PART III. CHARACTERIZE NATURAL RESOURCES IN STUDY AREA

Overall Purpose

This section describes the evaluations of natural resource sites within the study area. The purpose is to determine natural resource sites that can be preserved or restored in the surrounding landscape to attain the greatest ecological benefit. This analysis is conducted concurrently with the analyses of the ecological processes. The sites identified are ranked in the context of the DAU and the study area landscape.

Generalized Methods

In evaluating the natural resources, Thurston County evaluated wetlands, riparian corridors, and floodplains. All sites must be field verified and undergo further analysis, depending on the intended purpose (e.g., restoration or preservation, etc).

The following generalized attributes were used in the assessment of wetlands, riparian, and floodplain resource sites, using the most recent aerial photography at the time of the study and expert judgment:

- **Res_Pot** – This attribute is the photo interpreter's opinion of the natural resource site's restoration potential to provide an environmental lift in the DAU. This attribute was used to distinguish between sites that have potential to be used as a restoration site and those that have minimal restoration site potential.

    0 – no/minimal potential for restoration; this can include both high quality site and degraded or destroyed sites with substantial development that precludes reasonable options to restore the wetland

    1 – site has some level of restoration potential based on signatures from aerial photos indicating some level of hydrologic and/or vegetative alteration

    2 – the site has sufficient restoration potential to serve as a viable restoration option

- **Mit_Pot** – This attribute is the photo interpreter's opinion of a site's potential to be used in a mitigation or restoration project. Considerations used to determine restoration potential included the size of the site, the extent of hydrologic and vegetative alteration, indications of many separate landowners, and major infrastructure development, such as high power transmission lines or major water conveyances.

    0 – no/minimal potential for mitigation; this can include both high quality sites and degraded or destroyed sites with substantial development that precludes reasonable options to restore the resource.

    1 – site may have limited potential as a mitigation or restoration site due to one or more site conditions observed during photo interpretation

    2 – site has good potential for serving as a mitigation or restoration site

- **SLU** - This attribute represents the photo interpreter's evaluation of the general type of land use that surrounds the potential site. Land use codes that were useful at this stage in the analysis are presented in Table 9.

Table 9. Land use types recorded during wetland photo interpretation.

Land Use Code	Land Use Type
RES	Residential
OPEN	Park/Open Space
FOR	Forest
COM	Commercial/Business
IND	Industrial
AGR	Agriculture

- **Adjpublic** – This attribute identifies sites located on or adjacent to public lands. Publicly owned lands included all parcels that had permanent protections or easements. These included, but are not limited to: land trust properties, parks, reserves, schools, and green belts. Public properties were identified by a query of ownership parcels that pay no real estate tax.

  0 – the potential site is not on or adjacent to publicly-owned land

  1 – the potential site is on or adjacent to publicly-owned land

- **LocalPrior** – This attribute identifies potential restoration sites that are identified as local priority restoration projects by the Tribes, Salmon Recovery Lead Entities, Conservation Districts, and other non-profit organizations. Thurston County's methods include the local priority when ranking restoration and preservation sites.

  0 – the potential site is not included in a local watershed plan OR has not been prioritized in some manner for restoration
  1 – the potential site is on a local watershed plan or a prioritized restoration list

Step 1. Determine Location, Extent, and Condition of Wetland Resources.

Purpose

Identifying the location, extent, and condition of wetlands provides valuable insight into a l**a**ndscape's capacity to store surface water, sediment, nutrients, **to**xics, and bacteria. This information is used to help characterize the condition of ecological processes within drainage basins in the study area. The location and extent of existing, degraded, and destroyed wetlands serve as the pool of preservation sites and potential restoration or enhancement for past impacts to wetlands.

Methods

In evaluating the wetlands, Thurston County:

1. Identified and compiled available wetland datasets showing the location, extent, and condition of historic and existing wetlands within the study area.

2. Obtained additional datasets that provide supporting natural resource information within the study area.

3. Created a single polygon layer named *Existing Wetlands*, using all available datasets. On Totten and Eld Inlets and Deschutes, we found Thurston County's data which includes updates with Thurston Regional Planning Council to be most useful. This updated *Existing Wetlands* layer was the starting point for a new wetlands restoration data set.

4. Created a *Hydric Soils* polygon layer from the National Resource and Conservation Service (NRCS) web-based data. Three types of soils polygons were included: hydric soils with no upland soil inclusions, hydric soils with upland soil inclusions, and non-hydric soils with hydric inclusions. The soil survey descriptions show which soil–slope combinations can be considered hydric.

5. Used *Elevation*, *Slope*, *Low-Slope* and *Hillshade* layers in determining the potential wetlands in Step 6. We have found that a hillshade layer with darker-to-lighter shading between 0 and 5% is particularly useful.

***NOTE**: A clear distinction must be made between a "wetland inventory" and an inventory of "potential wetland restoration sites." Wetland inventories identify the location and extent of existing wetland resources, whether degraded or pristine. An inventory of potential wetland restoration sites identifies the location, extent and condition of existing and historical wetlands that have been altered by human activity but could be reestablished through restoration actions. For example, a wetland might have been converted to agricultural uses and dewatered (drained), and may no longer meet criteria for designation as a jurisdictional wetland, but it may provide an opportunity for restoring wetland functions within a watershed*

6. Used Photo Interpretation to conduct the detailed judgment-based interpretation of data layers developed in the previous steps to expand or reduce the *Potential Wetland* polygon.

   After all wetland and hydric polygons within a section were evaluated and recorded in the data table, the remaining areas were evaluated to identify wetland signatures that didn't coincide with a wetland or hydric soil polygon. These signatures included clusters or lines of deciduous trees within conifer forests, rough marsh vegetation, or sudden changes in vegetation type. When additional wetland signatures were identified, new polygons were added to the *Potential Wetland* data layer and their attributes recorded in the data table.

   Written data associated with existing wetland inventories, local and regional planning reports were useful to support determinations made during photo interpretation.

Wetland Assessment. Using best professional judgment, a wetland scientist examined the *Potential Wetland* data and attribute table, then made a series of determinations for each site and entered the results into additional fields in the attribute table.

The following fields were added to the *Existing* and *Potential Wetland* layers attribute table in the Totten and Eld Inlets and Deschutes studies, based on photo interpretation and from historical documents and reports:

- **Pot_wet -** This attribute represents the photo interpreter's opinion of the site's potential to be either an existing wetland **OR** a historical wetland area that has restoration potential. This attribute was used to distinguish between wetland and potential wetland areas and upland and historic wetland areas having no restoration potential.

  Y - site is an existing wetland or has restoration potential

  N - site is not an existing wetland and has no restoration potential due to site or surrounding human land use/alteration.

- **HG_Class** – This attribute is the site's existing Hydrogeomorphic Code, as described in Table 10. It represents the photo interpreter's opinion of the hydrogeomorphic wetland classification under existing site conditions.

Table 10. Hydrogeomorphic wetland types used to classify wetlands

Hydrogeomorphic Code	Hydrogeomorphic Type	General Description
RI	Riverine Impounding	Topographic depressions on a valley bottom
RF	Riverine Flow-through	Wetland systems associated with rivers and streams where water tends to flow through rather than pond
DC	Depressional Closed	Topographic depressions outside of valley bottoms having no surface water connection to a stream
DF	Depressional Flow-through	Topographic depressions outside of valley bottoms having a surface water connection to a stream
LF	Lacustrine Fringe	Wetlands occurring at the margins of deepwater lakes
LC	Lacustrine Open Water Lake	A lake system >20 acres in area and >2 meters deep
SL	Slope Wetland	Wetlands occurring on a slope where water tends to sheet flow across
UN	Unknown	Unable to determine hydrogeomorphic type from photos
NW	Non-wetland	Site is upland area
MM	Man made	Stormwater ponds and other artificial impoundments
ES	Estuary	Direct connection to marine waters

- **HG_Poten -** This attribute is the site's potential Hydrogeomorphic Code (**Table 10**) *following* restoration. It represents the photo interpreter's opinion of the wetland's Hydrogeomorphic Classification *after* restoration activities.

- **Hyd_Alter -** This attribute represents the photo interpreter's opinion of the extent of human induced hydrologic alteration for the site based on photo interpretation and available locally developed information.

  0 – no or minimal hydrologic alteration

  1 – some hydrologic alteration evident, but portions of the site appear to be providing reasonable levels of wetland functions

  2 – extensive hydrologic alteration is evident from surface drains and ditches, grading or filling, or is presumed to exist because of human land uses

- **Veg_Alt** - This attribute represents the photo interpreter's opinion of the extent of human-induced vegetative alteration to the site based on photo interpretation and available local information.

    0 – no or minimal vegetation alteration

    1 – some vegetation alteration/clearing is evident from aerial photos and/or LiDAR datasets

    2 – extensive vegetation alteration/clearing is evident from aerial photos and/or LiDAR datasets

If available data informed specific development actions, the following fields were also included:

- **SiteAvoid –** This attribute is the wetland scientist's opinion of the site-scale resource value of the wetland. It indicates the need to avoid and/or minimize impacts to the site. Thurston County used Ecology's Wetland Rating System (2004) to assign a value of High, Medium or Low to each site.

    H – High Avoidance: the wetland is an Ecology Category I or Category II (Ecology, 2004) and warrants the highest consideration for avoidance and minimization of impacts.

    M – Medium Avoidance: the wetland is an Ecology Category III or IV (Ecology, 2004) and warrants moderate consideration for avoidance and minimization of impacts.

    L – Low Avoidance: the wetland is an Ecology Category III or IV (Ecology, 2004) and warrants low consideration for avoidance and minimization of impacts.

- **LandAvoid** – This attribute is the wetland scientist's opinion of the landscape-scale resource value of the wetland in relation to the surrounding landscape and natural resources. Thurston County used Ecology's Wetland Rating System (2004) to assign a value of High, Medium or Low to each site.

    H – High Avoidance: the wetland warrants the highest consideration for avoidance and minimization of impacts based on its relationship to the landscape and natural resources around it.

    M – Medium Avoidance: the wetland warrants moderate consideration for avoidance and minimization of impacts based on its relationship to the natural resources around it.

    L – Low Avoidance: the wetland warrants low consideration for avoidance and minimization of impacts based on its relationship to the natural resources around it.

- **FinalAvoid** – This attribute is the wetland scientist's opinion of the overall resource value of the wetland based on averaging the site and landscape-scale rankings. Thurston County used Ecology's Wetland Rating System (2004) to assign a value of High, Medium or Low to each site.

    H – High Overall Avoidance: the wetland warrants the highest consideration for avoidance and minimization based on averaging its site-scale and landscape-scale ranks.

    M – Medium Overall Avoidance: the wetland warrants moderate consideration for avoidance and minimization based on averaging its site-scale and landscape-scale ranks.

    L – Low Overall Avoidance: the wetland warrants low consideration for avoidance and minimization based on averaging its site-scale and landscape-scale ranks.

- **ECY_Categ** – This attribute is Ecology's Wetland Category for the site, according to the wetland scientist's opinion. Thurston County used the Washington State Wetlands Rating System (Ecology, 2004) to determine the proper Category, and then assign a value of High, Medium or Low accordingly.

    H – High Value: the wetland is a Category I or Category II (Ecology, 2004). A high quality or rare wetland that warrants the highest consideration for avoidance and minimization of impacts.

    M – Medium Value: the wetland is a Category III or IV (Ecology, 2004). These may provide ecosystem services not provided by Categories I or II wetlands, and warrant moderate consideration for avoidance and minimization of impacts.

    L - Low Value: the wetland is a Category III or IV (Ecology, 2004), and may be small, isolated or degraded sites. These wetlands warrant low consideration for avoidance and minimization, but may provide restoration opportunities.

The following attributes were used to prioritize potential wetland restoration sites, but only if additional information (typically non-GIS) was available:

- **Rare_Type** – This attribute identifies wetland fens and bogs considered to be rare, unique, and/or irreplaceable. Hydric soils with > 25 % organic matter have the greatest potential of supporting peat bogs or fens.

    0 – potential wetland sites where ≤33% of the polygon area is a hydric soil series containing >25% organic matter

    1 – potential wetland sites where > 33% of the polygon area is a hydric soil series containing > 25% organic matter

- **RechrgPot** – This attribute identifies wetland sites having the greatest potential to recharge groundwater aquifers. Hydrologic code attributes within the soils data layer identify soil types having moderate to high percolation.

0 – potential wetland sites with ≤50% or less of the polygon intersecting soil mapping units with a Hydrologic Code of A or B

1 – potential wetland sites with > 50% of the wetland polygon intersecting soil mapping units with a Hydrologic Code of A or B

- **SWconnect** – This attribute identifies potential wetland sites having a surface water connection as defined by wetland hydrogeomorphic (HGM) classification. Surface water connection was defined as surface water movement from the wetland to a stream or lake for all or part of the year.

  0 – potential wetland sites with a potential wetland classification (HG_Class) of Depressional Closed (DC)

  1 – wetland sites with a potential wetland classification (HG_Class) of Depressional Flow-through (DF), Riverine Flow-through (RF), Riverine Impounded (RI), Lacustrine Fringe (LF), Lacustrine Open Water (LC), or Slope (SL).

- **SWflood** – This attribute identifies wetland sites having a direct surface water connection to a perennial stream or lake. Thurston County inferred the connection by the intersection of a wetland site and a stream or lake on a 1:24,000 hydrography map or GIS layer.

  0 – no direct intersection exists between the wetland site and a stream or lake

  1 – a direct intersection exists between the wetland site and a stream or lake

- **FishAccess** – This attribute identifies wetland sites having a direct surface water connection to a perennial stream or lake, where one or more species of fish have potential to access the wetland.

  0 – no direct intersection exists between the wetland site and a stream or lake, **OR** a direct intersection exists, but fish do not have access to that portion of the stream or lake

  1 – a direct intersection exists between the wetland site and a fish bearing stream or lake

Data Needs

Thurston County used the following data to complete Step 1:

1. National Wetlands Inventory (NWI) digital data, available free of charge at http://wetlands.fws.gov/
2. Soil survey digital data by County and State: digital maps and descriptions. Free digital datasets of county-level soil maps can be downloaded from USDA (NRCS) websites, or through local County Agricultural Extension websites. http://soils.usda.gov/survey

3. Hydric soils lists and descriptions by State: http://soils.usda.gov/use/hydric
4. Digital Elevation Models (DEM) developed from LiDAR or other sources. Government Land Office data from early land survey records
5. Hydrography dataavailable from WADNR
6. Fish access data
7. Public land ownership data
8. Local natural resource planning documents

Products

GIS polygon layers of existing and potential wetland restoration sites within the study area.

Attribute table populated with photo-interpreted data and natural resource information for each existing and potential wetland restoration site, and an assessment of the suitability of the site for preservation and restoration.

Step 2. Determine Location, Extent, and Condition of Riparian Resources

Purpose

The extent, location, and condition of riparian resources is used to help characterize the level of aquatic integrity within in the study area (Hyatt et al. 2004, Morley and Karr 2002, Sweeney et al. 2004). The location and extent of existing deforested riparian areas also serves as a pool of potential restoration sites for past impacts to riparian areas.

Methods

To determine the location, extent, and condition of riparian resources, Thurston County:

1. Applied a 67-meter buffer to a 1:24,000 scale hydrography layer within the study area, creating a riparian buffer layer around all rivers and streams (see previous section). The buffer was based on established minimum shade requirements and site potential tree height (SPTH) for large woody debris recruitment, respectively.
2. Used digital orthophotos, to draw polygons that included non-forested areas within the riparian buffer.
3. Used the following attributes based on best professional judgment.

- **Mend_rip** – This attribute is a measure of the created polygon to link two disjoined forest patches, if the site was chosen for riparian restoration.

  Y – the site would link two forest patches

  N – the site would not link two forest patches

- **Add_rip** – This attribute is a measure of the polygon's proximity to forest patches, whether the polygon would add forest to the existing forest if it was chosen as a restoration site and restored.

  Y – the site would add forest to the existing forest

  N – the site would not add forest to the existing forest

- **CTS** – This attribute represents the range of forest cover within the polygon, how much of the area is cleared to stream (i.e., "CTS") on a scale of 0 to 2, based on the 67-meter buffer distance from the stream.

  0 - <25% cleared

  1 – 25 to 50% cleared

  2 - >50% cleared

- **CDsoils** – This attribute represents how much of each non-forest contains C or D soil types using the soils layer.

  1 - > 50 percent C or D soils

  0 - < 50 percent C or D soils

4. Non-forested polygons were clipped to the border of the wetland or floodplain and their area and acreage reduced to avoid double-counting. For the Totten and Eld Inlets and Deschutes studies, non-forested areas less than three acres in size were removed from further consideration of potential riparian restoration sites.

Data Needs

Thurston County used the following data to complete Step 2:

1. Hydrography layer.
2. Available riparian coverages, current landcover, digital orthophotos.
3. Study area, Stream Catchments, and drainage basin boundary layers.
4. Soil survey layer, C and D soils.
5. Land ownership layer or maps of publicly owned lands.
6. Local priority sites
7. Wetland and floodplain potential restoration sites

Products

1. An approximation of riparian condition and forested riparian area within the study area andDAUs
2. A GIS data file of potential riparian restoration (i.e., non-forested) sites.

Step 3. Determine Location, Extent, and Condition of Floodplain Resources.

Purpose

Floodplain resources provide much of a landscape's capacity to store surface water, sediment, large wood, and nutrients, toxicants, and bacteria. The proportion of functioning versus non-functioning floodplains helps identify potential restoration sites.

Methods

In determining the location, extent, and condition of floodplain resources, Thurston County:

1. Determined historic (Holocene) floodplains. Holocene floodplains were delineated using topographic data combined with GIS coverage of alluvial soil deposits around modern streams and rivers.
2. Established condition of current floodplains within the study area using the Federal Emergency Management Agency (FEMA) floodplain coverage and orthophotos, the County identified the proportion of floodplain that is decoupled from the stream (area behind dikes or levees or affected by a road crossing), or confined (channel locked in place by dredging, rip-rap etc), versus free-flowing (i.e., channel is free to migrate across floodplain).
3. Evaluated floodplain restoration potential, using LiDAR (Light Detecting and Ranging) data to identify dikes, revetments, and filled terraces of the river channel. A 2-foot contour topographic coverage was also needed to quantify the extent of vertical relief for the decoupling features being analyzed. Their combination allowed the County to identify areas of floodplain decoupling. Additional coverages for FEMA floodplains were used to help identify coupled and decoupled floodplain features, which likely will require additional field verification work.
4. Used orthophotos to identify land uses in decoupled floodplain polygons with restoration potential (agriculture and open space).
    - L - < 25 % of the polygon.
    - M - 25 – 50 % overlap of polygon
    - H - 50 % overlap of polygon

Attributes used include:

- **Mend_fdpln** – This attribute represents the photo interpreter's opinion if the site can mend isolated patches of floodplain

    Y – site can mend floodplain

    N – site cannot mend floodplain

- **Chinmig_pot** – This attribute is a measure of the polygon's ability to migrate across the floodplain

    Y – the site could migrate

    N – the site could not migrate

- **Confined** – This attribute represents the photo interpreter's opinion if the site has been confined from the active floodplain

  Y – site has been confined

  N – site is not confined

- **Decoupled** – This attribute represents the photo interpreter's opinion if the site has been decoupled from the active floodplain

  Y – site has been decoupled.

  N – site has not been decoupled

- **Rechrg_pot** – This attribute identifies floodplain sites having the greatest potential to recharge groundwater aquifers. Hydrologic code attributes within the soils data layer were used to identify soil types having moderate to high percolation.

  0 – potential floodplain sites with 50 percent or less of the polygon intersecting soil mapping units with a Hydrologic Code of A or B

  1 – potential floodplain sites with > 50 % of the polygon intersecting soil mapping units with a Hydrologic Code of A or B

Data Needs

Thurston County used the following data to complete Step 3:

1. GIS FEMA floodplain coverage
2. Current orthophoto GIS coverage
3. LiDAR topographic data
4. GIS type A and B soils coverage
5. GIS coverage of dikes, levees, and riprap
6. Hydrography

Products

1. Information on the decoupling and alteration of floodplain areas