City of Florence
Local Wetlands and Riparian Inventory

(City Draft)

Prepared for

City of Florence
Florence, Oregon 97439

Prepared by

Pacific Habitat Services, Inc.
Wilsonville, Oregon

April 1, 2011

City of Florence
Local Wetlands and Riparian Inventory

Prepared for

City of Florence
250 Highway 101
Florence, Oregon 97439

Prepared by

Shawn Eisner
Amy Hawkins
John van Staveren
Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180
Wilsonville, Oregon 97070
(503) 570-0800
(503) 570-0855 FAX
PHS Project Number: 4611

April 1, 2011

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

Page

TABLES

1.0 INTRODUCTION

The City of Florence (City) hired Pacific Habitat Services, Inc. (PHS) to conduct an update to the 1996 *City of Florence Local Wetlands and Riparian Area Inventory*. This Inventory Report was prepared as part of the Wetland and Riparian Areas Project Element of the Siuslaw Estuary Partnership. The Siuslaw Estuary Partnership is a collaborative effort to protect and improve water quality and fish and wildlife habitat in the lower Siuslaw River Watershed. The Wetland and Riparian Project Element updates the Florence Wetland and Riparian Area Inventory performed in 1996 and it includes the adoption of protection measures, as required by state law. The objectives of this Project are to: update the 1996 biological and functional assessment; assess omitted wetlands; include delineations made since 1996; and adopt policies and measures to protect the unique functions and values of the resources. The City will also do preliminary work to assess the potential for restoration of riparian areas and wetlands on City-owned property. Ultimately, it will result in the development of a "Wetland and Riparian Area Protection and Restoration Plan". A comprehensive functional assessment is important in this watershed because the capacity of existing natural wetland systems, and potential future constructed wetlands, to store and slow the velocity of stormwater prior to discharge to area creeks and the estuary, is not currently established. It is also not known whether the carrying capacity of the land is sufficient for the environment to fully address the anticipated impacts from planned urbanization. The functional assessment of the wetlands within the Urban Growth Boundary will provide critical information to help guide future urbanization policy and stormwater management policy and capital programs.

"The Siuslaw Estuary Partnership has been funded in part by the United States Environmental Protection Agency under assistance agreement WC-00J04801-0 to the City of Florence. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use."

This update to the Florence Local Wetlands Inventory (LWI) included a larger study area than the 1996 work. This inventory included areas not previously located with the Urban Growth Boundary (UGB), as well as adjoining areas of Lane County east and north of the UGB. The eastern boundary of the study area follows the ridge line of hills east of the City. The study area was confined to the south by the Siuslaw River and adjoining estuary and by the Pacific Ocean on the west. The approximate study area is shown on Figure 1. All figures are in Appendix A.

The goal of the study was to respond to an interest in establishing some local protections of wetlands and to meet the wetland and riparian requirements of Statewide Planning Goal 5 (*Natural Resources, Scenic and Historic Areas, and Open Spaces)* Oregon Administrative Rule (OAR) Section 660, Division 23. The objective of Goal 5 is to "protect natural resources and conserve scenic, historic and open space resources for present and future generations."

PHS determined the general location, approximate size, and quality/condition of wetlands throughout the study area. The quality/condition of wetlands was determined by applying the Oregon Rapid Wetland Assessment Protocol (ORWAP) where appropriate, and then used the scores determined by ORWAP to identify locally significant wetlands. This report presents the results of the wetland inventory and riparian assessment.

1.1 Report Format

This report begins with definitions used in the report and inventory (Section 2). Section 3 includes a discussion of the methodology used to conduct the field work for the LWI; the wetland assessment methodology; and the methodology used to produce the maps for the inventory. Section 4 is a brief discussion of project cartography. Section 5 describes general conditions within the study area, addressing climate, topography, soils and vegetation. Section 6 is a more detailed discussion of wetlands within the study area and addresses wetland distribution, acreage, and Cowardin classification. Section 7 discusses the results of the *Oregon Rapid Wetland Assessment Protocol* and Section 8 lists Locally Significant Wetlands in the study area. Section 9 describes options for designating riparian corridors within the study area. Section 10 presents staff qualifications. Section 11 provides a list of the references used in the report.

There are six appendices to the report. Appendix A contains figures illustrating general location, soils and the National and Local Wetland Inventory maps of the study area.

Appendix B contains the wetland summary sheets for each wetland (or wetland grouping) of greater than one-half acre in size, organized by wetland code. The summary sheets note wetland location, tax lots, acreage, Cowardin classification, Hydrogeomorphic (HGM) classification, soil series, wetland and adjacent upland vegetation, and other unique or clarifying notes related to the wetland. If site access was granted, data was typically collected, and associated sample point numbers are noted. Locally significant wetlands are also noted on this sheet.

Appendix C contains the wetland determination data forms. These forms document wetland and upland conditions where data was collected for the inventory. Hydrology, soils, and dominant vegetation are recorded for each sample point where wetland or upland data was collected.

Appendix D includes the *Oregon Rapid Wetland Assessment Protocol* (ORWAP) answers for each wetland unit. Each wetland's functions were assessed according to an established state methodology.

Appendix E includes the *Oregon Rapid Wetland Assessment Protocol* (ORWAP) scores and the associated determination of significance for each wetland group.

Appendix F includes the *Urban Riparian Inventory and Assessment Guide* Field Forms and Summary Tables for mapped riparian areas within the study area.

2.0 DEFINITIONS

These terms helped define the methodology used for the Florence Local Wetlands and Riparian Inventory and may be referred to in this report.

1987 Manual

The primary source documents for wetland delineations within Oregon is the *Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1* (Environmental Laboratory, 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region, (Version 2.0)* (U.S Army Corps, 2010).

These manuals are used by the Army Corps of Engineers ("Corps") and the Oregon Department of State Lands ("DSL") to document the location of wetlands within the State of Oregon. The 1987 manual, along with regional supplement, provide technical criteria, field indicators, and recommended procedures to be used in determining whether an area is a jurisdictional wetland. Undisturbed areas require three criteria for them to be classified as wetland. These criteria are hydric soils, a dominance of hydrophytic vegetation, and wetland hydrology.

Cowardin Wetland Classification

The classification of wetlands as defined by plants, soils and the frequency of flooding is described in *"Classification of wetlands and deepwater habitats of the United States."* (Cowardin, et. al. 1979) See also "Palustrine Wetlands".

Estuarine Wetlands

" Deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the ocean, with ocean-derived water at least occasionally diluted by freshwater runoff from the land. The upstream and landward limit is where ocean-de rived salts measure less than .5 ppt during the period of average annual low flow. The seaward limit is (1) an imaginary line closing the mouth of a river, bay, or sound; and (2) the seaward limit of wetland emergents, shrubs, or trees when not included in (1). "(Cowardin et. al. 1979)

Field verify

To walk over and/or visually check an area to make a wetland determination and map wetlands. This may or may not include on-site access or the collection of sample plot data. (OAR 141-086)

Goal 5

Goal 5 (OAR 660, Division 23) is intended "to protect natural resources, and conserve scenic and historic areas and open spaces." (LCDC, 1996)

Growing Season

The growing season has begun and is ongoing when either of the two following conditions is met:

1) Two or more non-evergreen vascular plant species growing in the wetland or surrounding areas exhibit one or more of a specific list of indicators of biological

activity (such as leaf emergence; appearance of new growth; emergence or opening of flowers; etc.)

2) When soil temperature measured at a depth of 12 inches is 41ºF (5ºC) or higher

Hydric Soils

"Soils which are ponded, flooded, or saturated for long enough during the growing season to develop anaerobic conditions." (USDA, SCS, 1985)

Periodic saturation of soils causes alternation of reduced and oxidized conditions which leads to the formation of redoximorphic features (gleying and mottling). Mineral hydric soils will be either gleyed or will have bright mottles and/or low matrix chroma. The redoximorphic feature known as gley is a result of greatly reduced soil conditions, which result in a characteristic grayish, bluish or greenish soil color. The term mottling is used to describe areas of contrasting color within a soil matrix. The soil matrix is the portion of the soil layer that has the predominant color. Soils that have brightly colored mottles and a low matrix chroma are indicative of a fluctuating water table.

Hydric soil indicators include: organic content of greater than 50% by volume, sulfidic material or “rotten egg” smell, and/or presence of redoximorphic features and dark soil matrix, as determined by the use of a Munsell Soil Color Chart. This chart establishes the chroma, value and hue of soils based on comparison with color chips. Mineral hydric soils usually have a matrix chroma of 2 or less in mottled soils, or a matrix chroma of 1 or less in unmottled soils.

Hydrogeomorphic (HGM) Wetland Classification

A method of assessing wetlands using the physical, chemical, and biological functions of wetlands. It is based on the relationship of geomorphic setting, water source, and hydrodynamics. (Brinson, 1993)

Hydrophytic Vegetation

"Plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content." (National Resource Council, 1995)

The U.S. Fish and Wildlife Service, in the *National List of Plant Species that Occur in Wetlands*, has established five basic groups of vegetation based on their frequency of occurrence in wetlands. These categories, referred to as the "wetland indicator status,” are as follows: obligate wetland plants (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), and obligate upland (UPL).

Local Wetlands Inventory (LWI)

An inventory of all wetlands greater than 0.5 acres in size within a local jurisdiction using the standards and procedures of OAR 141-86-110 through 141-86-240.

In 1989, the Oregon State legislature authorized DSL to develop a statewide wetlands inventory for planning and regulatory purposes. Accordingly, DSL established Local

Wetlands Inventory (LWI) standards and guidelines under ORS 196.674. An approved LWI replaces the National Wetlands Inventory map (see Figure 3 in Appendix A) and is incorporated into the statewide wetlands inventory.

An LWI is conducted using color or color infrared aerial photographs taken within 5 years of the inventory initiation and at a minimum scale of 1 inch = 400 feet (1" = 400'). Wetlands are located using the on-site option where access to property is allowed or off-site where access is denied. Wetlands can be mapped off-site by using information such as topographic and National Wetlands Inventory maps, aerial photographs, and soils surveys.

The approximate location of wetlands is placed on a parcel-based map. The parcel-based map allows the property owner, the local jurisdiction, and DSL, to know which tax lots may contain wetlands.

The maps and documents produced for the LWI are intended for planning purposes only. Mapped wetland boundaries are accurate to within 5 meters; however, there may be unmapped wetlands that are subject to regulation. In all cases, actual field conditions determine wetland boundaries.

Palustrine Wetlands (e.g. PEM)

"All nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens and all such wetlands that occur in tidal areas where salinity is less than 0.5%. This includes areas traditionally called swamps, marshes, fens, as well as shallow, permanent or intermittent water bodies called ponds." (Cowardin et. al. 1979)

- **Palustrine Unconsolidated Bottom (PUB)**

A wetland or deepwater habitat with at least 25% cover of particles smaller than stones, and a vegetative cover less than 30%.

- **Palustrine Emergent Wetland (PEM)**

These wetlands have rooted herbaceous vegetation that stand erect above the water or ground surface.

- **Palustrine Scrub-shrub Wetland (PSS)**

Wetlands dominated by shrubs and tree saplings that are less than 20 feet high.

- **Palustrine Forested Wetland (PFO)**

Wetlands dominated by trees that are greater than 20 feet high.

Probable Wetland (PW)

An area noted during the course of LWI field work that appears to meet, or does meet, wetland criteria but is less than one half of an acre in size; or is small and of undetermined size, and is mapped as a point rather than a polygon on the LWI maps. Probable wetlands are designated in the inventory through the use of the extension ‘-PW’ at the end of the resource code.

Riparian Area

"The area immediately adjacent to a water resource, which affects or is affected by the water resource. Riparian areas do not include the water resource itself." (PHS, 1998)

Riverine System

"The riverine system includes all wetlands and deepwater habitats contained within a channel." (Cowardin, et. al. 1979)

Waters of the State

Natural waterways including all tidal and nontidal bays, intermittent streams, constantly flowing streams, lakes, wetlands and other bodies of water in this state, navigable and nonnavigable. Natural waterways are defined as: waterways created naturally by geological and hydrological processes and waterways that would be natural but for human-caused disturbances (e.g. channelized or culverted streams, impounded waters, partially drained wetlands or ponds created in wetlands). (ORS 196.800-196.990, 1995)

Water Resource

"An intermittent or perennial stream, pond, river, lake including their adjacent wetlands." (PHS, 1998)

Wetland

"Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." (Federal Register 1982).

Wetland Assessment

A scored determination of the relative effectiveness and relative values of various wetland functions. The methodology used for this LWI is the *Oregon Rapid Wetland Assessment Protocol (ORWAP).* (Adamus, et. al. 2010)

Wetland Condition

"The integrity of a wetland's physical and biological structure. This determines the ability of the wetland to perform specific functions, as well as its resilience and enhancement opportunities." (Roth et al., 1996)

Wetland Function

"A characteristic action or behavior associated with a wetland that contributes to a larger ecological condition such as wildlife habitat, water quality and/or flood control." (Roth, et. al. 1996)

Wetland Hydrology

"Permanent or periodic inundation or prolonged soil saturation sufficient to create anaerobic conditions in the upper soil profile." (COE, 1987)

Wetland hydrology is related to duration of saturation, frequency of saturation, and critical depth of saturation. The Regional Supplement defines wetland hydrology as 14 or more consecutive days of flooding or ponding, or a water table 12 inches or less below the soil surface, during the growing season at a minimum frequency of 5 years in 10.

Wetlands Regulation

Wetlands in Oregon are regulated by the Department of State Lands (DSL) under the Removal-Fill Law (ORS 196.800-196.990) and by the U.S. Army Corps of Engineers (Corps) through Section 404 of the Clean Water Act.

Wetland Value

The value of a wetland is an estimate of the importance or worth of one or more of its functions to society. For example, a value can be determined by the revenue generated from the sale of fish that depend on the wetland, by the tourist dollars associated with the wetland, or by public support for protecting fish and wildlife. (USEPA, 2001)

3.0 PROJECT METHODOLOGY

3.1 Public Involvement

Prior to beginning the inventory field work, selected landowners (i.e. those suspected of having wetlands or waters of the state on their property) were mailed notices describing the project and asking permission to enter their property. Right of access was granted to PHS by landowner permission only. The properties of those not responding were not accessed. Access information was collected in a database and then transferred to a base map for use in the field.

The City of Florence held an open house meeting May 5, 2010 to inform the public about the wetland inventory process and answering questions from property owners deciding whether or not to grant access to their property. The Siuslaw Estuary Partnership (SEP) distributed a newsletter community-wide and hosted an Open House on May 19, 2010 at which additional information about the wetland and riparian inventory was presented. Following completion of initial fieldwork, a second public meeting was held to allow citizens to observe the location of mapped wetlands and comment as appropriate. This second meeting was held on September 22,

2010. In addition to public meetings, several team meetings of the Siuslaw Estuarine Partnership occurred throughout 2010 and into early 2011; at which time meeting attendees had the opportunity to review and comment on the LWI process and preliminary results.

3.2 Local Wetlands Inventory Methodology

Within the study area PHS determined the location of wetlands and assessed the quality/condition of each. The wetland location was determined by application of the required methodology outlined in the Regional Supplement of the 1987 Manual (see Section 3.2.1 & 3.2.2 for more details). The quality/condition of wetlands was determined by applying the Oregon Rapid Wetland Assessment Protocol (ORWAP; see Section 3.3) where appropriate.

3.2.1 Routine Off-site Determination

Prior to beginning field work, off-site mapping was reviewed to determine the approximate location of wetland boundaries based on available information. This information included the 1996 LWI mapping and report, Regional Land Information System (RLIS) geographic information, the USGS topographic quadrangles, soil survey maps for Lane County (NRCS, 1982), the *National Wetlands Inventory* maps (USFWS, July 1989), and true color aerial photographs (1"=400'). The boundaries of wetlands that had been concurred with by DSL were utilized as well.

If access was allowed, the wetland boundaries were verified in the field (see Section 3.2.2). If access was not granted, the boundaries were based on the mapping conducted in the office (non-field verified), or on the observation of wetland boundaries from adjacent roads, right-of-ways, or properties, if possible (field verified). Some of the larger wetlands were only partially field verified, denoting access to and/or visual confirmation of a portion, but not all of the wetland. Due to limited time and resources for verification, wetlands on many of the large publicly owned parcels that could not be easily accessed were not field verified. Wetlands on the parcels were mapped and assessed using off-site assessment protocols.

3.2.2 Routine On-site Determination

On-site observation and inspection of soils, vegetation, and hydrology were made using the required methodology outlined in the Regional Supplement of the 1987 Manual. Soil pits were typically excavated to a depth of approximately 18-inches in selected locations. The soil profiles were examined for hydric soils and wetland hydrology field indicators.

A visual percent-cover estimate of the dominant species of the plant community for a maximum 30-foot radius was conducted at each sampling location. Sampling locations were chosen to document a change in the wetland boundary and a particular plant community. Data was recorded in the field and transferred to computer-generated wetland delineation data sheets (Appendix C).

Field work for the inventory was conducted between June and August 2010. Additional field work was conducted in March 2011 as a result of the September 2010 public meeting. Three property owners that attended the meetings granting PHS access to their properties to review the wetland boundaries. No wetland boundaries were staked or flagged in the field as part of this LWI.

3.3 Wetland Quality Assessment

3.3.1 The *Oregon Rapid Wetland Assessment Protocol*

An assessment of the quality for each wetland identified through the inventory was conducted using the *Oregon Rapid Wetland Assessment Protocol* (ORWAP) (Adamus et al, 2010). [The full text of methodology is available at http://www.oregon.gov/DSL/WETLAND/docs/orwap_manual_v2.pdf]. The ORWAP is a standardized protocol for rapidly assessing 16 wetland functions and 21 values. The protocol was developed by DSL, with funding from the U.S Environmental Protection Agency. It uses 140 indicators assessed from on-site analysis, aerial photography, and information from several web sites. The answers are tabulated within ORWAP spreadsheets to provide a final score for 16 individual wetland functions. These individual functions are further grouped to provide group scores (see Section 8.2.1 for a discussion of Grouped Functions).

The advantage of the ORWAP over other assessment methodologies is that it provides a standardized process for scoring indicators of wetland values and provides a score for the relative value of each function. Since the protocol baseline analyzed wetlands of diverse types throughout the state, it allows for a qualitative comparison of wetlands of any type anywhere in Oregon.

3.3.2 Functions and Values in ORWAP

A wetland's functions and values are independent of one another. For example, a wetland that is extremely effective for removing whatever nitrate enters it is not considered to be of high *value* for that *function* unless it is exposed to significant loads of nitrate and/or its watershed has been designated as "Water Quality Limited" as a result of ongoing problems with nitrate pollution. A high level of function does not alone make a wetland valuable. Likewise, even if a wetland's effectiveness for storing water is low, the *value* of that function may be considered potentially high if the wetland is situated above homes that are periodically flooded by heavy runoff. (Adamus et. al., 2010). In essence, the value of a particular function is linked to a specific wetland's opportunity to perform that function. The value of a wetland is determined in large part by adjoining land cover and land use.

Following is a brief description of each wetland function and value as defined for use in the ORWAP; this information and more can also be found in Appendix B of the ORWAP Manual (Adamus et.al;. 2010).

Water Storage & Delay: The effectiveness of a wetland for storing water or delaying the downslope movement of surface water for long or short periods (but for longer than a tidal cycle), and in doing so to potentially influence the height, timing, duration, and frequency of inundation in downstream or downslope areas.

Sediment Retention & Stabilization: The effectiveness of a wetland for intercepting and filtering suspended inorganic sediments thus allowing their deposition, as well as reduce current velocity, resist erosion, and stabilize underlying sediments or soil. The performance of this function has both positive values (e.g., reduction in turbidity in downstream waters) and negative values (e.g., progressive sedimentation of productive wetlands, slowing of natural channel migration).

Sediment Retention & Stabilization: The effectiveness of a wetland for intercepting and filtering suspended inorganic sediments thus allowing their deposition, as well as reduce current velocity, resist erosion, and stabilize underlying sediments or soil. The performance of this function has both positive values (e.g., reduction in turbidity in downstream waters) and negative values (e.g., progressive sedimentation of productive wetlands, slowing of natural channel migration).

Nitrate Removal & Retention: The effectiveness for retaining particulate nitrate and convert soluble nitrate and ammonia to nitrogen gas, primarily through the microbial process of denitrification, *while generating little or no nitrous oxide (N2O).* Note that most published definitions of Nitrate Removal do not include the important restriction on N2O emission.

Thermoregulation: The effectiveness of a wetland for maintaining or reducing summertime water temperature, and in some cases, for moderating winter water temperature.

Carbon Sequestration: The effectiveness of a wetland both for retaining incoming particulate and dissolved carbon, and through the photosynthetic process, converting carbon dioxide gas to organic matter (particulate or dissolved). And to then retain that organic matter on a net annual basis for long periods *while emitting little or no methane.* Note that most published definitions of Carbon Sequestration do not include the important limitation on methane emission.

Organic Matter Export: The effectiveness of a wetland for producing and subsequently exporting organic matter, either particulate or dissolved.

Aquatic Invertebrate Habitat: The capacity to support an abundance and diversity of marine and freshwater invertebrate animals which spend all or part of their life cycle underwater or in moist soil. Includes dragonflies, midges, crabs, clams, snails, crayfish, water beetles, shrimp, aquatic worms, and others. This function does not predict habitat suitability accurately for every species. See worksheet *WetInverts* in the *ORWAP_SuppInfo* file for list of freshwater aquatic invertebrates known or likely to occur in Oregon wetlands.

Fish Habitat – Anadromous: The capacity to support an abundance of native anadromous fish (chiefly salmonids) for functions other than spawning. This function does not predict habitat suitability accurately for every species, nor is it intended to assess the ability to restore fish access to a currently inaccessible wetland. See worksheet *WetVerts* in the *ORWAP_SuppInfo* file for the list of the species included in ORWAP.

Fish Habitat - Non-Anadromous: The capacity to support an abundance and diversity of *native* non-anadromous fish (both resident and visiting species). This function does not predict habitat suitability accurately for every species, nor is it intended to assess the ability to restore fish access to a currently inaccessible wetland. See worksheet *WetVerts* in the *ORWAP_SuppInfo* file for the list of the species included in ORWAP.

Amphibian & Reptile Habitat: The capacity of a wetland to support an abundance and diversity of native amphibians and native wetland-dependent reptiles. This function does not predict habitat suitability accurately for every species. See worksheet *WetVerts* in the *ORWAP_SuppInfo* file for the list of the species included in ORWAP.

Waterbird Habitat – Feeding: The capacity to support an abundance and diversity of feeding waterbirds, primarily outside of the usual nesting season. This function does not predict habitat suitability accurately for every species. See worksheet *WetVerts* in the *ORWAP_SuppInfo* file for the list of the species included in ORWAP.

Waterbird Habitat – Breeding: The capacity to support an abundance and diversity of nesting waterbirds. This function does not predict habitat suitability accurately for every species. See worksheet *WetVerts* in the *ORWAP_SuppInfo* file for the list of the species included in ORWAP.

Songbird, Raptor, & Mammal Habitat: The capacity to support an abundance and diversity of songbirds, raptors, and mammals, especially species that are most dependent on wetlands or water. This function does not predict habitat suitability accurately for every species. See worksheet *WetVerts* in the *ORWAP_SuppInfo* file for the list of the species included in ORWAP.

Pollinator Habitat: The capacity to support pollinating insects, such as bees, wasps, butterflies, moths, flies, and beetles.

Native Plant Habitat: The capacity to support an abundance and diversity of songbird, raptor, and mammal species and functional groups, especially those that are most dependent on wetlands or water. See worksheet *WetVerts* in the *ORWAP_SuppInfo* file for the list of the species included in ORWAP.

In addition to a value score for each of the functions above; except for carbon sequestration and organic matter export, which do not have value scores; ORWAP assesses five other values and attributes.

Public Use & Recognition: The potential and actual capacity of a wetland to sustain low-intensity human uses such as hiking, nature photography, education, and research. Considerations include (are assumed), wetlands designated officially as wetland priority areas, are in public ownership, have less restrictive access policies and a greater degree of visibility from roads, are physically accessible to a wider range of users, have more prior investment of funds for conservation or enhancement, and/or some history of scientific monitoring or use for compensatory mitigation.

Provisioning Services: The passive and sustainable providing of tangible natural items of potential commercial value (i.e. the harvesting of hay (crops), timber, other wild plants, fish, or wildlife.

Wetland Ecological Condition: The integrity or health of the wetland as defined primarily by its vegetation composition (because that is the only meaningful indicator that can be estimated rapidly). More broadly, the structure, composition, and functions of a wetland as compared to reference wetlands of the same type, operate within the bounds of natural or historic disturbance regimes. However, in the case of ORWAP, the model outputs were not scaled to reference wetlands.

Wetland Stressors (Risk): The degree to which the wetland is or has recently been altered by, or exposed to risk from, human and natural factors.

Wetland Sensitivity: The lack of intrinsic resistance and resilience of the wetland to human and natural stressors

3.3.3 Office Assessment

When possible, the ORWAP assessment begins in the office; where information on the wetland, its adjoining landscape, and contributing area are gathered. The office portion of ORWAP includes a series of 49 questions that are answered utilizing published databases available online, as well as resource mapping and air photo interpretation.

3.3.4 Field Methodology

The field component of the ORWAP involves visiting as much of the wetland as possible and filling out two field forms. Though the method suggests visiting during both the wettest and driest times of year, due to the limitations of time and resources for an LWI, these forms are generally completed during a single site visit (though multiple visits were made to several wetlands to get a local "feel" for changing hydrologic conditions over time).

. As a result, the assessment relied on aerial imagery, maps and other office information, as well as field indicators. Though not always available, information provided by landowners or other residents of Florence was also utilized when available.

If the wetland assessment was off-site or even office based (as was necessary for several of the wetlands located in the dunes, far from developed access), the assessment relied upon data and observations of wetlands that were presumed to be of similar condition, Cowardin class, and/or landscape position.

4.0 CARTOGRAPHY

Color aerial photographs were obtained for use in the field. These photos were taken in 2008, with a scale of approximately 1 inch = 400 feet. The boundaries of wetlands from the 1996 inventory were added to the field maps to assist with the field verification process. Wetland boundaries and data point locations were drawn directly onto field maps at the time of assessment. Wetland boundaries are intended to be accurate to within 5 meters. Separate maps were utilized for site access, hydric soils, and the National Wetland Inventory. Wetland boundaries as draw onto the field maps were transferred into a digital format and inserted into a computer-based map derived from the City's Geographic Information Systems (GIS) base.

Due to the complexity of each ORWAP, and time involved with completing each assessment, wetland sub-units that were hydrologically connected or in close proximity to each other were assessed as a single wetland unit if they were similar in character and adjacent land use. Small potential wetlands that could not be accurately assessed, or known wetlands of less than one-half acre in size, are labeled on the maps with a designation of “PW” (“probable wetland”). The final digital maps include the location of all streams, wetlands, and PW’s, as well as artificially created wetlands such as golf course or water quality features. They also include the location of sample points, legend, north arrow, scale, and a DSL required disclaimer.

5.0 STUDY AREA CHARACTERISTICS AND EXISTING INVENTORY INFORMATION

5.1 Topography

Elevations within the Florence study area range from sea level to approximately 495 feet National Geodetic Vertical Datum (NGVD) 1929. Elevations in Florence increase gently from the ocean to the base of the bedrock ridges that form the edge of the dune sheet along the eastern study area boundary. The highest elevations in the study area are along a ridge east of Clear and Collard Lakes, which defines the eastern edge of the study area.

5.2 Hydrology

5.2.1 Hydrologic Features of the Florence Area

Hydrologic features of the Florence study area include: the Pacific Ocean; the Siuslaw River, which flows along the southern and western edges of the city; the North Fork Siuslaw River, which flows south along the eastern edge of the city; Collard, Clear, Ackerley, and Munsel Lakes, a series of hydrologically connected lakes along the eastern boundary of the study area; Munsel Creek, a perennial stream channel flowing south from Munsel Lake into the Siuslaw River; and relatively large shallow lakes and ponds formed in the dunes.

The origin of Collard, Clear, Ackerley, and Munsel Lakes is the same. The lakes formed along the eastern margin of the dune sheet, between the accumulation of sand to the west and the impermeable bedrock to the east. The energy of the wind transporting sand to the west is deflected upward into the surrounding hills. The sand being carried by the wind is dropped, creating a ridge near the base of the hills. Between the ridge of sand and the hills is a depression or series of troughs. Collard, Clear, Ackerley, and Munsel Lakes all formed in this depressional area.

Clear Lake is over 80 feet deep and Munsel Lake is 71 feet deep. Water flows out of Collard Lake into Clear Lake through a small drainage channel. Water flow is a relatively constant 1 to 2 cubic feet per second. Water continues south into Ackerley Lake and Munsel Lake and into Munsel Creek, which eventually drains into the Siuslaw River. The average annual discharge of Munsel Creek is 3,000 acre-feet.

The source of hydrology for the creeks and lakes of the Florence area is groundwater. The dune sand which underlies Florence is moderately permeable and allows infiltration of large amounts of rainfall. It is estimated that over 55 inches of the 65-inch average annual rainfall goes to groundwater recharge. Each square mile of the dune sand produces approximately 2.7 million gallons per day (Hampton, 1963). Consequently, the water supply for the Florence area is drawn from the dunal aquifer, which stretches approximately 50 miles along the coast. The Heceta Water District draws water for domestic uses from Clear Lake in the northeast corner of the study area. The quality of the water is generally good. The water is soft and weakly acidic, but can contain high amounts of iron. High iron content is especially noticeable beneath wetlands and other bodies of shallow water.

Groundwater movement in the Florence area flows downward toward the edges of the dune sheet. Water drains out of the dune sheet south into the Siuslaw River, east into the North Fork Siuslaw River, or west into the Pacific Ocean. There is relatively little overland flow due to the high permeability of the sand. Only during times when excess rainfall has completely saturated the sand does water flow over the surface. The lack of well-defined tributaries to the streams and lakes is an indication that much of the water reaching the channels is through groundwater flow and not through surface water.

The water table adjacent to Munsel Creek and four other unnamed creeks in the project area is generally higher than the stream levels. During periods of sufficient recharge, the water table discharges into the creeks. However, during the summer months when the precipitation levels are low, the water table falls below the level of some of the creeks and water ceases to flow.

5.2.2 Hydrologic Basin Designation

The study area was divided into three drainage basins based on the 6^{th} field (sub-watershed) of the Hydrologic Unit (HUC-6). Sub-watersheds within the Florence LWI study area include Mercer Lake in north; Bernhardt Creek through the central and south portions; and the Lower North Fork Siuslaw River. These drainage basins and their size are listed in Table 1 below:

Table 1: Hydrologic Basin Areas for the City of Florence Local Wetlands Inventory

Hydrologic Basin (Sub-watershed)	Area (acres)
Bernhardt Creek	6827
Lower North Fork Siuslaw River	624
Mercer Lake	694
Total Project Acreage	**8,145**

5.3 Soils

Table 2 lists the soils that have been mapped by the Natural Resources Conservation Service (NRCS; formerly the Soil Conservation Service) within the study area. Figure 2 shows the mapped location of these soils.

Table 2. Soils Mapped Within the Florence LWI Study Area

Symbol	Map Unit Name	Hydric?
10	Beaches	Yes
16D	Bohannon gravelly loam, 3 to 25 percent slopes	No
17	Brallier muck, drained	Yes
18	Brallier variant muck	Yes
21C	Bullards-Ferrelo loams, 7 to 12 percent slopes	No
21E	Bullards-Ferrelo loams, 12 to 30 percent slopes	No
21G	Bullards-Ferrelo loams, 30 to 60 percent slopes	No
44	Dune land	No (Yes on marine terraces and interdunes)
47E	Fendall silt loam, 3 to 30 percent slopes	No
53	Heceta fine sand	Yes
74B	Lint silt loam, 0 to 7 percent slopes	No (Yes in depressions)
74C	Lint silt loam, 7 to 12 percent slopes	No

		(Yes in depressions)
74D	Lint silt loam, 12 to 20 percent slopes	No (Yes in depressions)
94C	Netarts fine sand, 3 to 12 percent slopes	No (Yes on marine terraces and interdunes)
94E	Netarts fine sand, 12 to 30 percent slopes	No (Yes on marine terraces)
111D	Preacher loam, 0 to 25 percent slopes	No
112G	Preacher-Bohannon-Slickrock complex, 50 to 75 percent slopes	No
124D	Slickrock gravelly loam, 3 to 25 percent slopes	No
124F	Slickrock gravelly loam, 25 to 50 percent slopes	No
131C	Waldport fine sand, 0 to 12 percent slopes	No (Yes on marine terraces and interdunes)
131E	Waldport fine sand, 12 to 30 percent slopes	No (Yes on marine terraces and interdunes)
131G	Waldport fine sand, 30 to 70 percent slopes	No (Yes on marine terraces)
132E	Waldport fine sand, thin surface, 0 to 30 percent slopes	No (Yes in interdunes)
133C	Waldport-Urban land complex, 0 to 12 percent slopes	No on dunes and urban land Yes on marine terraces
140	Yaquina loamy fine sand	Yes
141	Yaquina-Urban land complex	Yes on dune slacks No on urban land

5.4 Vegetation

5.4.1 Vegetation Overview

The City of Florence is located within the Sitka Spruce *(Picea sitchensis)* Forest Zone (as characterized by Franklin and Dyrness, 1973). This vegetation zone occupies a low-elevation strip along the immediate coastline, often only a few miles wide, subject to a relatively wet and mild climate. The zone is essentially a variant of the Western Hemlock *(Tsuga heterophylla)* Zone, distinguished largely by the presence of Sitka spruce, frequent summer fogs, and proximity to the ocean. The climate provides nearly ideal growing conditions, accounting for the high productivity of forest stands, as well as prolific growth in shrub and herb-dominated communities.

Common trees found in this region include Sitka spruce, western hemlock, western red cedar *(Thuja plicata),* Douglas fir *(Pseudotsuga heterophylla),* shore pine *(Pinus contorta),* and red alder *(Alnus rubra).* Sites disturbed through fire or logging may develop into stands of mixed conifers including spruce, hemlock and Douglas fir. However, red alder may overtop the regenerating conifers and develop into a nearly pure alder forest. Dense shrub communities may also form on disturbed sites, often in conjunction with red alder; the dense understory may delay conifer colonization almost indefinitely. Thicket-forming shrubs common in the region include salmonberry *(Rubus spectabilis),* salal *(Gaultheria shallon),* and evergreen huckleberry (*Vaccinium ovatum).* Further discussion of coastal plant communities within the Sitka Spruce Zone can be found in *Natural Vegetation of Oregon and Washington* (Franklin and Dyrness 1973).

A landform type especially significant to Florence area plant communities consists of the extensive active-to-stabilized dune systems that extend for miles both north and south of the Siuslaw River mouth, as well as several miles inland (see Section 4.1.3 for more discussion of this landform type). The dynamic nature of these systems represents rapidly changing, and oftentimes hostile, growing conditions for plants.

5.4.2 Local Vegetation Communities

Generalized plant communities encountered within the City of Florence study area include upland active dune complexes, upland broadleaf-scrub/shrub thicket, upland coniferous forest, upland mixed coniferous/deciduous forest, developed-urban, wetland, and riparian/ lacustrine. Wetland communities are further distinguished as freshwater, which includes deflation plains (palustrine unconsolidated bottom, palustrine emergent, palustrine scrub-shrub, and palustrine forested), and brackish (estuarine emergent, and estuarine scrub-shrub) following the Cowardin classification system developed for the US Fish and Wildlife Service (Cowardin et al., 1979). Each of the above communities is described in the sections below.

Upland Active Dune Complex

The upland dunal systems common in the Florence area are unconsolidated and dynamic, with large volumes of sand continually being brought ashore by wave action. The sand is highly mobile when subject to a sufficiently strong wind. Sand grains may be blown considerable distances unless held in place by surface tension when saturated (as within a deflation plain), protected from wind behind a ridge of accumulated sand, or in contact with stabilizing vegetation. Few plants are able to tolerate partial sand burial, let alone maintain a foothold in this shifting substrate. However, several grasses and forbs may persist for a time and eventually stabilize portions of the active dune. Species most commonly encountered include European beach grass *(Ammophila arenaria) (*widely introduced as a sand-binder), seashore bluegrass *(Poa macrantha),* beach silvertop *(Glehnia leiocarpa),* beach knotweed *(Polygonum paronychia),* American dune-grass *(Elymus mollis),* and beach pea *(Lathyrus japonicus).*

As larger areas of sand surface are protected from further wind action by these plants, other species less tolerant of sand burial are able to become established as well. Seedlings of such trees and shrubs as shore pine, Sitka spruce, Douglas fir, salal, and evergreen huckleberry establish more structured communities that protect ever-larger areas of sand, ultimately leading to the establishment of shrub and forest communities.

Upland Broadleaf-Scrub/Shrub Thicket

In addition to colonizing recently stabilized sand dunes, shrub communities are often associated with relatively recent disturbance (i.e. following logging, grading, or fire). Dominant species may include saplings of regenerating conifers such as Sitka spruce or Douglas fir, deciduous trees such as red alder, and shrubs such as salmonberry, thimbleberry *(Rubus parviflorus),* salal, evergreen huckleberry, rhododendron *(Rhododendron macrophyllum),* and blackberries *(Rubus* spp.). Introduced Scots' broom *(Cytisus scoparius)* and gorse *(Ulex europaeus)* are also rapid colonizers in disturbed areas. Herbaceous species are common in cleared openings, often being the first plants to colonize disturbed ground.

Upland Coniferous Forest

The dominant species in the coniferous overstory are Douglas fir, Sitka spruce, western hemlock, western red cedar, and shore pine. Sitka spruce and shore pine are more common closer to the ocean (especially within the dune systems) with the other species becoming more dominant inland, further from the effects of salt spray and shifting sands. Understory plants vary greatly with the density of the tree canopy. A closed canopy forest tends to suppress understory species diversity and density, though species such as false lily-of-the valley *(Maianthemum dilatatum)* and sword fern *(Polystichum munitum)* are commonly encountered. Openings in the canopy allow greater shrub development, with salmonberry, salal, rhododendron, and evergreen huckleberry often evident.

Upland Mixed Coniferous-Deciduous Forest

The conifer species mentioned above may be codominant with deciduous hardwoods such as red alder, bigleaf maple, and willows. Shrub understories are often well-developed given the more open tree overstory for much of the year. Common shrubs include salmonberry, red elderberry *(Sambucus racemosa),* evergreen huckleberry, salal, and Pacific wax myrtle *(Myrica californica).*

Developed-Urban

Plant communities in large portions of the City of Florence study area have been influenced by human activities for most of this century. The study area includes heavily developed commercial areas and single-family residential subdivisions, as well as widely dispersed residential to undisturbed natural areas. Residences, businesses, parking areas, roads, and sidewalks all represent unvegetated or landscaped areas. Vegetation is often of horticultural origin or weedy in these areas. The fringes of these developed areas may have been subject to disturbance as well, often allowed to regenerate as red alder, salmonberry, or blackberry thickets. More frequent disturbance may maintain areas as open spaces dominated by weedy grasses and forbs.

Riparian/Lacustrine

Riparian forests are often similar to the upland mixed evergreen-deciduous forests, though species preferring wetter sites may be more common. Sitka spruce and shore pine may codominate with red alder and western red cedar; Douglas fir and western hemlock may also be present. The shrub layer is often quite dense, especially within a red alder or otherwise more open stand, and may consist of such species as salmonberry, salal, and evergreen huckleberry. Herbaceous species may dominate the understory under a closed evergreen canopy, with lady fern, sword fern, or false lily-of-the-valley often present. Riparian communities are often transitional to or include wetland communities, especially along lake edges.

Lacustrine plant communities vary widely depending on water depths and the degree of stabilization of sideslopes. Many of the lakes in the study area are within interdunal depressions, with active dune movement into the lake edge from one or more directions. Consequently, slopes may be very steep with a short transition from unconsolidated sand into deep water. In these areas the riparian vegetation may be nonexistent or composed only of early successional dune species. In portions of the interdunal depression where wind is blowing sand away from the lake, nearly level sand flats may extend for hundreds of feet, with sufficient water to support a variety of palustrine emergent and scrub/shrub species.

Wetlands

Wetland areas are generally transitional between upland or riparian areas and truly aquatic sites with permanently open water. Open water may or may not be present, in which case the wetland can occupy a position where the groundwater table comes close to the surface for an extended period at some time during the growing season. The Florence study area contains extensive areas of freshwater, or palustrine wetlands, often associated with lake margins within interdunal depressions. In addition, brackish, or estuarine wetlands are present along the tidally influenced banks of the Siuslaw River estuary, as well as along the North Fork Siuslaw River.

The composition of palustrine wetlands in the study area is largely determined by the stability of the dune system surrounding wet depressions. Newly formed deflation plains between unstabilized dunes support primarily emergent species that can survive in soils with minimal organic content. The more stable dunes provide better growing conditions for a variety of species, especially shrubs and trees. More mature palustrine forested wetlands in the area are dominated primarily by an overstory of Sitka spruce, shore pine, and red alder; an herb understory dominated by skunk cabbage *(Lysichitum americanum)* and slough sedge *(Carex obnupta)* is often present as well. At earlier stages of dune stability, palustrine scrub/shrub wetlands often include saplings of the above tree species, along with such shrubs as Hooker's willow *(Salix hookeriana),* bog blueberry *(Vaccinium uliginosum),* Labrador tea, *(Ledum glandulosum),* Douglas' Spiraea *(Spiraea douglasii),* and four-line honeysuckle *(Lonicera involucrata).* Palustrine emergent wetlands are generally dominated by herbaceous species such as slough sedge, water parsley *(Oenanthe sarmentosa),* soft-stem bulrush *(Scirpus validus),* rushes *(Juncus* spp.), and purple cinquefoil *(Potentilla palustris).* Some of these least disturbed emergent areas include small populations of uncommon or rare species, including California pitcher plant (*Darlingtonia californica*) or sundew (*Drosera sp.*).

There are also brackish or estuarine wetlands along the margins of the Siuslaw River and its North Fork. These wetlands are primarily composed of emergent species, although occasional scrub/shrub patches are present. These marginal thickets primarily consist of Sitka spruce, Hooker willow, four-line honeysuckle, salmonberry, and occasionally red alder. At lower elevations, the combined influences of high salinity and daily tidal inundation produce pronounced zonation of species composition. Common herbaceous species in the high salt marsh areas include Lyngbye's sedge *(Carex lyngbyei),* tufted hairgrass *(Deschampsia cespitosa),* Puget Sound gumweed *(Grindelia integrifolia),* Baltic rush *(Juncus balticus),* and seacoast bulrush *(Scirpus maritimus).* At a somewhat lower elevation, and with a consequent increase in salinity and frequency of inundation, several halophytic species become dominant. These include pickleweed *(Salicornia virginica),* fleshy jaumea *(Jaumea carnosa),* and seashore saltgrass *(Distichlis spicata).* There are several estuarine wetlands along the south and southeastern limits of the study area, these wetlands are recognized under *Goal 16: Estuarine Resources*. Though these wetlands are identified on the LWI maps, they have not been assessed or inventoried as part of the Goal 5 work for this inventory.

5.4.3 Wetland and Upland Indicator Species

Species lists of commonly encountered plants, along with their status as indicators of wetland conditions, have been prepared for all regions of the country by the USFWS (1988). The status of a particular plant, as identified on Table 3, is the probability of that plant occurring in a wetland.

Table 3. Wetland Indicator Codes and Status

Indicator Code	Status
OBL	Obligate wetland. Estimated to occur almost exclusively in wetlands (>99%)
FACW	Facultative wetland. Estimated to occur 67-99% of the time in wetlands.
FAC	Facultative. Occur equally in wetlands and non-wetlands (34-66%).
FACU	Facultative upland. Usually occur in non-wetlands (67-99%).
UPL	Obligate upland. Estimated to occur almost exclusively in non-wetlands (>99%). If a species is not assigned to one of the four groups described above it is assumed to be obligate upland.
NI	Has not yet received a wetland indicator status, but is probably not obligate upland.

Many plants are found in transitional areas between wetlands and uplands. These areas are usually characterized by flat to gradually sloping terrain where the species composition may not reflect true wetland boundaries. In such areas, a species with a status of FACU may extend into the wetland areas, just as FACW species may also be present in upland areas.

6.0 LWI DISCUSSION AND CONCLUSIONS

6.1 U.S. Fish & Wildlife Service National Wetland Inventory Areas

The U.S. Fish and Wildlife Service, as part of the National Wetlands Inventory (NWI) program, have mapped wetland in the study area (Figure 3). The NWI maps are generated primarily on the basis of interpretation of relatively small-scale color infrared aerial photographs (e.g., scale of 1:58,000) with limited "ground truthing" conducted to confirm the interpretations.

Since much of the LWI study area was included in the previous LWI work, NWI mapping was utilized primarily for areas outside the original study area. The NWI maps were useful in identifying the approximate location of wetlands, though additional ground truthing and/or additional air photo interpretation were utilized to "fine tune" the boundaries as suggested on the NWI maps.

Despite being generally accurate as to the presence of wetlands in a given area, we found that there were often significant differences between the mapped size and shape. In forested areas for example, the NWI is prone to identifying medium to large wetlands in areas that are in actuality a complex of smaller wetlands. These general inaccuracies can be attributed to canopy cover (typically of shore pine) which creates difficulty in defining wetlands and uplands from air photo interpretation alone. Though development since the time of NWI mapping has no doubt contributed to small differences between NWI designated wetlands and those identified for the LWI, development in the Florence area has generally been limited to areas away from the large wetlands and forested tracts.

6.2 Local Wetlands Inventory Results

6.2.1 Wetland Acreage and Distribution

A total of 34 grouped wetlands of greater than one-half acre were identified during the LWI, with a total area of approximately 620.02 acres. Though some were isolated features and generally separated from other wetlands or water features, many were located in close proximity to other wetlands and as a result, formed larger wetland complexes that were grouped if they were similar in character and located in area of similar land use. The acreage total therefore does not included mapped PW's or exempt wetlands such as golf course ponds or stormwater facilities. It also does not include the acreage of other waters; including streams and lakes.

6.2.2 Wetland Classification

Each wetland was classified according to the Cowardin system. Forested (PFO) wetlands are the most dominant type within the study area at 58 percent, totaling 367.03 acres. Scrub shrub (PSS) wetlands were the second most common at 22 percent (138.82 acres). These were followed by emergent (PEM) wetlands at 11 percent (66.71 acres), unconsolidated bottom (PUB) at 8 percent

(49.54 acres), lacustrine aquatic bed (L2AB) at approximately 1 percent (6.1 acres), and aquatic bed (PEB) at only 1.4 acres within the study area.

Table 4 includes the total acreage of each Cowardin wetland class for each wetland. It should be noted that Table 4 does not include the acreage of probable wetlands, other water features (such as golf ponds or ditches), or other waters of the State (includes creeks and lakes). It also does not include any portion of a wetland that extends beyond the boundary of the LWI study area.

Table 4. Cowardin Classification of all Wetlands Identified in the Florence LWI

Wetland Code	USFWS Wetland Classification						Total Acreage
	PFO	PSS	PEM	PUB	PAB	L2AB	
1	3.24		4.93				8.17
2		2.59					2.59
3	4.59						4.59
4	12.93	6.27					19.2
5	38.02	6.61	5.31		0.43		50.37
6	0.21	29.33	1.19				30.73
7	2.75						2.75
8	1.78						1.78
9	0.69						0.69
10		1.34					1.34
11	6.14						6.14
12	44.87	0.85	10.29				56.01
13	11.86	0.94	4.64				17.44
14	9.22		14.55				23.77
15	3.83						3.83
16	1.83		1.11				2.94
17	2.42		0.07				2.49
18	0.58						0.58
19	4.47						4.47
20	1.97						1.97
21	23.30						23.3
22						1.06	1.06
23	60.57						60.57
24	16.34	14.04		16.36			46.74
25	3.5	6.71					10.21
26	1.23						1.23
27	69.02		1.24				70.26
28	5.04			0.80			5.84
29	16.89	0.12	23.38	24.44			64.83

30	6.88						6.88
31	10.41	70.02		7.94	0.97		89.34
32						5.04	5.04
33	0.61						0.61
34	1.86						1.86
TOTAL	**367.05**	**138.82**	**66.71**	**49.54**	**1.4**	**6.1**	**629.62**

7.0 OREGON RAPID WETLAND ASSESSMENT PROTOCOL RESULTS

7.1 Wetland Quality Assessment

The ORWAP has been formulated to produce an objective analysis of wetland functions and values. "ORWAP is intended to provide consistent and accurate numeric estimates of the relative ability of a wetland to support a wide variety of functions and values important to society" (Adamus et. Al. 2010). To obtain accurate and consistent results requires the observation and documentation of dozens of variables, or indicators. As is typical for an LWI, permission for right of access cannot be obtained for all wetlands. As a result, completing the ORWAP assessment via off-site methods increases the level of uncertainty for many variables. Subjectivity increases with the increase in off-site observations, aerial photo interpretation, the need for best professional judgment, or decisions based upon observations of wetland perceived to be similar in character. Nevertheless, an ORWAP assessment was completed for each wetland identified by this inventory.

As required by regulation the LWI must inventory and assess the condition of all wetlands greater than one-half acre in size. Wetlands of less than one-half acre in size (a probable wetland or PW) were not assessed. Where possible individual wetlands of less than one-half acre were grouped with other wetlands. Wetlands were grouped when they were located in the same geomorphic position, were hydrologically connected or shared a hydrologic source, and had similar adjacent land use patterns. Appendix D contains ORWAP data results of the quality assessment conducted on each wetland (or wetland group) of greater than one-half acre in size.

The resultant scores for the functions and values of each wetland can be found in Appendix B. These sheets include not only the scores produces by ORWAP, but also the wetland location, mapped soil type(s), Cowardin and hydrogeomorphic classes, dominant vegetation, and a general description of wetland characteristics and/or unique observations.

8.0 SIGNIFICANT WETLANDS DETERMINATION

8.1 Goal 5 Locally Significant Wetlands Criteria

On September 1, 1996, the Land Conservation and Development Commission adopted a revised Statewide Planning Goal 5. The goal requires local jurisdictions to inventory the natural resources covered under the goal, determine the significance of these resources, and develop plans to achieve the goal. In other words, local jurisdictions must adopt land use ordinances regulating development in and around significant areas.

The committee that created the Goal 5 significance criteria determined that even relatively small wetlands might provide an important (or major) function in their particular landscape position. For example, a small wetland in an urban area may provide habitat for a rare, threatened, or endangered species. However, as stated above, only wetlands greater than one-half acre were assessed with ORWAP.

Local jurisdictions determining significant wetlands must use the criteria adopted by the Oregon Department of State Lands (ORS 197.279(3)(b)) or other approved criteria. For this inventory, the ORWAP scores for the relative effectiveness and value of each function group were analyzed statistically by identifying which wetlands scored above the 75th percentile for both function and value. A percentile is the value of a variable below which a percent of observations fall. For example, the 75th percentile is the value below which 75 percent of the scores were located. To meet the criteria for significance, the score of any wetland's function and value had to score above the 75th percentile. The selection of the 75th percentile as the baseline for significance was the result of previous analyses by DSL that included the comparison of results from both ORWAP, and another wetland assessment method, the Oregon Freshwater Assessment Methodology (OFWAM).

8.2 Applying Significant Wetland Criteria to the LWI Study Area

8.2.1 Goal 5 Significant Wetlands

For the purpose of analyzing wetland functions and values for significance, the scores of "grouped services," as established in ORWAP, were utilized. The score for each group is defined by the maximum score of several component functions or values. The grouped function and its component functions are identified below.

Table 5. Grouped Functions in ORWAP

Grouped Function	Component Functions
Hydrologic Function (WS)	Water Storage & Delay (WS)
Water Quality Support Group (WQ)	Sediment Retention & Stabilization (SR) Phosphorus Retention (PR) Nitrate Removal & Retention (NR) Thermoregulation (T)
Aquatic Habitat Support Group (AQ)	Organic Matter Export (OE) Aquatic Invertebrate Habitat (INV) Amphibian & Reptile Habitat (AM) Waterbird Feeding Habitat (WBF) Waterbird Nesting Habitat (WBN)
Fish Support Group (FISH)	Anadromous Fish Habitat (FA) Non-anadromous Fish Habitat (FR)
Terrestrial Habitat Support Group (TERR)	Songbird, Raptor, & Mammal Habitat (SBM) Pollinator Habitat (POL) Native Plant Diversity (PD)

Though currently considered to be of secondary importance for state and federal permitting in Oregon, the City of Florence requested that *Public Use and Recognition* (PU) and *Provisioning Services* (PS) values also be considered in in the examination of significance.

The Locally Significant Wetlands criteria were applied to all wetlands. Based on the criteria, 21 of the 34 wetlands (62%) were determined to be locally significant. These wetlands met the criteria for significance because they score above the 75th percentile for the relative effectiveness and relative value in one more of the Grouped Functions (as defined in ORWAP). Although many of the wetlands scored high for relative effectiveness for one or more functions, if the relative value of that function did not also rise above the necessary percentile, the criteria for significance was not satisfied. The reverse is also true; wetlands with high relative values but low relative effectiveness are not locally significant. Identified locally significant wetlands are identified in the last column of Table 6.

Appendix E includes the raw scores for the function and value of each Grouped Function, for each wetland. The 75th percentile was calculated for both the function and value scores and can be found below the table of raw scores, along with the mean and median score. Each raw score was then compared to the 75th percentile for that function or value. The second table indicates which functions and values exceeded the 75th percentile for each Grouped Function. Cells marked “true” represent scores that exceeded the 75th percentile, while those marked “false” did not. Table 6 summarizes the results of the true-false tables by indicating with an ‘X’ those Grouped Functions that exceeded the 75th percentile (i.e. were both marked “true’).

Table 6. Grouped Wetland Functions that score above the 75th percentile for both relative effectiveness and relative values

Wetland	WS	WQ	FISH	AQ	TERR	PS	PU	LSW?
1	X	X	X				X	Yes
2								No
3	X						X	Yes
4			X		X			Yes
5			X		X			Yes
6			X		X			Yes
7	X						X	Yes
8								No
9								No
10							X	Yes
11					X			Yes
12				X	X			Yes
13								No
14								No
15			X					Yes
16				X				Yes
17				X				Yes
18								No
19								No
20								No
21	X			X				Yes
22			X			X		Yes
23				X			X	Yes
24				X				Yes
25								No
26								No
27							X	Yes
28								No
29							X	Yes
30								No
31			X					Yes
32			X		X	X	X	Yes
33							X	Yes
34								No
Count	4	1	8	6	6	2	9	21

WS = Hydrologic Function
WQ = Water Quality Group
FISH = Fish Support Group
AQ = Aquatic Support Group
TERR = Terrestrial Support Group
PS = Provisioning Services
PU = Public Use & Recognition
LSW? = Locally Significant Wetland

Though a detailed analysis regarding why particular wetlands were categorized as locally significant is not within the scope of this report, an examination of the raw scores is helpful in determining generally why wetlands might be locally significant for one grouped function and not for another.

At the bottom of Table 6 there is a tally for the number of wetlands that met the criteria for local significance for that function. It can be seen that of the 34 wetlands assessed, that only one wetland met the criteria for Water Quality, two were significant for Provisioning Services, while as many as nine were significant for Public Use and Recognition, and eight for Fish Support. The remaining three groups ranged from four to six wetlands each.

At first these totals seem a bit low, given that Florence has a great deal of wetlands, many that remain dominated by with native vegetation, are located significant distances from development pressures, and provide diverse habitat. However, it is just these conditions that, perhaps counter intuitively, have resulted in wetlands that do not meet the criteria for local significance; that is, they do not typically meet <u>both</u> the function <u>and</u> value criteria. For example, for Water Quality, where only Wetland 1 is locally significant, it can be seen from the raw scores that 22 of the 34 (65%) of assessed wetlands scored 10 for wetland function. By comparison, only 9 of the 34 (26%) scored above the 75^{th} percentile for function. As there was only one wetland where these two conditions overlap, there is only one wetland that met the necessary criteria for significance. With limited development adjoining many wetlands, as well as generally natural and unpolluted water sources, though these wetlands have a great capacity for sediment stabilization, pollutant removal, and thermoregulation, they have limited opportunity to perform these functions.

9.0 Riparian Areas and Corridors

A "riparian area" is defined as the area adjacent to a river, lake, or stream, consisting of the transition from an aquatic ecosystem to a terrestrial ecosystem. A "riparian corridor" is a Goal 5 resource that includes the water areas, fish habitat, adjacent riparian areas, and wetlands within the riparian boundary.

The riparian inventory for the Siuslaw Estuarine Partnership (SEP) project includes several perennial and intermittent streams that flow directly to the Siuslaw River or Pacific Ocean, plus a chain of interconnected lakes lying northeast of Florence.

The Goal 5 Administrative Rules require local governments to inventory and determine *significant* riparian corridors by following either a “safe harbor” process or a “standard” methodology. A plan for protection including trade-offs for conflicting uses is required for those riparian resources judged to be significant.

In the safe harbor approach, only fish-bearing water bodies are inventoried and all are classed as significant with a pre-determined corridor boundary width -- 50 feet from Top of Bank (TOB) for SEP waters.

In the standard method, all water resources are inventoried, riparian widths and characteristics are determined by field evaluation, and riparian quality is determined by a functional assessment scoring system. The local jurisdiction then uses these results to determine which water bodies are classed as significant and subject to protection plans and use trade-offs.

For the SEP project, the City of Florence elected to use the standard method, which is set forth in the Oregon DSL "Urban Riparian Inventory and Assessment Guide" (URIAG). This approach will assure that all riparian resources in the project area are identified, and that their location, extent, quality, and functional benefits are documented and made known to local officials, property owners, and residents. The safe harbor choice remains available as an alternative for any particular water resource.

9.1 Urban Riparian Inventory and Assessment Guide

The URIAG methodology is comprised of a riparian inventory and a riparian assessment.

For the inventory, hydrologic basins are identified and the riparian corridors within each basin are mapped and broken into "reaches" with similar characteristics such as water body (stream vs. lake), vegetation patterns, and/or land use. For each reach, the riparian area was characterized by a combination of field observations at accessible locations, aerial photographs, GIS maps, and the recently available Light Detection and Ranging (LIDAR) topography. Each riparian reach has a right (R) and left (L) side, looking downstream. If the riparian information differs for the left and right sides, two forms may be used.

The riparian inventory requires determination of the riparian width. Width of the riparian area is measured horizontally out from the edge of the water resource, typically either the top of a streambank (TOB) or the high water line of a lake or wetland. Based on stream shading and organic debris, the URIAG sets the width value as the Potential Tree Height (PTH) at maturity for the dominant tree species in the area.

The SEP inventory has used the PTH criteria wherever it provides a reasonable and credible result. However, several of the stream reaches within the urban City limits are favored with stands of Douglas fir, Western hemlock, and/or Sitka spruce; thus the PTH is 120 feet -- which would extend the riparian area well into the established residential structures and facilities. These reaches typically have a topographical break at the top of the riparian slope, which also sets the usual boundary with the adjacent residential or commercial development. For such reaches, the SEP inventory has chosen to recognize "realities on the ground" by defining the riparian width as "TOB to topographical break" -- the horizontal dimension of the slope which runs from the streambank up to where the ground is roughly level or slopes away from the water resource. This slope clearly has the primary potential for positive contributions to water quality and flood management (since land beyond the topographic break will typically drain away from the stream). Further, for water resources in the urban area, this slope also seems to support the heaviest and most consistent vegetation - trees, shrubs and woody debris - which is the primary source of shading for thermal regulation as well as organic material for wildlife habitat.

9.2 Riparian Area Assessment

The riparian area assessment is completed by "scoring" each reach with respect to beneficial riparian functions using URIAG parameters. The inventory field observations answered a series of questions which describe the characteristics of the riparian area. Those answers are weighted and summed to quantify riparian potential regarding water quality, flood management, thermal regulation, and wildlife habitat. The scored results for the reach indicate whether the potential for each function is High, Medium, or Low. The ratings provide a basis for local authorities to identify significant riparian resources, and to establish appropriate protection policies and land use trade-offs.

The SEP riparian assessment did depart from the URIAG in how it credits the shading function of riparian vegetation. The URIAG suggests that full shading credit can only be earned if the stream runs in a generally East-West direction. When the streamside vegetation is tall and dense, we have observed and therefore have assigned full shading credit regardless of the stream orientation.

9.3 Riparian Results

For the SEP project, riparian field assessments were conducted at 48 locations on the drainages and lakes in the project area. At many locations, separate information was recorded for the left and right sides of the water resource. Each assessment location was assigned a code based on drainage basin and a number (e.g. RMC-1). A data sheet was completed during the visit at each location which documents the existing channel, topography, and vegetation conditions and estimates riparian measurements. In a few cases, the assessments were based on aerial photographs and LIDAR data due to the lack of project access. Samples of the field data sheets are included as Figures X and X.

Based on these field observations, the streams and lakes in the SEP project area were divided into reaches with roughly uniform riparian qualities. Location of the reaches and the riparian areas are illustrated in the maps of Figures X through X. A total of 11 stream reaches and 5 lake reaches were identified, with codes based on drainage basin and a letter (e.g. RMC-A). The riparian characteristics for each reach were set as a composite of the assessment site information. Samples of the reach summary sheets are included as Figures X and X. These reach characteristics were scored as noted above to determine High, Medium, or Low functional quality of the reach.

Five tree species were determined to be the dominant native trees within riparian areas of the project. The most common tree species in the riparian areas included Douglas fir, Sitka spruce, western hemlock, shore pine, and red alder. Potential tree heights at maturity (PTH) for each are included in Table 7.

Table 7: Potential tree heights (PTH) of dominant species in the Florence area

Common Name	Botanical Name	Potential Tree Height/ Riparian Corridor Widths (feet)
Sitka spruce	*Picea sitchensis*	120
Shore pine	*Pinus contorta contorta*	50
Douglas fir	*Pseudotsuga menziesii*	120
Western Hemlock	*Tsuga heteropylla*	120
Red alder	*Alnus rubra*	65

9.4 Riparian Acreage and Distribution

Table 8 summarizes the riparian area widths and resulting acreage for each reach in the SEP project area. The criteria which were applied to determine riparian width are also indicated in each case.

Table 8: Acreage of Riparian Areas by Reach and Basin

Riparian Basin	Reach Code	Width L/R	Criteria	Acreage	Basin Total
Munsel Creek	RMC-A	30/40	Topography	0.9	146.8
	RMC-B	50/50	Topography	19.6	
	RMC-C	/40	Topography	2.8	
	RMC-D	40/40	Topography	15.4	
	RMC-D1	50/50	Topo/PTH	5.5	
	RMC-E	120/15	PTH	93.6	
	RMC-F	50/120	Topo/PTH	9.0	
North Fork Siuslaw	RNS-A	40/40	Topography	1.8	1.8
Airport	RAIR-A	20/20	Topography	8.0	18.6
	RAIR-B	65/65	PTH	9.0	
	RAIR-C	30/30	Topography	1.6	
Heceta Beach	RHB-A	20/20	Topography	0.6	2.6
	RHB-B	50/50	PTH	2.0	
Rhododendron	RRH-A	50/50	PTH	5.8	5.8
Riparian Acreage Total				**175.6**	

9.5 Riparian Assessment Results

Table 9 summarizes the riparian assessment results for each reach in the SEP project area.

Table 9: Summary of Riparian Functional Assessments

Riparian Reach	Water Quality	Flood Management	Thermal Regulation	Wildlife Habitat
RMC-A	H	H	M	H
RMC-B	H	M	H	H
RMC-C	H	H	H	H
RMC-D	H	M	H	H
RMC-D1	H	M	M	M
RMC-E Left	H	M	M	H
RMC-E Right	M	M	L	M
RMC-F Left	H	M	M	M
RMC-F Right	H	M	M	H
RAIR-A	M	M	L	L
RAIR-B	H	M	H	H
RAIR-C	M	M	M	M
RHB-A	H	M	H	M
RHB-B	H	H	H	H
RNS-A	M	M	H	M
RRH-A	M	M	H	M

H = High M = Medium L = Low

The quality of the SEP project riparian corridors using URIAG scoring indicate that most of the inventoried riparian reaches (70%) rate HIGH for water quality functioning, because they filter the runoff from nearby land. In the flood management category, 80% of the riparian areas rated MEDIUM; only the two with associated wetlands rated HIGH. For the important thermal regulation function, 50% rated HIGH while 12% rated LOW due to lack of effective vegetation coverage. Valuable wildlife habitat is characterized by multi-layered vegetation near the streams; for this function 50% of the SEP reaches rated HIGH and 45% rated MEDIUM.

In general, Munsel Creek and the undeveloped lakeshores were judged to have excellent riparian functional value. In addition, RAIR-B and the Heceta Beach (RHB) reaches also had superior ratings.

10.0 STAFF QUALIFICATIONS

John van Staveren:	President; Senior Scientist; Professional Wetland Scientist
Project Role:	Project Manager
Project Responsibility:	Contract negotiations, monthly billing Public presentations Quality control Regulatory agency coordination

As President, Mr. van Staveren directs Pacific Habitat Services' environmental projects throughout the Pacific Northwest. He has conducted over 1,000 wetland delineations, 30 Local Wetland Inventories and riparian inventories, designed and implemented dozens of freshwater and estuarine wetland mitigation plans, provided expert witness testimony, and testified at numerous public hearings. John served on three state-appointed Technical Advisory Committees concerning wetland policy in the State of Oregon. He is principal author of the *Urban Riparian Inventory and Assessment Guide* prepared for the Oregon Department of State Lands and *Freshwater Wetland Restoration,* a chapter in *The Art and Science of Ecological Restoration in Cascadia. The Science and Practice of Ecological Restoration (Island Press, 2006).*

Shawn Eisner

Project Role:	Wetland Scientist
Project Responsibility:	Wetland inventory field work and assessment Report writing Quality control and editing Data input

Shawn provides specialized support pertaining to wetland delineations, determinations, and monitoring; stream and natural resource assessments and environmental permit processing. He conducts field work and data collection for Local Wetland Inventories and is involved in data analysis and report preparation. He has played an integral role in the Arch Cape, North Bethany Planning Area, Bull Mountain Planning Area, Molalla, Bandon, North Plains, Corvallis, Depoe Bay, and Eugene LWIs.

Amy Hawkins

Project Role: Wetland Scientist
Project Responsibility: Wetland inventory field work and assessment

Amy is certified as a Professional Wetland Scientist and is certified by the Oregon Department of Transportation to prepare endangered species effects assessments. Amy has delineated numerous wetlands and prepared wetland mitigation plans. She conducts field work and data collection for Local Wetland Inventories as well as completion of functional assessments.

Caroline Rim

Project Role: Wetland Scientist
Project Responsibility: Wetland inventory field work

Caroline has over 14 years of experience as an environmental consultant. She conducts wetland delineations and wildlife habitat assessments, designs and monitors wetland mitigation areas, and assists environmental permit processing. She has worked on several local wetland inventories. She conducts field work and data collection.

Jane Le Blanc

Project Role: Technical Editor
Project Responsibility: Graphics
Report editing, formatting and layout
Data input

Jane is a technical editor and provides permitting support for PHS. Her duties include formatting and editing wetland reports, proposals, and letters as well as data input.

Kelli Weese

Project Role: GIS analyst and Cartographer
Project Responsibility: Mapping
GIS database preparation

Kelli's experience is in Geographic Information Systems (GIS) analysis and ???. Her specialties include Geodatabase development and management, and data presentation. Her roles in this project include the creation of field maps, GIS data from field collected and attribute data, and mapping of results.

Solye Brown

Project Role: GIS Cartographer
Project Responsibility: Mapping
GIS database management

Solye's experience is in AutoCad and Geographic Information Systems (GIS) mapping. Her specialties include Geodatabase development and management, and data preparation. Her roles in this project include the database management and preparation of final maps.

Clarence Lysdale

Project Role:	Riparian Inventory
Project Responsibility:	Riparian inventory field work and assessment

Clarence is a member of the Florence Planning Commission and a registered professional engineer. His roles in this project included riparian fieldwork; development of the assessment protocol; oversight of riparian map preparation; and riparian report preparation.

11.0 REFERENCES

Adamus, P., J. Morlan, and K. Verble. 2010. Oregon Rapid Wetland Assessment Protocol (ORWAP): calculator spreadsheet, databases, and data forms. Oregon Dept. of State Lands, Salem, OR.

Brinson, Mark. 1993. *A Hydrogeomorphic Classification for Wetlands*. Technical Report WRP-DE-4. Wetlands Research Program. U.S. Army Corps of Engineers. Washington D.C.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Fish and Wildlife Service, Office of Biological Services, FWS/OBS-79/31. 103 pp.

Environmental Laboratory. *Corps of Engineers Wetlands Delineation Manual (Technical Report Y-87-1)*. (U.S. Army Corps of Engineers, 1987).

Federal Register. 1982, *Title 33: Navigation and Navigable Waters, Chapter II*, *Regulatory Programs of the Corps of Engineers*, Vol. 47, No. 138, p31810, US Government Printing Office, Washington, D.C.

Land Conservation and Development Commission, 1996. *Statewide Planning Goal 5. Amended Administrative Rules OAR 660, DSL 23*.

Oregon Department of Environmental Quality, 2006. *2004/2006 Section 303(d) list* Oregon's 2004/2006 Integrated Report Database. http://www.deq.state.or.us/WQ/assessment/rpt0406/search.asp

Reed, Porter B., Jr. 1988 (May). *National List of Plant Species that Occur in Wetlands: Northwest (Region 9)*. Prepared by the U.S. Fish and Wildlife Service, St. Petersburg, FL. NERC-88/18.37.

Roth E.M., R.D. Olsen, P.L. Snow, and R.R. Sumner. 1996. *Oregon Freshwater Wetland Assessment Methodology*. Ed. by S.G. McCannell. DSL. Salem, OR.

U.S. Army Corps of Engineers. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys and Coast Region (Version 2.0). May 2010.*

U.S.D.A., Soil Conservation Service, 1987. *Soil Survey of Lane County Area, Oregon*.

U.S. Environmental Protection Agency, 2001. *Functions and Values of Wetlands.* EPA 843-F-01-002c September 2001.

Appendix A

Figures and Sheets

Appendix B

Wetland Summary Sheets

Appendix C

Wetland Determination Data Forms

Appendix D

ORWAP Data

-Office Forms
-Field Form F
- Field Form S

Appendix E

ORWAP Group Function Scores and Significance Calculations

Appendix F

Riparian Field Forms and Summary Tables