Rockaway Beach Riparian Inventory and Extension of Local Wetland Inventory to Urban Growth Boundary

Final Report
Prepared for the City of Rockaway Beach
November 1999

Prepared by:

Green Point Consulting

Laura Brophy
Green Point Consulting
Corvallis, Oregon
(541) 752-7671
http://www.peak.org/~brophyl

and

Loverna Wilson, Environmental Consultant
Corvallis, Oregon
(541) 758-3403

City of Rockaway Beach, Oregon
Riparian Inventory and Extension of Local Wetland Inventory to Urban Growth Boundary: November 1999
KEY TO MAP SYMBOLS

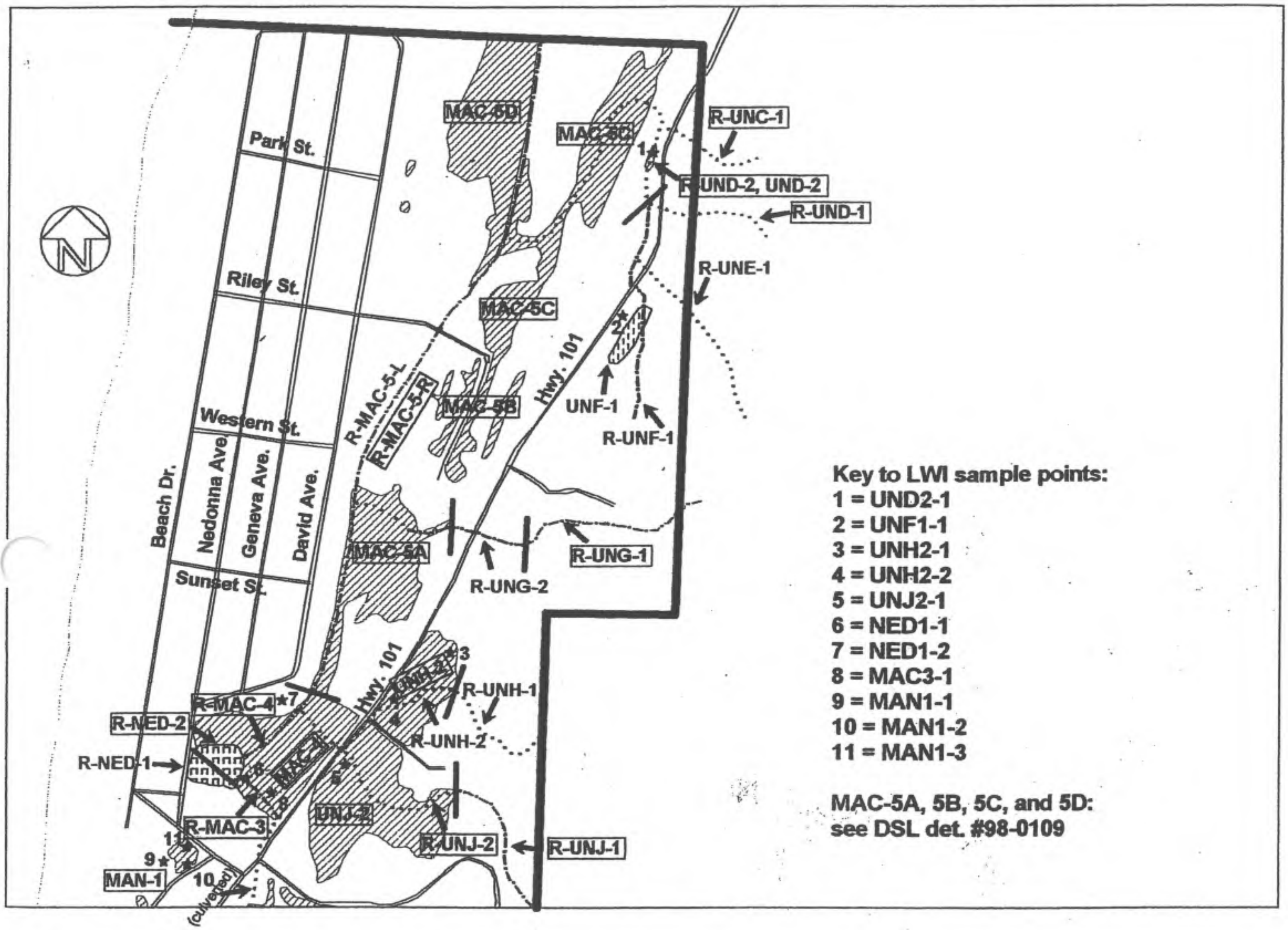
R-ROC7 ⁀	riparian resource (stream): SIGNIFICANT
R-ROC7 ┈	riparian resource (stream): SIGNIFICANT (location approximate)
R-ROC7 ⁀	riparian resource (stream): nonsignifcant
R-ROC7 ┈	riparian resource (stream): nonsignificant (location approximate)
R-ROC7	riparian reach code: SIGNIFICANT
R-ROC7	riparian reach code: nonsignificant
ROC7	LWI wetland code: SIGNIFICANT
ROC7	LWI wetland code: nonsignificant
✕	dividing line between riparian reaches
▦	riparian resource (pond or lake): SIGNIFICANT
▤	riparian resource (pond or lake): nonsignificant

━	Study area boundary (UGB)
★ 12	LWI sample location
┊	ocean shore
═	improved road
─	unimproved road or track
▨	Wetland: SIGNIFICANT
▒	Wetland: nonsignificant

Green Point Consulting

Laura Brophy, Green Point Consulting (541) 752-7671 Loverna Wilson, Environmental Consultant (541) 758-3403
http://www.peak.org/~brophyl

City of Rockaway Beach, Oregon
Riparian Inventory and Extension of Local Wetland Inventory to Urban Growth Boundary: November 1999
MAP 1: NEDONNA BEACH AREA



Key to LWI sample points:
1 = UND2-1
2 = UNF1-1
3 = UNH2-1
4 = UNH2-2
5 = UNJ2-1
6 = NED1-1
7 = NED1-2
8 = MAC3-1
9 = MAN1-1
10 = MAN1-2
11 = MAN1-3

MAC-5A, 5B, 5C, and 5D:
see DSL det. #98-0109

Green Point Consulting

Green Point Consulting

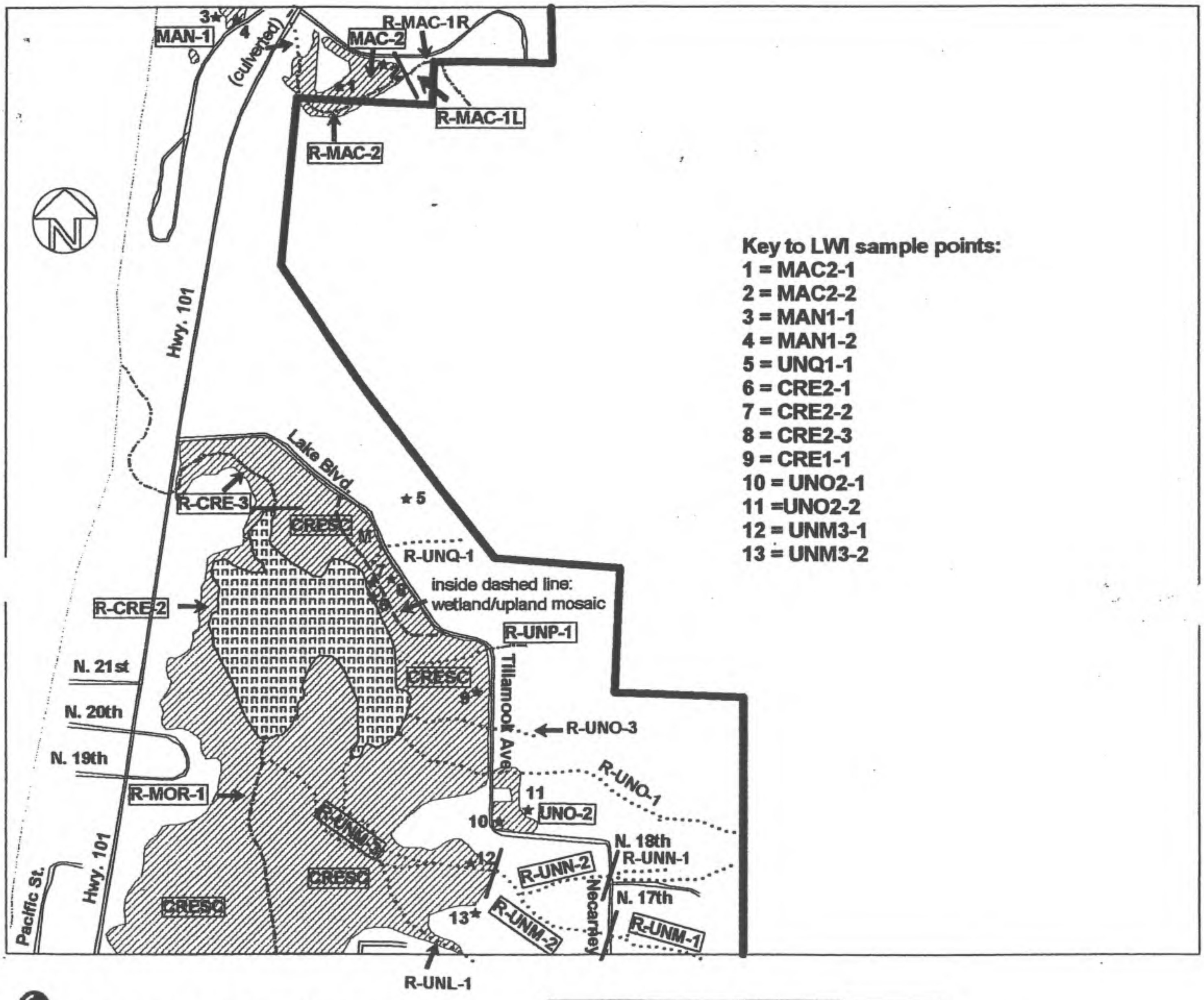
0' 1000' 2000'

Laura Brophy, Green Point Consulting (541) 752-7671 Loverna Wilson, Environmental Consultant (541) 758-3403
http://www.peak.org/~brophyl

Information on this map is for planning purposes only; all resource locations are approximate. There may be upland areas within mapped wetlands; there may also be unmapped wetlands and riparian areas subject to regulation. In all cases, regulators will use actual field conditions, not this map, to determine jurisdictional wetland boundaries and locations of riparian areas. Before planning development for a property, an onsite wetland determination or delineation must be conducted to determine presence or absence and/or boundaries of jurisdictional wetlands, and field work must be conducted to locate riparian areas.

Funding and assistance provided by the Oregon Department of Land Conservation and Development / Healthy Streams Partnership. Base map provided by the Tillamook Bay National Estuary Program and prepared by Earth Design Consultants, Inc.

City of Rockaway Beach, Oregon
Riparian Inventory and Extension of Local Wetland Inventory to Urban Growth Boundary: November 1999
MAP 2: CRESCENT LAKE AREA



Green Point Consulting

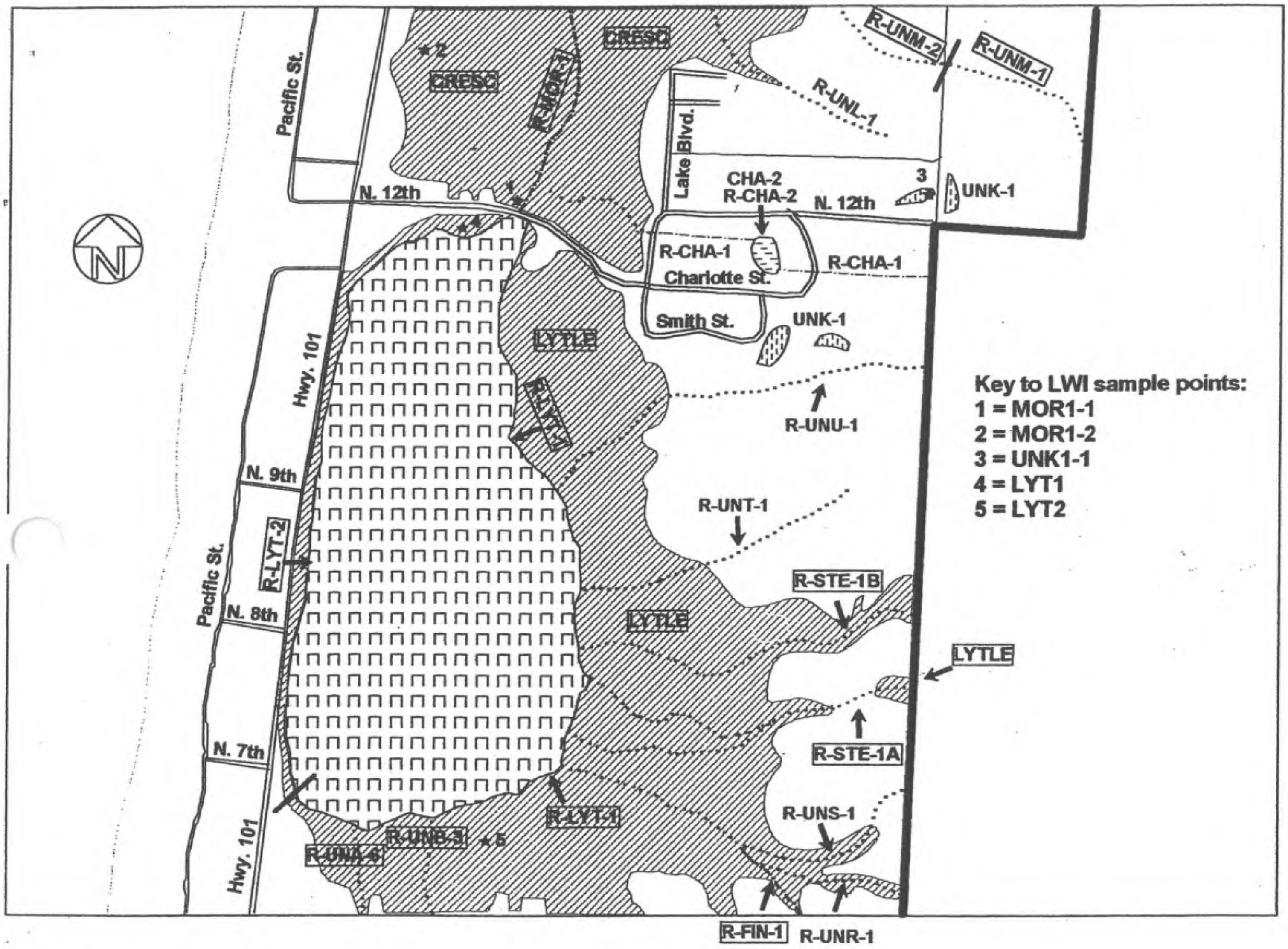
0' 1000' 2000'

Laura Brophy, Green Point Consulting (541) 752-7671 Loverna Wilson, Environmental Consultant (541) 758-3403
http://www.peak.org/~brophyl

Information on this map is for planning purposes only; all resource locations are approximate. There may be upland areas within mapped wetlands; there may also be unmapped wetlands and riparian areas subject to regulation. In all cases, regulators will use actual field conditions, not this map, to determine jurisdictional wetland boundaries and locations of riparian areas. Before planning development for a property, an onsite wetland determination or delineation must be conducted to determine presence or absence and/or boundaries of jurisdictional wetlands, and field work must be conducted to locate riparian areas.

Funding and assistance provided by the Oregon Department of Land Conservation and Development / Healthy Streams Partnership. Base map provided by the Tillamook Bay National Estuary Program and prepared by Earth Design Consultants, Inc.

City of Rockaway Beach, Oregon
parian Inventory and Extension of Local Wetland Inventory to Urban Growth Boundary: November 1999
MAP 3: LAKE LYTLE AREA



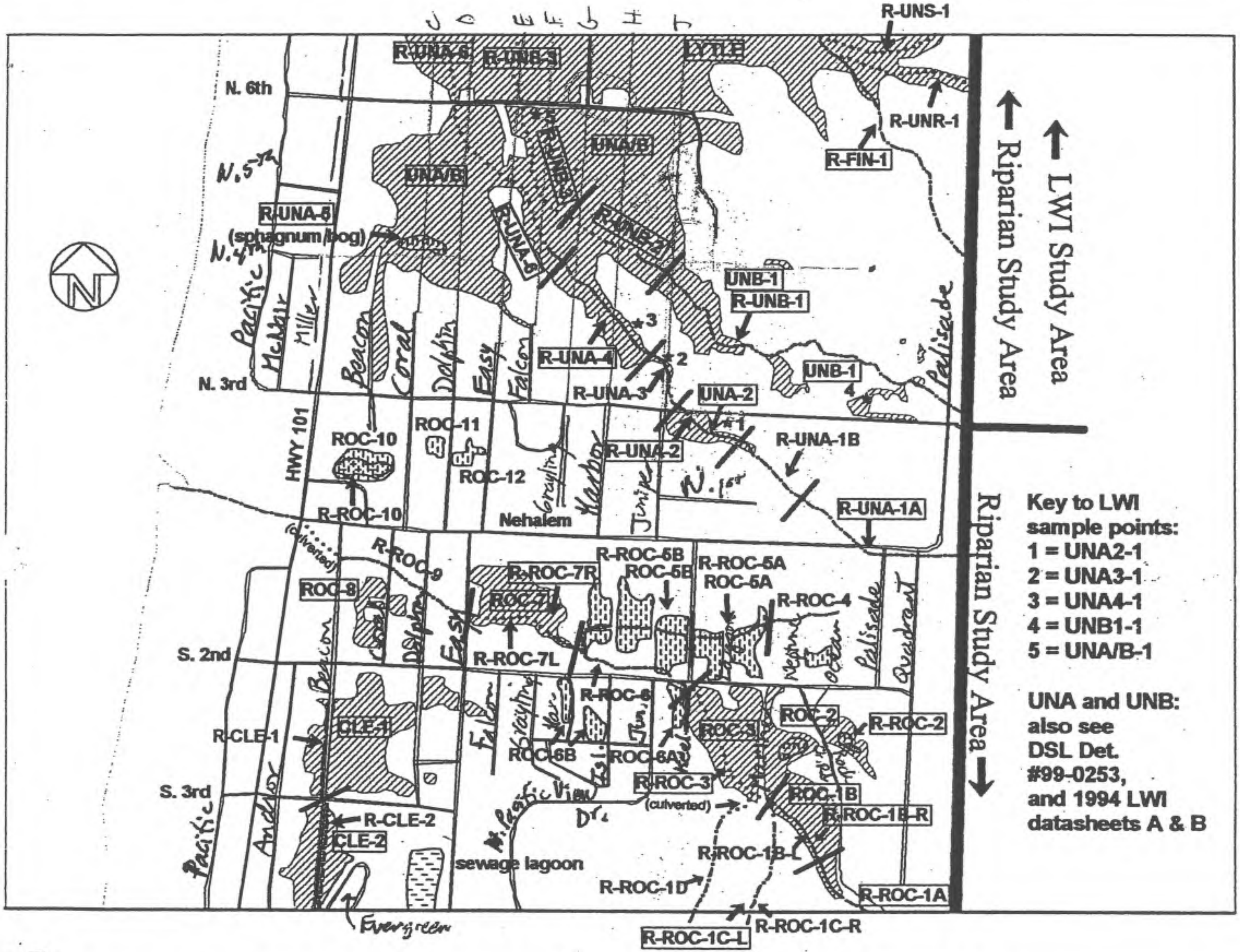
Green Point Consulting

Laura Brophy, Green Point Consulting (541) 752-7671 Loverna Wilson, Environmental Consultant (541) 758-3403
http://www.peak.org/~brophyl

Information on this map is for planning purposes only; all resource locations are approximate. There may be upland areas within mapped wetlands; there may also be unmapped wetlands and riparian areas subject to regulation. In all cases, regulators will use actual field conditions, not this map, to determine jurisdictional wetland boundaries and locations of riparian areas. fore planning development for a property, an onsite wetland determination or delineation must be conducted to determine sence or absence and/or boundaries of jurisdictional wetlands, and field work must be conducted to locate riparian areas.

Funding and assistance provided by the Oregon Department of Land Conservation and Development / Healthy Streams Partnership. Base map provided by the Tillamook Bay National Estuary Program and prepared by Earth Design Consultants, Inc.

City of Rockaway Beach, Oregon
Riparian Inventory and Extension of Local Wetland Inventory to Urban Growth Boundary: November 1999
MAP 4: ROCK CREEK AND S. LAKE LYTLE WETLANDS



Green Point Consulting

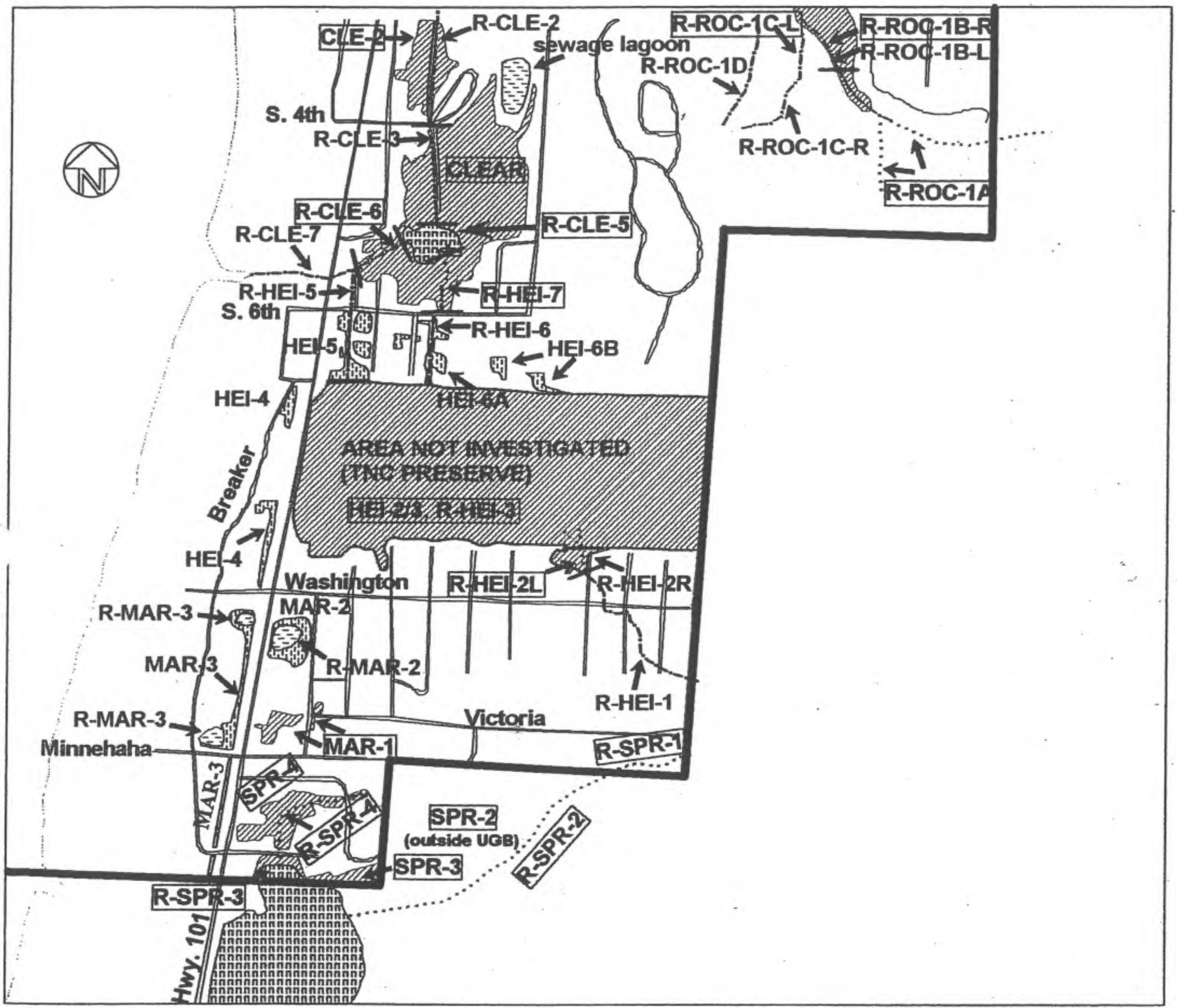
0' 1000' 2000'

Laura Brophy, Green Point Consulting (541) 752-7671 Loverna Wilson, Environmental Consultant (541) 758-3403
http://www.peak.org/~brophyl

Information on this map is for planning purposes only; all resource locations are approximate. There may be upland areas within mapped wetlands; there may also be unmapped wetlands and riparian areas subject to regulation. In all cases, regulators will use actual field conditions, not this map, to determine jurisdictional wetland boundaries and locations of riparian areas. Before planning development for a property, an onsite wetland determination or delineation must be conducted to determine presence or absence and/or boundaries of jurisdictional wetlands, and field work must be conducted to locate riparian areas.

Funding and assistance provided by the Oregon Department of Land Conservation and Development / Healthy Streams Partnership. Base map provided by the Tillamook Bay National Estuary Program and prepared by Earth Design Consultants, Inc.

City of Rockaway Beach, Oregon
Riparian Inventory and Extension of Local Wetland Inventory to Urban Growth Boundary: November 1999
MAP 5: SPRING LAKE TO CLEAR LAKE



Green Point Consulting

0' 1000' 2000'

Laura Brophy, Green Point Consulting (541) 752-7671 Loverna Wilson, Environmental Consultant (541) 758-3403
http://www.peak.org/~brophyl

Information on this map is for planning purposes only; all resource locations are approximate. There may be upland areas within mapped wetlands; there may also be unmapped wetlands and riparian areas subject to regulation. In all cases, regulators will use actual field conditions, not this map, to determine jurisdictional wetland boundaries and locations of riparian areas. Before planning development for a property, onsite wetland determination or delineation must be conducted to determine presence or absence and/or boundaries of jurisdictional wetlands, and presence or absence of regulated riparian areas must be verified.

Funding and assistance provided by the Oregon Department of Land Conservation and Development / Healthy Streams Partnership. Base map provided by Tillamook Bay National Estuary Program and prepared by Earth Design Consulting, Inc.

Rockaway Beach Riparian Inventory and Extension of Local Wetland Inventory to Urban Growth Boundary

Final Report
Prepared for the City of Rockaway Beach
November 1999

Prepared by:

Green Point Consulting

Laura Brophy
Green Point Consulting
Corvallis, Oregon
(541) 752-7671
http://www.peak.org/~brophyl

and

Loverna Wilson, Environmental Consultant
Corvallis, Oregon
(541) 758-3403

City of Rockaway Beach, Oregon
Riparian Inventory and Extension of Local Wetland Inventory to Urban Growth Boundary: November 1999
KEY TO MAP SYMBOLS

R-ROC7 ───	riparian resource (stream): SIGNIFICANT
R-ROC7 ┈┈┈	riparian resource (stream): SIGNIFICANT (location approximate)
R-ROC7 ───	riparian resource (stream): nonsignifcant
R-ROC7 ┈┈┈	riparian resource (stream): nonsignificant (location approximate)
R-ROC7	riparian reach code: SIGNIFICANT
R-ROC7	riparian reach code: nonsignificant
ROC7	LWI wetland code: SIGNIFICANT
ROC7	LWI wetland code: nonsignificant
✕	dividing line between riparian reaches
▦	riparian resource (pond or lake): SIGNIFICANT
▤	riparian resource (pond or lake): nonsignificant

━━━	Study area boundary (UGB)
★ **12**	LWI sample location
┆	ocean shore
═══	improved road
───	unimproved road or track
▨	Wetland: SIGNIFICANT
▥	Wetland: nonsignificant

Green Point Consulting

Laura Brophy, Green Point Consulting (541) 752-7671 Lovema Wilson, Environmental Consultant (541) 758-3403
http://www.peak.org/~brophyl

Table of Contents

Local Wetland Inventory

Introduction to the Wetland Inventory and Functional Assessment process

Wetlands are valuable resources, providing water quality enhancement, flood management, wildlife habitat, and recreational opportunities. Planners and citizens have learned that they need an overview of wetland types and locations within their entire community in order to protect and use these valuable wetland resources. Local Wetland Inventories are designed to gather this information. To set priorities in protecting wetlands, and to meet statewide planning goals, functional assessment is conducted for the inventoried wetlands.

A Local Wetland Inventory (LWI) is a systematic survey of a fairly large geographic area, intended to locate and map wetlands over 0.5A and classify them by type. The purpose of an LWI is to provide community-wide information on wetlands to aid in city planning and development. By mapping wetlands within an entire community, rather than waiting for landowners to conduct delineations on individual parcels in a piecemeal fashion, the community gains a valuable overview of the wetland situation in their area. With this overview, planners and citizens can then prioritize wetlands for protection, arrange for delineations in areas where development may occur, and streamline the removal/fill permitting process to help landowners avoid regulatory violations during development.

An LWI provides useful information, but it does not substitute for site-by-site wetland delineations. The wetland boundaries drawn during an LWI are approximate, and may be based on offsite methods where access is prohibited or logistically difficult. Although the intent is to map all wetlands over 0.5A, the methods used in an LWI are by nature less accurate than the more intensive methods used for jurisdictional wetland delineations. Therefore, the LWI wetland maps may not include all wetlands within the study area, and there may be upland areas within the mapped wetlands. When development may occur in or near an area with wetlands or probable wetlands, an onsite wetland delineation must be conducted at the development site to establish accurate boundaries for wetlands.

Wetlands serve many functions that are valuable to people and wildlife. To determine how well wetlands are performing those functions, functional assessment is conducted for inventoried wetlands using the Oregon Functional Assessment Methodology (OFWAM). The results of OFWAM are combined with other factors to determine which of the inventoried wetlands are Locally Significant Wetlands (LSW's). Under Statewide Planning Goals 5 and 17, these LSW's are protected through local ordinances.

This report provides information required by the Oregon Division of State Lands' Local Wetland Inventory Standards and Guidelines, as well as additional information intended to make the report easier to use. Included in this report are:

1. An executive summary of the wetland inventory and assessment process and results;
2. Descriptions of information sources, mapping methods, wetland inventory procedures, and functional assessment procedures used in the study;
3. A study area summary describing characteristics of the inventoried wetlands;
4. Technical staff qualifications;
5. References cited;
6. Wetland summary sheets (Appendix 1, "Wetland Summary Sheets");
7. Tables of wetland resources (Table A1, "Wetland Codes and Descriptions"; Table A2, "Results of Wetland Functional Assessment [OFWAM]"; Table A3, "Wetland Significance Determination", Table A4, "LSW Criteria Checklist", and Table A5, "Correspondence of Wetland Codes and Riparian Reach Codes"; all in Appendix 2);
8. Maps of wetlands identified during the inventory (Appendix 3, "Maps") with color and pattern coding to distinguish significant from nonsignificant wetlands.

Executive summary: Local Wetland Inventory

This LWI used onsite and offsite methods outlined in the Oregon Division of State Lands Local Wetlands Inventory Standards and Guidelines. Wetlands within the study area were located using the methods of the 1987 Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory, 1987), and were defined using characteristics described below in "Wetland Criteria." Before field work was begun, aerial photographs, National Wetland Inventory maps, soil surveys, and other data were used to create a preliminary wetlands map. Field work to ground-truth the preliminary map, establish wetland boundaries, and locate additional wetlands was conducted during April 1999. Offsite methods were used where access was not granted or where access was logistically difficult. Wetland boundaries were refined using 1997 true color aerial photos and stereo pairs where necessary. Wetland boundaries were drawn on aerial photos enlarged to a scale of 1" = 472'; the boundaries were then digitized, and a computer-aided design (CAD) program was used to overlay the boundaries on a series of digital base maps at a scale of 1" = 800'. The resulting composite maps are provided in Appendix 3 of this report.

A previous LWI had identified wetlands in the more developed portions of Rockaway Beach (Wilson et al, 1994). The current LWI study area extended the coverage to the Urban Growth Boundary (UGB) for the area north of North Third Street. It also included wetlands between Nehalem and North Third and between Juniper Street and the UGB (tax map 2N 10 32DB, or Map 15 on the City Index Map). The current LWI study area covered approximately 937 acres, of which 276 acres was wetland.

Most of the wetlands in the current study area are relatively undisturbed compared to those found in the earlier LWI. A large (204A), interconnected wetland complex is found around the south and east sides of Lake Lytle, on both sides of Moroney Canal, and around Crescent Lake. This wetland complex includes a great deal of very high quality wildlife habitat, and also includes a large example of a statewide rare plant community, the coastal sphagnum bog (Christy, 1993). (A second example of this rare plant community is found north of the City Park at Dolphin.) The size, connectivity and quality of Rockaway's forested wetlands makes them unusual for the Oregon Coast. Protection is recommended for these large, contiguous wetland areas.

Smaller (but often still significant) wetlands are found in low-lying areas along the study area's watercourses, particularly on the east side of Highway 101 north of Neah-Kah-Nie High School, and near the railroad and Highway 101 on the east side of the Nedonna Beach development. Very few isolated wetlands (not connected to surface water bodies) were found in the study area. Those isolated wetlands that were found are located in depressions that receive water from direct precipitation and surface flow.

Maps provided in this report show wetlands identified in the current inventory, and also show wetlands identified in the earlier LWI (Wilson et al, 1994). **Wetland mapping for the area south of North Third does NOT supersede mapping provided to the City on assessor's maps in the earlier LWI report** (Wilson et al, 1994). Some wetlands in the current LWI study area had previously been delineated by Laura Brophy and Loverna Wilson. Results of those delineations were included in this LWI; these results provide a level of detail not usually found in an LWI.

The lakes in the study area are permanently flooded lacustrine (lake) wetlands. Most of the other wetlands found are seasonally flooded palustrine wetlands. Vegetation types include emergent wetlands (consisting of grasses, sedges, and other herbaceous plants), scrub-shrub wetlands (generally dominated by willow), and forested wetlands, generally alder / Sitka spruce woodlands with skunk cabbage / slough sedge understory.

The area between North Third and Lake Lytle was undeveloped at the time of the previous LWI. At that time, the City asked for only approximate wetland boundaries for that area. For this study, more detailed information was needed because the area has become the focus of considerable development activity. Fortunately, Laura Brophy and Loverna Wilson have conducted a number of wetland delineations in this area during the past 5 years. The detailed wetland boundaries resulting from those delineations are included in this LWI.

This study also included functional assessment of all wetlands within the Rockaway Beach Urban Growth Boundary, including both the wetlands inventoried in the previous LWI and those inventoried during this LWI. Functional assessment used the Oregon Freshwater Assessment Methodology (OFWAM). The results of the wetland functional assessment are found in Tables A2 and A3 (Appendix 2) of this report.

Results of functional assessment of wetlands, along with information on rare plant communities, known mitigation sites, and existing zoning from the Rockaway Beach Comprehensive Plan, were used to determine which wetlands qualified as "Locally Significant Wetlands" for Goal 5 and Goal 17 purposes.

State regulatory criteria for determining significance of natural wetlands have no lower size limit. Therefore, some isolated wetlands met significance criteria, but were small in size (less than 0.5 acres). In applying the Goal 5 and Goal 17 ordinances, we recommend that the City consider the relative resource values and economic values of these small, isolated wetlands as a group (see **Criteria for Locally Significant Wetlands** below). Compared to the many large, contiguous wetland areas within the UGB, the small, isolated wetlands are less biologically significant.

Information sources

Background information for this study's wetland inventory, wetland functional assessment, riparian inventory and riparian assessment was gathered from the following sources:

Maps

- maps from the previous Rockaway Beach Local Wetland Inventory (Wilson et al, 1994)
- FEMA floodplain maps for entire study area
- USGS 7.5 minute topographic quadrangles: Garibaldi, Nehalem
- Oregon Department of Forestry fish use maps
- Natural Resource Conservation Service (NRCS) 1999 draft soil survey maps for Garibaldi and Nehalem quadrangles
- Rockaway Beach Comprehensive Plan and Zoning Map, revised January 1993
- Wetland Delineation maps and reports: Cedar Creek Subdivision (Brophy, 1999), Beachwood Estates (Brophy, 1996), Timberlake Subdivision (Wilson and Brophy, 1996), Nedonna Beach Subdivision (Brophy and Wilson, 1998), North Fourth Avenue Sanitary Sewer (Wilson and Brophy, 1996).
- Tillamook Bay National Estuary Project Geographic Information System (GIS) base map (roads and ocean shore)
- National Wetland Inventory maps: Garibaldi and Nehalem quadrangles
- Tax assessor's maps for Rockaway Beach
- ODOT street map for Rockaway Beach
- Essential Salmon Habitat maps from the Oregon Division of State Lands, 1999, available at http://statelands.dsl.state.or.us/counties.htm

Aerial photographs

- WAC (Western Air Corporation) 1997 "Co-op 97" flight, stereo pairs of contact prints at a scale of 1" = 1000'. Stereo pairs were used to help refine resource maps.

- Enlargements of above-mentioned WAC photos at a scale of 1" = 472'. Preliminary maps of resources were prepared by drawing directly on laminated copies of these enlargements.

Publications

- For publications consulted during this study, please see **Literature cited** below.

Personal contacts

- Joe Hutton, Oregon Department of Forestry
- Chris Knutsen, Oregon Department of Fish and Wildlife
- David Nusum, Oregon Department of Fish and Wildlife
- Keith Braun, Oregon Department of Fish and Wildlife
- John VanStaveren, Pacific Habitat Services
- Janet Morlan, Wetlands Program Leader, Oregon Division of State Lands
- Jeff Weber, Oregon Department of Land Conservation and Development
- Dale Jordan, Oregon Department of Land Conservation and Development
- Tony Stein, Oregon Department of Fish and Wildlife
- Mary Holbert, Oregon Department of Fish and Wildlife
- Chris Jasper, Natural Resource Conservation Service

Wetland inventory methods

LWI field methods

In February 1999, the City of Rockaway Beach sent a letter to property owners within the study area requesting property access for onsite sampling for this study. We received permission to do onsite sampling from over 80 property owners, which was a great help in conducting an accurate, efficient inventory.

Field studies followed the DSL Local Wetlands Inventory Standards and Guidelines (DSL 1999; ORS 141-86-180 through 145-86-230). Wetland determinations were conducted using the methods of the 1987 Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory, 1987). As described in the manual, the interaction of hydrology, vegetation, and soil results in the development of characteristics unique to wetlands. If a soil profile is saturated or flooded with water for a sufficient period of time, it becomes anaerobic (lacking oxygen). Lack of oxygen within the soil during the growing season changes the characteristics of both soil and vegetation. By examining the soil, vegetation and hydrology of an area, we can determine if a site is saturated long enough during the growing season to be classified as a wetland.

Following LWI guidelines, we mapped all wetlands larger than 0.5 acre. In cases where we had earlier conducted wetland delineations on sites within the study area, we mapped areas considerably smaller than that size.

We conducted field studies during April 1999. The early timing of field studies allowed more efficient work in the heavily forested portions of the study area. At this date, understory shrubs like salmonberry (*Rubus spectabilis*) were not yet leafed out completely, making it possible to see some distance into the woods. This allows more efficient navigation and determination of wetland boundaries.

We used enlarged (1" = 472'), laminated color airphotos as base maps for marking wetland boundaries in the field. We mapped wetlands directly onto the laminated photos. Using the enlarged air photos as base maps for field work gave us an accurate way to correlate landmarks and air photo signatures. With the air photos we could quickly locate likely wetland areas, vantage points for offsite observations, and access routes to the properties where we could conduct onsite sampling. We also found that working directly on the air photos helped us follow drainages and visualize watershed boundaries quickly and accurately in the field, an important factor in a study area where wetlands are generally associated with drainages. We used the assessor's maps in the field to locate accessible properties relative to the air photo landmarks. We also analyzed stereo pairs of the same photos, using a stereoscope in the field and in the office to visualize topography, drainages and vegetation types.

Field data was recorded on data sheets specially prepared for this study. Each wetlands was assigned a unique code (see Table A1 in Appendix 2 for wetland codes and locations). A separate, uniquely numbered data sheet was used for each sample point. Data sheets are numbered with the wetland code and the sample point number. For example, UNM3-1 and UNM3-2 are two sample points within the wetland called UNM3 (see **Map preparation** below for details on wetland codes). Names of plant species and wetland types were abbreviated using standard codes. Since we had conducted onsite wetland delineations for portions of the study area, we also used field data collected during those delineations (see next paragraph). All new LWI sample locations are marked on the maps (Appendix 3).

Team members for this study (Laura Brophy and Loverna Wilson) have conducted many wetland delineations within the current LWI study area. Field data and surveyed wetland boundaries from those delineations were used to supplement the ordinary LWI procedures, providing highly accurate results for these areas. Areas delineated are shown on the maps in Appendix 3, and wetland summary sheets (Appendix 1) describe which inventoried wetlands incorporated information from earlier delineations. Because these delineations used numerous sample points, it was not possible to map all of these points on the LWI maps. Data sheets from these wetland delineations can be found in the reports referenced in **Literature Cited** below (Brophy, 1996 and 1999; Brophy and Wilson, 1998; Wilson and Brophy 1996a, 1996b). Concurrence has been received from the DSL on all of these delineations.

To locate wetlands within the study area, each drainage was field checked, both in obvious wetland areas and in areas for which the air photo and background information was ambiguous. Onsite sample points were located in wetlands and in contrasting upland sites wherever possible, subject to access limitations. In some cases, the wetland boundary was abrupt and did not require a contrasting upland sample point. Sample points were used to locate the wetland/upland transition, which is characterized by changes in the plant community. We then looked at surrounding plant communities to locate the same plant community changes in areas farther from the sample points, and drew the wetland boundary where those changes occurred. Where wetlands were extensive, we sampled at several locations to characterize the range of soils and vegetation types present.

We sampled hydrology at each sample point using a soil auger to check soil saturation and soil moisture levels. We also used indirect, secondary indicators of wetland hydrology as described in "Wetland Criteria" above, such as drift lines, high water marks, sediment deposits, wetland drainage patterns, water-stained leaves, living oxidized root channels, soil survey data, and historic records. We sampled vegetation by visual estimation of dominant species and their percent cover. We sampled soils by observing the soil profile using a tile spade or soil auger. Soil color was recorded using Munsell Soil Color Charts; texture, moisture, and structure were determined by feel. Mottling, concretions, oxidized root channels, and other characteristics were recorded.

fish habitat because these wetlands are not connected to any surface water body, so they can not provide fish habitat. The large, undisturbed wetland areas around Clear Lake, Crescent Lake, and Lake Lytle (wetlands CLEAR, CRESC, and LYTLE) are rated "0" for enhancement potential, because they are in undisturbed condition and enhancement is not possible.

The results of functional assessment for Rockaway Beach wetlands are found in Table A2 in Appendix 2.

Wetland Summary Sheets

Appendix 1 contains a Summary Sheet for each wetland inventoried during this study.

Criteria for Locally Significant Wetlands

Locally significant wetlands (LSW's) for Rockaway Beach were determined following the procedure outlined in Oregon Division of State Lands, Administrative Rules for Identifying Significant Wetlands (OAR 141-86, available at http://arcweb.sos.state.or.us/rules/oar_default.html). The procedure is shown in Table A4, "LSW Criteria Checklist", in Appendix 2. Other significant wetlands were those meeting the definition of "wetlands of special interest" as defined in OFWAM (DSL, 1996), such as areas zoned "special wetlands area" in the Rockaway Beach Comprehensive Plan, and known mitigation sites. The results are shown in Table A3, "Wetland significance determination" (Appendix 2).

State regulatory criteria for determining significance of natural wetlands have no lower size limit. Therefore, some isolated wetlands met significance criteria, but were small in size (less than 0.5 acres). Such areas located during this study are the *isolated portions* of wetlands groups MAC-5D, MAC-5B, UNB-1A, UNB-1B, ROC-8, CLE-1, and MAR-1. In comparison to the larger, contiguous wetland areas of these wetland groups, the small, isolated portions are less biologically significant. In applying the Goal 5 and Goal 17 ordinances, we recommend that the City consider the relative resource values and economic values of these small, isolated wetlands as a group, and compare the value of protection versus development separately for the isolated sections. Please note that only *portions* of these wetlands are recommended for separate consideration; for instance, the wetland coded as CLE-1 includes a large, contiguous area adjacent to Beacon Street, but also includes a small, isolated wetland near the northeast corner of S. 3rd and Dolphin.

LWI map preparation

After field work was completed, we finalized the wetland boundaries on the air photo enlargements. Where necessary, we used the air photos in conjunction with the soil survey, NWI maps, and other background information to place the boundaries. Use of stereo pairs of air photos greatly enhanced accuracy at this stage.

After wetland boundaries were marked on the airphotos, we traced the boundaries onto acetate/mylar and scanned them into a computer-aided design (CAD) program. The boundaries were then overlaid on a GIS (Geographic Information Systems) base map obtained from the Tillamook Bay National Estuary Program. A process called "rubber-sheeting" was used to place the wetlands on the map as accurately as possible. Tracings from the airphotos included registration points in both east-west and north-south dimensions (mainly street intersections). These registration points were aligned with the base map in the CAD program. In general, alignment of registration points required only proportional enlargement or shrinking of the traced and scanned digital image. In some cases, the scanned image had to be stretched or shrunk in one dimension to be accurately registered on the base map ("rubber-sheeting"). To ensure maximum accuracy, measurements were frequently checked in the CAD program and compared to measurements from both the airphotos and the tax assessor's maps.

In several parts of the study area, Laura Brophy and Loverna Wilson had previously conducted wetland delineations (see **LWI field methods** above). Where possible, CAD files of these wetland boundaries were brought directly into the mapping procedure. Where CAD files were not available, wetland boundaries were traced from surveyors' maps onto transparencies, then scanned and digitized into the CAD program. In both cases, the "rubber-sheeting" procedure described above was used to accurately register the wetland boundaries with the digital base map.

The current LWI study area starts at North Third and goes north to Nedonna Beach (the only part of the current LWI study area south of North Third is map 2N 10 32DB, which is map 15 on the City Index Map). Maps in Appendix 3 show wetlands inventoried in the earlier LWI (i.e., south of North Third), with their new codes assigned for purposes of functional assessment. However, **wetland mapping for the area south of North Third does NOT supersede mapping provided to the City on assessor's maps in the earlier LWI report** (Wilson et al, 1994). The LWI maps drawn on assessors' maps should be consulted to determine exact locations of wetlands inventoried in 1993, particularly to determine how wetland boundaries from that inventory correspond to tax lots. In summary:

1. Use maps in Appendix 3 for wetland locations in the north part of Rockaway Beach (North Third to Nedonna Beach), and for map 2N 10 32DB (map 15 on the City Index Map).
2. Use the earlier, 1994 LWI maps (drawn on tax assessor's maps) for wetland locations in the south part of Rockaway (Spring Lake to North Third);

Wetland coding

Wetland areas were assigned unique codes for inventory and functional assessment purposes. All wetlands in Rockaway Beach were assigned codes, not just the newly inventoried wetlands, because all wetlands went through the functional assessment procedure. Some areas were large wetland complexes; others were smaller sections of wetlands that were hydrologically divided, e.g. by culverts or road crossings. Table A1 in Appendix 2 shows the wetland codes, acreages, and locations. The first three letters of the code relate wetlands to the drainage with which they are associated. For example, ROC1B, ROC2, and ROC7 are three wetlands associated with Rock Creek. The number following the first three letters (and in some cases, a final letter such as 1A or 1B) is used to separate wetlands within a particular drainage from one another. A new number was assigned at hydrologic constrictions, such as culverts, or where data from sample points indicated that a wetland should be separated into distinct subareas. Hydrologically isolated wetlands were assigned letter codes that related them to the nearest drainage. Large wetland complexes such as Clear Lake, Crescent Lake, and Lake Lytle were assigned special 5-letter codes (CLEAR, CRESC, and LYTLE respectively); they include several riparian reaches. A summary sheet was prepared for each of the wetlands that were newly inventoried (see Appendix 3, Summary sheets); summary sheets for wetlands inventoried during the earlier LWI were contained in that inventory's report (Wilson et al, 1994).

Wetland complexes containing several different types of resources (lakes, emergent wetlands, and forested wetlands, for example) were not divided for inventory and assessment purposes, because much of their value comes from their size and the number of different vegetation communities they contain. As a result, wetland coding diverges from riparian coding. For example, McMillan Creek broadens and forms several different types of wetlands west of Highway 101. Riparian coding divided these areas into separate resources: Nedonna Lake is separated into two different riparian reaches; the inlet where McMillan Creek flows into Nedonna Lake is a separate riparian reach; and the different sections of the channelized portion of McMillan Creek downstream from Nedonna Lake are assigned to separate riparian reaches. This is necessary because these sections (reaches) have different characteristics for riparian assessment (namely, streambank and lakeshore characteristics like vegetation communities and channelization differ greatly between riparian reaches). However, these different sections are **not** separated for wetland functional assessment purposes, because there is no hydrologic separation between them. Table A5 in Appendix 2 describes the correspondence between riparian reach codes and wetland codes.

Map scale and accuracy

We chose to use the Tillamook National Estuary Program's GIS base map because its features matched up well with the airphoto enlargements on which we drew the wetland boundaries. Tracings of streets from the airphoto enlargements generally registered very closely with the GIS base map. This was surprising, because the GIS base map was prepared at a scale of 1:24,000 (1" = 2000 ft), while the airphoto enlargements were at a scale of 1" = 472 feet. The obvious conclusion is that the GIS mapping is actually more accurate than the nominal scale of 1:24,000. In any case, the maps in Appendix 3 are drawn at a scale of 1" = 800 feet, as required by DSL mapping standards for Local Wetland Inventories.

A discussion of absolute and relative accuracy of maps and airphotos is beyond the scope of this report. However, because maps are only a representation of reality, not reality itself, it is important to emphasize the warning at the bottom of each map in Appendix 3 (see **"Limitations of the LWI process"** below).

Wetland descriptions and Goal 5 and Goal 17 resources

Table A1, Appendix 2 describes the wetlands inventoried, their locations, acreage, and whether they are Goal 5 or Goal 17 resources. Goal 17 resources were determined from the table entitled "Rockaway Shorelands Use Priority Guidelines," page 19a of the Rockaway Beach Comprehensive Plan. Only resources that were determined to be significant for Goal 5 and Goal 17 purposes (see **"Criteria for Locally Significant Wetlands"** above) were assigned to Goal 5 or Goal 17 in Table A1.

Limitations of the LWI process

This LWI was conducted within a strictly limited budget and covered a large area, approximately 937 acres. The LWI procedures were designed to allow efficient location of wetlands while attempting to avoid expenditures beyond the budget. We made every effort to locate, describe and map all wetlands within the study area, but due to lack of access and limited time and budget, some inaccuracy is possible. This is particularly true for the large wooded areas east of Crescent Lake and Lake Lytle. In some of these areas, the tree canopy consists almost entirely of alder, and there is virtually no difference visible on the airphotos between wetlands and uplands. In these areas, only the understory vegetation differs from wetland to upland, and the understory vegetation can not be seen in the airphotos. Although we spent considerable time combing this area for wetlands, very few lot lines are marked on the ground, and very few landmarks are visible on the airphotos, so there is a possibility that we missed some wetlands or included some upland areas in the mapped wetlands. Despite these limitations, we feel this inventory provides the quality and accuracy needed by Rockaway Beach for planning purposes.

As stated on the wetland/riparian area maps provided in Appendix 3:

Information on these maps is for planning purposes only; locations of wetlands and riparian resources shown are only approximate. There may be upland areas within mapped wetlands; there may also be unmapped wetlands and riparian areas subject to

regulation. In all cases, regulators will use actual field conditions, not the maps in Appendix 3, to determine jurisdictional wetland boundaries and locations of riparian areas.

Most importantly, an LWI provides useful information, but it does not substitute for site-by-site wetland delineations (see "Introduction to the LWI Process" above). Therefore:

Before planning development for a property, an onsite wetland determination or delineation must be conducted to determine presence or absence and/or boundaries of jurisdictional wetlands, and presence or absence of regulated riparian areas.

Wetland Criteria

Hydrology

Hydrology is considered the driving force of wetland ecology. To be classified as a wetland, an area must exhibit a water table saturating the major portion of the root zone for a significant period during the growing season, or about 3 weeks on the Oregon coast. Positive indicators of wetland hydrology include visual observation of inundation and soil saturation in the upper 12" of the soil profile (direct indicators), and indirect indicators such as high water marks, drift lines, sediment deposits, wetland drainage patterns, living oxidized root channels, soil survey data, stream gauge data, flood predictions and historic records.

Vegetation

Some plant species can tolerate saturated soil conditions for long periods during the growing season. These plants are considered hydrophytic. An area must show a predominance of hydrophytic vegetation to be classified as a wetland. For the purpose of determining hydrophytic vegetation, plants are classified into five categories in the National List of Plant Species That Occur in Wetlands (Reed 1988; Reed 1993). The categories, from most to least tolerant of wet soil, are: obligate wetland plants (OBL), facultative wetland plants (FACW), facultative plants (FAC), facultative upland plants (FACU), and obligate upland plants (UPL). Modifiers to these categories, consisting of "+" and "-", show if a plant is more (+) or less (-) tolerant of wet conditions than plants in an unmodified category. There are two other categories: "no indicator" (NI) is used when insufficient information is available for a species; and "not on list" (NOL) is used for species that are not included in the national list. It is frequently inferred that NOL species are UPL. If a site, under normal conditions, has more than 50 percent of dominant species classified as OBL, FACW, and/or FAC (excluding FAC-), that site meets the vegetation criterion for classification as a jurisdictional wetland.

Soils

Jurisdictional wetlands must have hydric soils, which are soils that developed under conditions of saturation or flooding long enough during the growing season to develop anaerobic conditions within the major portion of the root zone. These soils are listed in Hydric Soils of the United States (Soil Conservation Service, 1987), and in the federal delineation manual (Environmental Laboratory, 1987). Hydric soils usually develop morphological indicators of prolonged wetness, and these indicators must be observed in the field to confirm hydric soils. The indicators include histic layers, hydrogen sulfide odor, aquic moisture regime, gleying, low chroma matrix, distinct mottling, and iron and manganese concretions.

Study area summary: Local Wetland Inventory

The study area for this LWI includes the area beyond the study area of the previous LWI (Wilson et al, 1994), that is, the portion of Rockaway Beach north of North Third, and extending out to the Rockaway Beach Urban Growth Boundary. Total study area is about 937 acres. The highest elevation in the study area is about 450 feet near Pacific View Drive, but most of the study area is between sea level and 100 feet elevation. The study area is located between the west edge of the coast range foothills and the ocean. The land surface generally slopes to the west; water flows off the foothills and into the ocean through streams and lakes including (from south to north) Spring Creek (flowing into Spring Lake), Heitmiller Creek, Saltair Creek and ditches feeding Clear Lake, Rock Creek, Spring Creek (flowing into Lake Lytle), Finney Creek, Steinhilber Creek, Lake Lytle, Moroney Canal, Crescent Lake, McMillan Creek, and numerous unnamed streams.

This inventory located approximately 276 acres of wetlands within the 937 acre study area. General characteristics of these wetlands are described below under "Hydrology", "Vegetation" and "Soils."

Hydrology

Wetland occurrence in the study area is generally related to proximity to lakes and watercourses. Water sources for wetland hydrology include direct precipitation, runoff from higher ground, and a high water table associated with the surface water bodies. A few isolated wetlands are found in depressions; these are fed by surface runoff and/or a high water table. Soils within inventoried wetlands are saturated to within 12 inches of the surface for a significant portion of the growing season.

Hydrology in Rockaway Beach is complicated by underground flow. Many of the moderate gradient streams run underground for some distance after they exit from the toe slope of the Coast Range. Unnamed streams O and P are good examples of this phenomenon. Riparian reaches R-UNO3 and R-UNP1 both spring out from underground at headwalls a short distance east of Tillamook Avenue. Above these headwalls, it is possible they flow aboveground. However, due to time and access limitations, the exact course of these streams above their points of emergence could not be determined.

Vegetation

Most wetlands in the study area fall into the wetland type classified by Cowardin et al (1979) as PFO (palustrine forested wetland). Crescent Lake is classified L2AB (lacustrine, littoral, aquatic bed) and Lake Lytle is classified L1UB (Lacustrine, limnetic, unconsolidated bottom). An extensive sphagnum bog along Moroney Canal is a rare plant community and therefore a significant wetland resource; it is classified as a palustrine emergent wetland (PEM). A smaller, but still significant and rare sphagnum bog is located just north of the City Park at Dolphin Street. Other emergent wetlands are found around the margins of the lakes, and on the south side of North Sixth, where past clearing and an apparently rising water table have eliminated woody species. Some areas of palustrine shrub-scrub wetland (PSS) are found between North Fifth and North Sixth, around the margins of Lake Lytle, Crescent Lake, and Clear Lake, and on the west edge of the Nature Conservancy Preserve.

Forested wetlands generally have a red alder canopy (*Alnus rubra*, FAC), often with scattered Sitka spruce (*Picea sitchensis*, FAC). The shrub layer consists mainly of willows (*Salix* species, FAC to FACW+), salmonberry (*Rubus spectabilis*, FAC+), and black twinberry (*Lonicera involucrata*, FAC+). Dominant herbaceous species include skunk cabbage (*Lysichiton* *americanum*, OBL), water parsley (*Oenanthe sarmentosa*, OBL), slough sedge (*Carex obnupta*, OBL), and subarctic lady-fern (*Athyrium filix-femina*, FAC).

Scrub-shrub wetlands generally have a shrub layer dominated by willow (*Salix* species, FAC to FACW), salmonberry, and Douglas spiraea (*Spiraea douglasii*, FACW). The herbaceous layer is generally dominated by slough sedge, skunk cabbage, water parsley, and soft rush (*Juncus effusus*, FACW).

Two types of emergent wetlands are present in the study area. The largest area of emergent wetland is a rare plant community, the sphagnum bog found along Moroney Canal and just north of the city Park. This community consists of a mat of sphagnum (peat moss, *Sphagnum* spp.) floating on the surface of the water. Along Moroney Canal, the sphagnum mat supports other emergent wetland plants such as Sitka sedge (*Carex sitchensis*, OBL), softstem bulrush (*Scirpus validus*, OBL), and marsh cinquefoil (*Potentilla palustris*, OBL). North of the City Park, the sphagnum bog consists of a narrower fringe of sphagnum around an open water pond, and associated species include soft rush, Douglas spiraea, slough sedge, Labrador-tea (*Ledum glandulosum*, FACW+) and Pacific bayberry (*Myrica californica*, FACW).

The second type of emergent wetland is found where forested wetlands have been cleared, and where soils have been disturbed or compacted. Here, dominants include slough sedge, soft rush, small-fruited bulrush (*Scirpus microcarpus*, OBL), reed canarygrass (*Phalaris arundinacea*, FACW), creeping buttercup (*Ranunculus repens*, FACW), and velvetgrass (*Holcus lanatus*, FAC). Skunk cabbage is found in a few particularly wet emergent areas, but it generally does not persist once the forest canopy is removed.

Soils

The NRCS (1999) has produced draft soils maps for Tillamook County. Soils along the oceanfront are generally Waldport fine sands (not hydric; dune sands) and Heceta fine sands (hydric, interdunal swales). In these sandy areas, wetlands are found only where watercourses and depressions intercept the water table, and where finer-textured sediments deposited by floods retain water (for example, in the Nedonna Beach area). The Chitwood-Hebo complex is found on flat ground (stream terraces) surrounding Lake Lytle and Crescent Lake, around Clear Lake, and throughout the Nature Conservancy Preserve. Chitwood soils are somewhat poorly to moderately well-drained soils; Hebo soils are poorly drained. Both units formed in clayey alluvium, but only the Hebo component is hydric. On the gentle slopes at the base of the Coast Range foothills, Chitwood-Knappa silt loams predominate. Knappa soils are deep, well-drained soils formed on mixed alluvium. Chitwood-Knappa soils are not in general hydric, but they often have inclusions of hydric Hebo soils. Along Moroney Canal, the soils are haplohemists -- peat soils that form under sphagnum in wetlands. Small areas of Brenner silt loam are found in forested wetlands along Rock Creek, east of Spring Lake, and on flat ground along McMillan Creek just east of Highway 101. Brenner soils are poorly drained and formed in silty alluvium; they are hydric.

RIPARIAN INVENTORY

Introduction to the Riparian Inventory process

Riparian areas are those areas of land located near water bodies such as rivers, streams, lakes and ponds, which are affected by and in turn affect the water bodies. Riparian areas provide many functions that are valuable to people and animals, including wildlife habitat, flood management, water quality enhancement, and thermal regulation (moderation of water temperatures). With increasing concern over declining populations of salmonids and other wildlife, protection of riparian areas has become an important resource management goal.

Local and regional planners need information on the riparian resources found in their jurisdictions. A riparian inventory is a way of providing this information. In a riparian inventory, riparian areas in a large geographic area are located, mapped, and described. For this inventory, we used methods very similar to those described in the Urban Riparian Inventory and Assessment Guide (DSL, 1998) (hereafter referred to as the DSL Guide). These methods are detailed in **Riparian inventory and assessment methods** below. The DSL Guide provides a method for determining the width of each riparian resource, and a functional assessment method, which evaluates how the riparian area performs in four functional areas: wildlife habitat, thermal regulation, water quality, and flood management.

The results of riparian functional assessment, along with other information on water quality, rare plant communities, and designated Essential Salmon Habitat, were used to designate significant riparian resources. Protection of significant riparian resources is accomplished through local ordinance, as required by statewide planning goals. Where significant riparian resources adjoin Locally Significant Wetlands, Statewide Planning Goal 5 requires the riparian setback to be applied to the upland edge of the wetland.

As for the LWI, the Riparian Inventory provides useful information, but it does not substitute for onsite field work. Many of the streams in Rockaway Beach were very accessible and therefore could be easily described and mapped. However, large areas of the city are still undeveloped and are heavily forested, and in addition, property access was not granted in many areas. In these areas, exact locations of smaller, low-gradient streams could not be determined, but the resources were mapped as accurately as possible using aerial photographs (see **Riparian Inventory offsite methods** below). For these streams, a distinctive mapping symbol -- a dotted line, instead of the dash-dot line used for more accurately mapped streams -- was used (see maps, Appendix 3). Since these resources are subject to the same regulations as those which are mapped more accurately, onsite field work should be conducted before any development plans are made, to determine the exact location of each significant riparian resource.

Information on riparian resources provided in this report includes:

1. An executive summary;
2. A description of riparian area functions;
3. A description of information sources, riparian inventory, assessment & mapping methods;
4. Tables of riparian resources:
    - Correspondence of wetland and riparian codes (Table A5, Appendix 2), with significant resources in bold type;
    - Reach locations and Goal 5 and Goal 17 resources (Table A6, Appendix 2);
    - Riparian functional assessment scores (Table A7, Appendix 2);
    - Riparian significance determination & riparian widths (Table A8, Appendix 2);
    - Summary of riparian significance, showing map locations (Table A9, Appendix 2);
5. Literature cited;

6. Maps of riparian resources identified during the inventory (Appendix 3). (The maps also show wetlands identified during this Local Wetland Inventory, and locations of wetlands inventoried during the 1994 LWI.)
7. Riparian inventory data sheets (Appendix 5).

Executive summary: Riparian Inventory

This Riparian Inventory used methods outlined in the Urban Riparian Inventory and Assessment Guide (DSL, 1998). The study area for the riparian inventory consisted of the area within the Urban Growth Boundary of Rockaway Beach, Oregon, totalling about 1500 acres.

A preliminary map of riparian areas within the study area was drawn using aerial photographs, USGS topographic maps, FEMA floodplain maps, Oregon Department of Forestry fish use maps, and other resources. Field work to ground-truth the preliminary map, locate additional riparian areas, and characterize all riparian resources was conducted during April 1999. Offsite methods were used where access was not granted or where access was logistically difficult. Locations of riparian areas were refined using 1997 true color aerial photos and stereo pairs where necessary. Riparian resources were drawn on aerial photos enlarged to a scale of 1" = 472 feet. The resource locations were then digitized, and a computer-aided design (CAD) program was used to overlay the boundaries on a digital base map. The resulting maps (which also show wetlands) are included as Appendix 3 of this report.

A total of 34 streams, 24 of which are not shown on USGS topographic quadrangles were inventoried. The largest group of riparian resources inventoried includes Rockaway's two large lakes (Lake Lytle and Crescent Lake); the seventeen streams that flow into those lakes; and Moroney Canal, which connects the two lakes. Other riparian resources in the City include (from south to north): two drainages flowing into Spring Lake; Heitmiller Creek; Clear Lake and a number of ditches that flow to Clear Lake; Rock Creek; and eight streams flowing under Highway 101 into the Nedonna Beach area. Also included in the inventory were several small lakes: Nedonna Lake, Lake Marie, Seaview Lake; and the pond at Charlotte and North 12th.

The Lake Lytle / Crescent Lake complex is the largest and most important group of riparian resources in Rockaway. The east sides of Lake Lytle and Crescent Lake are relatively undisturbed and have a great deal of valuable wildlife habitat. Two riparian areas containing examples of a rare plant community, the coastal sphagnum bog, were inventoried: one along Moroney Canal, and one just north of the City Park at Dolphin.

Functional assessment procedures outlined in the DSL Guide (DSL, 1998) were used to rate each riparian reach for its performance in four functional areas: water quality enhancement, flood management, thermal regulation (moderation of water temperatures), and wildlife habitat. The results were used, along with information on water quality, rare plant communities, and designated Essential Salmon Habitat, to designate significant riparian resources. The results are presented in tables in Appendix 2, and on maps in Appendix 3.

The DSL Guide was used to establish a riparian width for each reach, and these widths are shown in Table A8 in Appendix 2. To improve readability, the maps in Appendix 3 do not show the width of the riparian area.

Statewide planning goals (Goal 5 and Goal 17) require communities to plan for and regulate certain land uses around significant riparian areas. Local ordinances specify how setbacks will be used to protect significant riparian areas. It is important to note that Goal 5 states that "When a riparian corridor contains all or part of a significant wetland..., the standard distance to the riparian corridor boundary shall be measured from, and include, the upland edge of the wetland."

Riparian area functions

Riparian areas are areas adjacent to surface water bodies such as streams and lakes. Riparian areas are influenced by the presence of the water bodies, and in turn influence those water bodies. As transition areas between water bodies and uplands, riparian areas provide many valuable services to humans and wildlife. Vegetation in riparian areas provides wildlife habitat, slows floodwaters, stabilizes soils, and traps pollutants and sediment that might otherwise enter streams.

Water Quality. Vegetation in riparian areas promotes water infiltration into the soil. This stabilizes the soil, reduces soil erosion and helps prevent excessive sediment movement into streams and lakes. Sedimentation occurs under natural conditions, but it can be accelerated by removal of riparian vegetation. It can also be accelerated by development, such as buildings and roads near streams. Development disturbs soils and creates a sediment source. When water carrying these sediments flows across developed areas, it often can not infiltrate into the soil, because many developed surfaces are impervious (for example, roads, buildings and parking lots). The water with its load of sediment and other pollutants moves more quickly to the stream, degrading water quality.

Flood management. When water flows through the watershed, vegetated riparian areas can help slow the floodwaters and reduce the peak flows that flood nearby homes and businesses. Riparian areas that have topographic features like backwater wetlands, sloughs, depressions, overflow channels, active floodplains, and low terraces are particularly effective at slowing and temporarily detaining floodwaters. Historically, beaver have been highly important in creating wetlands and floodplain environments that support salmon and regulate peak flows in the Oregon Coast (Nickelson *et al*, 1992). Human manipulation of the riparian zone -- vegetation removal, buildings, roads, wetland fill, beaver trapping and stream channelization -- greatly reduces the ability of riparian areas to absorb and slow down floodwaters.

Thermal regulation. Cool water is needed by species we value, like salmon and steelhead. Riparian vegetation can shade streams and keep water cool. Trees provide the best shade, and also provide large woody debris which provides wildlife habitat.

Wildlife habitat. Because riparian areas are found between surface water bodies and upland, they provide diverse habitat for many species. Aquatic animals often use the adjacent riparian areas during part of their life cycle. Conversely, species that live mainly on land often need water to survive, so they may need to live in riparian areas near water. Many creatures are specifically adapted to live in the wetlands, shrubby areas and forests of the riparian zone. The vegetation in the riparian area is important in determining which animals can live there. Trees in the riparian zone are not only important habitat for birds and other wildlife when they are alive, but when they die and fall down, they form "large woody debris" that is important for several reasons. Large woody debris provides shelter and a food source for many animals, and its breakdown nourishes the soil. When large woody debris falls in a stream, it creates "structure" in the stream, causing the water to move in patterns like pools and riffles. Many creatures (such as salmon) are adapted to live in pools and riffles, and do not thrive in channelized streams or streams from which all large wood has been removed.

Information sources

The information sources listed for the Local Wetland Inventory above were also used for the Riparian Inventory.

Riparian inventory and assessment methods

Methods used for the riparian inventory were based on the Urban Riparian Inventory and Assessment Guide (DSL, 1998). Details are presented below.

Riparian Inventory personnel

Laura Brophy of Green Point Consulting and Loverna Wilson, Environmental Consultant, conducted the field work and prepared the report for this study.

Onsite methods: Riparian Width Determination Form

Riparian widths were determined by observing dominant vegetation within 100 feet of the top of bank of surface water bodies such as streams or lakes. This 100 foot wide area is called the "observation area." Where wetlands were found adjacent to surface water bodies, these wetlands were included within the observation area. We determined the dominant tree species in the observation area, and then determined the Potential Tree Height for that species using the table provided in the DSL Guide. The riparian width for the reach in question is equal to the Potential Tree Height for the dominant species in the observation area. If vegetation had been recently removed, or if the area was urbanized and lacked trees in the riparian area, we used a nearby reference area to determine the dominant species, Potential Tree Height and riparian width.

In Rockaway Beach, a great deal of surface water flow is directed through ditches along roadsides and along the rear lot line of house lots. These ditches were only inventoried if they were part of major streamcourses, such as Rock Creek, Heitmiller Creek or MacMillan Creek.

In some cases, a stream was culverted along a significant portion of its length, and the exact course of the culvert could not be determined.

Riparian widths for all reaches are shown in Table A8, Appendix 2. The width is measured out in a perpendicular direction from the top of bank of the surface water body (stream, lake, or pond). The riparian width shown is for **one side** of the water body only -- that is, a riparian area with the width shown is located on each side of the water body.

We drew a typical cross-section of the riparian reach on the Riparian Width Determination form. This cross-section shows the width of the water resource (stream or lake), the approximate slope of the ground surface, and the nature of the vegetation community on the streambank or lakeshore.

Riparian width and significant wetlands

Where wetlands were found adjacent to surface water bodies, these wetlands were included within the observation area, and also within the final riparian area as determined using Potential Tree Height. However, according to Statewide Planning Goal 5 (DLCD, 1998), "**where the riparian corridor includes all or portions of a significant wetland..., the standard distance to the riparian corridor boundary shall be measured from, and include, the upland edge of the wetland.**" In other words, the setback (either the riparian width contained in this report, or the Safe Harbor setback) must be "moved over" to the upland edge of any significant wetland that adjoins a significant riparian area. The net effect is that **significant wetlands which contain significant riparian resources must be protected by a setback equal to the setback that would be used to protect those riparian resources (whether that setback is the riparian width contained in this report, or the safe harbor setback).**

Onsite methods: Riparian Characterization Form

We used the Riparian Characterization Form in the field to record information on riparian characteristics. Each reach was characterized separately. Right and left banks were characterized separately, unless they were similar to each other, in which case only one characterization was done for the reach. This information was later used for functional assessment – that is, determining how well a riparian area performs certain functions, namely water quality enhancement, flood management, thermal regulation (water temperature moderation), and wildlife habitat. Computerized spreadsheets were constructed for recording and analyzing riparian characteristics. Since computerized data entry was more efficient, not all of the information fields on the Riparian Inventory datasheets were filled in. Details are provided in Table 1 below.

Table 1. Riparian Characterization Form data fields and comments

Field	**Comments**
Date	Date of field work, or if filled out in office, date of office work
Riparian code	Code used to identify riparian reach on maps
Reach length	Not filled in – not used in assessment. Could be determined through analysis of CAD files used for mapping.
Investigators	Personnel who conducted field or office work
Hydrologic Basin	Not filled in – not used in assessment.
Water resource	Type of water resource associated with the riparian area
LWI Wetland Code	See Table A5, "Wetland/riparian code correspondence".
Water present year-round?	Difficult to determine. Would require on-site, year-round observation and/or stream gaging data. See notes below.
Within FEMA floodplain?	Determined by analysis of FEMA maps and used in characterization; not filled in on forms due to time limitations.
Mapped soil series	Determined by analysis of soil survey maps and used in characterization; not filled in on forms due to time limitations.
Are salmonids present?	Not filled in; unknown for most streams. Could be determined by field investigation (e.g., by ODFW); such investigation has not been conducted for Rockaway Beach streams. Designated Essential Salmon Habitat streams are shown in Table A8, Appendix 2.
Is resource 303(d) listed?	Not filled in; none in Rockaway Beach.
Adjacent Land Uses	Determined from onsite observation and airphotos
Woody & Herbaceous Vegetation	Recorded on Riparian Width Determination Form, so not duplicated on Riparian Characterization Form.

Riparian Inventory offsite methods

We used a combination of field work, airphotos, and the resources listed above to map the course of streams through the study area. In areas where we did not have access, airphotos were used more heavily. In many cases, stream courses were clearly visible on the airphotos. In other cases, the stream course could not be located precisely even with the help of stereo pairs. This was particularly true for small, low-gradient streams flowing under an alder canopy in large, undeveloped wooded areas. Such streams were mapped as accurately as possible using all possible geomorphic indicators (slope changes, outlets into lakes, etc.), but their locations are only approximate. Therefore, such streams were marked distinctively on the maps in Appendix 3 (they are marked as dotted lines, as opposed to the dash-dot lines used for streams whose locations are more accurately mapped).

Riparian reach coding

Riparian areas were divided into "reaches" as described in the DSL Guide. Reach divisions (red bars on the maps in Appendix 3) were placed where riparian vegetation or land use changed markedly, or where slope changed suddenly leading to noticeably different stream characteristics. Each reach is relatively homogeneous, to the extent possible while still maintaining a manageable number of reaches within the study area. Table A6 (Appendix 2) lists riparian areas, codes, descriptions, locations, and whether each riparian area is a Goal 5 or Goal 17 resource. Reach divisions were generally not placed at the confluence of a tributary and a larger stream; the tributary reach is understood to end at the confluence.

As described in **Wetland coding** above, riparian reaches were generally coded similarly to the associated wetlands. However, because the criteria for dividing riparian areas into reaches differ from the criteria used to divide up wetlands for wetland inventory and assessment purposes, there are inevitably differences in the two coding systems. Table A5 (Appendix 2) shows which riparian codes correspond to which wetland codes. In general, wetlands were not divided as finely as riparian areas, so several riparian reaches are often found within a single LWI wetland.

At the end of each riparian reach code is a suffix indicating the bank being characterized. "R" indicates the right bank, and "L" indicates the left bank, as viewed looking **downstream.** Where both banks were similar, characterization (see Riparian characterization below) was done for right and left banks together (suffix "R&L"). For ponds and lakes, right and left banks are not designated.

Riparian areas along lakeshores are generally not divided into reaches; however, two exceptions were made for this inventory. Lake Lytle was divided into two separate riparian reaches, R-LYT-1 and R-LYT-2, because of the very different characteristics of the west side of Lake Lytle (along Highway 101) versus the east side (forested). Similarly, Nedonna Lake was divided into two reaches, R-NED-1 (southwest half; bounded by roads, with no forest cover; nonsignificant) and R-NED-2 (northeast side, with forested margins; significant). For Lake Lytle, both reaches are significant due to the designation of the Spring Creek/Lake Lytle complex as Essential Salmon Habitat (DSL, 1999).

Criteria for Significant Riparian Resources

Any Riparian Area that meets one or more of the following criteria is considered a "Significant Riparian Resource":

1. Essential salmon habitat. Any Riparian Area mapped as "Essential Salmon Habitat" on maps compiled by the Oregon Division of State Lands is significant. Maps are available at http://statelands.dsl.state.or.us/counties.htm.

** Spring Creek (at the north end of Rockaway Beach), and the lakes and canal through which it flows to the ocean (Lake Lytle, Moroney Canal and Crescent Lake), are mapped as Essential Salmon Habitat on the DSL maps. The relevant riparian reaches are coded R-UNB, R-LYT1, R-LYT2, R-MOR1, R-CRE2 and R-CRE3 in the Rockaway Beach Riparian Inventory.*

2. Rare Plant community. Any Riparian Area that contains a plant community that is rare on a statewide basis, as described in Christy (1993), is significant.

** Two such Riparian Areas are present within the Rockaway Beach Urban Growth Boundary: the sphagnum bog just north of the City Park at North 4th and Coral Street (coded R-UNA-5), and*

Moroney Canal (coded R-MOR-1). Both contain the rare plant community described by Christy (1993) as "coastal [sphagnum] bog."

3. High functional level. Any Riparian Area that scores "High" for any two of these three functional assessment categories is significant: (1) Flood Management, (2) Thermal Regulation, (3) Wildlife Habitat. Functional assessment was performed using the functional assessment method described in the DSL Guide (DSL, 1998). The DSL Guide's assessment of water quality function was not used in significance determination, since it was not useful (specifically, it did not separate the water quality functions of highly impacted ditches from the water quality functions of pristine, undisturbed streams).

THE RESULTS OF SIGNIFICANCE DETERMINATION FOR RIPARIAN AREAS IN ROCKAWAY BEACH ARE SHOWN IN TABLES A8 AND A9, APPENDIX 2, "RIPARIAN SIGNIFICANCE DETERMINATION." Table A5 (Appendix 2) shows which significant riparian resources also contain significant wetlands, which determines how protective setbacks are applied (see DLCD, 1998).

Note: The DSL functional assessment method does not provide an adequate means of distinguishing functional differences between small streams and larger streams. For some undeveloped areas of Rockaway (some tributaries to Rock Creek, and some areas east of Highway 101, Lake Lytle, and Crescent Lake), some small streams rated high for two of three of the above functions and would therefore have been designated as significant by a strict application of this criterion. However, their biological value is quite limited compared to the more prominent drainages. To provide useful information on significance of riparian resources, we used channel size, channel morphometry and major differences in drainage area to separate out the more prominent drainages in these areas. Only these more prominent drainages were designated as significant resources. For the area east of Lake Lytle, these more prominent drainages are Finney Creek (FIN1), and the north and south forks of Steinhilber Creek (STE1A and STE1B). For the area east of Crescent Lake, these more prominent drainages are Unnamed M (UNM1 and UNM2), and Unnamed P (UNP1). The drainages eliminated from the significance list due to small size, underground flow, or likely intermittent flow include ROC1D, ROC4, ROC5A, ROC5B, UNE1, UNF1, UNH1, UNL1, UNN1, UNO1, UNO3, UNR1, UNS1, UNT1, and UNU1. None of these reaches contained rare plant communities or essential salmon habitat. **Despite these streams having been removed from the significant resource list, protection of a minimal buffer of 50 feet on each side of these drainages is still highly recommended.**

Riparian Characterization

A series of questions about the characteristics of the riparian area are found on the reverse side of the Riparian Characterization Form. The answers to these questions are used for functional assessment of each riparian reach, that is, to determine how well the riparian area is performing four functions: water quality enhancement, thermal regulation (moderation of water temperatures), flood management, and wildlife habitat.

For each riparian reach, the questions are answered for the riparian area, that is, the area within the width on the Riparian Width Determination Form (based on potential tree height for the dominant tree species). If the riparian reach contains a wetland, that wetland was included in the riparian area, so the answers to the functional assessment questions apply to the wetland as well as to any non-wetland areas within the riparian width.

Questions on the Riparian Characterization Form are:

1. <u>What is the average slope in the riparian area?</u> Choices: <10%, 10-20%, >20%. Slope is averaged from the top of bank out to edge of riparian area. Slope affects the risk of soil erosion, which can impact water quality.

2. What is the extent of impervious surface within the riparian area? Choices: <10%, 10-25%, >25%. Impervious surfaces are buildings, paved roads, gravel roads, parking lots, etc. Water cannot infiltrate into impervious surfaces, so the soil can not filter out pollutants. Thus, impervious surfaces contribute to water quality problems.
3. Is the reach constricted by man-made features? Yes or no. Constrictions include ditching, rip-rap, retaining walls, roads near the stream, etc. Constriction speeds water flow downstream and greatly impairs the flood management functions of the riparian reach.
4. Does the orientation of the riparian area allow for shading of the water resource at midday in summer? Yes or no. If the riparian reach runs east-west, the answer is yes. If the riparian reach runs north-south, the answer may still be yes if the water resource is a small stream, since vegetation growing on either bank often shades the entire stream in this situation. Shaded water is cooler than unshaded water; cooler water temperatures are required by anadromous fish and other valued species.
5. What is the dominant vegetation layer within riparian area? Choices: woody vegetation, herbaceous vegetation, or bare ground. Woody vegetation provides optimum soil stabilization and promotes water infiltration, which helps enhance water quality and thermal regulation. Woody vegetation also provides a source of large woody debris for improved wildlife habitat. Undisturbed vegetation with a variety of species and plant community types provides the highest quality wildlife habitat.
6. What is the dominant vegetation layer at the top of bank (if defined) or the edge of the water resource? Choices: woody vegetation, herbaceous vegetation, or bare ground. Woody vegetation at the top of the streambank or lakeshore helps stabilize the banks, preventing erosion. Herbaceous vegetation stabilizes banks to a lesser extent.
7. How many vegetation layers are present within the riparian area? More vegetation layers provide more diverse wildlife habitat.
8. Does woody vegetation hang over the edge of the water? Yes or no. Overhanging vegetation shades the water, keeping it cool, and provides fish with a refuge from predators.
9. Is there large woody debris in the riparian area? Yes or no. Large woody debris from conifer trees helps create fish habitat, so if conifer trees were present in the riparian area, this question was answered "yes."
10. What percentage of the water resource is bordered by a vegetated riparian area at least 30 feet wide? Choices: >40%, 10-40%, <10%. A vegetated buffer provides wildlife habitat, helps slow and temporarily detain floodwaters, promote water infiltration, and prevent soil erosion.
11. What is the degree of development or human caused disturbance? Choices: <25%, 25-75%, >75%. This refers to buildings, roads, recent or extensive vegetation removal, excavation or fill, lawns and gardens, agriculture, etc. Such development especially reduces wildlife habitat functions, and also affects the other riparian functions.
12. Are there flood-prone areas beyond the top-of-bank or edge of water resource? Yes or no. Low-lying areas such as depressions or swales, FEMA-mapped 100 year floodplain, backwater wetlands, and overflow channels provide the possibility of detaining floodwaters, reducing flood risks downstream.
13. Is woody vegetation dominant in the flood-prone areas? Yes or no. Woody vegetation improves floodwater retention.

During the functional assessment process, three additional questions (besides the ones on the form) were answered for each riparian reach:

14. What is the erosion hazard within the riparian reach? Choices: low or high, based on mapped soil type from NRCS 1999 draft soil maps. A high erosion hazard contributes to water quality problems.

15. Is there more than one type of water resource (stream, wetland, lake/pond) present within or immediately adjacent to the riparian reach? Choices: yes or no, based on field observation and airphotos. More types of water resource provide more diverse, higher quality wildlife habitat.

16. Is surface water present throughout the year? Choices: yes or no, based on field observation. Streams and lakes where water is present year-round ("perennial" streams, for example, as opposed to intermittent streams) provide habitat for a wider variety of fish. Note: This question is not easily answered for smaller streams. An accurate answer would require year-round observation of the stream, or additional field work in late summer. Where any doubt existed, year-round surface water was assumed to be present. In no case did this assumption alter the determination of significance for a riparian reach.

Riparian functional assessment scoring

The answers to the questions on the riparian characterization form were used to give each reach a certain number of points for each riparian function. The final result was a score – low, medium, or high – for that function for the reach in question. Table 2 below shows the scoring relationship (that is, which questions provided points for each function).

Table 2. Riparian functional assessment questions and functions scored

	Function(s) scored			
Characterization question	**water quality**	**flood management**	**thermal regulation**	**wildlife habitat**
slope	X			
extent of impervious surfaces	X			
reach constriction		X		
orientation allows shading			X	
dominant vegetation in riparian area	X		X	X
dominant vegetation at top of bank	X			
number of vegetation layers				X
overhanging woody vegetation			X	X
large woody debris				X
vegetated buffer				X
degree of development/disturbance				X
flood-prone areas		X		
woody vegetation in flood-prone areas		X		
erosion hazard	X			
more than one type of water resource				X
water present year-round?				X

Table A7 (Appendix 2) shows the results of functional assessment of the riparian reaches inventoried; Table A8 shows the riparian width of each reach. The riparian width was determined using the Riparian Width Determination From (see above). Table A9 provides a summary of riparian significance and shows the map location of each riparian resource.

Riparian map preparation

Mapping methods used for the riparian inventory were the same as the mapping methods used for the Local Wetland Inventory (see **LWI Map preparation** above). The discussion of **Map scale and accuracy** in the LWI section of this report above also applies to the Riparian Inventory.

As for the wetland resources, riparian resources which qualify as significant for Goal 5 / Goal17 purposes are color-coded blue, while nonsignificant resources are colored red on the resource maps (Appendix 3). In addition (in case maps are reproduced in black-and-white), reach codes for significant resources are outlined with a text box, but not for nonsignificant resources. In cases where a riparian reach had one bank rated significant and one bank rated nonsignificant, the entire reach was coded blue, and labels indicated the nonsignificant and significant banks.

To improve readability on the maps included in Appendix 3, the left and right banks of a reach were not coded separately on the map unless they had different significance determinations. Similarly, to improve readability, riparian widths are not shown on the map. The appropriate protective setback (either the riparian width listed in Table A8, or some other width determined by local ordinance) must be measured out from the top of bank of the stream or lake, or, if the riparian reach includes all or part of a significant wetland, from the upland edge of that wetland.

Please note that mapped locations of streams flowing through forested areas are only approximate. Time limitations prevented exact location of the 34 drainages that flow through wooded areas within the Rockaway UGB.

The riparian width is the recommended setback for significant riparian areas. However, some other designated setback width such as the Safe Harbor setback may be used. In either case, as described above, the presence of significant wetlands adjoining a significant riparian area affects how the setback is applied. Goal 5 states that "where the riparian corridor includes all or portions of a significant wetland..., the standard distance to the riparian corridor boundary shall be measured from, and include, the upland edge of the wetland." The net effect is that significant wetlands **which contain significant riparian resources** must be protected by a setback equal to the setback that would be used to protect those riparian reaches (whether that setback is the riparian width contained in this report, or some other setback determined by local ordinance). Table A5, Appendix 2 shows which riparian reaches are associated with significant wetlands.

Riparian reaches, locations, and Goal 5 and Goal 17 resources

Table A6, Appendix 2 describes the riparian areas inventoried, their locations, and whether they are Goal 5 or Goal 17 resources. Goal 17 resources were determined from the table entitled "Rockaway Shorelands Use Priority Guidelines" in the Rockaway Beach Comprehensive Plan, page 19a. In addition, riparian areas west of Highway 101, and riparian areas around Spring Lake were added to the list of Goal 17 resources based on Goal 17 guidelines (DLCD, 1996).

The column in Table A6 (Appendix 2) headed "Contains significant resources?" shows whether any reach (section) of the riparian area (lake or stream) is a significant resource, as defined by this inventory. Where "Y" is shown, at least one reach of the area is significant, but not all reaches are necessarily significant.

Riparian area descriptions

The descriptions below apply to streams or lakes, which are generally composed of several riparian reaches. For individual reach descriptions, see the riparian inventory data sheets in Appendix 5. For locations of riparian resources, see maps in Appendix 3. **Please note that mapped locations of streams flowing through forested areas are only approximate.** Time limitations prevented exact location of the 34 drainages that flow through wooded areas within the Rockaway UGB.

CHA: This perennial stream feeds the small lake in the center of the new development at Tillamook Avenue and North 12th (the riparian code was taken from Charlotte Street, just south of the stream). It is the only stream shown between Lake Lytle and Crescent Lake on the USGS map and ODF fish use maps for Rockaway. The ODF fish use maps show the stream as a small game fish (Type F) stream, but it is not listed as essential salmon habitat. The portion of this stream east of Tillamook Avenue was channelized fairly recently (about 15 or 20 years ago, according to local residents). A solid stand of young alder surrounded the channelized stream in the 1997 airphotos; all but a thin strip of alder has been removed since 1997, leaving a single line of young alder about 15 feet wide as the only woody vegetation along the stream channel. Water and sewer lines were being placed for the surrounding residential development during our field work on this study.

CHA changes character when it enters the significant wetland "CRESC," just west of Lake Boulevard. However, due to time limitations, the section of the stream within the wetland was not inventoried separately. The inventoried reaches (east of Lake Boulevard) were nonsignificant mainly due to surrounding development and removal of riparian vegetation. **The portion of CHA west of Lake Boulevard retains all its natural riparian vegetation and has no surrounding development; it is a significant riparian resource** and is marked as such on Map 3.

CLE: This riparian area includes **Clear Lake**, the ditches that feed it from the north and south, and its outlet, Saltair Creek. Inflow into the lake is mainly through channelized drainages (CLE1,CLE2, CLE3, HEI5, HEI6, and HEI7), and outflow is also channelized (CLE6, CLE7).

CRE: This riparian area consists of the shores of **Crescent Lake** and its outflow. Riparian vegetation is largely intact on the south and east sides of the lake and along the outflow (except adjacent to Lake Boulevard). On the west side of the lake, the reach is somewhat impacted by development along Highway 101.

FIN: Finney Creek originates outside the UGB, and flows northwest from the corner of the North 4th right-of-way and Palisade, through the Timberlake development. There is an apparent error on the Garibaldi USGS 7.5 minute quadrangle, which shows this portion of Finney Creek as "Spring Creek". (The course of Spring Creek east of the UGB and south of North Third is correctly shown on the USGS quad.) Spring Creek is the only listed essential salmon habitat stream in the Rockaway Beach area, so this error is of some importance.

HEI: Heitmiller Creek originates far outside the UGB, and enters the city flowing northwest at Juniper, halfway between Washington and Victoria. The USGS map incorrectly shows Heitmiller Creek as turning southwest at the east end of Victoria; in fact, it turns northwest and flows northwest to the Nature Conservancy preserve between Washington and South 6th. A branch of Heitmiller Creek flows in from the northeast and joins the main creek in the preserve. Heitmiller Creek is shown on ODF fish use maps as a medium Type F (fish-bearing) stream. Although Heitmiller Creek is often riprapped as it flows through the residential area south of the Preserve, and has little riparian vegetation, water quality in this stream is important to fish and other wildlife and also to the maintenance of the Nature Conservancy preserve.

LYT: This riparian area includes **Lake Lytle** and all of the streams which flow through the extensive significant wetland to the south and east of Lake Lytle. As described in **Riparian map preparation** above, stream reaches which fell inside this large significant wetland were not inventoried or mapped separately. At least nine streams feed Lake Lytle from the south and east (from south to north: UNA, UNB, FIN, UNR, UNS, STE1A, STE1B, UNT, and UNU), so **this riparian/wetland complex is the largest single significant wetland and riparian resource in the City of Rockaway**. Most of the streams are relatively undisturbed within the UGB. Logging occurred long enough ago that many of the second growth conifers are now large. However, more recent and extensive logging has removed much riparian vegetation in the area east of the UGB. The only streams of this complex that are shown on USGS and ODF maps are Finney Creek (which, according to state agency staff, is incorrectly labeled as "Spring Creek"), and the two branches of Steinhilber Creek (south and north branches, coded STE1A and STE1B respectively). Because the other streams feeding Lake Lytle are relatively small, they were not assigned significant riparian status in this study. However, as described in **Criteria for**

significant riparian resources above, **protection of a minimal buffer of 50 feet is recommended for all of the drainages in this area.**

MAC: McMillan Creek is a substantial perennial stream that flows west under Highway 101 from north of Neah-Kah-Nie High School. It is culverted under 101 just north of Beach Street, and from there flows west into Nedonna Lake. From the lake it flows north through a dredged canal to the Nehalem River outside the UGB. This area has been subject to frequent flooding in the past 50 to 60 years (Brophy, 1998). McMillan Creek is rated as a Medium fish-bearing (Type F) stream by ODF. Several tributaries flow into McMillan Creek, including (from the south): UNJ, UNH, UNG, UNF, UNE, UND, and UNC.

MAR: This riparian area includes **Lake Marie** and two small ponds west of Highway 101. The ponds and lake are probably remnants of a larger wetland area that was fragmented and largely filled for construction of Highway 101. The only surface water connection to the lake and ponds appears to the ditch on the west side of Highway 101, which is not inventoried as a riparian resource.

MOR: Moroney Canal is the outflow from Lake Lytle, that in turn flows into Crescent Lake. It is channelized, but has a substantial significant wetland surrounding it. The large sphagnum bog surrounding this canal and extending west to Highway 101 is a rare plant community, making the riparian reach highly significant. Lack of woody vegetation here is natural; the surrounding marsh is too wet to support trees or even shrubs like willows.

NED: Nedonna Lake is divided into two reaches for the purposes of this study; the south and west sides are developed, with many impervious surfaces and little riparian vegetation. The north and east sides are undeveloped and relatively undisturbed, with intact riparian vegetation.

ROC: This riparian area includes **Rock Creek.** It also includes tributaries to Rock Creek coded ROC1C, ROC1D, ROC4, ROC5A and ROC5B. Rock Creek is the major drainage in central Rockaway. It is subject to frequent flooding and has already been highly fragmented and fairly extensively developed, so **protection of the remaining riparian areas is important.**

SPR: This riparian area includes **Spring Lake** at the south end of Rockaway Beach, and the two drainages that flow into it, Spring Creek (SPR1 and SPR2) which flows west just south of Victoria and then southwest into Spring Lake, and an unnamed drainage, SPR4, which flows into Spring Lake from the north. Note: another drainage named Spring Creek flows into Lake Lytle from the SE; it is coded as UNB in this inventory to avoid confusion.

STE: Steinhilber Creek flows into Lake Lytle from the foothills of the Coast Range. The north and south branches of this creek join in the extensive forested wetlands east of Lake Lytle. Steinhilber Creek is a medium Type F (fish-bearing stream) and worthy of careful protection, as it is one of only two prominent drainages east of Lake Lytle.

UNA: Unnamed stream A flows northwest from Nehalem to Lake Lytle. The sphagnum bog north of the City Park is a rare plant community and a significant riparian resource; it is part of this riparian area. Unnamed stream A appears to flow through multiple channels by the time it reaches North Sixth, and may in fact join Unnamed stream B (also known as Spring Creek) somewhere between North Fourth and North Sixth. Drainage patterns in this area are complex and it was not possible to precisely map the multiple-channel watercourses. Residential development is increasing rapidly along this drainage between Nehalem and North Fourth.

UNB: This is **Unnamed stream B, also known as Spring Creek,** which flows west from the corner of North Third and Palisade, then turns northwest at the Keel right-of-way and flows northwest until it reaches Lake Lytle. According to ODFW and DSL agency personnel, this appears to be the Spring Creek that is the only listed essential salmon habitat stream in Rockaway Beach. Residential development is increasing rapidly along this drainage between North Third and North Fourth. This stream appears to flow through multiple channels by the time it reaches North Sixth; it was not possible to precisely map the watercourse due to time and access limitations.

UNC: Unnamed stream C is a small-to-medium-sized drainage flowing under Highway 101 into the Nedonna Beach area.

UND: Unnamed stream D is a small-to-medium-sized drainage flowing under Highway 101 into the Nedonna Beach area.

UNE: Unnamed stream E is a small drainage flowing under Highway 101 into the Nedonna Beach area.

UNF: Unnamed stream F is a small drainage flowing under Highway 101 into the Nedonna Beach area.

UNG: Unnamed stream G is shown on ODF fish use maps as a small Type F (fish-bearing) stream. It flows under Highway 101 into the Nedonna Beach area. UNB changes character when it enters the significant wetland "MAC5A," just west of Highway 101. However, due to time limitations, the section of the stream within the wetland was not inventoried separately. The inventoried reach UNG-2 (just east of Hwy. 101) was nonsignificant mainly due to surrounding development and removal of riparian vegetation. **The portion of UNG within wetland MAC5A west of Hwy. 101 retains all its natural riparian vegetation and has no surrounding development; it is a significant riparian resource** and is marked as such on Map 3.

UNH: Unnamed stream H is a small stream flowing under Highway 101 into the Nedonna Beach area.

UNJ: Unnamed stream J is a small-to-medium-sized stream flowing under Highway 101 into the Nedonna Beach area.

UNL: Unnamed stream L is a small stream that originates west of Necarney and north of the development at Tillamook and North 12th. It flows underground for part of its length. It flows into the large wetland area southeast of Crescent Lake.

UNM: Unnamed stream M is a small-to-medium-sized stream flowing west through the undeveloped land east of Crescent Lake. It is culverted under Necarney at about North 15th, and flows into the large wetland area southeast of Crescent Lake.

UNN: Unnamed stream N is a small stream culverted under Necarney at about North 17th. It flows into the large wetland area southeast of Crescent Lake.

UNO: Unnamed stream O is a small stream. Its south branch (UNO1) is culverted under Tillamook Avenue at about North 19th. It flows into the large wetland area east of Crescent Lake. The north branch of UNO (coded UNO3) springs from underground about 150 feet east of Tillamook Avenue and is culverted under Tillamook at about North 20th.

UNP: Unnamed stream P is a small-to-medium-sized stream culverted under Tillamook Avenue at about North 22nd. It appears to spring from underground a short distance east of Tillamook Avenue, but time limitations prevented investigation of its possible course upstream of that point. It flows into the wetland area east of Crescent Lake.

UNQ: Unnamed stream Q is a small stream culverted under Lake Boulevard at about North 24th. It flows into the wetland/upland mosaic east of Crescent Lake.

UNR: Unnamed stream R is one of at least seven streams flowing into the extensive forested wetland east of Lake Lytle. It is a tributary to Finney Creek and is a small stream.

UNS: Unnamed stream S is one of at least seven streams flowing into the extensive forested wetland east of Lake Lytle. It appears to be a tributary to Finney Creek and is a small stream.

UNT: Unnamed stream T is one of at least seven streams flowing into the extensive forested wetland east of Lake Lytle. It is a small stream.

UNU: Unnamed stream U flows west/southwest into the Lake Lytle wetlands, just south of the development at Tillamook and North 12th. It is a small stream, one of at least seven streams flowing into the extensive forested wetland east of Lake Lytle.

Team qualifications

Laura Brophy, owner of Green Point Consulting, provides consulting services to public and private clients in western Oregon. Her focus is on environmental problem-solving using the disciplines of applied plant ecology, resource management, wetland ecology, and biostatistics. Ms. Brophy has 19 years of professional experience in interpreting landscape and vegetation patterns. She gained this experience in a variety of landscapes, including Pacific Northwest coastal rainforests, Willamette Valley prairies and wetlands, Pacific Coast estuaries, tropical rainforests, Midwestern native prairies, high-altitude and high desert scrub-shrub communities, agricultural systems.

In recent years Ms. Brophy has maintained a geographic focus on western Oregon. Her recent projects have included watershed assessment, inventory and assessment of wetlands and riparian areas, plant community analysis, wetland mitigation design and delineation, native plant community restoration, and control of invasive plant species. As consultant or contractor, Ms. Brophy emphasizes close communication with clients and other stakeholders, as well as high-quality, user-friendly products, to ensure project success.

Loverna Wilson, Environmental Consultant, is a sole proprietorship owned by M. Loverna Wilson, with primary focus on wetland and plant ecology. Loverna has worked as a **wetland scientist and botanist** in Oregon for 22 years, the last 17 years for her own business. Loverna has been responsible for a wide variety of studies involving wetland delineation, plant community analysis, habitat type sampling, aerial photo interpretation, vegetation mapping, impact assessment and mitigation design. She also has designed and conducted long-term monitoring studies of community development and succession in upland and wetland settings. In addition, she is a plant taxonomist familiar with the plant communities of much of the northwestern United States.

Ms. Wilson frequently teaches classes and workshops in plant identification, and also conducts threatened and endangered species surveys. She is a skilled communicator in the public involvement process. Wetland-related studies have comprised a major part of her work during the past eleven years. She conducts wetland determinations and delineations, local wetland and riparian inventories, and wetland functional assessments, as well as providing impact assessments, mitigation design, and assistance with the wetland removal/fill permitting process.

Literature cited

Brophy, Laura. 1999. Wetland Delineation: Cedar Creek Subdivision, Rockaway Beach, Oregon. DSL Det. # 99-0253.

Brophy, Laura, and Loverna Wilson. 1998. Wetland Delineation: Nedonna Beach Subdivision Phases 2, 3 and 4. Rockaway Beach, Oregon. DSL Det. # 98-0109.

Brophy, Laura. 1996. Wetland Delineation: Donnemuir (aka Beachwood) Estates, Rockaway Beach, Oregon. DSL Det. # 96-0510.

Christy, John. 1993. Classification and Catalog of Native Wetland Plant Communities in Oregon. 68 pages. Available from Oregon Natural Heritage Program, 821 SE 14th Avenue, Portland, OR. 97214, (503) 731-3070.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. US Fish and Wildlife Service, Biological Services Program, Document FWS/OBS-79/31.

DEQ (Oregon Department of Environmental Quality). 1998. Oregon's Public Comment Draft 1998 Water Quality Limited Streams – 303(d) List.

DLCD (Oregon Department of Land Conservation and Development). 1998. Procedures and Requirements for Complying with Goal 5, Oregon Administrative Rules, Division 23, 1998 compilation.

DLCD (Oregon Department of Land Conservation and Development). 1996. Goal 5: Open Spaces, Scenic and Historic Areas, and Natural Resources *and* Goal 17: Coastal Shorelands *in* Oregon's Statewide Planning Goals and Guidelines.

DSL (Oregon Division of State Lands). 1999. Administrative rules for identifying significant wetlands. ORS 141-86, available at http://arcweb.sos.state.or.us/rules/oar_default.html

DSL (Oregon Division of State Lands). 1998. Urban Riparian Inventory and Assessment Guide: A Tool for Oregon Land Use Planning.

DSL (Oregon Division of State Lands). 1996. Oregon Freshwater Wetland Assessment Methodology.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Technical report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Nickelson, T.E., J.D. Rodgers, S.L. Johnson, and M.F. Solazzi. 1992. Seasonal changes in habitat use by juvenile coho salmon (*Onchorhynchus kisutch*) in Oregon coastal streams. Canadian Journal of Fisheries and Aquatic Science 49: 783-789.

Oregon Fish Commission. 1961. Coastal Lake Studies, Part II, Lake Lytle.

Reed, P.B., Jr. 1993. 1993 Supplement to List of Plant Species that Occur in Wetlands: Northwest (Region 9). U.S. Fish and Wildlife Service, Supplement to Biological Report 88 (26/9). 6 pp.

Reed, P.B., Jr. 1988. National List of Plant Species that Occur in Wetlands: Northwest (Region 9). U.S. Fish and Wildlife Service, Biological Report 88 (26/9). 244 pp.

Soil Conservation Service. 1964. Soil Survey of Tillamook Area, Oregon. USDA Soil Conservation Service, in cooperation with Oregon Agricultural Experiment Station.

Soil Conservation Service. 1989. Hydric Soils in Tillamook County Area, Oregon. USDA Soil Conservation Service, May 31, 1989.

Wilson, Loverna, and Laura Brophy. 1996a. Wetland Determination and delineation for N. 6th Avenue Extension, Timberlake Project, Rockaway Beach, Oregon.

Wilson, Loverna, and Laura Brophy. 1996b. Wetland Determination and delineation for N. 4th Avenue Sanitary Sewer, Rockaway Beach, Oregon.

Appendix 1. Wetland Summary Sheets

The following pages present summary sheets for the wetlands identified during this LWI. Wetlands included are:

LWI wetland code	Description
CHA2	Pond at Tillamook and N. 12th
CRESC	Crescent Lake and surrounding wetlands
LYTLE	Lake Lytle and surrounding wetlands
MAC2	McMillan Creek, wetlands east of Highway 101
MAC4	McMillan Creek, wetlands W of Hwy. 101, from Beach Street N to Adah Hidy St., including Nedonna Lake
MAC5A	McMillan Creek wetlands W of Hwy 101, from Ada Hidy Street N to Western Street r/o/w
MAC5B	wetlands on E and W side of Evergreen Street in Nedonna Beach development
MAC5C	wetlands in Nedonna Beach development; E of McMillan Creek, from Riley Street N to Section Line St.
MAC5D	wetlands in Nedonna Beach development; W of McMillan Creek, from Riley Street N to Section Line St.
MAN1	Manhattan Beach wayside, wetlands just W of entrance road at N end of wayside
UNA2	wetlands and mitigation site at SE corner of Juniper and N 3rd
UNA/B	wetlands between N 3rd and N 6th, associated with Unnamed Streams A and B (stream B is also known as Spring Creek); flowing to Lake Lytle
UNB1	wetlands along Unnamed Stream B (also known as Spring Creek), N 3rd to N 4th, Palisade to Juniper St.
UND2	wetland on W side of Hwy. 101, in ravine cut by Unnamed Stream D
UNF1	small wetland on E side of Hwy. 101, N of Scenic View Drive
UNH2	wetlands on E side of Hwy 101, N of Nedonna Lake
UNJ2	wetlands on E side of Hwy 101, directly E of Nedonna Lake
UNK1	small wetland at Necarney and N 12th
UNO2	wetland at NE corner of Tillamook and N. 18th

Appendix 2. Tables of wetland and riparian resources

LWI wetland code	Goal 5 or Goal 17?*	Year inventoried	Acreage**	Map #	Description
HA2		1999	0.5A	3	Pond at Tillamook and N. 12th
CLE1	5	1994		4	wetlands north of Clear Lake, between S. 2nd and S. 3rd
CLE2	5	1994		4,5	wetlands north of Clear Lake, between S. 4th and S. 3rd
LEAR	17	1994		5	Clear Lake and associated wetlands
RESC	17	1999	85A	2	Crescent Lake and surrounding wetlands
HEI2-3	5	1994		5	The Nature Conservancy preserve
HEI4		1994		5	ditch and wetlands W of Hwy. 101, west of TNC preserve
HEI5		1994		5	wetlands along channelized outflow N of TNC preserve, both sides of Front Street
HEI6A		1994		5	wetlands along channelized outflow N of TNC preserve, between Beacon and Coral
HEI6B		1994		5	wetlands N of TNC preserve, between Dolphin and Easy Street
LYTLE	17	1999	119A	3;4	Lake Lytle and surrounding wetlands
MAC2	5	1999	3.7A	2	McMillan Creek, wetlands east of Highway 101
MAC4	17	1999	5.7A	1	McMillan Creek, wetlands W of Hwy. 101, from Beach Street N to Adah Hidy St., including Nedonna Lake
MAC5A	17	1999	4.1A	1	McMillan Creek wetlands W of Hwy 101, from Ada Hidy Street N to Western Street r/o/w
MAC5B	17	1999	1.3A	1	wetlands on E and W side of Evergreen Street in Nedonna Beach development
MAC5C	17	1999	5.8A	1	wetlands in Nedonna Beach development; E of McMillan Creek, from Riley Street N to Section Line St.
MAC5D	17	1999	5.1A	1	wetlands & mitigation site in Nedonna Beach development; W of McMillan Creek, from Riley Street N to Section Line St.
MAN1	17	1999	0.4A	1,2	Manhattan Beach wayside, wetlands just W of entrance road at N end of wayside
MAR1	5	1994		5	wetlands just N of Minnehaha and W of Front Street
MAR2		1994		5	Lake Marie
MAR3		1994		5	ponds and ditches on W side of Hwy. 101, between Minnehaha and Washington
ROC1B	5	1994		4	wetlands on E side of Rock Creek, W of Rock Creek Road
ROC2	5	1994		4	ponds S of S 2nd, Marine St. to Palisade
OC3	5	1994		4	wetlands along Rock Creek between Keel and Marine St., S 2nd to S 3rd
ROC5A		1994		4	wetlands along tributary to Rock Creek, between Keel and Marine St., S 2nd to Nehalem
5B		1994		4	wetlands along tributary to Rock Creek, between Harbor and Keel, S 2nd to Nehalem
ROC6A		1994		4	wetland between Juniper and Keel, S of S 2nd
ROC6B		1994		4	two small wetlands between Grayling and Island, S of S 2nd
ROC7	5	1994		4	wetlands along Rock Creek between Easy and Harbor, S 2nd to Nehalem
ROC8	5	1994		4	wetlands between Beacon and Coral, S. 2nd to Nehalem
ROC10		1994		4	Seaview Lake
ROC11		1994		4	small wetland between Nehalem and N. 3rd, W side of Dolphin
ROC12		1994		4	small wetland between Nehalem and N. 3rd, E side of Dolphin
SPR2	5	1994		5	Spring Creek (flowing into Spring Lake), extensive wetlands S of Minnehaha (mostly outside UGB)
SPR3	5	1994		5	Spring Lake and associated wetlands to E (mostly outside UGB)
SPR4	5	1994		5	wetlands along unnamed stream flowing into Spring Lake from the N, between Pansy and Hollyhock
UNA2	5	1999	0.5A	4	wetlands and mitigation site at SE corner of Juniper and N 3rd
UNA/B	5	1999	33A	4	wetlands flowing to Lk. Lytle between N 3rd and N 6th, associated with Unnamed Streams A and B (stream B is also known as Spring Creek)
UNB1	5	1999	2.5A	4	wetlands along Unnamed Stream B (also known as Spring Creek), N 3rd to N 4th, Palisade St. to Juniper St.
UND2	17	1999	0.06A	1	wetland on W side of Hwy. 101, in ravine cut by Unnamed Stream D
UNF1		1999	0.1A	1	small wetland on E side of Hwy. 101, N of Scenic View Drive
UNH2	5	1999	1.7A	1	wetlands on E side of Hwy 101, N of Nedonna Lake
UNJ2	5	1999	5.7A	1	wetlands on E side of Hwy 101, directly E of Nedonna Lake
UNK1		1999	0.2A	3	small wetland at Necarney and N 12th
UNO2	5	1999	1.1A	2	wetland at NE corner of Tillamook and N. 18th

* Applies only to wetlands that were determined to be significant for Goal 5 and Goal 17 purposes

Goal 17 resources determined from list of shorelands in "Rockaway Shorelands Use Priority Guidelines", p.19a of Rockaway Comprehensive Plan

acreage determined only for wetlands inventoried during the current LWI

Spring Lake is not listed on the Rockaway Shorelands Use Priority Guidelines table, but appears to fall within the Goal 17 study area (which includes coastal lakes)

TABLE A3. WETLAND SIGNIFICANCE DETERMINATION

Wetland Code	Size (acres)	SIG	NOT SIG	Reasons/Comments
CHA 2			X	Meets no significance criteria.
CLE 1		X		High hydrologic control function.
CLE 2		X		High hydrologic control function.
CLEAR		X		High quality wildlife habitat and hydrologic control; zoned a Significant Wetlands Area (SA) by the City.
CRESC		X		High quality wildlife habitat and fish habitat; has an large and uncommon Laborador tea/sphagnum bog community; zoned a Significant Wetlands Area (SA) by the City.
HEI 2-3		X		High quality fish habitat and hydrologic control; contains an uncommon old-growth cedar/skunk cabbage wetland (TNC); zoned SA by the City.
HEI 4			X	Meets no significance criteria.
HEI 5			X	Meets no significance criteria.
HEI 6A			X	Meets no significance criteria.
HEI 6B			X	Meets no significance criteria.
LYTLE		X		High quality wildlife habitat and fish habitat; zoned SA by the City.
MAC 2		X		High quality wildlife habitat and fish habitat.
MAC 4		X		High quality wildlife habitat and hydrologic control; zoned SA by the City.
MAC 5A		X		High quality fish habitat and hydrologic control; zoned SA by the City.
MAC 5B		X		High hydrologic control; zoned SA by the City.
MAC 5C		X		High quality fish habitat and hydrologic control; zoned SA by the City.

Wetland Code	Wildlife Habitat	Fish Habitat	Water Quality	Hydrologic Control	Sensitivity to Impact	Enhancement Potential	Education	Recreation	Aesthetic Quality	Size (acres)
MAR 3	M	M	M	M	M	H	M	M	M	
ROC 1B	M	H	M	M	M	H	M	L	L	
ROC 2	M	H	M	M	M	H	H	M	H	
ROC 3	M	H	M	H	M	H	H	M	M	
ROC 5A	M	M	M	M	M	H	H	M	L	
ROC 5B	M	M	M	M	M	H	H	M	L	
ROC 6A	M	M	M	L	M	M	M	M	M	
ROC 6B	M	M	M	M	M	H	M	M	M	
ROC 7	M	M	M	H	M	H	M	M	M	
ROC 8	M	M	M	H	M	H	M	M	M	
ROC 10	M	M	M	M	M	H	M	M	H	
ROC 11	M	0	M	L	M	L	M	M	M	
ROC 12	M	0	M	L	M	L	M	M	M	
SPR 2	M	H	M	H	M	H	L	H	L	
SPR 3	H	H	M	M	H	L	H	H	M	
SPR 4	M	M	M	H	M	M	H	H	M	
UNA 2	M	H	M	M	M	H	M	M	M	
UNA/B	H	H	M	H	M	0	H	H	H	
UNB 1A	M	H	M	M	M	H	M	M	L	
UNB 1B	M	H	M	M	M	H	M	M	M	
UND 2	M	H	M	L	M	M	M	L	L	

Wetland Code	Size (acres)	SIG	NOT SIG	Reasons/Comments
SPR 4		X		High hydrologic control.
UNA 2		X		High quality fish habitat.
UNA/B		X		High quality wildlife, fish habitat, and hydrologic control; has an uncommon Laborador tea/sphagnum bog community adjacent to City Park.
UNB 1A		X		High quality fish habitat.
UNB 1B		X		High quality fish habitat.
UND 2		X		High quality fish habitat.
UNF 1			X	Meets no significance criteria.
UNH 2		X		High quality wildlife habitat and fish habitat.
UNJ 2		X		High quality wildlife habitat, fish habitat, and hydrologic control.
UNK 1			X	Meets no significance criteria.
UNO 2		X		High quality fish habitat.

Table A4.

LSW Criteria Checklist

Evaluating Wetland # _____ City: _________

A. "OUT" Test

Wetlands that score "Yes" in any of the following categories do NOT proceed to Section B:

Y	N	
		Wetlands ARTIFICIALLY CREATED ENTIRELY FROM UPLAND that are: (a) created for the purpose of controlling, storing, or maintaining stormwater; (b) active surface mining or active log ponds; (c) ditches without free & open connection to waters of the state AND w/o fish (d) < 1 acre and unintentionally created from irrigation leak or construction activity (e) created for the purpose of wastewater treatment, cranberry production, stock watering, settling of sediment, cooling industrial water, or as a golf course hazard
		Documented as being contaminated by hazardous substances, materials or wastes ("Hazmat sites")

B. "IN" **Those that meet ONE OR MORE of the following criteria are LSWs.**

Y	N	
		Wetlands that score the highest rank (stated in italics below) for <u>any</u> of the four ecological functions addressed by OFWAM or equivalent methodology: ____ *diverse* wildlife habitat, ____ *intact* fish habitat, ____ *intact* water quality, or ____ *intact* hydrologic control.
		Wetlands that are rated in the second highest functional category for water quality (called *impacted or degraded* in OFWAM), <u>AND</u> that occur within 1/4 mile of a water quality-limited stream listed by DEQ.
		Contain one or more rare/uncommon wetland plant communities in Oregon. (Most concise list is found as Appendix G in OFWAM).
		Inhabited by any species listed by the federal or state government as a sensitive, threatened or endangered species in Oregon (unless consultation w/appropriate agency deems the site not important for the maintenance of the species).
		Wetland rates in the second highest functional category for fish habitat (called *impacted or degraded* in OFWAM), and has a surface water connection to a stream segment that is mapped by ODFW as habitat for "indigenous anadromous salmonids."
		Optional Criterion (local discretion): Wetland represents a *locally* unique plant community.
		Optional Criterion (local discretion): Wetland rates in highest category for education potential (it must be publicly owned to rank that in OFWAM) and there is documented use for educational purposes by a school or organization.

TABLE A2. RESULTS OF WETLAND FUNCTIONAL ASSESSMENT (OFWAM)

Wetland Code	Wildlife Habitat	Fish Habitat	Water Quality	Hydrologic Control	Sensitivity to Impact	Enhancement Potential	Education	Recreation	Aesthetic Quality	Size (acres)
CHA 2	M	M	M	M	M	M	M	L	M	
CLE 1	M	M	M	H	M	H	M	M	M	
CLE 2	M	M	M	H	M	H	M	M	M	
CLEAR	H	M	M	H	M	0	M	M	H	
CRESC	H	H	M	M	M	0	H	H	H	
HEI 2-3	M	H	M	H	M	H	M	M	M	
HEI 4	M	0	M	M	M	M	M	M	M	
HEI 5	M	M	M	M	M	H	H	M	M	
HEI 6A	M	M	M	M	M	H	M	M	M	
HEI 6B	M	0	M	L	M	L	M	M	M	
LYTLE	H	H	M	M	M	0	H	H	H	
MAC 2	H	H	M	M	M	0	M	M	H	
MAC 4	H	M	M	H	M	0	M	M	H	
MAC 5A	M	H	M	H	M	H	M	M	L	
MAC 5B	M	0	M	H	M	M	M	M	M	
MAC 5C	M	H	M	H	M	H	M	M	M	
MAC 5D	M	H	M	M	M	H	M	H	H	
MAN 1	M	0	M	M	M	M	H	H	H	
MAR 1	M	0	M	H	M	M	M	L	L	
MAR 2	M	M	M	M	M	H	M	M	M	

Wetland Code	Size (acres)	SIG	NOT SIG	Reasons/Comments
MAC 5D		X		High quality fish habitat; has wetland mitigation site in compensation for wetlands lost during construction in the vicinity; zoned SA by the City.
MAN 1		X		Has an uncommon shore pine/slough sedge vernal pool community on site; part of Manhattan Beach Wayside.
MAR 1		X		High hydrologic control.
MAR 2			X	Meets no significance criteria.
MAR 3			X	Meets no significance criteria.
ROC 1B		X		High quality fish habitat.
ROC 2		X		High quality fish habitat.
ROC 3		X		High quality fish habitat and hydrologic control.
ROC 5A			X	Meets no significance criteria.
ROC 5B			X	Meets no significance criteria.
ROC 6A			X	Meets no significance criteria.
ROC 6B			X	Meets no significance criteria.
ROC 7		X		High hydrologic control.
ROC 8		X		High hydrologic control.
ROC 10			X	Meets no significance criteria.
ROC 11			X	Meets no significance criteria.
ROC 12			X	Meets no significance criteria.
SPR 2		X		High quality fish habitat and hydrologic control.
SPR 3		X		High quality wildlife habitat and fish habitat; zoned SA by the City.

Wetland Code	Wildlife Habitat	Fish Habitat	Water Quality	Hydrologic Control	Sensitivity to Impact	Enhancement Potential	Education	Recreation	Aesthetic Quality	Size (acres)
UNF 1	M	0	L	L	M	M	M	L	M	
UNH 2	H	H	M	M	M	0	M	L	L	
UNJ 2	H	H	M	H	M	0	M	L	M	
UNK 1	M	M	M	L	M	M	M	L	L	
UNO 2	M	H	M	L	M	M	M	L	L	

Rockaway Beach Riparian and Wetland Inventory, November. 1999

Table A5. Correspondence of wetland codes and riparian reach codes

SIGNIFICANT RESOURCES IN **LARGE, BOLD TYPE**

For riparian reaches, significant/nonsignificant determination refers to both R and L banks, unless otherwise noted under reach code

R and L banks are defined as right and left banks looking downstream

Riparian reach code		Wetland code	Riparian reach code		Wetland code
R-CHA	1	none	R-ROC	7L	**ROC7**
R-CHA	2	CHA2	**R-ROC**	**7R**	**ROC7**
R-CLE	1	**CLE1**	none		**ROC8**
R-CLE	2	**CLE2**	R-ROC	9	none
R-CLE	3	**CLEAR**	R-ROC	10	ROC10
R-CLE	**5**	**CLEAR**	none		ROC11
R-CLE	**6**	**CLEAR**	none		ROC12
R-CLE	7	none	**R-SPR**	**1**	none
R-CRE	**2**	**CRESC**	**R-SPR**	**2**	**SPR2**
R-CRE	**3**	**CRESC**	**R-SPR**	**3**	**SPR3**
R-FIN	**1**	**LYTLE**	**R-SPR**	**4**	**SPR4**
R-HEI	1	none	**R-STE**	**1A**	**LYTLE**
R-HEI	**2L**	**HEI2-3**	**R-STE**	**1B**	**LYTLE**
R-HEI	2R	**HEI2-3**	**R-UNA**	**1A**	none
R-HEI	**3**	**HEI2-3**	R-UNA	1B	none
none		HEI4	**R-UNA**	**2**	**UNA2**
R-HEI	5	HEI5	R-UNA	3	**UNA/B**
R-HEI	6	HEI6A	**R-UNA**	**4**	**UNA/B**
none		HEI6B	**R-UNA**	**5**	**UNA/B**
R-HEI	**7**	**CLEAR**	**R-UNA**	**6**	**UNA/B**
R-LYT	**1**	**LYTLE**	**R-UNB**	**1**	**UNB1A, UNB1B**
R-LYT	**2**	**LYTLE**	**R-UNB**	**2**	**UNA/B**
R-MAC	**1L**	none	**R-UNB**	**3**	**UNA/B**
R-MAC	1R	none	**R-UNC**	**1**	none
R-MAC	**2**	**MAC2**	**R-UND**	**1**	none
R-MAC	**3**	**MAC4**	**R-UND**	**2**	**UND2**
R-MAC	**4**	**MAC4**	R-UNE	1	none
R-MAC	5L	**MAC5A, 5C, 5D**	R-UNF	1	UNF1
R-MAC	**5R**	**MAC5A, 5C, 5D**	**R-UNG**	**1**	none
none		**MAC5B**	R-UNG	2	none
none		**MAN1**	R-UNH	1	none
none		**MAR1**	R-UNH	2	**UNH2**
R-MAR	2	MAR2	**R-UNJ**	**1**	none
R-MAR	3	MAR3	**R-UNJ**	**2**	**UNJ2**
R-MOR	**1**	CRESC	none		UNK1
R-NED	1	**MAC4**	R-UNL	1	**CRESC**
R-NED	**2**	**MAC4**	**R-UNM**	**1**	none
R-ROC	**1A**	none	**R-UNM**	**2**	none
R-ROC	1B-L	**ROC1B**	**R-UNM**	**3**	**CRESC**
R-ROC	**1B-R**	**ROC1B**	R-UNN	1	none
R-ROC	**1C-L**	none	**R-UNN**	**2**	**CRESC**
R-ROC	1C-R	none	R-UNO	1	none
R-ROC	1D	none	none		**UNO2**
R-ROC	**2**	**ROC2**	R-UNO	3	none
R-ROC	**3**	**ROC3**	**R-UNP**	**1**	none
R-ROC	4	none	R-UNQ	1	none
R-ROC	5A	ROC5A	R-UNR	1	none
R-ROC	5B	ROC5B	R-UNS	1	none
R-ROC	6	ROC6A	R-UNT	1	none
none		ROC6B	R-UNU	1	none

Rockaway Beach Riparian Inventory, November 1999

Table A6. Riparian codes, descriptions, locations, and Goal 5 or Goal 17 resources

Reach code	Description	Location	Y/N: Contains significant resources?*	Goal 5 or Goal 17 Resource?[a]
R-CHA	stream flowing into pond at Charlotte and N 12th	Charlotte & N 12th	N	n/a
R-CLE	Clear Lake and its outflow (Saltair Crk.)	S 4th to S 6th	Y	17
R-CRE	Crescent Lake and its outflow	S of Lake Blvd	Y	17
R-FIN	Finney Creek	N 3rd to Lake Lytle	Y	5
R-HEI	Heitmiller Creek and TNC Preserve	Victoria Ave. to The Nature Conservancy Preserve	Y	5
R-LYT	Lake Lytle	N 6th to N 12th	Y	17
R-MAC	MacMillan Creek (canal)	flows from E of Hwy. 101 into Nedonna Beach	Y	E of 101: 5 W of 101: 17
R-MAR	Lake Marie and ponds W of Hwy. 101	Washington St. to Minnehaha	N	n/a
R-MOR	Moroney Canal	connects Lake Lytle to Crescent Lk.	Y	17
R-NED	Nedonna Lake	Nedonna Beach	Y	17
R-ROC	Rock Creek, small tributaries to Rock Cr., and Seaview Lake	S 3rd to N 2nd	Y	5
R-SPR	Spring Lake and Spring Creek (flowing into Spring Lake)	Pansy to Minnehaha (mostly outside UGB)	Y	Spring Cr. 5 Spring lake: 17
R-STE	Steinhilber Creek	E of Lake Lytle	Y	5
R-UNA	Unnamed stream A	Nehalem to Lake Lytle	Y	5
R-UNB	Unnamed stream B: Spring Creek (flowing into Lake Lytle)	N 3rd to Lake Lytle	Y	5
R-UNC	Unnamed stream C	N of Neahkahnie High School;E of Hwy. 101	Y	5
R-UND	Unnamed stream D	N of Neahkahnie High School;E of Hwy. 101	Y	5
R-UNE	Unnamed stream E	N of Neahkahnie High School;E of Hwy. 101	N**	n/a
R-UNF	Unnamed stream F	N of Neahkahnie High School;E of Hwy. 101	N**	n/a
R-UNG	Unnamed stream G	N of Neahkahnie High School;E of Hwy. 101	Y	5
R-UNH	Unnamed stream H	N of Neahkahnie High School;E of Hwy. 101	N**	n/a
R-UNJ	Unnamed stream J	N of Neahkahnie High School;E of Hwy. 101	Y	5
R-UNL	Unnamed stream L	E of Moroney Canal, west of Necamey Ave.	N**	n/a
R-UNM	Unnamed stream M	E of Moroney Canal	Y	5
R-UNN	Unnamed stream N	E of Moroney Canal	Y	5
R-UNO	Unnamed stream O	E of Crescent Lake	N**	n/a
R-UNP	Unnamed stream P	E of Crescent Lake	Y	5
R-UNQ	Unnamed stream Q	E of Crescent Lake	N**	n/a
R-UNR	Unnamed stream R	E of Lake Lytle	N**	n/a
R-UNS	Unnamed stream S	E of Lake Lytle	N**	n/a
R-UNT	Unnamed stream T	E of Lake Lytle	N**	n/a
R-UNU	Unnamed stream U	E of Lake Lytle	N**	n/a

[a] Applies only to resources determined to be significant for Goal 5 & Goal 17 purposes (see report for details).

* "Y" indicates that at least one reach of the riparian area is significant; see Tables A7 and A8 for details.

** not a significant resource, but protection of a minimal 50 foot buffer on each side of stream is recommended.

Rockaway Beach Riparian Inventory, November 1999

Table A7. Results of riparian functional assessment

Reach name	Reach #	BANK	Water quality	Flood management	Thermal regulation	Wildlife habitat
R-CHA	1	R&L	MED	LOW	MED	MED
R-CHA	2	POND	MED	LOW	MED	LOW
R-CLE	1	L	HIGH	MED	MED	HIGH
R-CLE	1	R	HIGH	MED	MED	HIGH
R-CLE	2	L	HIGH	MED	MED	HIGH
R-CLE	2	R	HIGH	MED	MED	HIGH
R-CLE	3	L	HIGH	MED	MED	HIGH
R-CLE	3	R	HIGH	MED	MED	HIGH
R-CLE	5	LAKE	HIGH	HIGH	HIGH	HIGH
R-CLE	6	R&L	HIGH	MED	HIGH	HIGH
R-CLE	7	R&L	MED	LOW	MED	LOW
R-CRE	2	LAKE	HIGH	HIGH	HIGH	HIGH
R-CRE	3	R&L	HIGH	HIGH	MED	HIGH
R-FIN	1	R&L	HIGH	MED	HIGH	HIGH
R-HEI	1	R&L	MED	LOW	LOW	MED
R-HEI	2	L	HIGH	HIGH	HIGH	HIGH
R-HEI	2	R	MED	LOW	MED	MED
R-HEI	3	R&L	HIGH	HIGH	HIGH	HIGH
R-HEI	5	L	HIGH	MED	MED	HIGH
R-HEI	5	R	HIGH	MED	LOW	MED
R-HEI	6	R&L	MED	MED	MED	MED
R-HEI	7	R&L	HIGH	HIGH	HIGH	HIGH
R-LYT	1	LAKE	MED	MED	LOW	MED
R-LYT	2	LAKE	HIGH	HIGH	HIGH	HIGH
R-MAC	1	L	HIGH	MED	HIGH	HIGH
R-MAC	1	R	HIGH	MED	HIGH	MED
R-MAC	2	L	HIGH	MED	HIGH	HIGH
R-MAC	2	R	HIGH	MED	HIGH	HIGH
R-MAC	3	L	HIGH	MED	HIGH	HIGH
R-MAC	3	R	HIGH	HIGH	HIGH	HIGH
R-MAC	4	L	HIGH	MED	HIGH	HIGH
R-MAC	4	R	HIGH	MED	HIGH	HIGH
R-MAC	5	L	HIGH	MED	HIGH	MED
R-MAC	5	R	HIGH	MED	HIGH	HIGH
R-MAR	2	LAKE	HIGH	MED	HIGH	MED
R-MAR	3	POND	HIGH	MED	HIGH	MED
R-MOR	1	R&L	HIGH	MED	MED	HIGH
R-NED	1	POND	MED	MED	MED	MED
R-NED	2	POND	HIGH	HIGH	MED	HIGH
R-ROC	1A	R&L	MED	MED	HIGH	HIGH
R-ROC	1B	L	MED	MED	HIGH	MED
R-ROC	1B	R	HIGH	HIGH	HIGH	HIGH
R-ROC	1C	L	MED	HIGH	HIGH	HIGH
R-ROC	1C	R	MED	MED	LOW	MED
R-ROC	1D	R&L	MED	MED	HIGH	HIGH
R-ROC	2	POND	MED	MED	HIGH	HIGH
R-ROC	3	L	HIGH	MED	HIGH	HIGH
R-ROC	3	R	HIGH	HIGH	HIGH	HIGH
R-ROC	4	L	HIGH	MED	HIGH	MED
R-ROC	4	R	HIGH	MED	HIGH	HIGH
R-ROC	5A	L	HIGH	HIGH	HIGH	HIGH
R-ROC	5A	R	HIGH	MED	HIGH	HIGH
R-ROC	5B	R&L	HIGH	MED	HIGH	HIGH
R-ROC	6	R&L	MED	MED	HIGH	MED

Rockaway Beach Riparian Inventory, November 1999

Table A7. Results of riparian functional assessment

Reach name	Reach #	BANK	Water quality	Flood management	Thermal regulation	Wildlife habitat
R-ROC	7	L	HIGH	MED	MED	MED
R-ROC	7	R	HIGH	HIGH	HIGH	HIGH
R-ROC	9	R&L	MED	MED	MED	LOW
R-ROC	10	POND	HIGH	MED	HIGH	MED
R-SPR	1	L	HIGH	MED	HIGH	HIGH
R-SPR	1	R	HIGH	MED	HIGH	HIGH
R-SPR	2	R&L	HIGH	HIGH	HIGH	HIGH
R-SPR	3	LAKE	HIGH	MED	HIGH	HIGH
R-SPR	4	R&L	HIGH	HIGH	HIGH	HIGH
R-STE	1A	R&L	HIGH	HIGH	HIGH	HIGH
R-STE	1B	R&L	HIGH	HIGH	HIGH	HIGH
R-UNA	1A	R&L	HIGH	LOW	HIGH	HIGH
R-UNA	1B	R&L	HIGH	LOW	HIGH	MED
R-UNA	2	R&L	HIGH	MED	HIGH	HIGH
R-UNA	3	R&L	MED	MED	LOW	MED
R-UNA	4	R&L	HIGH	HIGH	HIGH	HIGH
R-UNA	5	BOG	HIGH	HIGH	HIGH	HIGH
R-UNA	6	R&L	HIGH	HIGH	HIGH	HIGH
R-UNB	1	R&L	HIGH	MED	HIGH	HIGH
R-UNB	2	R&L	HIGH	HIGH	HIGH	HIGH
R-UNB	3	R&L	HIGH	MED	MED	MED
R-UNC	1	L	MED	MED	HIGH	HIGH
R-UNC	1	R	MED	MED	HIGH	HIGH
R-UND	1	R&L	HIGH	MED	HIGH	HIGH
R-UND	2	R&L	MED	HIGH	HIGH	HIGH
R-UNE	1	R&L	MED	MED	HIGH	HIGH
R-UNF	1	R&L	HIGH	HIGH	HIGH	MED
R-UNG	1	R&L	MED	MED	HIGH	HIGH
R-UNG	2	R&L	MED	LOW	HIGH	MED
R-UNH	1	R&L	HIGH	MED	HIGH	HIGH
R-UNH	2	R&L	HIGH	MED	HIGH	MED
R-UNJ	1	L	MED	MED	HIGH	HIGH
R-UNJ	1	R	MED	MED	HIGH	HIGH
R-UNJ	2	R&L	HIGH	HIGH	HIGH	HIGH
R-UNL	1	R&L	HIGH	MED	HIGH	HIGH
R-UNM	1	R&L	MED	MED	HIGH	HIGH
R-UNM	2	R&L	HIGH	MED	HIGH	HIGH
R-UNM	3	R&L	HIGH	HIGH	HIGH	HIGH
R-UNN	1	R&L	MED	MED	HIGH	HIGH
R-UNN	2	R&L	HIGH	MED	HIGH	HIGH
R-UNO	1	R&L	MED	MED	HIGH	HIGH
R-UNO	3	R&L	HIGH	MED	HIGH	HIGH
R-UNP	1	R&L	HIGH	MED	HIGH	HIGH
R-UNQ	1	R&L	HIGH	MED	HIGH	HIGH
R-UNR	1	R&L	HIGH	MED	HIGH	HIGH
R-UNS	1	R&L	HIGH	MED	HIGH	HIGH
R-UNT	1	R&L	HIGH	MED	HIGH	HIGH
R-UNU	1	R&L	HIGH	MED	HIGH	HIGH

Rockaway Beach Riparian Inventory, November 1999

Table A8. Riparian significance determination, sorted by reach

Reach name	Reach #	Bank	2 of 3 functions (FM, TR, WH) rated"HIGH?"	Rare plant community?	Essential salmon habitat?	Riparian area width (1 side)	Final significance determination**
R-CHA	1	R&L	NO	NO	NO	65	NO
R-CHA	2	POND	NO	NO	NO	65	NO
R-CLE	1	L	NO	NO	NO	65	NO
R-CLE	1	R	NO	NO	NO	65	NO
R-CLE	2	L	NO	NO	NO	65	NO
R-CLE	2	R	NO	NO	NO	65	NO
R-CLE	3	L	NO	NO	NO	65	NO
R-CLE	3	R	NO	NO	NO	65	NO
R-CLE	5	LAKE	YES	NO	NO	35	YES
R-CLE	6	R&L	YES	NO	NO	65	YES
R-CLE	7	R&L	NO	NO	NO	65	NO
R-CRE	2	LAKE	YES	NO	YES	120	YES
R-CRE	3	R&L	YES	NO	YES	120	YES
R-FIN	1	R&L	YES	NO	NO	120	YES
R-HEI	1	R&L	NO	NO	NO	120	NO
R-HEI	2	L	YES	NO	NO	65	YES
R-HEI	2	R	NO	NO	NO	120	NO
R-HEI	3	R&L	YES	NO	NO	120	YES
R-HEI	5	L	NO	NO	NO	65	NO
R-HEI	5	R	NO	NO	NO	65	NO
R-HEI	6	R&L	NO	NO	NO	65	NO
R-HEI	7	R&L	YES	NO	NO	65	YES
R-LYT	1	LAKE	NO	NO	YES	35	YES
R-LYT	2	LAKE	YES	NO	YES	120	YES
R-MAC	1	L	YES	NO	NO	120	YES
R-MAC	1	R	NO	NO	NO	65	NO
R-MAC	2	L	YES	NO	NO	65	YES
R-MAC	2	R	YES	NO	NO	65	YES
R-MAC	3	L	YES	NO	NO	120	YES
R-MAC	3	R	YES	NO	NO	120	YES
R-MAC	4	L	YES	NO	NO	65	YES
R-MAC	4	R	YES	NO	NO	120	YES
R-MAC	5	L	NO	NO	NO	65	NO
R-MAC	5	R	YES	NO	NO	65	YES
R-MAR	2	LAKE	NO	NO	NO	120	NO
R-MAR	3	POND	NO	NO	NO	35	NO
R-MOR	1	R&L	NO	YES	YES	35	YES
R-NED	1	POND	NO	NO	NO	65	NO
R-NED	2	POND	YES	NO	NO	65	YES
R-ROC	1A	R&L	YES	NO	NO	120	YES
R-ROC	1B	L	NO	NO	NO	120	NO
R-ROC	1B	R	YES	NO	NO	65	YES
R-ROC	1C	L	YES	NO	NO	65	YES
R-ROC	1C	R	NO	NO	NO	120	NO
R-ROC	1D	R&L	YES	NO	NO	120	NO**
R-ROC	2	POND	YES	NO	NO	120	YES
R-ROC	3	L	YES	NO	NO	120	YES
R-ROC	3	R	YES	NO	NO	65	YES
R-ROC	4	L	NO	NO	NO	120	NO
R-ROC	4	R	YES	NO	NO	120	NO**
R-ROC	5A	L	YES	NO	NO	65	NO**
R-ROC	5A	R	YES	NO	NO	120	NO**

R-ROC	5B	R&L	YES	NO	NO	65	NO**
R-ROC	6	R&L	NO	NO	NO	65	NO
R-ROC	7	L	NO	NO	NO	65	NO
R-ROC	7	R	YES	NO	NO	65	YES
R-ROC	9	R&L	NO	NO	NO	65	NO
R-ROC	10	POND	NO	NO	NO	35	NO
R-SPR	1	L	YES	NO	NO	120	YES
R-SPR	1	R	YES	NO	NO	120	YES
R-SPR	2	R&L	YES	NO	NO	65	YES
R-SPR	3	LAKE	YES	NO	NO	120	YES
R-SPR	4	R&L	YES	NO	NO	65	YES
R-STE	1A	R&L	YES	NO	NO	120	YES
R-STE	1B	R&L	YES	NO	NO	120	YES
R-UNA	1A	R&L	YES	NO	NO	120	YES
R-UNA	1B	R&L	NO	NO	NO	120	NO
R-UNA	2	R&L	YES	NO	NO	65	YES
R-UNA	3	R&L	NO	NO	NO	65	NO
R-UNA	4	R&L	YES	NO	NO	65	YES
R-UNA	5	BOG	YES	YES	NO	120	YES
R-UNA	6	R&L	YES	NO	NO	35	YES
R-UNB	1	R&L	YES	NO	YES	65	YES
R-UNB	2	R&L	YES	NO	YES	65	YES
R-UNB	3	R&L	NO	NO	YES	35	YES
R-UNC	1	L	YES	NO	NO	120	YES
R-UNC	1	R	YES	NO	NO	120	YES
R-UND	1	R&L	YES	NO	NO	120	YES
R-UND	2	R&L	YES	NO	NO	120	YES
R-UNE	1	R&L	YES	NO	NO	120	NO**
R-UNF	1	R&L	YES	NO	NO	120	NO**
R-UNG	1	R&L	YES	NO	NO	65	YES
R-UNG	2	R&L	NO	NO	NO	65	NO
R-UNH	1	R&L	YES	NO	NO	120	NO**
R-UNH	2	R&L	NO	NO	NO	65	NO
R-UNJ	1	L	YES	NO	NO	120	YES
R-UNJ	1	R	YES	NO	NO	120	YES
R-UNJ	2	R&L	YES	NO	NO	65	YES
R-UNL	1	R&L	YES	NO	NO	120	NO**
R-UNM	1	R&L	YES	NO	NO	120	YES
R-UNM	2	R&L	YES	NO	NO	120	YES
R-UNM	3	R&L	YES	NO	NO	65	YES
R-UNN	1	R&L	YES	NO	NO	120	NO**
R-UNN	2	R&L	YES	NO	NO	65	YES
R-UNO	1	R&L	YES	NO	NO	120	NO**
R-UNO	3	R&L	YES	NO	NO	120	NO**
R-UNP	1	R&L	YES	NO	NO	120	YES
R-UNQ	1	R&L	NO	NO	NO	65	NO
R-UNR	1	R&L	YES	NO	NO	120	NO**
R-UNS	1	R&L	YES	NO	NO	120	NO**
R-UNT	1	R&L	YES	NO	NO	120	NO**
R-UNU	1	R&L	YES	NO	NO	120	NO**

*FM = flood management, TR = thermal regulation, WH = wildlife habitat

**reaches R-ROC1D, R-ROC4R, R-ROC5A, R-ROC5B, R-UNE1, R-UNF1, R-UNH1, R-UNL1, R-UNN1, R-UNO1, R-UNO3, R-UNR1, R-UNS1, R-UNT1, and R-UNU1 were eliminated from the significant resource list due to small drainage area, likely intermittent or underground flow.

However, protection of a minimal 50 foot buffer on each side of these streams is recommended.

Table A9. Summary of riparian significance determination, showing map number

Reach name	Reach #	Bank	Final significance determination**	Map number		Reach name	Reach #	Bank	Final significance determination**	Map number
R-CHA	1	R&L	NO	3		R-ROC	5A	L	NO**	4
R-CHA	2	POND	NO	3		R-ROC	5A	R	NO**	4
R-CLE	1	L	NO	4		R-ROC	5B	R&L	NO**	4
R-CLE	1	R	NO	4		R-ROC	6	R&L	NO	4
R-CLE	2	L	NO	4,5		R-ROC	7	L	NO	4
R-CLE	2	R	NO	4,5		R-ROC	7	R	YES	4
R-CLE	3	L	NO	5		R-ROC	9	R&L	NO	4
R-CLE	3	R	NO	5		R-ROC	10	POND	NO	4
R-CLE	5	LAKE	YES	5		R-SPR	1	L	YES	5
R-CLE	6	R&L	YES	5		R-SPR	1	R	YES	5
R-CLE	7	R&L	NO	5		R-SPR	2	R&L	YES	5
R-CRE	2	LAKE	YES	2		R-SPR	3	LAKE	YES	5
R-CRE	3	R&L	YES	2		R-SPR	4	R&L	YES	5
R-FIN	1	R&L	YES	3,4		R-STE	1A	R&L	YES	3
R-HEI	1	R&L	NO	5		R-STE	1B	R&L	YES	3
R-HEI	2	L	YES	5		R-UNA	1A	R&L	YES	4
R-HEI	2	R	NO	5		R-UNA	1B	R&L	NO	4
R-HEI	3	R&L	YES	5		R-UNA	2	R&L	YES	4
R-HEI	5	L	NO	5		R-UNA	3	R&L	NO	4
R-HEI	5	R	NO	5		R-UNA	4	R&L	YES	4
R-HEI	6	R&L	NO	5		R-UNA	5	BOG	YES	4
R-HEI	7	R&L	YES	5		R-UNA	6	R&L	YES	4
R-LYT	1	LAKE	YES	3		R-UNB	1	R&L	YES	4
R-LYT	2	LAKE	YES	3		R-UNB	2	R&L	YES	4
R-MAC	1	L	YES	2		R-UNB	3	R&L	YES	4
R-MAC	1	R	NO	2		R-UNC	1	L	YES	1
R-MAC	2	L	YES	2		R-UNC	1	R	YES	1
R-MAC	2	R	YES	2		R-UND	1	R&L	YES	1
R-MAC	3	L	YES	1		R-UND	2	R&L	YES	1
R-MAC	3	R	YES	1		R-UNE	1	R&L	NO**	1
R-MAC	4	L	YES	1		R-UNF	1	R&L	NO**	1
R-MAC	4	R	YES	1		R-UNG	1	R&L	YES	1
R-MAC	5	L	NO	1		R-UNG	2	R&L	NO	1
R-MAC	5	R	YES	1		R-UNH	1	R&L	NO**	1
R-MAR	2	LAKE	NO	5		R-UNH	2	R&L	NO	1
R-MAR	3	POND	NO	5		R-UNJ	1	L	YES	1
R-MOR	1	R&L	YES	2,3		R-UNJ	1	R	YES	1
R-NED	1	POND	NO	1		R-UNJ	2	R&L	YES	1
R-NED	2	POND	YES	1		R-UNL	1	R&L	NO**	3
R-ROC	1A	R&L	YES	5		R-UNM	1	R&L	YES	2
R-ROC	1B	L	NO	5		R-UNM	2	R&L	YES	2
R-ROC	1B	R	YES	5		R-UNM	3	R&L	YES	2
R-ROC	1C	L	YES	5		R-UNN	1	R&L	NO**	2
R-ROC	1C	R	NO	5		R-UNN	2	R&L	YES	2
R-ROC	1D	R&L	NO**	5		R-UNO	1	R&L	NO**	2
R-ROC	2	POND	YES	4		R-UNO	3	R&L	NO**	2
R-ROC	3	L	YES	4		R-UNP	1	R&L	YES	2
R-ROC	3	R	YES	4		R-UNQ	1	R&L	NO	2
R-ROC	4	L	NO	4		R-UNR	1	R&L	NO**	3,4
R-ROC	4	R	NO**	4		R-UNS	1	R&L	NO**	3,4
						R-UNT	1	R&L	NO**	3
						R-UNU	1	R&L	NO**	3

*FM = flood management, TR = thermal regulation, WH = wildlife habitat

**reaches R-ROC1D, R-ROC4R, R-ROC5A, R-ROC5B, R-UNE1, R-UNF1, R-UNH1, R-UNL1, R-UNN1, R-UNO1, R-UNO3, R-UNR1, R-UNS1, R-UNT1, and R-UNU1 were eliminated from the significant resource list due to small drainage area, likely intermittent or underground flow. However, protection of a minimal 50 foot buffer on each side of these streams is recommended.

Appendix 3. Maps

- Index Map
- Key to map symbols
- Map 1. Nedonna Beach area
- Map 2. Crescent Lake area
- Map 3. Lake Lytle area
- Map 4. Rock Creek & S. Lake Lytle wetlands
- Map 5. Spring Lake to Clear Lake