW Mitigation Bank Credit Summary

Type of Prescription	Mitigation Acres*	Ratio	Uncertified Credits
Wet Prairie Restoration	40.36 acres	1:1 (1.0)	40.36
Vernal Pool/Emergent Wetland	5.53 acres	1:1 (1.0)	5.53
Wet Prairie Enhancement	0.47 acres	2.5:1 (.40)	0.19
Total	46.36 acres	-	**46.08**

**acreage listed is estimated. Numbers will be adjusted for credit certification based on as-built conditions.*

Monitoring

The purpose of this monitoring plan is to identify the tasks that must be followed to document and demonstrate that the wetland mitigation goals for the site have been met. The Mitigation Bank partners will be responsible for monitoring, maintenance, and reporting the performance of this project. Monitoring shall occur for a period of not less than five years from the date of project completion. The monitoring program is based on the standard field protocol for quarterly monitoring that was developed and implemented in fall 1997.

The goals, performance criteria, and objectives listed below are intended for areas proposed for wetland restoration and enhancement under the Mitigation Bank and do not apply to areas proposed for upland prairie restoration or for non-Bank wetland or riparian enhancement.

Vegetation

Wetland Mitigation Goals

- Re-establish a mosaic of wetland and upland prairie and vernal pools that likely existed in the area prior to agricultural conversion.
- Control invasive plant species in areas immediately adjacent to the proposed restoration area to prevent their spread into the newly graded areas. This would include reed canarygrass (Phalaris arundinacea), teasel (*Dipsacus sylvestris*) Scot's broom (*Cytisus scoparius*), and Himalayan blackberry (*Rubus armeniacus*).
- Enhance existing wet prairie vegetation along the southern edge of the site by removing exotic species and re-establishing native wet prairie species.

Performance Criteria

- The restored wetlands shall be dominated by native plant species where total native composition represents at least 50% cover within two years of planting and at least 70% cover within five years.
- The wet prairie enhancement area shall remain free of woody vegetation and largely free of exotic species such as reed canarygrass (*Phalaris arundinacea*), teasel (*Dipsacus fullonum*), and Himalayan blackberry (*Rubus armeniacus*). These species shall not exceed 10% of the total vegetative cover after five years. The enhancement area shall also be dominated by native plant species where total native composition represents at least 50% cover within five years.

Monitoring Objectives

- Objective: Document establishment of wetland plant communities in the area proposed for wetland restoration. Quantitative monitoring will be conducted during years two and five after planting. Quantitative monitoring for herbaceous vegetation will take place in the months of June or July. Location, size, and number of macroplots will be determined on-site based upon the number of plant communities present. Percent cover estimates should have 90% confidence intervals of no more than +/- 10 percent cover. In addition, we want

to be 90% sure of detecting a 25% change in cover for any species occurring in the macroplot and we are willing to accept a 1 in 10 chance that we will incorrectly conclude that a 25% change took place even if it really did not.

- Objective: Estimate the percent cover of all species in the enhanced wet prairie using point intercept sampling methodology five years after enhancement. Estimates should have 90% confidence intervals of no more than +/- 20 percent frequency. In addition, we want to be 90% sure of detecting a 30% change in percent frequency for any species occurring in the macroplot and we are willing to accept a 1 in 10 chance that we will incorrectly conclude that a 30% change took place even if it really did not.
- Objective: Annually survey the wetland restoration and enhancement area for populations of rare plants. Monitoring will occur during the time of year when the plants are flowering.
- Objective: Inventory and compile a checklist of all vascular plant species present on the site. Inventory will be updated, at a minimum, during quarterly site visits. The purpose is to document species diversity, to document the relative proportion of native and non-native species present on the site, to assess the presence of non-native species that may require management actions, and to document which species, that were planted or seeded, have successfully established.

Hydrology

Mitigation Goals

- Replicate the historic mound-swale topography of the area on site by creating a mix of deeper vernal pool areas and drier upland prairie within the larger expanse of wetland prairie.
- Reestablish a hydrologic connection between the waterways on the site (Amazon Creek and Meadowlark Swale) and the adjacent wetlands where possible. Consider hydrologic impacts to the Greenhill Tributary to the east. This will be based on further hydrologic study
- Eliminate the agricultural drainage features present across the site to better retain wetland hydrology.

Performance Criteria

- No performance criteria for wetland hydrology have been formally established in the MOA. However, hydrologic conditions must be appropriate for the types of wetland plant communities that are to be established.

Monitoring Objectives

- Objective: Document post construction hydrology during the year following construction.
- Objective: Document quarterly (with photographs and written observations) the extent of surface hydrology and soil saturation during quarterly site visits. Staff gauges should be placed across the management area in accessible locations and should be coordinated with established photo points.

- Objective: Document periodically the extent of flood hydrology subsequent to Amazon Creek flood events. Staff gauges should be placed across site in accessible locations and should be coordinated with established photo points where possible.
- Objective: Visually observe the soil saturation within the wetland restoration areas. Examination of soil saturation will require the digging of a soil pit to a depth of 16 inches and observing the level at which water stands. This should be done in May and in November, once per week during the course of each of the two months at a location that corresponds with photo points that focus on areas where hydrology has been restored or enhanced. A minimum of one soil pit per restoration or enhancement area should be dug for this purpose. This should be done to extract an estimate that inundation or saturation does in fact extend into at least 15% of the growing season. This should be done only the first fall and second spring following wetland restoration.

Soils

Mitigation Goals

- Maintain and restore native wet prairie and vernal pool wetland conditions.

Performance Criteria

- No performance criteria for hydric soils have been formally established in the MOA. However, the soil should be hydric and able to support the native wetland plant community and wetland hydrology.

Monitoring Objectives

- Objective: Document the presence of hydric soils within each plant community present on the site.

Wildlife

Mitigation Goal

- Provide suitable habitat for the endangered Fender's blue butterfly (*Icaricia icarioides fenderi*) and its host plant Kincaid's lupine (*Lupinus sulphureus* ssp. *kincaidii*) in the drier prairie areas to be restored.
- Enhance habitat conditions for native wildlife species associated with upland and wetland prairie habitats. This would include species such as western meadowlark, short-eared owl, harrier, camas pocket gopher, gray-tailed vole, chorus frog, garter snake, gopher snake, and Fender's blue butterfly.
- Provide habitat suitable for the lifecycle of dragonflies in conjunction with waterway enhancements.
- Provide suitable Western pond turtle habitat areas along and adjacent to Amazon Creek.

Performance Criteria

- No performance criteria for wildlife have been formally established in the MOA.

Monitoring Objectives

- Objective: Document wildlife sightings within the mitigation areas during quarterly site visits.
- Objective: Document wildlife sightings within the area quarterly site visits. A baseline survey should be conducted to assess the extent of resident populations of species in advance of implementation of prescriptions. Subsequent surveys should be conducted at a minimum of two-year intervals to assess the extent of the wildlife population.
- Objective: Collect and summarize annually other known wildlife use information from sources including field trips, Audubon records, and ODF&W coordinated monitoring of species such as osprey eagle nests and western pond turtle habitat.

Appendix A

Wetland Delineations

Wetland delineations were conducted on the site by Scoles, Associates, Inc. in March 1997 (northern half of the site), and by Scott Craig, PWS in September 1996 (southern half of the site) . Full delineation reports are on file at the DSL, LCOG, and City of Eugene.

SCOLES ASSOCIATES
SOIL WATER & WETLANDS SCIENTISTS

March 21, 1997

Janet Morlan
Oregon Division of State Lands
775 Summer Street N.E.
Salem, OR 97310

Roger Borine
Natural Resource Conservation Service
20350 Empire Avenue, No. A-3
Bend, OR 97701

Dear Janet and Roger,

On behalf of Marvin Investments, Inc. (Wells Marvin, Project Manager), please review the enclosed agricultural wetland determination report for Tax Lot 1900, T. 17S, R. 4W, Sec. 20. The subject property is located directly east of Greenhill Road and 0.25-mile north of Royal Avenue in west Eugene, Lane County, Oregon. At present, this 80-acre property consists of a broad alluvial plain with wide and shallow bottomlands, and segments of Amazon Creek and Marshall Ditch. The majority of the site is presently under cultivation with annual golf or English perennial ryegrass.

On the basis of our field study conducted in accordance with the National Food Security Act Manual, the areas of wetland hydrology and hydric soil consist of the broad bottomlands, Amazon Creek, Marshall Ditch and an undisturbed swale. The bottomlands are dissected into West, Northeast and Southeast fields by Amazon Creek and Marshall Ditch. The undisturbed swale occurs along the base of the Amazon Creek dike in an uncultivated portion of the Southeast field. Within the bottomland areas, several pockets of standing water have sufficient ponding in the growing season to qualify as Farmed Wetland. The pockets of standing water (Farmed Wetland) within the Northeast field contain mostly hydrophytic plants, while ryegrass has been planted across the rest of the bottomlands. The vast majority of surrounding land lacks sufficient ponding; therefore, it qualifies as Prior Converted Cropland.

The subject property is zoned for future single-family residential and future development would most likely impact the scattered pockets of farmed wetlands and possibly the wetland swale at the base of the Amazon Creek dike. Although site plans have not yet been formulated, it is plausible that development plans and a wetland fill application will be submitted later this year. So, in the interest of all parties, I am submitting the report for your advance review and comment. If you have any questions about the delineation or related matters, please feel welcome to call me. Thank you in advance for your attention to this request.

Cordially yours,

SCOLES ASSOCIATES, INC.

Phil Scoles

RECEIVED
MAR 24 1997

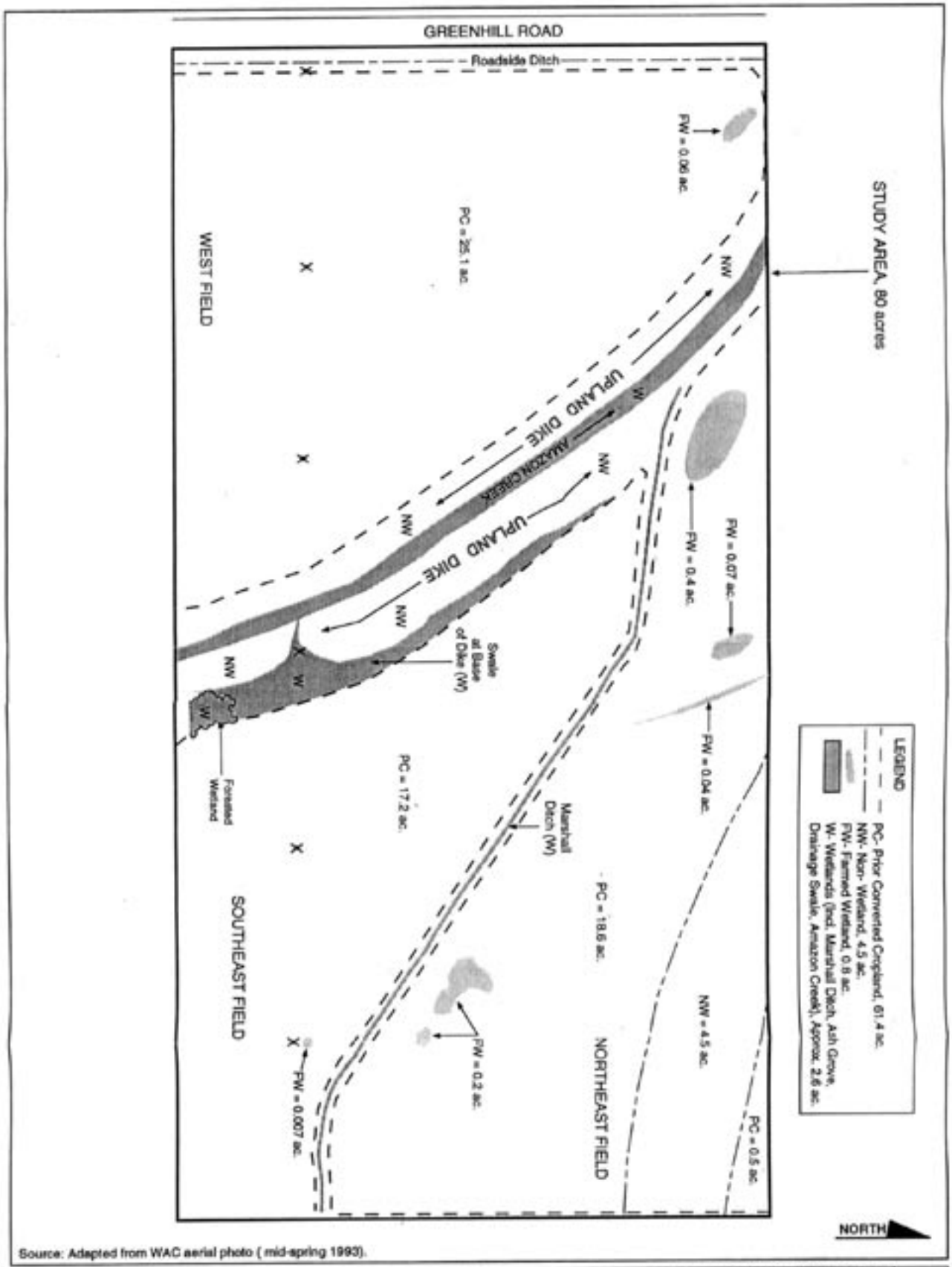
Phil Scoles, RPSS, PWS
Soil and Water Scientist

enclosure

cc: Wells Marvin, Marvin Investment, Inc., 303 First Avenue, Suite 03, Los Altos, CA 94022-3604

Morlan/Borine 970321 ltr SA-960917

Post Office Box 3558
Portland, Ore. 97208
(503) 224-2811



Source: Adapted from WAC aerial photo (mid-spring 1993).

SCOLES ASSOC., INC. *Soil, Water & Wetland Scientists*	AGRICULTURAL WETLAND DETERMINATION FOR TAX LOT 1900, T. 17S, R. 4W, SEC 20 Eugene, Lane County, Oregon	**FOOD SECURITY ACT LABELS AND WETLAND JURISDICTION**	FIGURE 7
	November 1996	Approx. Scale 1 in. = 210 ft. 0 210 ft. 420 ft.	

Oregon

DIVISION OF
STATE LANDS

STATE LAND BOARD
JOHN A. KITZHABER
Governor
PHIL KEISLING
Secretary of State
JIM HILL
State Treasurer

775 Summer Street NE
Salem, OR 97310-1337
(503) 378-3805
FAX (503) 378-4844
TTY (503) 378-4615

September 9, 1996

Scott Craig, PWS
W.E.T.
P.O. Box 632
Corvallis, OR 97339-0632

Re: Wetland Delineation for Royal M Company (Det. #96-0288)
T17S R4W Section 20 TL 2000, 2400 Eugene (WEWP Wetland B8)

Dear Scott:

I have reviewed your wetland determination and delineation report for the above-noted parcel in West Eugene and concur with your conclusions. The small (0.47 acre) wetland at the southwest corner and the 0.06-acre "farmed wetland" near the "A" channel are the only areas subject to permit requirements of the state Removal-Fill Law. The remainder (29.8 acres) has been drained to the extent that it is exempted as "prior-converted cropland."

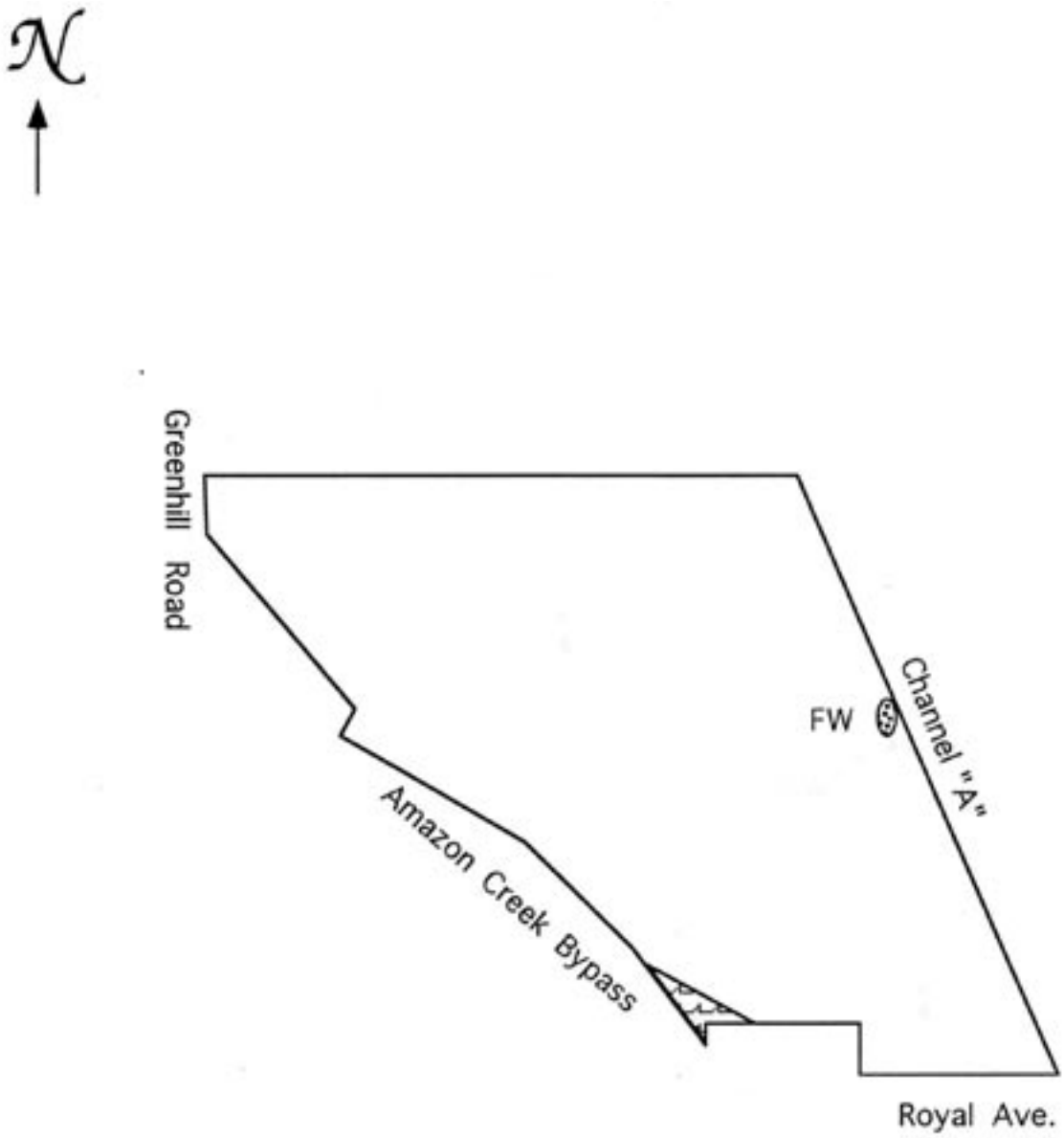
Thank you for your report.

Sincerely,

Janet C. Morlan

Janet C. Morlan, PWS
Wetlands Program Leader

c: Roger Borine, NRCS
Jim Goudzwaard, Corps of Engineers
Neil Bjorklund, City of Eugene
Nancy Leibowitz, DSL



FW Farmed Wetland

Wetland

Scale 1"=400'

Wetland and Farmed Wetland
Location Map
Greenhill and Royal Site
Eugene OR
W.E.T., Inc. June 1996

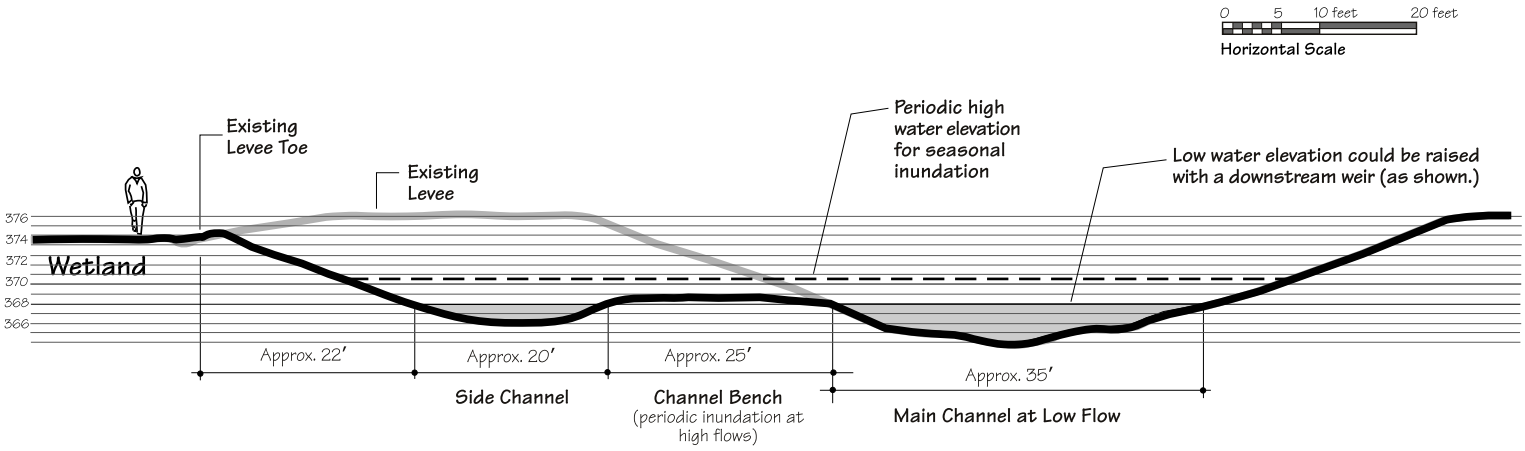
Appendix B

Amazon Creek Enhancement Concept

Note: This concept is conceptual and will be refined based on future study and engineering. Using $740,000 of *Cooperative Conservation Initiative* funds received through the BLM, the City will be taking the lead on developing and implementing the channel enhancements. Design development and engineering will take place beginning summer 2003 with construction tentatively scheduled to being in summer 2004.

Amazon Creek Channel Widening Concept

Cross Section (looking south)



Note: Channel widening would allow a series meandering side channels with wetland benches. These shallow backwaters would provide excellent habitat for wildlife species dependent on year-round water and slower streamflows, such as dragonflies and other aquatic insects, waterfowl, and the Western pond turtle.

Amazon Creek as it passes through the Dragonfly Bend mitigation site (December 2002).

Amazon Creek upstream, near Oak Patch Road. This section was recently widened and could be similar to the channel treatment near Dragonfly Bend. Photo above was taken shortly after channel widening.