APPENDIX C. METHODOLOGY

All mapping and geospatial analysis was performed used Environmental Science Research Institute's (ESRI) ArcGIS 10.5. The methods and processes used to map the regional open space network, conduct the park access analysis, and map protected lands are described below. Names of layers created as part of these methods are in **bold** (layer names are generalized for ease of reading).

Data inputs to map the regional open space network were gathered from cities, counties, non-profits, and state and federal resource agencies. PSRC staff attempted to use the best available data sources to represent different open spaces. However, there are limitations to the accuracy and validity of each dataset that should be considered when using the maps in the Regional Open Space Conservation Plan. This analysis was conducted at the regional scale and the results were not ground-truthed. In some cases, the reality on the ground may have changed since a GIS layer was created. Groups interested in taking conservation actions in an area should conduct site visits to better characterize the open spaces there.

The area of focus for mapping included the eight major watersheds that overlap with the central Puget Sound region: Stillaguamish, Snohomish, Cedar – Sammamish, Green – Duwamish, Puyallup – White, Nisqually, Chambers – Clover, and Kitsap. Parts of the region that were outside of these watersheds were generally excluded (primarily the northeast corner of Snohomish County). For some of these excluded areas –the Town of Darrington and the northwestern piece of Snohomish County along the shore – data were still analyzed and are included in the regional open space geodatabase. Watershed boundaries were obtained from the Washington Department of Ecology's water resource inventory area dataset. The Snohomish, Cedar - Sammamish, and Green - Duwamish, and Puyallup - White watershed boundaries were modified using King County's watershed mapping data to better reflect hydrological processes and management realities.

These watersheds included lands from outside of the region within Skagit, Mason, Thurston, and Lewis counties. Where possible, open space datasets were obtained from these counties, as well.

Regional Open Space Network

Farmland

Criteria for farmland in the open space network were:

- areas designated for agriculture
- lands that are currently farmed within half a mile of an agriculture zone
- lands that are currently farmed and that contain at least 5 acres of prime farmland soils (including restrictions).

To map currently farmed land for the regional open space network, these areas were first identified using parcel and assessor's data. Using the parcel feature classes from each county, as well as assessor's data

including land use and owner information, parcels with agriculture land uses were extracted. For each county, the queries used to extract farm parcels were:

Snohomish County: "parcels.USECODE" IN('816 Farms & Ranches - Livestock (Not Dairy)' , '817 Farms - Poultry' , '818 Farms - General (No Predominant Activity)' , '819 Other Agriculture & Related Activities NEC' , '821 Agricultural Processing' , '829 Other Agricultural Related Activities NEC' , '830 Open Space Agriculture RCW 84.34')

King County: "PresentUse" IN (130, 327) OR "CurrentUse" in (1).
130 = "Farm"; 327 = "Open Space(Agric-RCW 84.34)"; 1 = in PBRS program from agriculture

Pierce County: "Landuse_De" IN('AG NOT CURRENT USE' , 'AG RELATED ACTIVITIES' , 'CU FARM & AGRI RCW 84.34 CURRENT USE')

Kitsap County: "PropClass" in (822, 830)

Mason County: "LANDUSE" IN('81 - Resource - Agriculture' , '82 - Resource - Agriculture Activities' , '83 - Resource - Agriculture Current Use')

Lewis County: "USE_DESC" IN('81 Agricultural Not Cultivated' , '83 Cur - Use - Ag')

Skagit County: "USE_DESC" IN('81 Agricultural Not Cultivated' , '83 Cur - Use - Ag')

Thurston County: "USE_CODE" IN (81, 83)

These extractions were merged to form **Ag Parcels Region**. The Washington Department of Agriculture's "WSDACrop_2016" GIS dataset was used to supplement the assessor datasets because they appeared to miss some farming areas (according to aerial imagery). Parcels that had their centroid in "WSDACrop_2016" and that were not already included in **Ag Parcels Region** were extracted from each county and merged to form **WSDA Crop Parcels Region**.

These two datasets were merged to form **Farmedland**. Any parcels in **Farmedland** that were within regional growth centers were then removed. Data on soils were obtained from the National Resource Conservation Service's Web Soil Survey. Prime farmland soils, prime farmland soils with restrictions, and soils of statewide importance were selected and tablulate intersection with **Farmedland** was performed to calculate the acres and percent coverage of prime soils for each parcel identified in **Farmedland.** The field "PrmSoilAcres" is the number of acres of prime soils contained on each parcel, while the field "PrmSoilPrcnt" is the percent of each parcel covered in prime soils.

To map county-designated agriculture areas, future land use shapefiles for each county were obtained. Agriculture zones were extracted and merged to form **Ag Designations**. In **Farmedland**, the field "zoned_ag" identifies whether a parcel is within ('1') or outside of ('0') an agriculture zone. The field "nearagzone" identifies whether a parcel is within a half mile of an agriculture zone ('1') or not ('0').

Parcels in **Farmedland** were then extracted for the regional open space network using the following criteria:

- Zoned for agriculture,
- Within a half mile of agriculture zoning, or
- Contain at least 5 acres of prime soils.

Farmedland and Ag Designations were unioned to form Farmland, the final layer for the regional open space network.

Working Forests

To map working forests for the regional open space network, areas that are used for timber harvest were first identified using parcel and assessor's data.

Privately-owned timber lands

Using the parcel shapefiles from each county, as well as assessor's data including land use and owner information, parcels with forestry-related land uses were extracted. For each county, the queries used to extract farm parcels were:

Snohomish County: "parcels.USECODE" IN '880 DF Timber Acres Only RCW 84.33' , '881 DF Timber Acres / Imp/Unimp Ac With Bldg' , '889 DF Timber Acres / Imp/Unimp Ac No Bldg')

King County: "PropType" IN ('T') or "CurrentUse" in (2, 3)

Pierce County: "Landuse_De" IN(' DESIG FOREST LND RCW 84.33')

Kitsap County: "PropClass" in (880, 950)

Mason County: "LANDUSE" in ('88 - Resource - Designated Forest Land', '95 - Undeveloped – Timberland')

Lewis County: "USE_DESC" in ('88 Designated Forest Lnd')

Skagit County: "Land Use" in ('(831) CLASSIFIED TIMBER', '(984) DESIGNATED TIMBER')

Thurston County: "USE_CODE" IN (88, 95)

These parcels extracted from each county were merged into WF1 – privately owned.

State-owned timber lands

Parcels owned and managed by the Washington Department of Natural Resources (DNR) that are not set aside for state parks or natural resource conservation areas were extracted for each county. DNR's "WA_DNR_Managed_Land_Parcels" shapefile was used to help identify these lands. These parcels from each county were merged into WF2 – state owned.

National forest timber lands

Lands within the Mount Baker – Snoqualmie National Forest (MBSNF) and the Gifford – Pinchot National Forest (GPNF) that were identified by the Northwest Forest Plan as available for harvest were included as working forests. These areas were identified by obtaining the land management GIS coverages ("lrmp.00") from each forest's GIS database. The following queries were used to identify lands available for harvest:

MBSNF: "NWFP" in ('AMA', 'AVAIL')

GPNF: "PRES" in ('MATR')

Parcels that overlapped with these areas were extracted from each county and then clipped to these areas. The resulting layer was **WF3 – federally-owned**.

Parcels that were within regional growth centers were removed from each of these three layers. These three layers were then merged to form **Working Forests**.

Aquatic Systems

Regionally important aquatic systems were identified using the following criteria:

- Lands within a 100- or 500-year floodplain
- Lands within 200 feet of a river corridor important for salmon recovery (as identified by salmon recovery plans for each watershed resource inventory area (WRIA))
- Lands within 200 feet of a shoreline containing a feeder bluff
- Lands within 200 feet of a shoreline containing spawning areas for forage fish
- Lands supporting a source of drinking water
- Tidelands and sub-tidal areas containing eelgrass meadows or kelp forests (not included in total acreage calculations)

Floodplains

County-mapped 100-year and 500-year floodplains were obtained in shapefile form from Snohomish, King, and Pierce counties. Floodplain GIS data for Kitsap, Mason, Lewis, Thurston, and Skagit were obtained from the Federal Emergency Management Agency (FEMA). These were merged together to form **Aq1 - Floodplains Region.**

Riparian areas

County-mapped stream and river lines were obtained in shapefile form from each county, where available. For Lewis, Mason, and Thurston counties, stream and river lines were obtained from the National Hydrography Dataset (NHD).

WRIA salmon recovery plans were reviewed to identify important river and stream corridors. Salmon recovery planners at each WRIA were interviewed to refine these lists of important corridors. These rivers and streams were then extracted from the county and NHD shapefiles and merged to form **Aq Reaches.** In the case of WRIA 8, the Cedar-Sammamish River basin, the shorelines of Lake Sammamish, Lake Washington, and Lake Union were identified as important aquatic corridors, and so were also included. A 200-foot buffer was drawn around each of these river and streamlines to map regionally important riparian areas and call **Aq2 – Riparian Areas**

Feeder bluffs

The Washington Department of Ecology has mapped shorelines in Puget Sound and identified the type of geology each shoreline has (including feeder bluff, artificial, etc.). The geodatabase that contains these data, "Puget Sound Landforms and Feeder Bluffs" was obtained. Shorelines that were identified as feeder bluffs were extracted, and a 200-foot buffer with flat ends was generated around each bluff to create **Aq3 - Feeder Bluffs**.

Forage fish spawning areas

The Washington Department of Fish and Wildlife (WDFW) has mapped beaches and shorelines where forage fish (surf smelt, Pacific sand lance, and Pacific herring) spawn. These data are contained within the Priority Habitats and Species geodatabase, which was obtained for the central Puget Sound region. WDFW mapped surf smelt and sand lance spawning areas as lines along shorelines. They mapped herring spawning areas as polygons, generally in the inter-tidal and sub-tidal area. 200-foot buffers with flat ends were drawn around surf smelt and sand lance spawning areas and herring spawning areas were included as they were. A union among these three sets of polygons was performed to create **Aq4 - Forage Fish Spawning Areas** .

Drinking Water Protection Areas

Drinking water protection areas include lands that support drinking water for the region's residents. These areas were identified using the Washington Department of Health's "Source Water Protection Areas" geodatabase. Source water protection areas that supply transient non-community water systems were excluded.

Areas that are owned and managed by municipalities and water districts were also identified using parcel data from each county.

These two datasets were unioned to form **Aq5 Source Water Protection**.

Lakes

Most lakes were not included in the regional open space network, unless specifically called out in a WRIA plan or other plan. Lake areas were not included in area calculations to better estimate the quantity of land that may be targeted for acquisition and other conservation actions. A lakes layer was created to overlay with the network so these areas could be subtracted out. GIS data on lakes were obtained from each county and merged into one layer – **Aq6 – Lakes**. For Lewis, Mason, and Thurston counties, lake polygons were obtained from the National Hydrography Dataset (NHD).

Combining layers

The resulting polygon feature classes generated from the six above analyses were merged into one layer using a union: **Aquatic Systems**.

Natural Lands

Natural lands were identified using the following criteria:

- Lands identified by WDFW or a county as containing important habitat or species
- Regional parks, including state parks, wilderness areas, and national parks
- Public lands being managed for habitat and other ecological benefits
- County-identified biodiversity areas (Pierce County only)

Important habitat and species areas

Two datasets were used to map important habitat and species areas: WDFW's Priority Habitat and Species database (PHS), and WDFW's Habitats of Greatest Conservation Need (as identified in WDFW's 2015 Statewide Action Plan) (HGCN).

Priority Habitat and Species

The PHS geodatabase for the central Puget Sound region was obtained from WDFW. This dataset (specifically "phsregion_sv") contains polygons representing locations of priority habitats and priority species. Many of these polygons overlap with one another. The next several GIS steps describe how these overlapping polygons were handled to remove overlap (and thus remove double-counting of area) but retain information on the type of habitats or species that were overlapping:

A union with just "phsregion_sv" as an input layer was performed to split polygons along areas of overlap. This was then dissolved by "SHAPE_AREA" to dissolve any overlapping polygons into a single polygon ("WDFW_phsregion_union_dissolve"). A spatial join with "WDFW_phsregion_union_dissolve" as the target features and the original "phsregion_sv" as the join features was conducted with aggregating of feature attributes (specifically the habitat/species name). The result was NatLands1 – WDFW PHS. This process is shown in Figure C.1

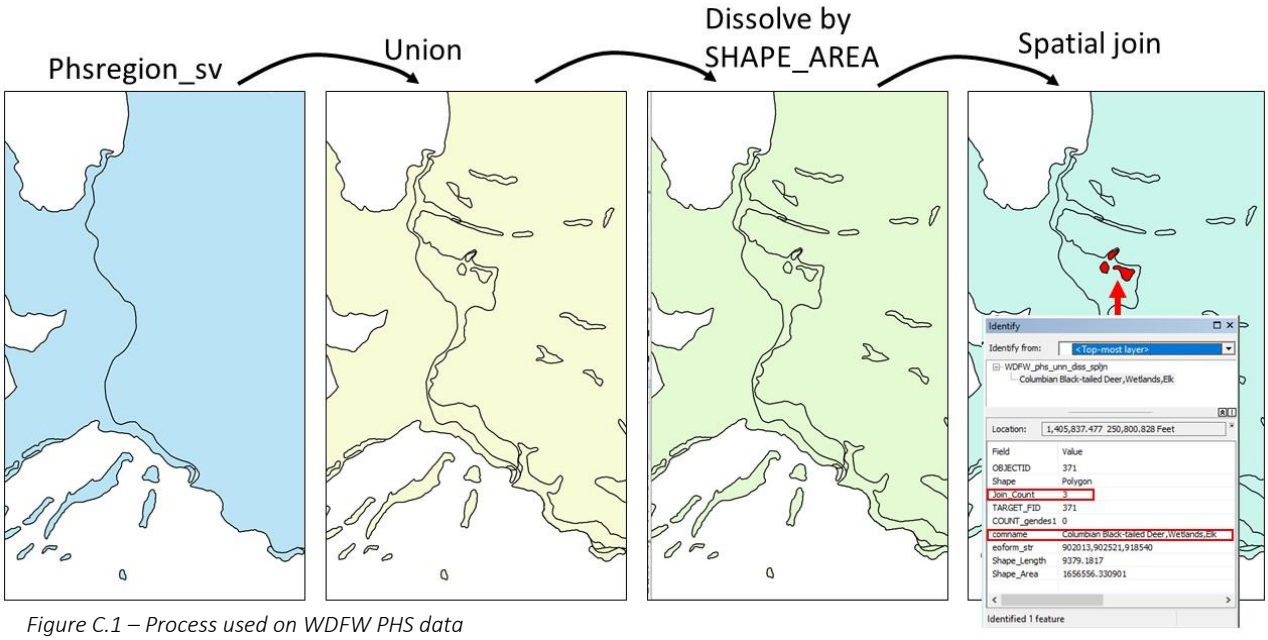

Figure C.1 – Process used on WDFW PHS data

For the final regional open space network layer, areas that were mapped for elk range that did not overlap with any other component of natural lands were excluded. This is because these range lands covered large portions land and the best management strategy for these areas is not necessarily land acquisition. It is important for local planners to know where elk range lands are for planning considerations, but these areas were not counted in final conservation needs.

Note on elk and marine habitat. The PHS dataset contains polygons for elk ranges, which cover wide swaths of land in parts of the region. These areas are important to map for planning purposes, but do not necessarily represent habitat that should be acquired in order to support elk populations. As such, lands in the PHS database that only support elk range (and did not overlap with other habitats) are included in the natural lands mapping but are excluded from acreage calculations and from the final map of the regional open space network. A similar circumstance occurs with marine habitat – these areas are important to map for planning purposes but are not necessarily areas to acquire for protection. Marine

habitats (areas used by seals, sea lions, waterfowl, and whales, and eelgrass meadows and estuarine zones) were excluded from acreage calculations and the regional open space network map (but are still within the natural lands feature class). See the final section of natural lands for a definition query to use to remove these.

Habitats of Greatest Conservation Needs

WDFW published their latest Statewide Action Plan in 2015. They identified habitats that have the greatest conservation needs because there are very few areas with those habitats left or because they support a priority species. The central Puget Sound region has these habitats of greatest conservation need:

- North Pacific Bog and Fen
- North Pacific Dry Douglas-fir-(Madrone) Forest
- North Pacific Hardwood-Conifer Swamp
- North Pacific Intertidal Freshwater Wetland
- North Pacific Lowland Riparian Forest and Shrubland
- North Pacific Oak Woodland
- Temperate Pacific Freshwater Emergent Marsh
- Temperate Pacific Tidal Salt and Brackish Marsh
- Willamette Valley Upland Prairie and Savanna

The Washington Department of Natural Resources has mapped habitat types across the region in the raster dataset "ecolog_sys_wa." The WDFW habitat types listed above, were extracted from this raster dataset and converted to polygons. Polygons larger than 30 acres were extracted to form NatLands2 – WDFW HGCN. Accuracy (i.e. actual land cover matches that identified by the layer) of polygons smaller than 30 acres was inconsistent, so these smaller areas were not included.

County Mapping

Additional habitat datasets were included for Pierce, Kitsap, and Mason counties. Pierce County underwent a process to identify the major biodiversity areas in their county, now called Biodiversity Management Areas. These areas and their connecting corridors were included in as NatLands1c – Pierce BMAs.

WDFW PHS coverage of the Kitsap Peninsula was less thorough than for the other areas, so additional county data on wetlands were included. Kitsap County's wetland mapping dataset and the National Wetland Inventory for Mason County were merged to form Natlands1b – Wetlands Kitsap Mason

Land managed for ecological benefits

The U.S. Forest Service manages the national forests in the region according to the Northwest Forest Plan (NFP). The NFP identifies parts of the Mount Baker – Snoqualmie and Gifford – Pinchot National Forests to be reserved for old growth forest habitat, riparian areas, and other natural features. GIS coverages from the two national forests were obtained to map out these areas. Specifically, all areas of the forests others than those areas identified as available for harvest (as described in the working forests section above) were included for natural lands. This included designated wilderness areas. Parcels from each of

the counties that overlapped with these reserved areas were extracted and then clipped to the reserved areas, forming **NatLands4 – USFS habitat areas**.

WDFW owns and manages several habitat reserves, called "wildlife areas" in the region. These were identified using parcel data to identify lands owned by WDFW and cross-checked with WDFW's list of these reserves. This layer is **NatLands6 – State Reserves**.

Regional Parks

Parks and designated open space in the region larger than 100 acres were consider regional parks to be included in natural lands. These included areas managed by DNR as Natural Resource Conservation Areas and Natural Area Preserves and were called **NatLands5 – Parks**

Combining Layers

Resulting layers from each of the five analyses were merged using a union to form **Natural Lands**. As discussed in the wildlife section, elk ranges and marine habitats were not included in acreage calculations or the final regional open space network maps. The following definition query was used on **Natural Lands** to achieve this:

FID_NatLands2_HGCN >0 OR FID_NatLands4_federalreserves_dis>0 OR FID_NatLands5_parks >0 OR FID_NatLands6_statereserves>0 OR FID_NatLands1b_wetlandskitsapmason >0 OR FID_NatLands1c_PierceBMAs >0 OR (FID_NatLands1_phs >0 AND comname NOT IN('Elk' , 'Elk,Elk' , 'Elk,Elk,Elk' , 'Esturine Zone', 'Surf Scoter', 'California Sea Lion', 'California Sea Lion,Esturine Zone', 'California Sea Lion,Harbor Seal', 'California Sea Lion,Steller Sea Lion' , 'Harbor Seal' , 'Harbor Seal,Harbor Seal' , 'Harbor Seal,Harbor Seal,Esturine Zone' , 'Harbor Seal,Harbor Seal,Waterfowl Concentrations' , 'Waterfowl Concentrations' , 'Waterfowl Concentrations,Shorebird Concentrations' , 'Eelgrass Meadows' , 'Eelgrass Meadows,Waterfowl Concentrations' , 'Eelgrass Meadows,Waterfowl Concentrations,Shorebird Concentrations', 'Gray Whale' , 'Gray Whale,Shorebird Concentrations' , 'Gray Whale,Waterfowl Concentrations' , 'Gray Whale,Waterfowl Concentrations,Shorebird Concentrations' , 'Harbor Seal,Harbor Seal,Waterfowl Concentrations,Shorebird Concentrations' , 'Harbor Seal,Waterfowl Concentrations,Shorebird Concentrations'))

Note: Shorebird concentrations are included, just not when they overlap with waterfowl conentrations.

Combining into the Regional Network

To map the entire regional open space network, **Farmland**, **Working Forests**, **Aquatic Systems**, and **Natural Lands** were merged using a union. This was then clipped to the study area (the eight watersheds in the central Puget Sound region) to form **Regional Open Space Network**. Area calculations were made from this layer (coordinate system = Washington State Plane North, feet).

Regional Trails

Regional Trails contain the regional trail network. It includes existing regional trails, proposed regional trails, and ferry routes, which are part of the network.

The 2018 Regional Bike Network that PSRC mapped for the Regional Transportation Plan was used to map regional trails. The criteria for regional trails are facilities that:

- Are all ages and abilities

- Connect regional destinations
- Cross multiple jurisdictions

These trails were identified and included in **Regional Trails**. Sections that are not complete yet were also included as "proposed." Additional regional trails that have no existing segments and are entirely proposed were included as well.

Urban Open Space

Urban open space was mapped by obtaining data on parks and recreational open spaces. Parks GIS data were obtained from each of the counties. City park plans and park maps were reviewed to identify any parks missing from the county inventories. Missing parks were digitized and added to the database.

Mapping protected open space

Open space in long-term protection

Open space lands that are owned outright by a public agency, tribe, or conservation non-profit were assumed to be in long-term protection. These lands were identified using three sources of information:

- County assessor's data on parcel ownership
- Washington Department of Natural Resource's "Washington State Non-DNR Major Public Lands" GIS layer
- Forterra's "2015 Central Puget Sound Public, Tribal and Protected Lands Database"

Parcels from each county that were identified as being owned by a public agency, tribe, or non-profit were extracted and merged to form a regional layer of protected parcels – **Protected Parcels**. Some public lands in some counties have not been platted. Polygons were created to represent those areas (primarily national forest land and military land).

Open space lands that are protected through a conservation easement were also assumed to be in long-term protection. These were identified through the following datasets:

- National Conservation Easement Database 2016
- Forterra's "2015 Central Puget Sound Public, Tribal and Protected Lands Database"
- For King County, the assessor's database contained a field for whether a parcel had an easement and a second field for whether the parcel had its development rights purchased.

Parcels that overlapped with areas identified as having easements were extracted for each county and merged into a regional dataset – **Easement Parcels**. Where possible, data on the easement holder was retained.

Protected Parcels and **Easement Parcels** were each intersected with **Regional Open Space Network** to calculate the area of the network protected by ownership and easements.

Open space zoning protections

To identify open space lands that are protected by agricultural designations, GIS datasets on land use designations were obtained from each county. The following designations were used:

Snohomish County: Local Commercial Farmland, Upland Commercial Farmland, and Riverway Commercial Farmland.

King County: Snoqualmie River APD, Sammamish River APD, Lower Green River APD, Upper Green River APD, Enumclaw Plateau APD

Pierce County: Agriculture Resource Lands, Rural Farm

Kitsap County: none

Mason County: Agricultural Resource Lands

Skagit County: Agricultural - NRL

Lewis County: Agricultural Resource Lands

Thurston County: Nisqually Agriculture, Long-Term Agriculture

Forestry designations:

Snohomish County: Commercial Forest, Commercial Forest – Forest Transition Area, Mount Baker-Snoqualmie National Forest Administered Lands

King County: Forest Production District

Pierce County: Designated Forest Land

Kitsap County: Forest Resource Lands

Mason County: Long Term Commercial Forest

Skagit County: Industrial Forest - NRL, Secondary Forest – NRL

Lewis County: Forest Resource Lands, Forest Resource Lands – Local Importance

Thurston County: Long-Term Forestry

These zoning designations were extracted for each county and merged to form **Ag Designations** and **Forest Designations**. These layers were intersected with **Regional Open Space Network** to calculate the area of the network protected by resource land designations.

Calculating Conservation Needs

Farmland

The **Farmland** layer described above was used to calculate conservation needs for farmland. Conservation needs were defined as actively farmed parcels of land that do not have a conservation easement, are not protected through fee ownership, and that have development capacity. Development capacity was calculated by subtracting the current number of housing units on a parcel from the allowed number of housing units on the parcel (according to zoning).

Working Forests

The **Working Forests** layer described above was used to calculate conservation needs for working forests. Conservation needs were defined as parcels of working forest that do not have a conservation easement, are not owned by a public agency, tribe, or non-profit, and that are not designated for forestry or that are

designated but are smaller than 20 acres in size. The following query was used to select these parcels from the layer:

pro_fee IN(0) AND easement IN(0) and FID_wf1_usfs <0 and FID_wf2_dnr<0 AND (FID_wf_designations<0 OR Acres_1 <20)

Aquatic Systems and Natural Lands

Conservation needs for aquatic systems and natural lands were defined as lands in those categories that do not overlap with farmland or working forests, that are not in long-term protection, and that are undeveloped. To identify lands that were undeveloped, the 2011 National Landcover Database was used. This raster was reclassified - pixels that were classified as developed (22, 23, 24) or open water (11) were reclassified as '0' and all other pixels were classified as '1' for open space. This created **2011 NLCD Open Space**.

To estimate conservation needs for aquatic systems and natural lands, the **Regional Open Space Network** layer was overlaid with the **Protected Parcels** and **Easement Parcels** layers using "Identity." Lands that were in the aquatic systems and natural lands categories, that did not overlap with working forests or farmland, and that were not in long term protection were overlaid with **2011 NLCD Open Space** using "Extract by mask" in Spatial Analyst. The resulting raster for each was used to estimate areas of intact aquatic systems and natural lands. These rasters do not necessarily represent the exact areas that should be conserved; the National Landcover Database has a low resolution and is seven years old. However, this analysis helps estimate the magnitude of conservation needs. When the 2016 Landcover Database is released (estimated for December 2018), this analysis should be updated.

Note: Lands in Aquatic Systems that overlap with areas designated for agriculture but not currently farmed WERE included here in conservation needs. This is because farmland conservation needs only include lands actively farmed. Whether these lands are more appropriate for farming or for aquatic habitat should be determined through collaboration with farming communities and salmon recovery planners.

Park Access Analysis

To map access to parks and recreational open space in urban areas, the Urban Open Space layer from the regional open space network was used. Parks were classified as "neighborhood," (less than 10 acres in size) "community," (10 to 100 acres) or "regional" (greater than 100 acres) parks according the American Planning Association's Planning and Urban Design Guidelines. Park service areas were defined according to the Washington State Recreation and Conservation Office's (RCO) level of service guidelines. Service areas were defined as up to a half mile from neighborhood parks, one mile from community parks, and ten miles from regional parks.

In ArcGIS, park polygons were converted to points and then loaded into a service area analysis using Network Analyst. Park points within 300 feet of a road or trail were considered to be on that road or trail. Half mile service areas were generated around all park points. One-mile service areas were generated

around community and regional park points. Ten-mile service areas were generated around regional park points.

Population and demographic data were obtained from the U.S. Census's American Community Survey (ACS) for 2015 at the census block group level. Because this analysis was focused within the urban growth area (UGA), block groups were classified as urban or rural based on their level of overlap with the UGA. Block groups with greater than 50 percent of their area within the UGA were considered urban, and thus included in this analysis. Other, rural block groups were excluded. Urban block groups with greater than 50 percent coverage of a service area were considered as having park access and all of the population in such a block group was counted towards the number of resident with park access. If a block group had less than 50 percent coverage from a service area, none of its population was counted. Population within urban block groups with park access was summed to estimate the number of residents with access to parks.

Three demographic indicators were also explored for potential use in prioritizing investments in areas without access to parks ("gap areas"). These were percent people of color, percent households with limited English, and median household income (data obtained from ACS 2015). An index combining these three indicators was calculated for each census block group. For each indicator, census block groups were divided into top, middle, and lower 33rd percentiles. Scores of 1, 2, or 3 were assigned to each block group for each indicator according to the following table:

Score:	1	2	3
People of color	< 19.8 %	19.8 – 37.9 %	> 37.9 %
Households with limited English	0	0.1 – 4.7 %	> 4.7 %
Median Income	> $85,833	$60,317 - $85,833	< $60,317

A total score for a census block group of 8 or 9 was considered "high numbers of people from low income and minority populations." A score of 5, 6, or 7 was consider "medium" and a score of 3 or 4 was consider "low numbers of people from low income and minority populations.

Canopy cover of each census block group was also calculated as a potential indicator for prioritized open space investments. Block groups were then divided into three categories of canopy coverage: high (>40% cover), middle (20-40%), and low (<20%).

Block groups within a service area gap (less than 50 percent coverage by a park service area) with high number of people from low income and minority populations and/or low canopy coverage could potentially be considered in higher need for open space investment than other block groups.

Urban Open Space Needs

To quantify urban open space needs, two types of needs were looked at. The first is current needs - the urban open space needed to fill the neediest open space gaps identified in the above analysis. The second type is future needs – the urban open space needed to fully serve areas where future growth is planned.

For current needs, the neediest gap areas are those areas with low canopy cover and high numbers of people from low income or minority populations. There are 40 census block groups in this category. Some of these block groups are clustered and could be served by the same open space investments. A total of 24 unique open space needs were identified from these 40 census block groups.

For future needs, regional growth centers and high capacity transit station areas were used to identify areas where a significant portion of future growth is planned. Two regional growth centers overlap with the highest priority gap areas in the previous paragraph. Another 4 overlap with lower-priority gap areas, and are included as open space needs. Five high capacity transit station areas overlap with the highest priority gap areas. Another 19 overlap with lower priority gap areas and included as open space needs.