Necanicum Wildlife Corridor Conservation Plan

NORTH COAST LAND CONSERVANCY

September 2014

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THE NECANICUM WILDLIFE CORRIDOR

Necanicum Forest Habitat Reserve[3]

The Necanicum Wildlife Corridor initiative targets land within the nearly 49,000 acre Necanicum River watershed. The watershed includes all of the land and tributaries contributing water to the Necanicum River as it flows from its headwaters 2,800 feet above sea level in the Coast Range to the Pacific Ocean in the City of Seaside. Within a watershed, water connects the mountain tops and the forests to the streams and the ocean.

A WATERSHED IS AN AREA OF LAND WHERE ALL THE WATER THAT DRAINS OFF OF IT OR IS UNDER IT FLOWS INTO THE SAME PLACE.

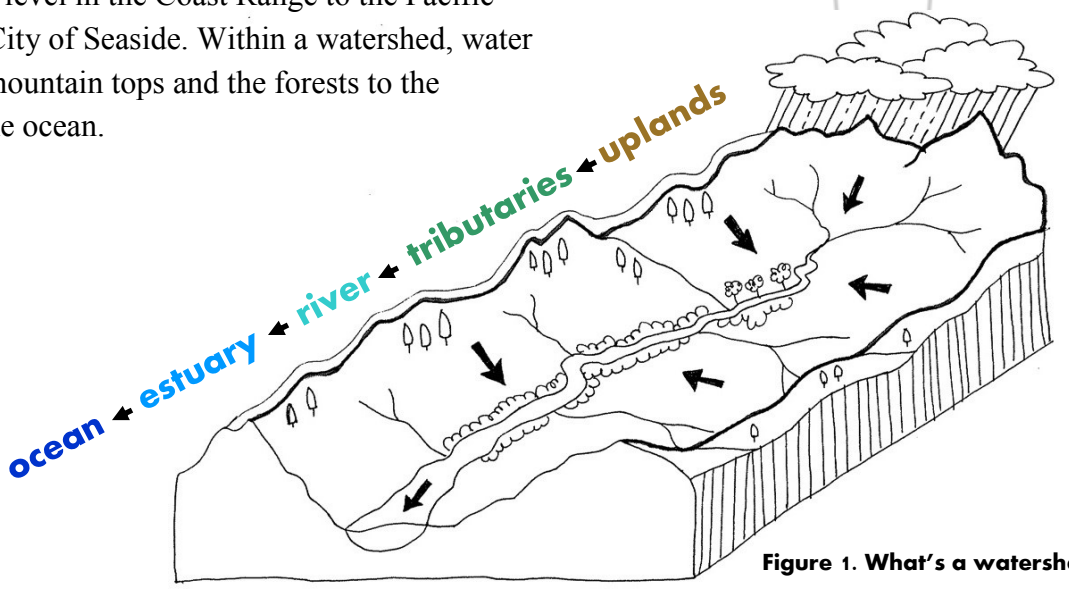


Figure 1. What's a watershed?

Figure 2. The Necanicum Wildlife Corridor initiative focuses on the Necanicum River watershed.

The Necanicum River flows from the Coast Range to the Pacific Ocean (Circle Creek Habitat Reserve visible in center).[2]

The watershed provides critical habitat for many coastal plant and animal communities. Floodplains and associated wetland and riparian ecosystems provide important flood protection for downstream communities and act as corridors allowing wildlife to move along and between habitat areas. Spawning salmon deliver nutrients from the ocean upstream to the forests of the upper watershed.[1] More than 70% of all terrestrial species utilize riparian corridors in some way,[2] making the rivers and surrounding areas vital to the watershed's inhabitants. The South Fork Necanicum River subwatershed also serves as the drinking water source for the City of Seaside.

Necanicum Estuary elk[1]

Necanicum River[1]

As evidenced by the salmon in our rivers and the elk visible throughout the North Coast, wildlife corridors exist. All we need to do is protect them.

Thompson Creek Habitat Reserve[3]

Conservation to date

As of summer 2014, North Coast Land Conservancy (NCLC) has conserved approximately 633 acres of land within the Necanicum watershed. This area is comprised of 15 properties varying in size from less than one acre to 364 acres. Twelve of these properties, covering 194 acres, are located within the estuarine portion of the watershed and are considered part of NCLC's Estuaries initiative. This conservation plan focuses on the riverine portion of the watershed, upstream of the estuary in Seaside.

Conservation goals

Our goals in this watershed are to conserve, maintain, and promote wildlife corridors and ecological connectivity through a green infrastructure approach. Green infrastructure is a landscape scale conservation planning approach meant to consider the needs of nature and people.

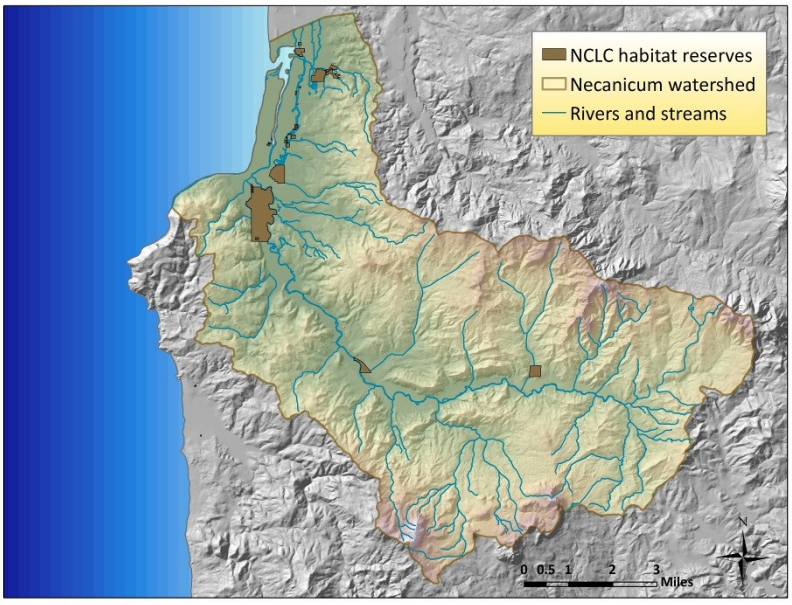


Figure 3. North Coast Land Conservancy habitat reserves (in brown) within the Necanicum River watershed as of summer 2014.

Geology: shaping the watershed

The landscape we see today in the Necanicum watershed is the product of geologic forces at work over millennia. From the slope of the mountains to the sediment in the streams, geology influences the habitats and, thus, plants and animals present in the watershed.

The headwaters of the Necanicum River are located in the rugged peaks of the Coast Range near Humbug and Sugarloaf Mountains. From a maximum elevation of 2,846 feet, water flows northwest along the Necanicum Valley Fault to sea level at the mouth of the Necanicum estuary. The highest elevations in the watershed are rocky peaks made of Columbia River Basalt (CRB) in the now-uplifted submarine canyon of the Columbia River. This implies that the Necanicum River formed on the side of the rising hills as the CRB lava complex emerged from the ocean, about 10 million years ago.[3]


Sugarloaf Mountain[3]

Steeper slopes tend to develop higher in the watershed and landslides tend to be more common, sometimes manifesting in large block slides continuing to the valley bottom. It is common to find large ridges of cinnamon brown earth comprised of decomposed breccia (basalt conglomerates cemented together like concrete) and large blocks of rounded basaltic breccia. These deposits on the flanks of peaks creep or occasionally cascade downslope during heavy rains or strong regional earthquakes.[3]

Because these basalt boulders may bridge over one another, caves can form where the soils erode away providing den habitat for animals. Rubbly deposits on slopes host aquifers and contain large numbers of rocky springs, in which amphibians gather. The tendency of the basaltic highlands to have thin soils, results in numerous seeps with abundant sunlight for unique plant and animal habitat niches.[3]

Erosional forces break down the basaltic breccias into gravels, which landslides deliver to the stream beds of the Necanicum River and its tributaries, providing high quality spawning gravels for anadromous fish. Land slides are an important part of the sediment transport system that replenishes stream bed gravels and enhances spawning conditions.[3]


North Fork Necanicum River[1]

The introduction of fine sediments to the streams during landslides usually occurs during heavy rains and snowmelts when much of the bed load of the stream is in motion. These sediments have historically contributed to stream meanders in the lower gradient parts of the water-

shed, where log jams have redirected the river to new channels, leaving ponds and swamps behind as a result.[3]

Historically, the Necanicum River floodplain likely contained denser mixed stand forests of Sitka spruce, red alder, western hemlock, grand fir, big-leaf maple, and western red cedar.[4] Forested floodplains contributed woody debris to the river system, providing habitat complexity and nutrients for aquatic species.[3]

Changes to watershed processes

Recent clear-cut logging practices have increased peak flood events, by increasing overland flow, and it is likely that more fine sediment is being delivered to the channels and floodplains.[3]

Today, portions of the Necanicum floodplain have been converted to agricultural and residential uses, reducing woody vegetation in the bottomlands. A lack of downed trees in the river has nearly eliminated significant flow blockages, which has reduced side-channel and pond habitats in the lower river valley.[3] The banks of the lower Necanicum River are now almost entirely surrounded by development as it flows through Seaside.


Necanicum Estuary[3]


Circle Creek Habitat Reserve[2]

These land use changes as well as the construction of Highway 26, which parallels the Necanicum River from its junction with Highway 101 to the eastern extent of the watershed, restrict the ability of the river to meander in response to high flow events and deposit sediment and nutrients on its historic floodplain.

Restoring processes

A large scale floodplain restoration project is taking place on North Coast Land Conservancy's Circle Creek reserve , which includes the partial removal of a berm that disconnected the Necanicum River from its floodplain south of Seaside. This project is returning 100 acres of historic floodplain back to the river, putting it on a trajectory toward the forested floodplain it was once was, providing habitat for aquatic and terrestrial species, and alleviating local and downstream flooding.

Circle Creek Habitat Reserve serving as Necanicum River floodplain[2]

Human Dimensions

The Necanicum Wildlife Corridor initiative focuses on the main stem Necanicum River and its associated tributaries. The largest town located within this area is the City of Seaside, which comprises approximately 2,700 acres of the watershed. Seaside is located along the Necanicum and Neawanna riverine systems and is bounded on the north by the Necanicum estuary. Seaside is one of the most popular beach communities along the Oregon coast. Its beaches, outdoor recreational opportunities, and scenery attract 900,000 to 1,000,000 tourists a year[5] from throughout the Pacific Northwest and the world, providing key economic stability to the area. The population of year round residents has increased by approximately 1,000 people during the last 20 years to a population of 6,500 residents;[6] however, summer weekends can attract as many as 40,000 tourists.[5] The unincorporated portion of the watershed is home to a small population of mostly year-round residents primarily situated along the Necanicum River. Natural resource challenges facing the Seaside community include:

(1) lack of buildable lands within the current Urban Growth Boundary, which will force the city to expand into historic timber lands;

(2) increased demand on natural resources produced by the summer population (e.g., water, trails, fishing), which without careful planning could affect the area's natural beauty and diminish tourism; and

(3) planning for future Cascadia earthquakes and tsunamis, as well as sea level rise and migration of wetlands, which will alter current land use patterns.

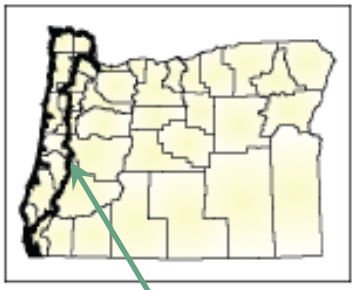
Hood to Coast relay finish at Seaside[4]

CONSERVATION GOALS & PRIORITIZATION STRATEGY

Broadly, the conservation goals of NCLC are to conserve green infrastructure by protecting lands that contribute to a fully-functioning coastal landscape where healthy communities of people, plants and wildlife all thrive. We are dedicated to conserving the diversity of habitats that exist within our service area, and maintaining connectivity between them through a green infrastructure approach. This plan outlines NCLC's conservation goals and prioritization strategy for the Necanicum Wildlife Corridor initiative. In order to prioritize and visualize our conservation strategies within the Necanicum Wildlife Corridor we established a system for ranking priority habitats, ecological connectivity, and land use patterns.

Priority Habitat Types

NCLC's service area encompasses a wide array of habitats within the Coast Range ecoregion, stretching from coastal prairie to temperate rainforest and from estuaries to headwater streams. With this diverse landscape in mind, NCLC has developed a systems level approach to our initiatives targeting key habitat types within the context of broad ecological values (e.g., wildlife corridors and connectivity) within different regions of our service area.



The Coast Range ecoregion is characterized by diverse habitats ranging from sandy dunes to headwater streams in temperate rainforests and by mild, moist weather moderated by the ocean.

The habitat types that NCLC has prioritized for conservation within the Necanicum watershed are aligned with those identified in the Oregon Department of Fish and Wildlife's Oregon Conservation Strategy,[7] the Necanicum River Watershed Assessment,[3] the Oregon Department of Land Conservation and Development's Oregon Statewide Planning Goals[8] and various local Comprehensive Plans. The Oregon Conservation Strategy designated more strategy habitats in the Coast Range ecoregion than any other ecoregion, highlighting the importance of conservation efforts within NCLC's service area. Below is a list of strategy habitat types from the Oregon Conservation Strategy of particular interest to NCLC within our Necanicum Wildlife Corridor initiative, from highest to lowest priority. This prioritization of habitats represents not their ecological significance but their priority for focused new land conservation within this initiative.

- **Freshwater aquatic and riparian areas**
- **Wetlands, including depressional forested wetlands**
- **Late successional mixed conifer forests**
- **Estuaries**

Descriptions of Priority Habitats

Freshwater Aquatic & Riparian Areas

Freshwater aquatic habitats include freshwater ponds, freshwater emergent wetlands, and riverine habitats. Riparian areas, including floodplains, are transition zones between aquatic and terrestrial habitats, providing critical refuge to many species, mitigating runoff and erosion, and providing many other ecosystem services. Within the Necanicum watershed, these areas provide critical habitat for salmonids, including the threatened Oregon coast coho, and yield clean water for the City of Seaside. Freshwater aquatic and riparian areas are highly prioritized habitats within this initiative as they act as natural corridors for both aquatic and terrestrial species.

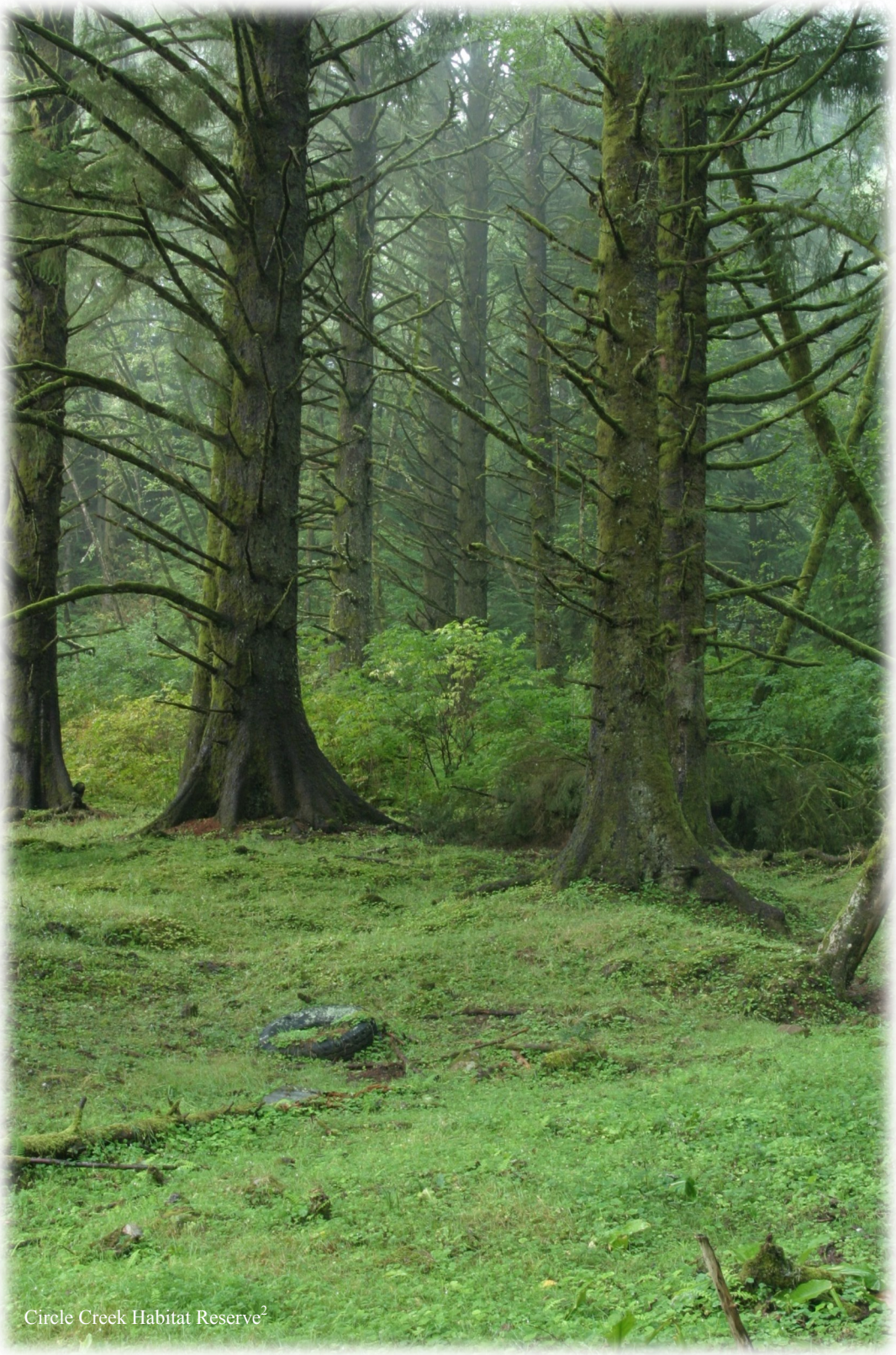
Circle Creek Habitat Reserve[3]

Depressional Wetland Forests & Shrublands

Despite covering less than 2% of Oregon,[9] the ecological and economical value provided by wetlands is disproportionally great. In addition to providing critical plant and animal habitat, wetlands protect water quality. Acting as "nature's kidneys," wetlands filter out sediment, excess nutrients, and pollutants. Through their ability to store water, wetlands protect the natural and manmade environment by attenuating floodwaters and storm surges. In Oregon, wetland acreage has declined by more than 1/3 in the last 200 years.[9] The Sitka spruce swamp and forested wetland communities found here are considered globally rare.[10] Providing a similar service as riparian areas, these depressional wetlands are often found within the floodplain of the Necanicum River and its tributaries.

Depressional wetland forest at Circle Creek Habitat Reserve[3]

Late Successional Forests



Circle Creek Habitat Reserve[2]

Forests comprise 92% of the Necanicum watershed. While much of the watershed is best described as third generation hemlock-dominated timber farms, these forests still provide important habitat and natural benefits within the initiative area.

Uncut portions are dominated by Sitka spruce with lesser occurrences of western red cedar (*Thuja plicata*). The understory is most often comprised of salmonberry (*Rubus spectabilis*), evergreen (*Vaccinium ovatum*) and red huckleberry (*Vaccinium parvifolium*), sword fern (*Polystichum munitum*), deer fern (*Blechnum spicant*), and salal (*Gaultheria shallon*), with hardwoods such as Pacific crabapple (*Malus fusca*) and cascara (*Rhamnus purshiana*) appearing in light gaps and windthrow areas.

Most of the forested areas in the watershed have been logged, making any remaining late successional forests a rare habitat type and a priority for protection. Because nearly all forest land in the Necanicum watershed is privately owned, the locations of these late successional forests are not widely available. NCLC depends on local knowledge and partnerships with landowners to identify opportunities to protect late successional forests.

Necanicum-Neawanna Estuary with Neawanna Point Habitat Reserve at bottom left.[3]

Estuaries

Estuaries are the grand interface of freshwater and saltwater, where rivers and streams meet the ocean. These transition zones serve as key habitats for myriad species, including salmonids and various types of shellfish. Estuary conditions can be greatly influenced by the condition of the associated watershed. The Necanicum estuary is fed by the Necanicum and Neawanna riverine systems, which drain approximately 49,000 acres stretching from the Coast Range to the Pacific Ocean.

While recognizing the interdependence of riverine and estuarine systems, the ecological significance of estuaries is such that this habitat type is the subject of its own initiative. NCLC has conserved nearly 200 acres of natural areas along the estuarine portions of the Necanicum River and Neawanna Creek. The Necanicum-Neawanna estuary is in the heart of the city of Seaside and much of the remaining landscape is developed. NCLC's future conservation priorities within the Necanicum Wildlife Corridor initiative are primarily focused on the Necanicum River upstream of Seaside. More detailed analysis of the estuary portion of the watershed can be found within our Estuaries conservation plan.

Prioritization Strategy

A fully-functioning coastal landscape where people, plants, and animals all thrive is a big goal. To prioritize NCLC's conservation efforts and those of our many partners, criteria have been identified that support ecological integrity and contribute to high conservation values. Data were collected from local, state, and federal agencies and synthesized for a comprehensive view of the landscape. While the potential variables are limitless when modeling a landscape, the scope of this project restricted our data inputs to those compiled by secondary sources that are applicable to the initiative area.

A scoring matrix was developed to reflect high, medium, and low conservation priorities. Within each category, scoring ranges from 5 to -1, with 5 and 4 signifying the highest priority, 3 and 2 representing medium priority and 1 to -1 the lowest overall priority.

Using geographic information systems (GIS) software, scores from each dataset are combined, resulting in an overall score for every part of the landscape. The final product of this process is a co-occurrence map. Areas with the highest cumulative scores represent areas with the greatest conservation values based on the modeled criteria.

CRITERIA

Wetland type

+

Land use type

+

Floodplain vs. upland

+

County comprehensive planning goals

+

Parcel size

+

Proximity to public/ conserved lands

+

Forest type

+

Salmonid habitat

FINAL CO-OCCURRENCE MAP

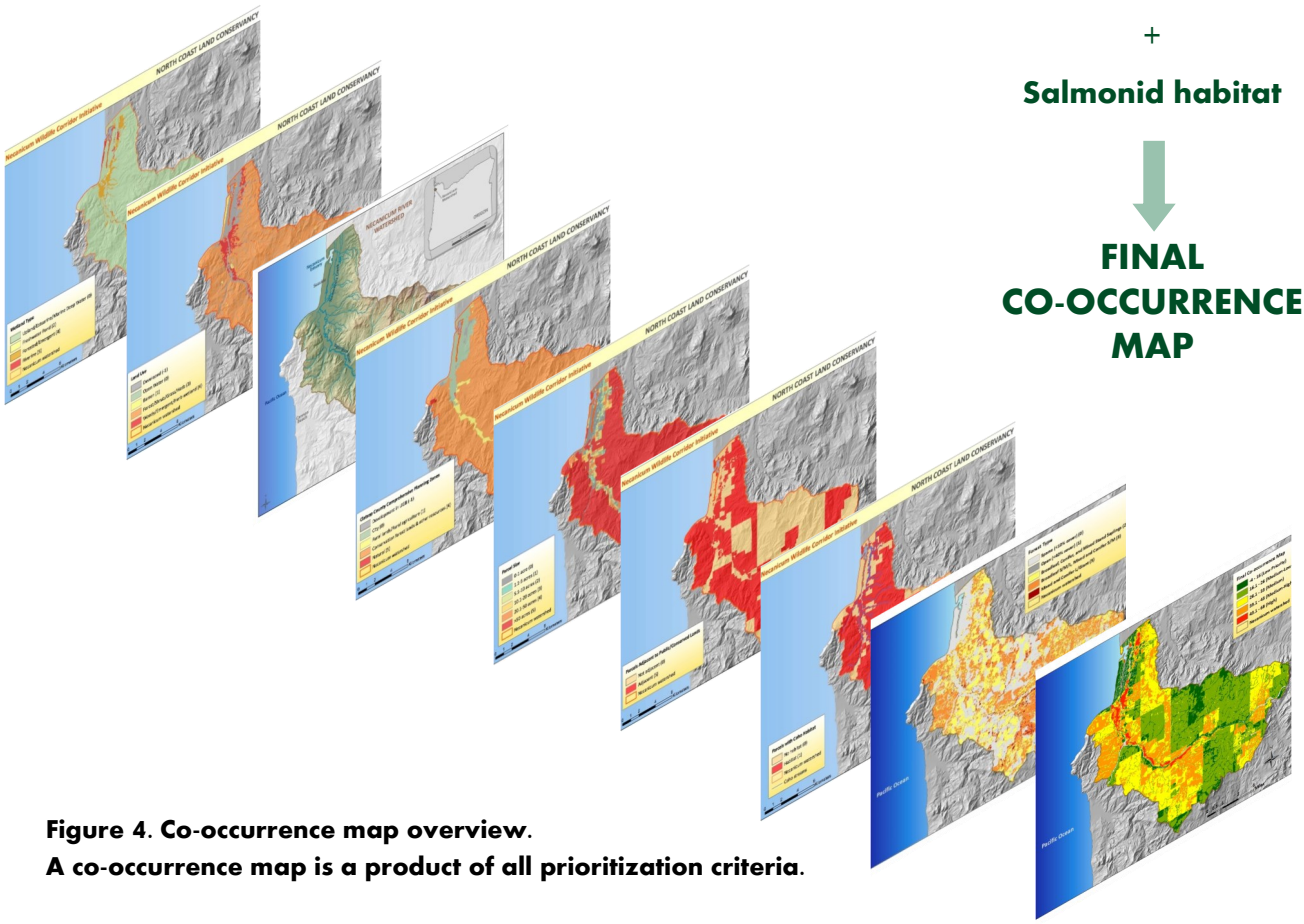


Figure 4. Co-occurrence map overview.
A co-occurrence map is a product of all prioritization criteria.

Scoring Matrix

Criteria	Data Source	Category	Score
WETLAND TYPE	U.S. Fish & Wildlife Service National Wetlands Inventory	Upland/estuarine/marine deep water	0
		Freshwater pond	2
		Forested/emergent	4
		Riverine	5
LAND USE	U.S. Geological Survey	Developed	-1
		Open water/Barren	0
		Forest/Shrub/Grass/Herbaceous	3
		Woody/Emergent/Herbaceous Wetland	4
FLOODPLAIN	Federal Emergency Management Agency	Upland	0
		Floodplain (500 year)	5
COUNTY COMPRE HENSIVE PLANNING GOALS	Clatsop County GIS Department	Development	-1
		Rural lands/rural agriculture	1
		Conservation forest lands	2
		Conservation resources	4
		Natural lands	5
PARCEL SIZE	Clatsop County GIS Department	<1 acre	0
		1.1-5 acres	1
		5.1-10 acres	2
		10.1-20 acres	3
		20.1-50 acres	4
		>50 acres	5
ADJACENCY TO CONSERVED LANDS	Clatsop County GIS Department	Not adjacent	0
		Adjacent to	5
FOREST TYPE	Landscape Ecology, Model-ing, Mapping, and Analysis (LEMMA)	Sparse (<10% cover)	0
		Open (<40% cover)	1
		Broadleaf, conifer and mixed stand saplings	2
		Broadleaf - small, medium, or large; conifer and mixed stand - small and medium	3
		Conifer and mixed stand - large and giant	5
COHO HABITAT	Oregon Department of Fish & Wildlife (ODFW)	Parcels without coho streams	0
		Parcels with coho streams	1
CHUM HABITAT	ODFW	Parcels without chum streams	0
		Parcels with chum streams	1
FALL CHINOOK HABITAT	ODFW	Parcels without chinook streams	0
		Parcels with chinook streams	1
WINTER STEELHEAD HABITAT	ODFW	Parcels without steelhead streams	0
		Parcels with steelhead streams	1

Scoring Rationale

Wetland Type

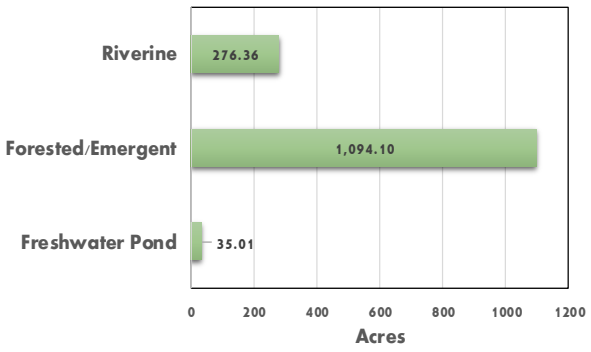


Figure 5. Wetland acres within watershed, by wetland type.

Wetlands are a key aspect of the watershed, providing wildlife habitat and water storage and filtration. National Wetland Inventory (NWI) data created by the U.S. Fish and Wildlife Service was used to provide a coarse overview of jurisdictional wetlands within our initiative. Based upon our research, the NWI provides the most comprehensive, easily mapped representation of wetlands for this area.

This initiative focuses on riparian and stream systems, which form natural terrestrial and aquatic wildlife corridors. Scoring riverine wetlands highest accentuates our focus on the Necanicum River and its tributaries as the main arteries of the system and providers of vital habitat connectivity.

Forested/emergent wetlands are ranked as the second highest wetland type within our model. In this watershed, these areas are commonly associated with floodplains, and provide off-channel habitat and water filtration. Protecting these areas is vital to the overall health of the riverine system, promoting a fully-functioning watershed.

Within this watershed, areas categorized as freshwater ponds are mostly associated with quarries or manmade ponds, and are not connected to the riverine systems we prioritize in this initiative. These waterbodies are not the focus of this particular initiative and, thus, are assigned low ranks. Similarly, estuaries and marine deep water habitats are targeted by NCLC's Estuaries initiative and are not mapped here.

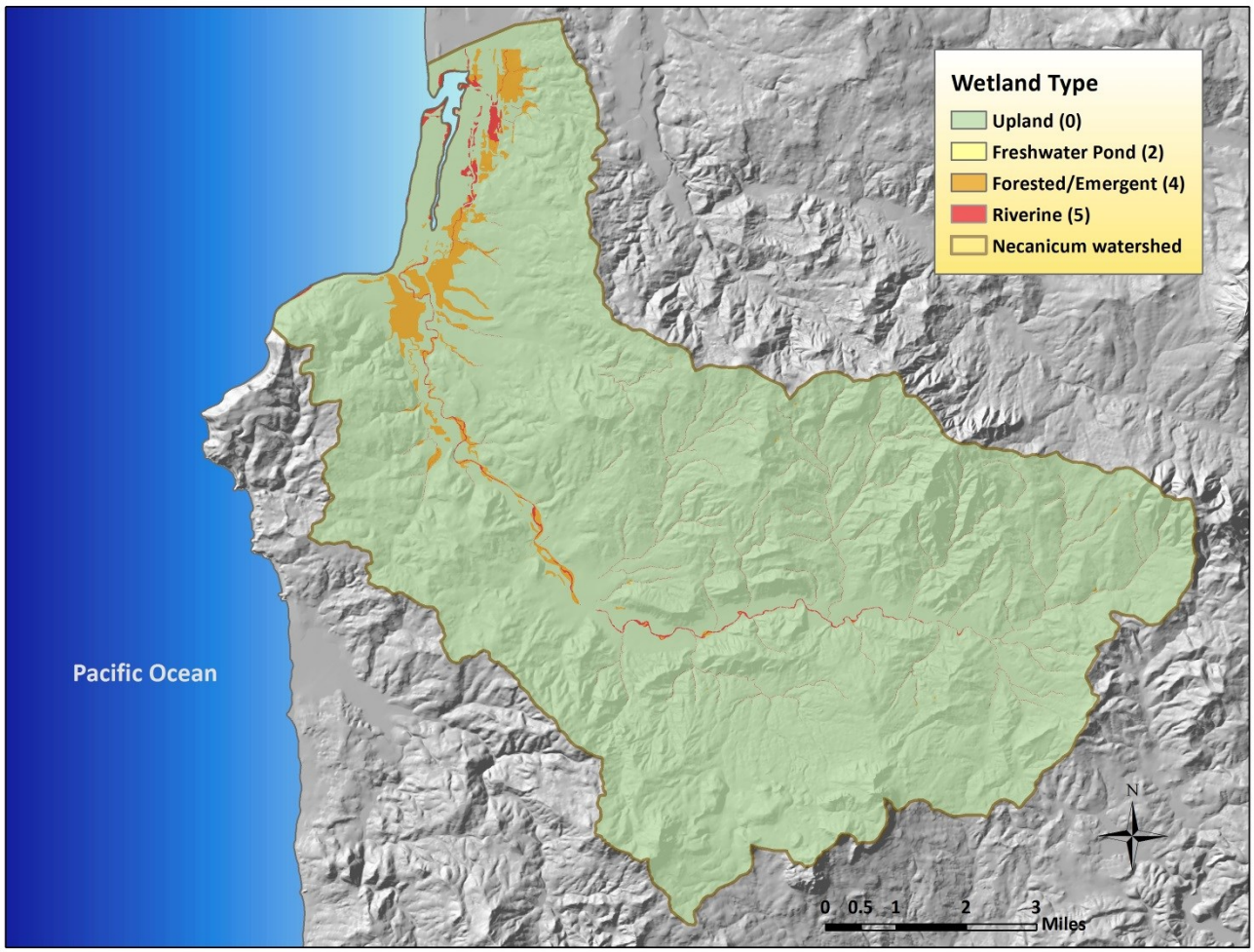


Figure 6. Wetlands in the Necanicum River watershed. Scoring is indicated in parenthesis in the legend.

Land use/cover

Data on land use/cover was acquired from the National Land Cover database managed by the U.S. Geological Survey. This dataset categorizes land cover using aerial photography. We found this to be an accurate representation of land use patterns in our focus area. Land use categories distinguish between developed and undeveloped areas within broad vegetation types.

Because wetlands in this watershed are commonly associated with riparian corridors we have chosen to rank wetlands as the highest priority land cover.

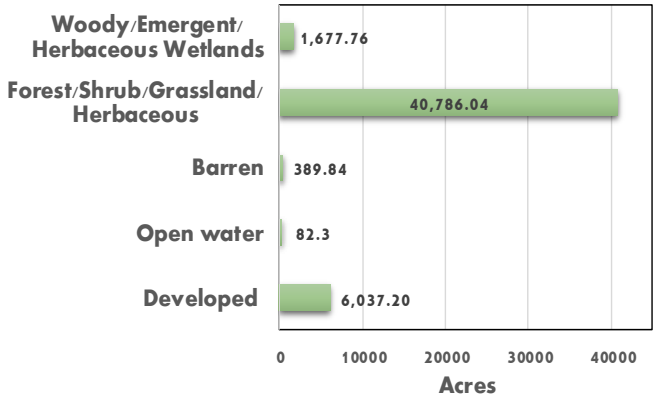


Figure 7. Land use/cover within watershed.

The upland cover classes (forest/shrub/grass/herbaceous) are ranked as moderately important, recognizing the critical roles they play in the movement of terrestrial species and the buffering of wetlands and streams.

While undeveloped barren lands have the potential to provide connectivity between habitats, the areas designated as barren lands by this dataset are often quarries or beaches. Quarries provide little to no ecological value and beaches are already managed by the state of Oregon. Open water in this dataset highlights manmade ponds, which are disconnected from the riverine system.

Developed areas are identified as roads or building footprints. These developed areas can impede or obstruct connectivity between habitats and therefore are treated as a loss of green infrastructure.

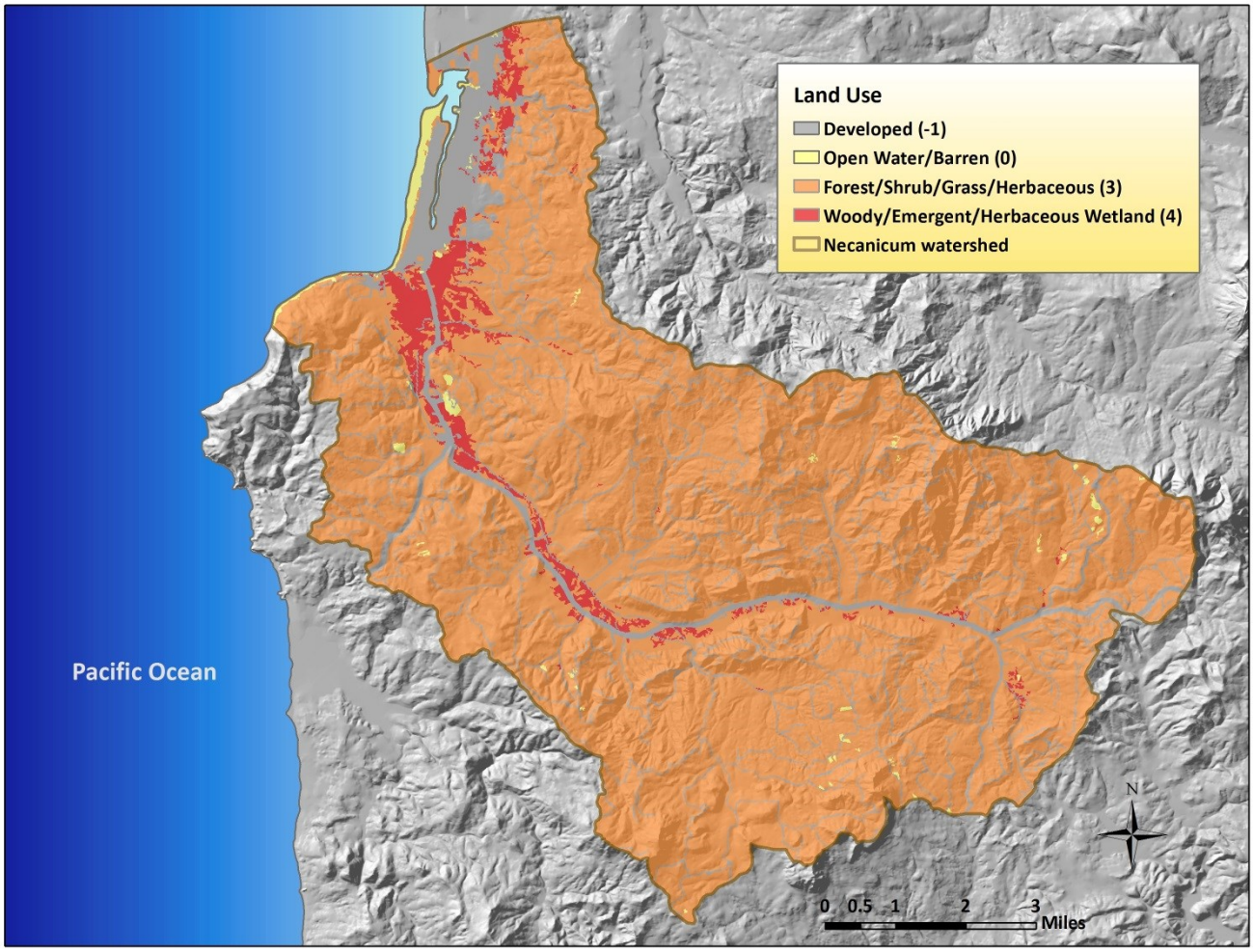


Figure 8. Land use in the Necanicum River watershed. Scoring is indicated in parenthesis in the legend.

Floodplain

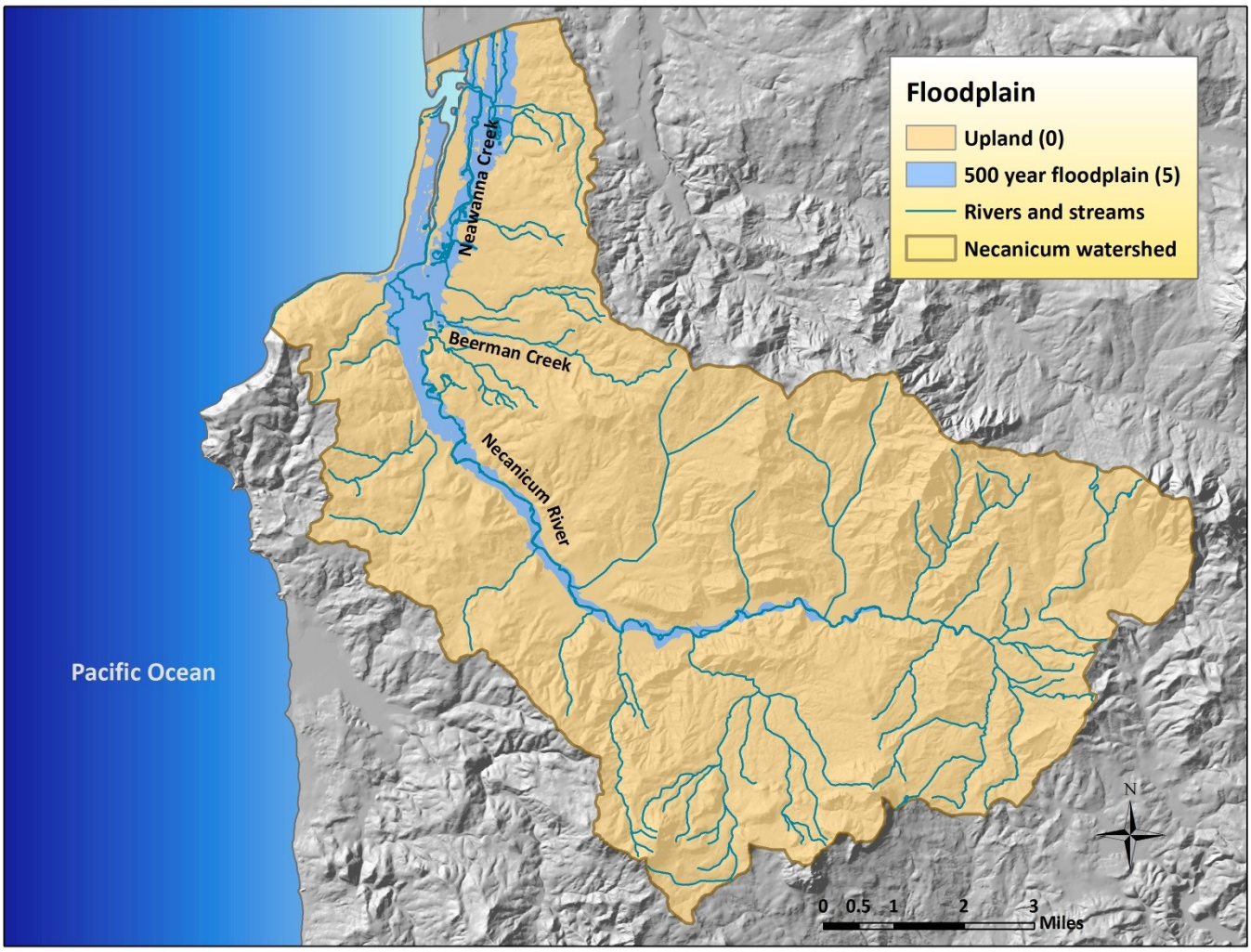


Figure 9. Floodplains of the Necanicum River and Neawanna Creek. Scoring is indicated in parenthesis in the legend.

Floodplain data was derived from the Federal Emergency Management Agency's flood insurance mapping program. These data focused on the Necanicum River, Neawanna Creek, and Beerman Creek, as the majority of the development within the watershed is near these waterways. We prioritized land within the 500 year floodplain to reflect the importance of the Necanicum River valley as an important wildlife corridor, containing most of the strategy habitats essential to the health of the initiative area.

Circle Creek Habitat Reserve serving as Necanicum River floodplain[2]

County comprehensive planning goals

These data were acquired from Clatsop County's GIS Department and is based on the county's comprehensive planning goals for lands outside of incorporated municipalities. NCLC interfaces with counties and municipalities to help implement their comprehensive planning goals.

Natural lands are defined by Clatsop County as those which have not been significantly altered and provide resource support vital to riparian and estuarine ecosystems. Natural lands were ranked most highly because they are often found next to large, conserved parcels, increasing the conservation impacts of these lands by promoting landscape scale connectivity.

Clatsop County defines conservation resources as areas that provide important resource or ecosystem support functions such as lakes, wetlands, and federal, state, and local parks. These lands are meant to be used for low intensity uses that do not disrupt the resource and recreational value of the land. For this reason and in order give weight to high priority uplands, these lands are ranked as a high priority.

Forest lands are defined as those that are to be retained for production of wood fiber and other forest uses. For this reason these forests, outside of riparian areas, are considered a low priority.

Rural lands are small developed home sites along the mainstem Necanicum. Because of their small acreage and level of development, these areas area a low priority for conservation.

Development areas are suitable future development sites, as identified by the county. Although these areas may not be currently developed, they are within the county's developable lands inventory. These lands are ranked as a low priority for conservation as we recognize the important balance between development and conservation within the framework of the county's comprehensive plan.

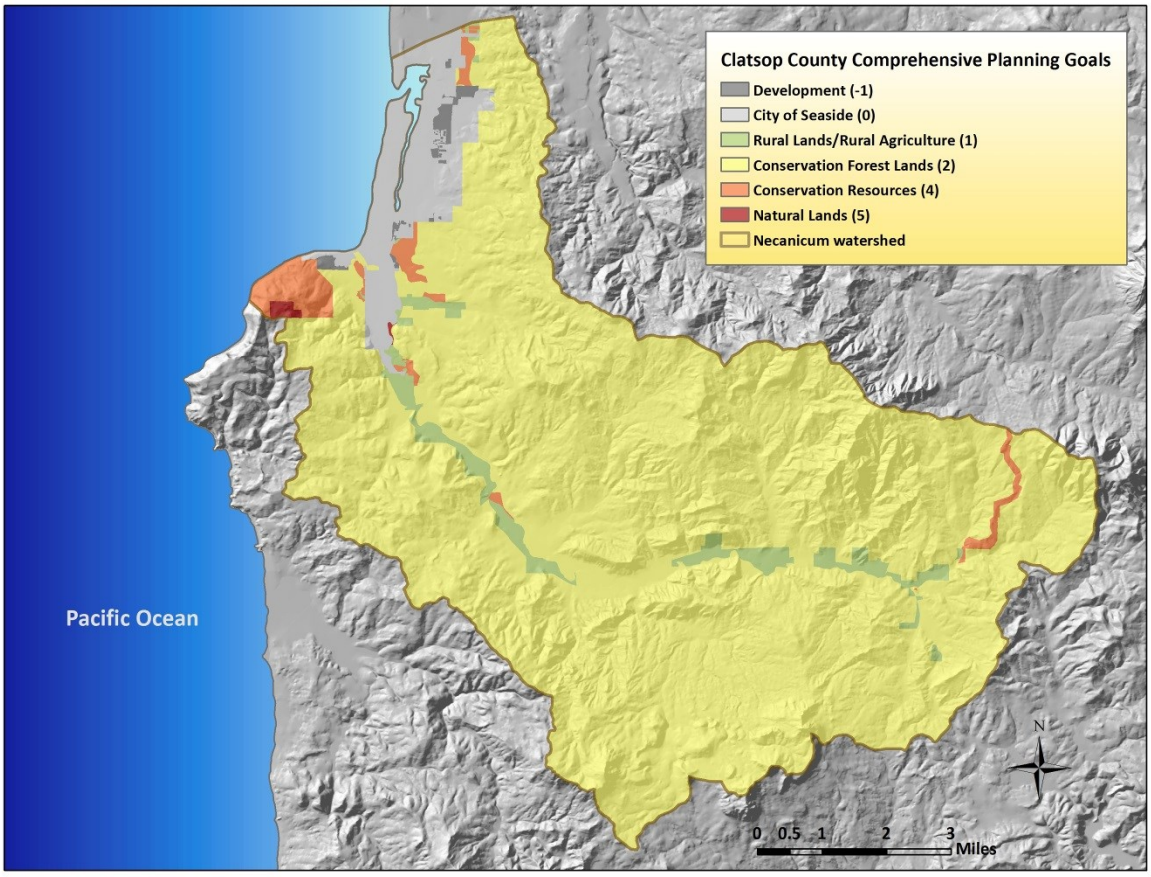


Figure 10. Clatsop County Comprehensive Planning Goals within the Necanicum River watershed. Scoring is indicated in parenthesis in the legend.

Parcel size

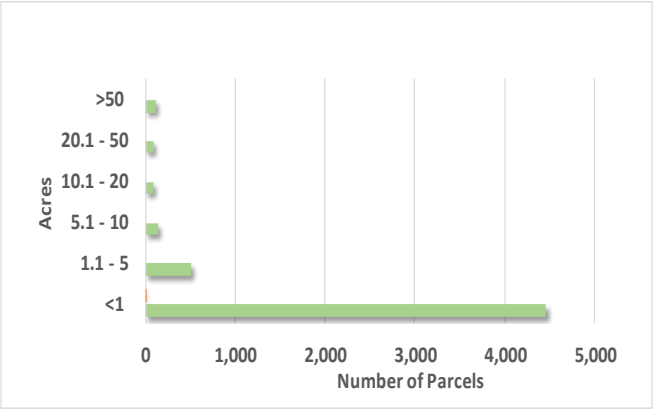


Figure 11. Parcels within watershed, by acreage.

Habitat size is an important factor in healthy populations and ecosystems. Habitat requirements vary greatly by species and conservation objective, but habitat conservation has a trickle down effect. If we aim to protect larger pieces of habitat, species with the greatest need for space and resources will benefit along with the other members of their communities.[11] Additionally, the smaller a habitat reserve, the greater the influence of the surrounding areas.[12] Since land ownership is delineated by parcels, the protection of larger parcels contributes to the conservation of not only more overall habitat but also potentially larger core areas buffered from external conditions.

Using parcel data obtained from Clatsop County's GIS Department, parcels were divided into six size classes and larger parcels assigned high scores. The majority of parcels less than one acre in size are located within the City of Seaside and most parcels larger than 50 acres are owned by industrial timber companies.

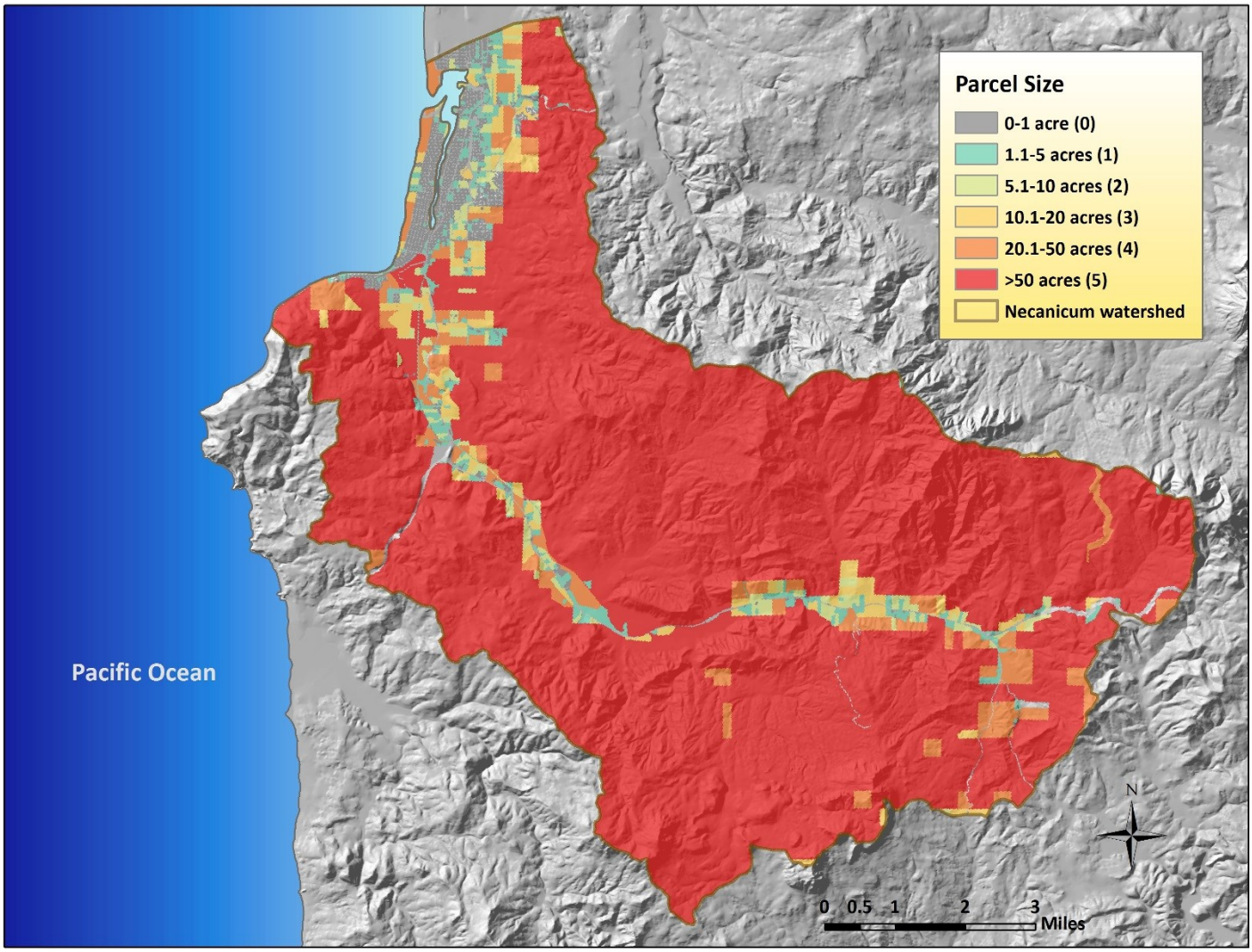


Figure 12. Parcel size categories in the Necanicum River watershed. Scoring is indicated in parenthesis in the legend.

Adjacency to conserved lands

NCLC works within a green infrastructure model that prioritizes habitat connectivity at a landscape scale. One way to approach this concept is to build upon the existing network of public and conserved lands. In this vein, we highly prioritized land adjacent to parcels in public ownership or otherwise already conserved, thereby building green infrastructure and creating larger continuous corridors. Conserving parcels adjacent to already protected lands impedes the fragmentation of habitats.

Based on data obtained from Clatsop County's GIS Department, parcels owned by local, county, or state government or conservation organizations such as The Nature Conservancy and North Coast Land Conservancy were identified. These parcels as well as parcels with which they share a boundary, were highlighted and ranked highly in our model.

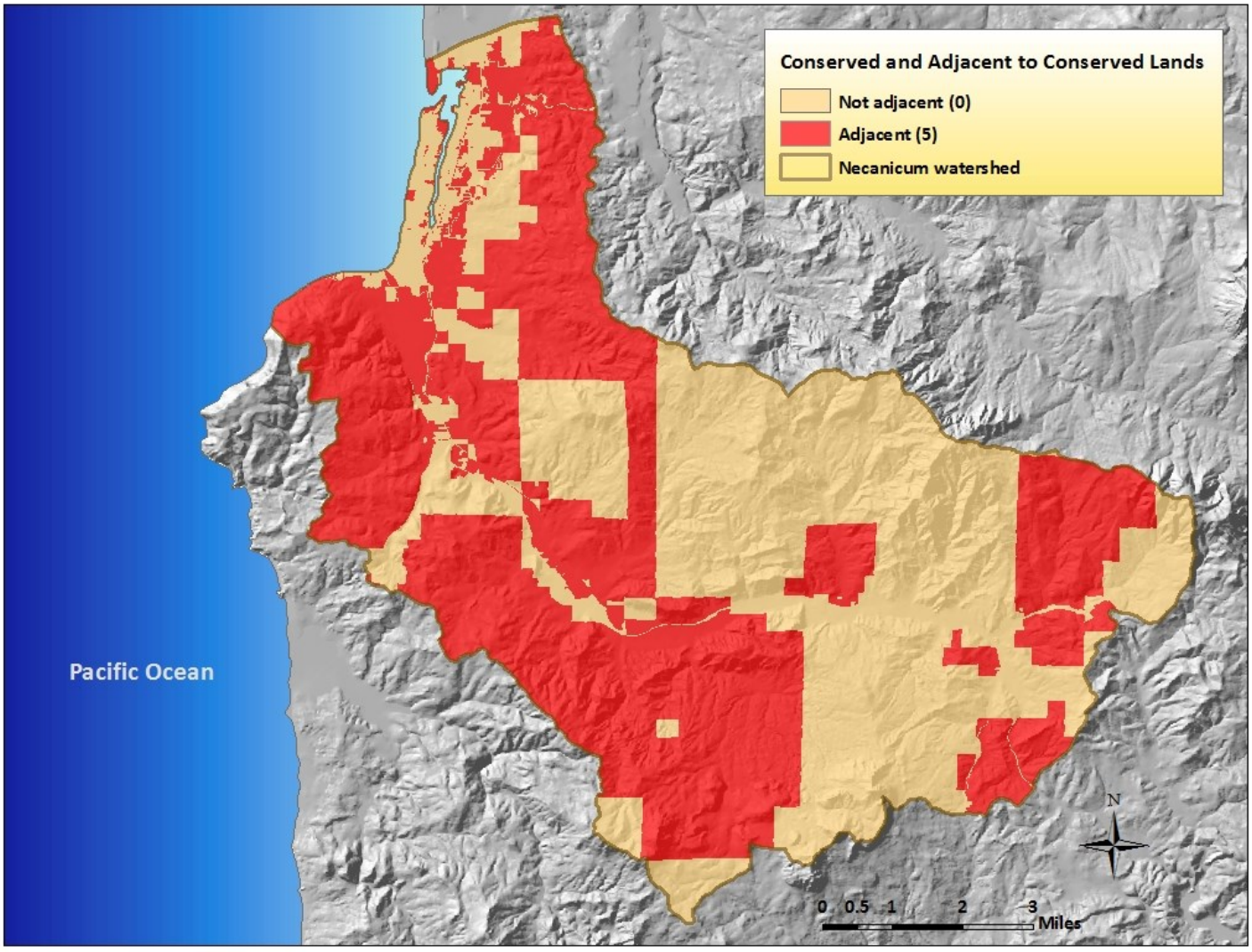


Figure 13. Conserved lands and parcels adjacent to conserved lands in the Necanicum River watershed. Currently conserved lands as well as adjacent parcels are shown in red. Scoring is indicated in parenthesis in the legend.

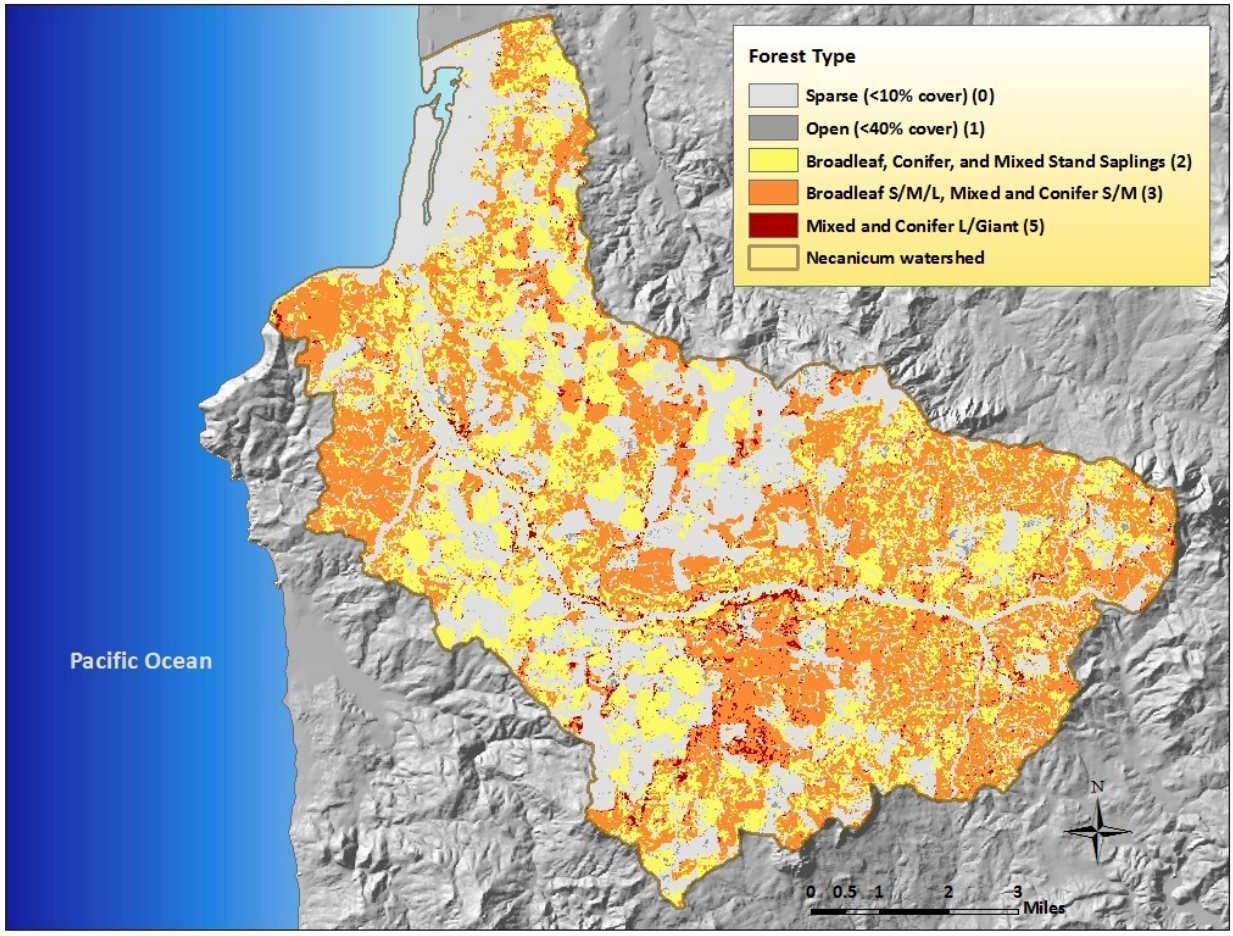


Figure 14. Forest types within in the Necanicum River watershed. A model was used to map forest types based on broad canopy cover classes, structure, and tree type. Scoring is indicated in parenthesis in the legend.

Forest Type

Data on forest type and structure were obtained from the Landscape Ecology, Modeling, Mapping, and Analysis (LEMMA) project, a cooperative project of Oregon State University, the U.S. Forest Service, and the Oregon Department of Forestry. The LEMMA data layer was created using a model that uses data collected from vegetation inventory plots throughout the coastal ecoregion in combination with aerial imagery and environmental characteristics such as temperature, precipitation, and elevation. This model was used to characterize coastal forests based on broad canopy cover, stand type (broadleaf, conifer, or mixed), and size classes. Although the data represents a snapshot in time, and forest structure is constantly evolving, it provides the best available data on the locations of large trees within privately owned forests.

For the purpose of this conservation plan, we consolidated the LEMMA data into five categories: (1) sparse (<10% canopy cover), (2) open (<40% cover), (3) broadleaf, conifer, and mixed stand saplings (>40% cover) (<25 cm mean diameter), (4) small, medium, and large broadleaf (>25 cm) and small and medium mixed and conifer stands (25-50 cm) (>40% cover), and (5) large (50-75 cm) and giant conifers (>75 cm) and mixed stands (>50 cm) (>40% cover).

NCLC is interested in identifying the locations of the remaining late successional stands. These large and giant conifer and mixed stands were highlighted and ranked highly in our model because of their mature canopy, understory communities, and rarity within the watershed. Saplings and mid-sized trees were assigned medium rankings due to their existing and future habitat value. Areas with sparse and open canopy cover were ranked lowest as these areas contain the least forest structure, and these categories capture both developed and clear cut areas with low habitat value.

Salmonid habitat

Data on historical stream usage by salmonid species was obtained from the Oregon Department of Fish and Wildlife. The Necanicum watershed provides habitat for fall chinook, Oregon coast coho, chum, and winter steelhead. These data were used to identify priority stream corridors by giving weight to reaches historically used by salmonids as rearing and spawning habitat. Using this data, we were also able to identify parcels that provide vital upland buffers to salmonid streams. Due to some known inaccuracies in the stream locations layer, we applied a 30 meter buffer to the streams to better highlight parcels containing salmonid habitat. The four species were scored separately to identify their habitats but in order to not skew our overall model, parcels containing habitat for each species was given a score of one. Parcels that contain habitat for all four salmonid species, receive a cumulative score of four and are considered a high priority.

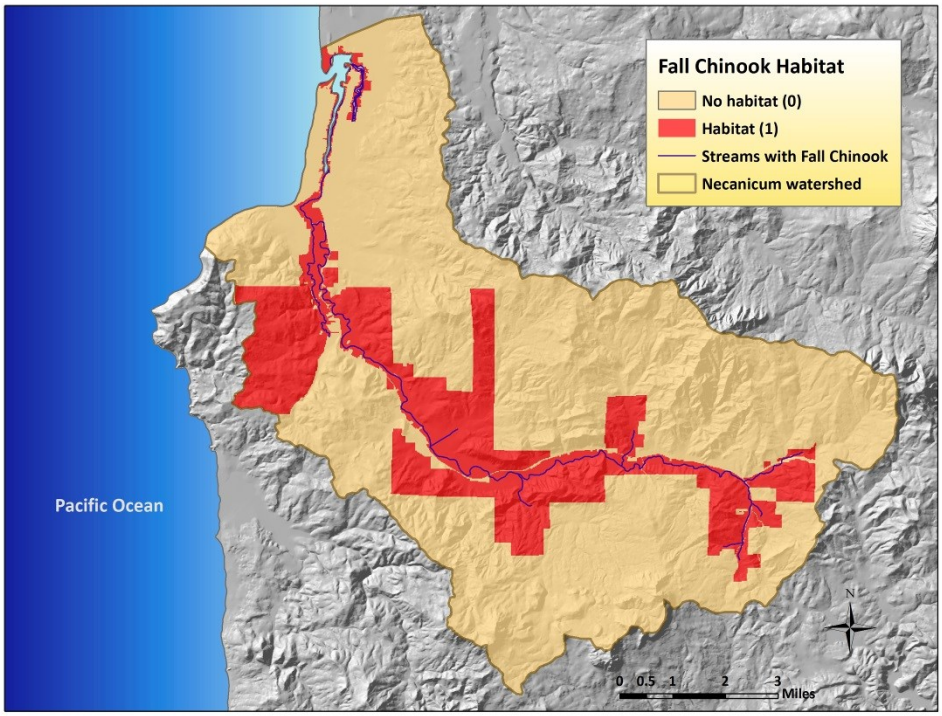


Figure 15. Fall chinook salmon were introduced into the Necanicum River watershed in the 1970s[4]. Parcels containing habitat utilized by fall chinook are shown in red. Scoring is indicated in parenthesis in the legend.

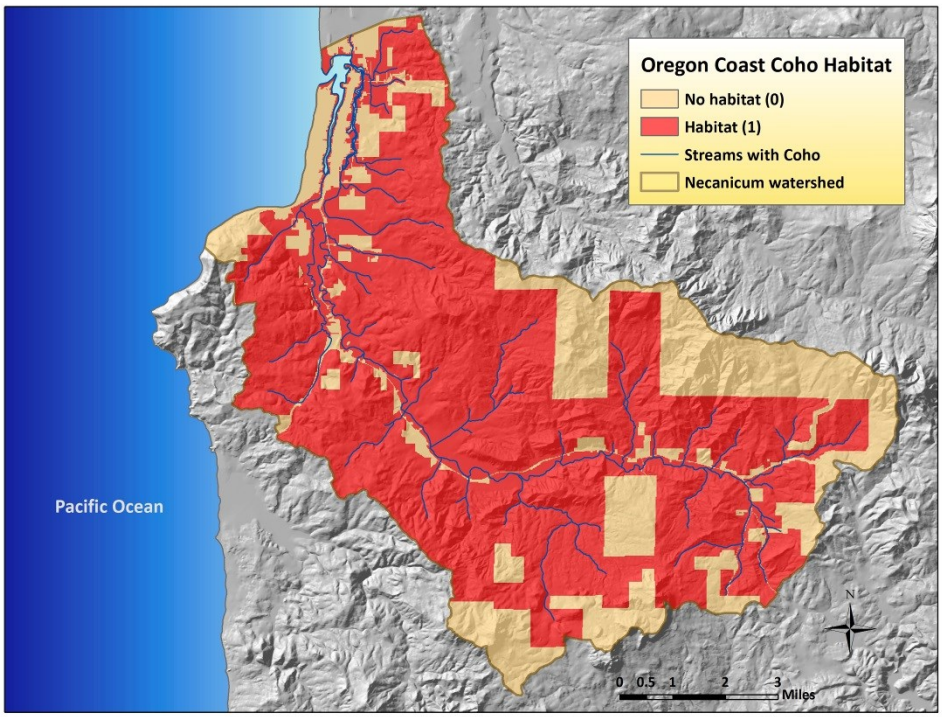


Figure 16. Oregon coast coho salmon habitat in the Necanicum River watershed. Parcels containing habitat utilized by coho are shown in red. Scoring is indicated in parenthesis in the legend.

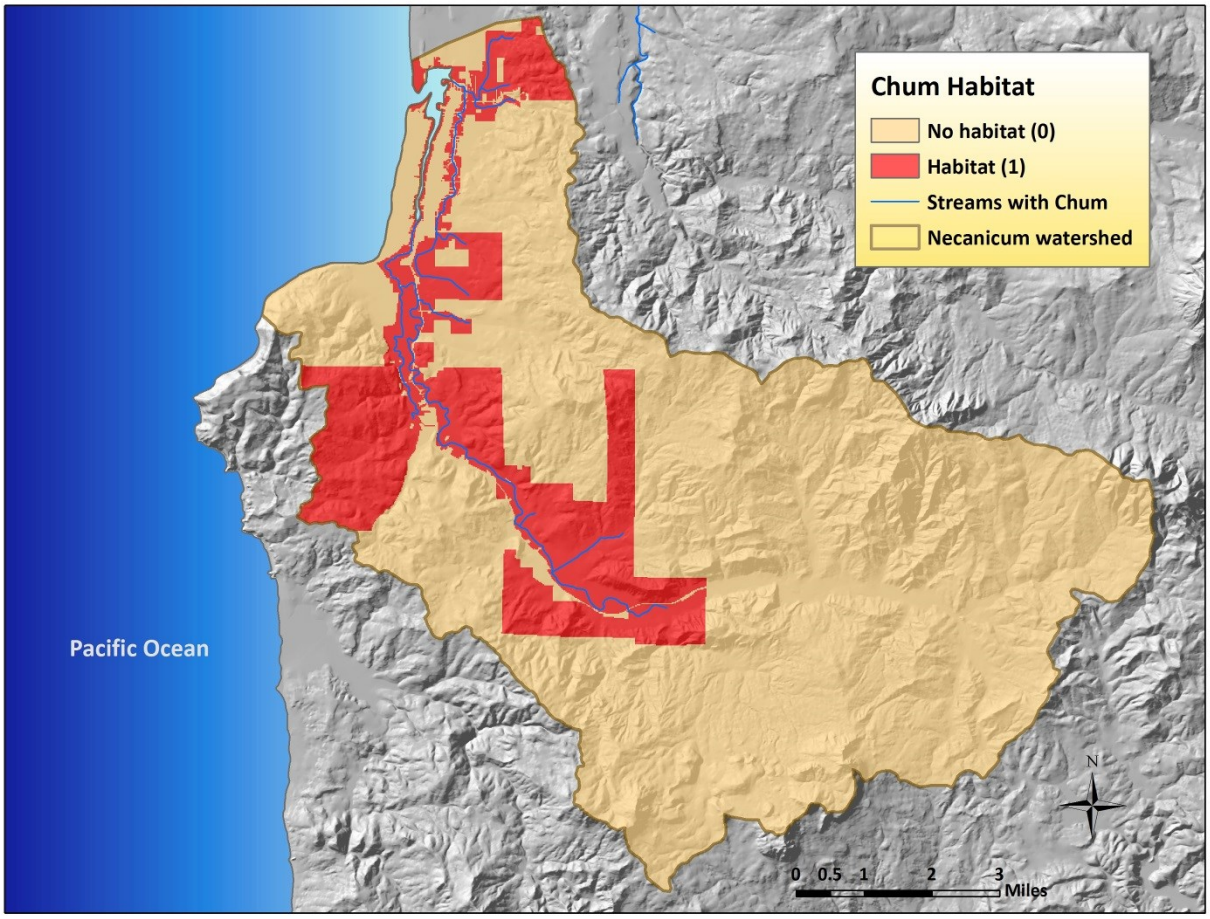


Figure 17. Chum salmon habitat in the Necanicum River watershed. Parcels containing habitat utilized by chum salmon are shown in red. Scoring is indicated in parenthesis in the legend.

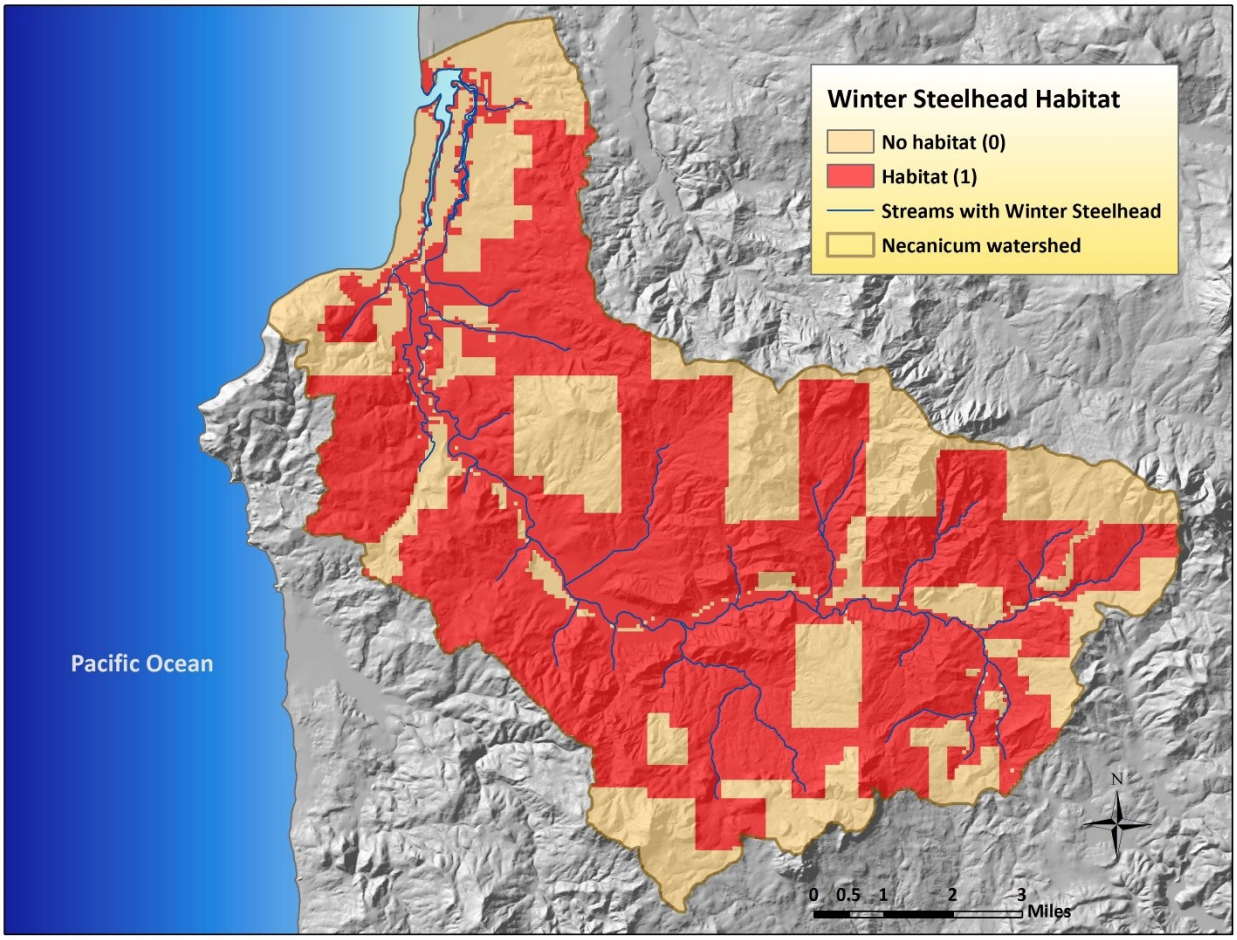


Figure 18. Winter steelhead habitat in the Necanicum River watershed. Parcels containing habitat utilized by winter steelhead are shown in red. Scoring is indicated in parenthesis in the legend.

Building the final map

All of the previously described criteria are pieces of the puzzle, but in concert they provide a comprehensive assessment of the landscape. In building our model, initial analysis demonstrated that in this initiative, which contains many large parcels, parcel size was outweighing important habitat criteria. In order to compensate for this, all other criteria were weighted 2:1 over parcel size. Devaluing parcel size in our model prevents large parcels from rising in the prioritization structure and undeveloped but heavily parcelized areas from being scored too low.

Maps as an initial guide

GIS analysis has become a method commonly used by land conservation groups to visualize areas and develop conservation plans. These maps are an important piece of NCLC's science-based, initiative-driven conservation planning model, which help prioritize and focus our work. The maps not only highlight high value areas already known to NCLC through fieldwork and working with landowners, but also highlight high conservation potential in areas in which NCLC has not worked. The maps also allow NCLC to take a step back and visualize, at a landscape level, how we might be better able to build wildlife corridors or prioritize individual parcels within our initiatives. That said, this conservation plan should be considered only a first step in gauging the land trust's interest in a property and how the property advances NCLC's overall goals within the initiative. NCLC is a conservation organization firmly rooted in the ground and nothing can replace the importance of on the ground site visits and the detailed knowledge of the land that is derived from these visits.

Circle Creek Habitat Reserve[3]

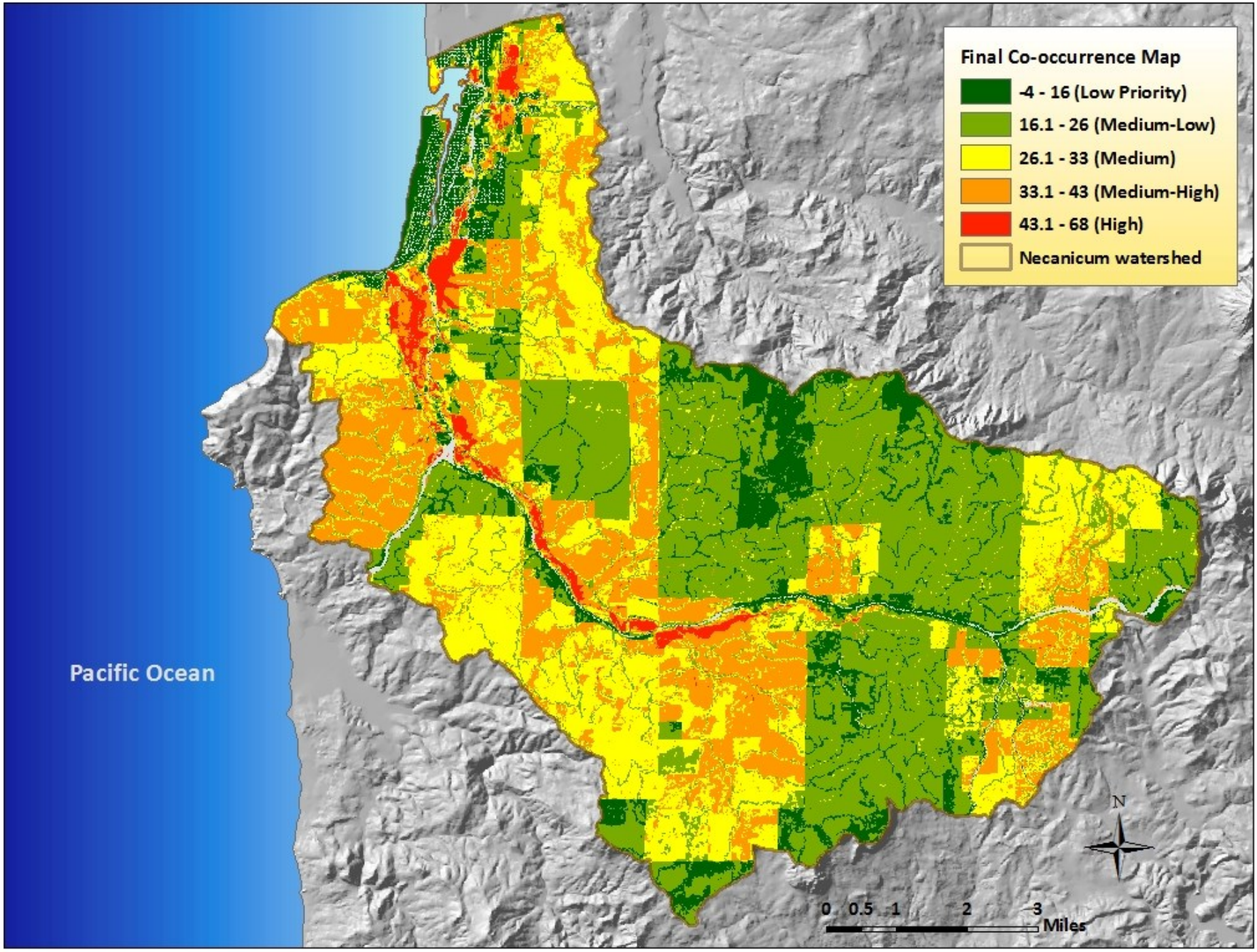


Figure 19. Final co-occurrence map. Conservation priority levels and cumulative scores are indicated in parenthesis. Grey areas within the watershed are roads and are not prioritized. Scoring is indicated in parenthesis in the legend.

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[2] North Coast Land Conservancy staff, board member, or volunteer

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