

The specific functions to be assessed were chosen on the basis of several considerations, including:

- the functions should be easily understood by decision-makers and the public,
- the functions should be closely linked to the “beneficial uses” that are regulated, and
- the functions should be as narrowly defined as possible.

The functions assessed are shown in Table 2.

Performance Index Ratings

To develop the mechanistic models used to rate wetland functions, reference wetlands for each subclass were selected throughout a specific region. The highest model score from the reference wetlands was designated as the highest possible level of performance for each function.

For each function being assessed, variables or indicators are used on the basis of their ability to be easily observed and/or characterized in the field and office. Using the data collected for each variable, a numeric rating is generated for each function. These function ratings are then compared against the highest corresponding reference wetland ratings using various multipliers. The resulting index rating is a number ranging between 0 and 10, with 0 being the lowest rating and 10 being the highest rating. This index rating reflects the level of performance of the function being assessed relative to the highest possible function ratings within the same wetland subclass and region.

Once the indices are calculated, they are then multiplied by the size of the wetland to obtain an overall performance index (acre-points) for each function. This step factors in the size of the wetland, and determines how much relative performance is provided per acre of wetland.

Performance Index Limitations

There are several limitations with the mechanistic relative performance index method. These limitations include:

- Performance indices are specific to the function being assessed. A performance index for one particular function cannot be compared to the performance index of a different function. For example, a performance index of 8 for one function is not necessarily the same level of performance as a performance index of 8 for a different function.
- Performance indices of a particular region, class, or subclass cannot be compared to wetlands of other regions, classes, or subclasses.
- Performance indices do not represent actual levels of function; they are only representations of a relative level of performance.
- Performance indices do not account for the opportunity of a wetland to actually perform a function.

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- Performance indices for a particular wetland cannot be summed together for an overall wetland performance index rating. Each function is meant to be assessed separately; the methods do not combine indices into group scores or rank functions hierarchically by importance.
 - Performance indices do not assess the habitat suitability for any individual species. For example, the index for wetland-associated mammals does not differentiate if the wetland provides better habitat for beaver or river otter.

Judgment of Opportunity

Although the performance index ratings do not take into account the opportunity a wetland has to actually perform a function, a qualitative judgment of opportunity can be made regarding wetland functions. After reviewing aerial photographs and maps of the Connor Creek watershed, opportunity ratings of “Low”, “Moderate”, or “High” were assigned to each function. The opportunity ratings were determined using best professional judgment regarding the upstream conditions within the watershed and the area immediately surrounding the wetland. They represent the actual opportunity of the wetland to perform the specific functions to which they are applied.

Selection of the Assessment Unit

The assessment unit (AU) is defined as the wetland area in which the level of performance of various functions is being assessed. The boundaries of the AU were determined using aerial photographs taken April 3, 2002, at a scale of approximately 1 inch: 500 ft. Several areas immediately adjacent to the open waters of Connor Creek were found not to contain hydrophytic vegetation during the assessment site visit; however these areas were deemed too small to warrant fragmenting the AU into smaller units. Additionally, some areas on the outer fringes of the wetland were left outside the AU boundary during the aerial photograph interpretation. The field inspection also revealed that these areas were too small to warrant expanding the AU to include them. It was determined that the inclusion and exclusion of these small areas would not have any effect on the performance index ratings of the wetland.

Assessment Results

Four soil pits were excavated for the purpose of characterizing soil composition. The pH of the interstitial water was taken at these pits as well. Open-water pH readings were also collected from the stream channel adjacent to the soil pits. The soil characteristics, as well as the interstitial and open-water pH readings, were represented as an average after compiling the data from each of the four pits. The locations of the soil pits are shown in Figure 1.

The results of the wetland functional assessment at the Connor Creek wetland area are presented in Table 2. A comprehensive list of the plant species identified within the AU is included in Table 3. Copies of the data sheets used to collect and analyze the data, as well as the key used to determine the wetland subclass, are included in Appendix A.

Table 2. Connor Creek Wetland Function Assessment Results.

Function	Performance Index	Acre-Points	Qualitative Rating of Opportunity	Description of Qualitative Rating
Potential for Removing Sediment	5	141.7	Moderate	small clear-cut areas along creek in upper watershed, little/no development
Potential for Removing Nutrients	5	141.7	Low	little/no agriculture, development, clear-cuts in watershed
Potential for Removing Metals & Toxic Organics	5	141.7	Low	little/no farming or development in upper watershed
Potential for Reducing Peak Flows	6	170.04	Low	little/no farming or development in upper watershed, wetland's position in watershed
Potential for Decreasing Downstream Erosion	5	141.7	Low	little/no farming or development in upper watershed, wetland's position in watershed
Potential for Recharging Groundwater	4	113.36	High	all wetlands, by nature, are assumed to have some link to groundwater
General Habitat Suitability	7	198.38	Moderate	development to north and south of wetland, road to east alter buffer
Habitat Suitability for Invertebrates	7	198.38		
Habitat Suitability for Amphibians	10	283.4		
Habitat Suitability for Anadromous Fish	5	141.7	High	Connor Creek supports runs of coho and chum
Habitat Suitability for Resident Fish	8	226.72		
Habitat Suitability for Wetland-associated Birds	10	283.4		
Habitat Suitability for Wetland-associated Mammals	8	226.72		
Habitat for Native Plant Associations	6	170.04		
Potential for Primary Production and Organic Export	7	198.38		

Based on the assessment methods, qualitative ratings of opportunity are not given for Habitat Suitability for Invertebrates, Amphibians, Resident Fish, Wetland-associated Birds, Wetland-

associated Mammals, Native Plant Associations, and Potential for Primary Production and Organic Export (Ecology 1999). Additionally, the descriptions for the qualitative ratings are based on guidance provided in the methods.

Table 3. Connor Creek Wetland Plant List.

Common Name	Scientific Name	Indicator Status
Yarrow	<i>Achillea millefolium</i>	FACU
Red alder	<i>Alnus rubra</i>	FAC
Sitka Alder	<i>Alnus viridis ssp. sinuate</i>	FACW
European beachgrass	<i>Ammophila arenaria</i>	FACU
Different-leaved water starwort	<i>Callitriche heterophylla</i>	OBL
Bighead sedge	<i>Carex macrocephala var. macrocephala</i>	FAC-
Slough sedge	<i>Carex obnupta</i>	OBL
Creeping spike rush	<i>Eleocharis palustris</i>	OBL
Dunegrass	<i>Elymus mollis</i>	FACU
Coastal strawberry	<i>Fragaria chiloensis</i>	UPL
Common marestail	<i>Hippuris vulgaris</i>	OBL
Yellow Iris*	<i>Iris pseudacorus*</i>	OBL
Soft rush	<i>Juncus effusus</i>	FACW
Sickleleaf rush	<i>Juncus falcatus var. sitchensis</i>	FACW
Mud rush	<i>Juncus gerardii var. gerardii</i>	FACW+
Lesser duckweed	<i>Lemna minor</i>	OBL
Prairie lupine	<i>Lupinus lepidus</i>	FAC
Wax Myrtle	<i>Myrica californica</i>	FACW
Pacific bayberry/ sweetgale	<i>Myrica gale</i>	OBL
Milfoil	<i>Myriophyllum ssp.</i>	OBL
Water-parsley	<i>Oenanthe sarmentosa</i>	OBL
Mock orange	<i>Philadelphus lewisi var. gordonianus</i>	UPL
Floatingleaf pondweed	<i>Potamogeton natans</i>	OBL
Silverweed	<i>Potentilla anserina ssp. pacifica</i>	OBL
Marsh cinquefoil	<i>Potentilla palustris</i>	OBL
Sheep sorrel	<i>Rumex acetosella</i>	FACU+
Curled dock	<i>Rumex crispus</i>	FAC+
Ditch-grass	<i>Ruppia maritime</i>	OBL
Hookers Willow	<i>Salix hookeriana</i>	FACW
Scouler's willow	<i>Salix scouleriana</i>	FAC
Soft stemmed bulrush	<i>Scirpus validus</i>	OBL
Narrowleaf burreed	<i>Sparganium emerson</i>	OBL
Common dandelion	<i>Taraxacum officinale</i>	FACU
Marsh clover	<i>Trifolium wormskjoldii</i>	FACW+
Cattail	<i>Typha latifolia</i>	OBL
American vetch	<i>Vicia americana</i>	FAC

* Non-native

Judgments of Opportunity

Using aerial photographs and USGS 7.5 minute quadrangle maps, judgments were made on the opportunity the wetland has to perform the functions being assessed in this study. The upper and middle watersheds were examined to determine the extent, and the proximity to the stream, of disturbances such as clearcuts, agriculture, and housing developments. There are a few small, scattered clearcuts in the upper watershed and virtually no housing or agricultural development.

Because of the presence of the small clearcuts, and their proximity to the creek in the upper watershed, the opportunity for the wetland to remove sediment from the water column is moderate. The opportunity ratings for the wetland to remove nutrients, metals and toxic organics, reduce peak flows, and reduce downstream erosion are all low. These ratings are the result of the lack of housing or agricultural development within the watershed. The potential to recharge groundwater is high. According to the methods, wetlands by nature are assumed to have a link to groundwater and should therefore be given a rating of high for groundwater recharge (Ecology 1999). The opportunity rating for general habitat suitability is moderate due to the presence of housing developments to the north and south of the wetland, as well as SR 109 reducing the effective width of the eastern wetland buffer. The rating for providing anadromous fish habitat is high due to the presence of coho and chum salmon.

Other Observations

Several fish and wildlife species were observed during the field survey portion of the assessment. Table 4 contains a list of the species identified in the Connor Creek wetland during the site visit. Mallards were observed using the eastern portion of the wetland. Several species of shorebirds, including Western grebes and greater yellowlegs, were also observed throughout the wetland. A river otter den was located east of the stream channel near the middle of the wetland. The den contained three entrance holes along with numerous slides and paths. Juvenile Northern red-legged frogs and Pacific tree frogs were observed throughout the area, as was one garter snake. Additionally, black bear and black-tailed deer tracks were observed along the stream banks.

Fish species observed included juvenile chum and coho salmon, three-spine stickleback, and sculpin that were not identified to species.

Table 4. Fish and Wildlife Species Observed.

Common Name	Scientific Name
Western grebe	<i>Aechmophorus occidentalis</i>
Mallard	<i>Anas platyrhynchos</i>
Sculpin, unidentified	<i>Cottus</i> sp.
Three-spine stickleback	<i>Gasterosteus aculeatus</i>
River otter	<i>Lontra canadensis</i>
Black-tailed deer	<i>Odocoileus hemionus</i>
Chum salmon	<i>Oncorhynchus keta</i>
Coho salmon	<i>Oncorhynchus kisutch</i>
Pacific treefrog	<i>Pseudacris regilla</i>
Northern red-legged frog	<i>Rana aurora aurora</i>
Common garter snake	<i>Thamnophis sirtalis</i>
Greater yellowlegs	<i>Tringa melanoleuca</i>
Black bear	<i>Ursus americanus</i>

Discussion

Based on the results of the functional assessment, the Connor Creek wetland appears to be functioning at a relatively high level, given the downstream location and lack of development within the basin. The majority of the functions assessed are being performed in the upper range of relative performance levels.

The functions of reducing sediment and nutrient loads, organic and toxic metals, peak flows, and downstream erosion all scored in the middle ranges of relative performance. However, these functions receive low to moderate ratings of opportunity. The minimal opportunity the wetland has to perform these functions negatively influences the actual performance potential of the functions.

The function of recharging groundwater had a relative rating of 4, whereas the judgment of opportunity was rated high. The groundwater recharge opportunity rating is based on the methods' assumption that all wetlands have an inherent connection to groundwater. Therefore wetlands must be rated as having a high opportunity to recharge groundwater. However, this assumption does not take into account the position of the Connor Creek wetland, which is near the lowest end of the watershed. In real terms, this lowers the significance of the groundwater recharge opportunity rating.

All habitat suitability indices scored in the upper ranges of relative performance, with the habitat suitability ratings for amphibians and wetland-associated birds scoring at the top of the range. The opportunity rating for general habitat suitability was rated as moderate. This indicates that the wetland provides suitable habitat at a very high level of performance, relative to the opportunity present to provide habitat.

The lowest rated habitat suitability index, habitat suitability for anadromous fish, scored an index rating of 5; however the rating of opportunity is high. This function scored lower as a result of an absence of cobbles or gravels in the streambed, as well as a lack of stream channel cover. The lack of gravel or cobble substrate indicates an absence of spawning habitat, while the lack of cover contributes to increased water temperatures and decreased opportunities for predator avoidance.

References

Pacific International Engineering (PIE). 2001. Connor Creek Technical Memorandum: Wetland Delineation. Connor Creek Project, Grays Harbor County.

Washington State Department of Ecology (Ecology). 1999. Methods for Assessing Wetland Functions Volume I: Riverine and Depressional Wetlands in the Lowlands of Western Washington. WA State Department of Ecology Publication #99-115.

APPENDIX A

Assessment Data Sheets