Baseline Habitat and Vegetation Functional Analysis

for the

Meydenbauer Bay Park and Land Use Plan

Prepared for:

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ACRONYMS AND ABBREVIATIONS

BMC	Bellevue Municipal Code
CAO	Critical Areas Ordinance
COB	City of Bellevue
CWA	Clean Water Act
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FR	Federal Register
HPA	Hydraulic Project Approval
LUC	City of Bellevue's Land Use Code
LWD	Large Woody Debris
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OHWM	Ordinary High Water Mark
PFMC	Pacific Fishery Management Council
RRMTWG	Regional Road Maintenance Technical Working Group
SPCC	Spill Prevention, Control, and Countermeasure
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
Ecology	Washington Department of Ecology
WRIA	Watershed Resource Inventory Area

Executive Summary

Meydenbauer Bay Park's unique urban waterfront setting, between Medina and the Downtown Bellevue core, contains several natural features that provide opportunities for the integration of native habitat for people, wildlife and sustainable ecological systems. The City of Bellevue (Bellevue) owns Meydenbauer Bay Park (an existing park) and has purchased additional property adjacent to the park, with the intention of implementing a master plan for a new waterfront park. Early planning stages for the Meydenbauer Bay Park and Land Use Plan defined primary goals for the park that include 1) creating a memorable waterfront park experience, and 2) creating a sustainable landscape that supports ecological function. The purpose of the Baseline Habitat and Vegetation Functional Analysis is to identify ecological elements within the study area that can be integrated into the park to maximize potential for wildlife, habitat, hydrologic function, and provide an aesthetic and recreational experience that respects the native landscape.

Historically, Meydenbauer Bay was surrounded by mixed-coniferous forests that were logged as the population grew. Whaling ships used Meydenbauer Bay as an off-season anchor site, and the upland areas around the bay were cleared for the economic value of the logs, and to open up the waterfront views (HistoryLink 1998). Riparian wetlands near the lake shore were likely very common surrounding Meydenbauer Bay, and topography suggests that small streams were present prior to urban development around the bay. Increasing population and urban development diverted water to storm-water systems and underground pipes. The watersheds surrounding Meydenbauer Bay, including Meydenbauer Bay Creek, have historically been prone to flooding (Entranco 1998).

Existing resources that provide opportunities for incorporation of ecological features and processes into the design, and those features protected by local, state and federal regulations within the Meydenbauer Bay Park and Land Use Plan study area include:

- Two areas of continuous canopy significant tree cover, 3.6 acres
- 27 individual significant trees,
- Approximately 1,976 square feet of wetlands,
- Potential Habitat Associated with Species of Local Importance,
- Approximately 1,296 feet of shoreline, and
- An historic stream piped underneath the park access road, 98th Place NE.

The continuous canopy (forested areas) is characterized by a mature mixed-deciduous canopy with an invasive English-ivy dominated understory. English ivy and many trees reaching the end of their natural life span are threatening the future character of the native canopy unless trees are replaced and invasive plants are controlled. The canopy and individual trees within it are protected by

Bellevue's Tree Retention Ordinance (BMC 20.20.900), as are the 27 individual trees identified as significant trees isolated from the continuous canopy cover.

West of the forested areas near the shoreline, the Category IV wetland and 40-foot wetland buffer provide low levels of water quality and hydrologic function, and almost no habitat value in their current condition. Significant room for enhancement of all functions of this wetland exists. Wetlands and buffers are protected by Bellevue's critical areas ordinance (CAO) (LUC 20.25H.095) and are further discussed in Technical Memo 6, the Wetland Delineation Report for the Meydenbauer Bay Park and Land Use Plan (EDAW, 2008).

Wildlife and fish species which may occur along the lake shoreline include federally threatened fall-run chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*Oncorhynchus mykiss*), bull trout (*Salvelinus confluentus*), and Lake Washington sockeye (*Oncorhynchus nerka*) in the near-shore. Chinook, steelhead and bull trout also are Species of Local Importance under Bellevue's CAO, along with 16 other species that potentially use the vicinity or the park specifically. Osprey (*Pandion haliaetus*) and bald eagles (*Haliaeetus leucocephalus*) are regularly spotted in the vicinity using the forest and trees for perching, nesting and foraging, and the near-shore for fishing. Several bat species are likely to use the large trees as day roosts, and lake to forage insects. Vaux's swifts have the potential to nest in the largest trees or in chimneys of the single-family homes within area affected by the park plan. Habitat Associated with Species of Local Importance that is not otherwise designated a critical area is considered a critical area due to the importance of key habitat in maintaining local wildlife populations (LUC 20.25H.150).

The Meydenbauer Bay Park and Land Use Plan shoreline is entirely armored, with concrete at the developed park, low-rise rip-rap through the residential areas, and timber bulkheads at the Bellevue Marina. From an ecological perspective, the dominant design opportunity and challenge is to remove shoreline armoring and return the shoreline to native soils and vegetation where ever possible. Removal of the armoring would improve habitat for fish and wildlife, hydrologically connect adjacent wetlands and uplands to the lake, and allow vegetative connectivity with uplands.

The shoreline of Meydenbauer Bay is a Shoreline of the State, protected by federal, state, and local regulations. Bellevue's CAO protects shorelines to 25 feet landward of the Ordinary High Water Mark (OHWM) (LUC 20.25.115). Permitting compliance for the Shoreline Management Act is completed through the City of Bellevue's Shoreline Management Program, which protects shorelines to 200 feet from the OHWM. Additionally, chinook, steelhead and bull trout that occur in Lake Washington are protected under the Federal Endangered Species Act. Washington State Department of Fish and Wildlife (WDFW) may require a hydraulic permit depending on the shoreline design. Washington State Dept. of Ecology (Ecology) coordinates the National Pollution Discharge Elimination

System (NPDES) Storm-water Construction and Municipal Compliance permits. Finally, the U.S. Army Corps of Engineers (USACE) provides permitting and regulatory guidance for section 404 Clean Water Act compliance and section 10 Rivers and Harbors Act compliance.

The habitat features important to fish and wildlife are primarily associated with the lake shoreline and the forested areas. Restoration and continued management of these two major features to improve the native vegetation, topography and hydrologic processes would invite have a corresponding effect on the occurrence of fish and wildlife species and on the park's aesthetic appeal. Actions with a high potential to positively affect fish, wildlife and ecological processes in the Meydenbauer Bay Park and Land Use Plan include:

- Removal of shoreline armoring to the greatest extent possible, return shorelines to native soils and vegetation,
- Removal of invasive vegetation, and planting native coniferous trees
- Significant Trees conservation of all native conifers taller than 100 feet and within 200 feet of the OHWM, and all individual Pacific madrones.
- Control erosion on steep slopes using native vegetation
- Remove impervious surfaces, replace those areas with native coniferous forest,
- Reconnect wetlands and shoreline hydrology and vegetation
- Daylight the piped stream flow from under 98th Place NE as a surface flowing stream within a forest ravine

1.0 Introduction

Meydenbauer Beach Park (the park) currently serves the City of Bellevue (Bellevue) primarily as a beachfront park with a swimming area and a view of Meydenbauer Bay (the bay). The City of Bellevue (Bellevue) has purchased several properties adjacent to the park in anticipation of development the Meydenbauer Bay Park and Land Use Plan (the plan). The Meydenbauer Bay Park and Land Use Plan study area (the study area) is mapped in Figure 1.1, the Vegetation and Habitat map, outlined in dark red. The study area includes nine single family home properties, several apartment complexes and condominiums, commercial properties, street rights-of-way, the Bellevue Marina and the park. The study area is 33.07 acres. The Baseline Habitat and Vegetation Functional Analysis will help inform the planning process to ensure habitat, vegetation and ecological features are identified and considered early in the planning process.

1.1 Goals for the Meydenbauer Bay Park and Land Use Plan

Early planning stages resulted in several recurring guiding principals for the park, however two principals were re-iterated by almost all participants. Citizens and stakeholders have expressed that they value the unique natural character and setting of the park, and want to maximize ecological sustainability within the plan study area, while also creating a memorable urban waterfront park experience that will draw citizens from all over the city. Integration of the natural features in the study area with passive and active recreational opportunities, and a unique aesthetic unlike other waterfront parks, will be key to successfully meeting these goals. Additional goals expressed for the plan include maximization of available view corridors, knitting the park with the surrounding residential community in a way that both respects and engages the existing neighborhood, and enhancement of waterfront-dependant recreational activities, such as boating and kayaking. Concern was also expressed for consideration of existing access and habitat corridors.

1.2 History and Current Conditions

Historically, Meydenbauer Bay was surrounded by dry coniferous forests typical of Puget Sound lowlands. Lake-fringe wetlands were probably common along the shoreline, and were extensive in the south end of Meydenbauer Bay, adjacent to Meydenbauer Creek. By the mid 1930s, much of the area around Meydenbauer Bay had been logged for the economic value of the timber, and most land was converted to agriculture. Whaling ships were docked in Meydenbauer bay during the off-season for storage and to assist with maintenance, because the fresh water of the bay killed barnacles and salt water vegetation that was damaging to the boats (HistoryLink 1998)

Baseline Habitat and Vegetation Map

Meydenbauer Bay Park and Land Use Plan

City of Bellevue

Legend

- Significant Trees
- Contiguous Canopy (Transparent Overlay)
- Nearshore Aquatic Habitat (Transparent Overlay)
- Wetlands
- 40 ft. Wetland Buffer
- Ordinary High Water Line
- Study Area

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Feet

0 100 200

The plan study area includes an urban single-family residential neighborhood and park continuous with a downtown business and residential core on the Meydenbauer Bay waterfront. Many of the natural features originally present have been altered for urban and residential land uses, and are maintained primarily for human access and leisure. The park habitat is isolated from other forested and natural areas. No upland habitat corridors exist to the east or south, toward the two nearest remaining wooded areas, Wildwood Park and Meydenbauer Creek. Remaining habitat within the study area is largely concentrated in the park or associated directly with the shoreline and near-shore habitats. Table 1.2-1 the available habitats and natural features, and their primary ecological functions.

Table 1.2-1 Natural Features in the Study Area and their Functions

Natural Feature	Ecological Function
Significant trees	Perches and roosts for raptors
Significant Tree Canopy	Forest habitat for wildlife species
Piped Stream Channel ** (under 98th Place NE)	Riparian habitat, water quality and hydrologic connectivity, environmental education opportunities **No stream habitat currently exists
Shoreline & Near shore aquatic habitat	Fish habitat, wildlife foraging, habitat for Aquatic mammals and birds
Wetlands	Flood attenuation, water quality, riparian habitat connectivity

Topography slopes steeply towards Meydenbauer Bay from the east end of 98th Place NE until about 100 feet from the shoreline, where the slope is much gentler as the land meets the waterfront. The southern portion of the study area is generally less steep, but more urbanized, with impervious surfaces as the primary land cover. A Wetland Delineation Report (EDAW 2008) provides details on the occurrence and function of the wetlands within the study area.

1.3 Regulatory Review

Most natural features in the study area are regulated at the local, state and federal levels, with requirements in place to ensure that these natural features maintain their ecological integrity and function. Disturbance of natural features, even if implemented as part of a restoration effort, will require some regulatory permitting. Regulatory requirements for natural features within the study area include:

- City of Bellevue Tree Retention Ordinance 20.20.900: The City of Bellevue requires that Significant Trees and Significant Tree Continuous Canopy (forested areas) be retained at a rate of at least 15 percent of the diameter inches of the significant trees existing in the development area.

- City of Bellevue Land Use Code 20.25H Critical Areas. The Meydenbauer Bay Shoreline is a designated critical area. Buffers for shorelines are 25 feet from the OHWM.
- City of Bellevue Land Use Code 20.25H Critical Areas. Category IV wetlands are protected, and a 40 foot buffer surrounding all wetland areas is also protected to ensure wetland function is retained.
- City of Bellevue Land Use Code 20.25H Critical Areas. Habitat associated with Species of Local Importance that is not otherwise designated a critical area is also designated a critical area, If alterations to habitat is planned, WDFW review may be required, including preparation of a Habitat Management Plan.
- City of Bellevue Shoreline Substantial Development and Shoreline Conditional Use Permits, for work near or on Shorelines of the State. Bellevue's Shoreline Management Plan was developed in accordance with the state Shoreline Management Act, and permitting and regulatory authority are delegated from the Washington Department of Ecology to the City of Bellevue. Any designs requiring work waterward of the OHWM will require shoreline permitting and regulatory documentation.
- State Environmental Protection Act (SEPA) Checklist
- Washington Dept. of Fish and Wildlife (WDFW) Hydraulic Permit Approval (HPA) for work waterward of the OHWM. The stream under 98th Place NE has been 'grandfathered' as a non-regulatory feature, however restoration of surface flow and natural hydrology may require an HPA, and may trigger critical areas protections for the stream at the local level (City of Bellevue critical areas codes).
- Washington Dept. of Ecology (Ecology) Section 401 permit for projects needing fill or excavation in state waters
- Ecology coordinated National Pollution Discharge Elimination System (NPDES) Storm-water Construction and Municipal Compliance permits
- U.S. Army Corps of Engineers Section 10 compliance for work in, over or under navigable waters of the United States
- U.S. Army Corps of Engineers Section 404, Clean Water Act compliance, for projects requiring discharge of fill or dredge in Waters of the United States, with documentation to include the Wetland Delineation Report (EDAW, 2008)
- U.S. Fish and Wildlife Service/ National Marine Fisheries Service Biological Assessment due to the presence of Threatened fish species under the Endangered Species Act (chinook salmon, bull trout, and steelhead).

Depending on the designs proposed, a complex mix of studies and permit applications may be required. Each design proposed in or near aquatic resources has the potential to trigger a variety of permitting actions, and these should be considered when the design is proposed to ensure complete information when various options are considered.

2.0 Upland Habitat

Upland Habitat in the park and study area is primarily associated with native trees. Wildlife associated with the trees and forested areas include Species of Local Importance, designated by the Bellevue CAO (20.25H)

2.1 Current Conditions and Functional Analysis

Primary land uses within the study area are urban residential, urban commercial and recreational in the park and Bellevue Marina. Impervious surfaces and grass-lawns limit the ability of the area to support wildlife; however two upland habitat elements do occur within the study area that are important to wildlife. Forested areas of 1.6 acres are located along the ravine adjacent to the park access road, these areas are protected by the Bellevue City Code as Significant Trees with continuous canopy coverage. Twenty-seven individual significant trees are also present outside of the areas of continuous canopy cover.

The Vegetation and Habitat Map indicated the extent of forested habitat and individual Significant Trees. Continuous canopy areas are located primarily on steep slopes, on the north and south sides of 98th Place NE, that forms a natural ravine that historically contained a stream. The stream has been piped underneath the road, and is discussed in section 3.0. Tree species in this area include big-leaf maple (*Acer macrophyllum*), alder (*Alnus rubra*), western red cedar (*Thuja plicata*), Douglas-fir (*Pseudotsuga menziesii*), western hazelnut (*Corylus cornuta*) Pacific madrone (*Arbutus menziesii*) and invasive cherry laurel (*Prunus laurocerasus*). Very little native understory is present, although oceanspray (*Holodiscus discolor*) was noted in several locations. The herbaceous layer is dominated by English ivy (*Helix hedera*), which is damaging many of the mature trees. The presence of Pacific madrone diversifies the tree canopy, and conservation of these trees is extremely important to wildlife (Adams and Hamilton, 1999).

The forest habitat provides nesting sites for many bird species and provides the potential for snags and large woody debris, which many birds and small mammals use as cover, den shelter and forage substrate (Bull 2002). Diverse forested areas support fruits and insect forage for a wide variety of birds and mammals, and provide structural complexity. Individual trees, especially those near water, are favorite perches for raptors, providing opportunities for bald eagles *(Haliaeetus leucocephalus)* and osprey (*Pandion haliaetus*), which are often spotted in Meydenbauer Bay and vicinity.

In addition to wildlife habitat functions, water quality and hydrologic functions are provided by trees and continuous forested areas. Leaf litter inputs improve the soil porosity and its ability to infiltrate storm water, and contribute to nutrient cycles that support healthy plant communities. Trees and forests on steep

slopes assist in erosion control, anchoring unconsolidated soils, withdrawing water from the slops and contributing to soil stability.

2.2 Habitat Connectivity

There is no potential to connect the park's forested habitat to nearby natural areas. No vegetated corridors or land with potential for that use is available between the study site and other habitats such as Meydenbauer Creek, and creation of wildlife habitat corridors would require major land use changes. Meydenbauer Creek and the associated wetlands are approximately 0.55 miles from forested habitat in the study area. Wildwood Park, a small isolated park, is about .37 miles from Meydenbauer Beach Park.

2.3 Species of Local Importance

Bellevue has designated a list of 23 species as Species of Local Importance in the critical areas code (BMC 20.20H.150). Species of Local Importance associated with available upland habitats include:

- Bald eagle (*Haliaeetus leucocephalus*);
- Peregrine falcon (*Falco peregrinus*);
- Pileated woodpecker (*Dryocopus pileatus*);
- Vaux's swift (*Chaetura vauxi*);
- Merlin (*Falco columbarius*);
- Purple martin (*Progne subis*);
- Great blue heron (*Ardea herodias*);
- Osprey (*Pandion haliaetus*);
- Red-tailed hawk (*Buteo jamaicensis*);
- Western big-eared bat (*Plecotus (Corynorhinus) townsendii*);
- Keen's myotis (*Myotis keenii*);
- Long-legged myotis (*Myotis volans*);
- Long-eared myotis (*Myotis evotis*);
- Western toad (*Bufo boreas*);

Habitat associated with Species of Local Importance, not otherwise designated a critical area due to other features, is designated a critical area, and design and development proposals that would alter habitat may trigger application of WDFW Priority Habitat and Species Management plans, as well as the need to complete a Habitat Assessment critical areas report. Species known to or which may occur within the study area are discussed below.

Bald Eagles

Bald eagles are commonly sighted around Meydenbauer Bay and Lake Washington, and a known nest location is across the bay from the study area. Bald eagles use tall trees, especially tall conifers such as Douglas-firs, to perch and forage near large water bodies. Primary food sources for bald eagles in our area include marine and fresh-water fishes and fish carrion, as well as waterfowl

and their carrion. Secondary food sources include small mammals, mollusks, and crustaceans (Watson and Rodrick 2001). In addition to resident breeding eagles, over-wintering eagles congregate in western Washington, including around Lake Washington, increasing bald eagle numbers in the winter. Roost trees and staging trees are often limiting to bald eagle populations in urban areas. Trees selected for use by bald eagles are taller, larger in diameter and nearer to water bodies than randomly available trees within the landscape (Stinson et. all. 2001). WDFW recommended thresholds for bald eagle habitat are 20 inch diameter trees within 250 feet of a shoreline.

Peregrine Falcons

Peregrine falcons prefer open habitats, meadows and coastal areas, although they have been observed in many Puget Sound cities using tall buildings as roosts and nesting sites (White et al., 2002). Peregrine falcons are not specifically documented in the park or bay, however it is likely that they occasionally perch and forage in the vicinity. Conservation of perch trees (Significant Trees) will likely support peregrine activity at current levels.

Pileated Woodpecker

Pileated woodpeckers are strongly associated with larger patches of mixed-coniferous forest (>7 acres) and prefer riparian habitat with a relatively tall canopy (Rohila 2002, Lewis and Azerrad 2003). Pileated woodpeckers are often described as a “keystone species” due to their ability to create large cavities, which many other species, including Vaux’s swifts and purple martins, use for nesting (Lewis and Azerrad, 2003). Occasional visits by pileated woodpeckers may occur in forested areas in the study area, however overall habitat is not suitable to support nesting or regular foraging.

Vaux’s Swift

Vaux’s swifts are historically associated with old growth (>200 years of age) forests as wintering habitat in the Pacific Northwest, and traditionally nested in woodpecker tree cavities. Land use changes and the removal of standing snags in urban and suburban areas have limited this resource; however Vaux’s swifts have been widely documented to use old open chimneys when their preferred natural tree cavities are unavailable (Bull and Collins 1993). Chimneys used by these birds are typically at least 20 feet tall, with minimum openings of nine inches by nine inches. Nests are secured with mud and vegetation to the interior corners of the chimney brick (Lewis et. al. 2002).

To ensure designs do not negatively affect Vaux’s swifts which may be nesting in residential chimneys, a survey of residents’ observations and of existing suitable chimneys on property owned by Bellevue within the study area should be conducted Chimneys will be surveyed if and when designs may require their disturbance or removal, and appropriate mitigation implemented if Vaux’s swift activity is confirmed.

Merlin
Merlin, like other falcons, prefer open grasslands, meadows and shorelines for hunting and foraging, however they most often breed in coniferous forests (Gordon 1999). Merlin are not specifically documented in the park or bay, however it is likely that they occasionally perch and forage in the vicinity. Conservation of perch trees (Significant Trees) will likely support merlin foraging activity at current levels.

Purple Martin
Purple Martins nest almost entirely in artificial nest boxes in western Washington; no appropriate nest boxes exist in the study area (Hays and Milner, 2003). Snag habitat is lacking, and purple martins rarely establish in areas without snags or managed artificial nest boxes to encourage their occupancy.

Great Blue Heron
No great blue heron nesting occurs in the vicinity, but any forested area near a fish-bearing waterbody has the potential to support great blue heron foraging, roosting and perhaps breeding. Occasionally great blue heron form breeding colonies in forested urban ravines, such as the one in Kiwanis Park, in the Magnolia neighborhood of Seattle. The Meydenbauer Beach Park ravine contains similar habitat to the Kiwanis Ravine, although it is smaller in size and has no connections to other forested habitats, unlike Kiwanis Ravine.

Great blue heron in the Puget Sound lowlands appear to be remarkably adaptable given foraging opportunity in close proximity to mature forested stands suitable for breeding colonies (Quinn and Milner, 1999). Although they are adaptable as a species, they are prone to abandoning nests if breeding colonies are disturbed too often during the breeding season. Disturbances may be caused by natural predation, from bald eagles and other raptors, or due to human disturbances (Butler, 1992).

Osprey
An osprey nest was identified by the WDFW as occurring on the north side of the park in taller trees near the shoreline, however several site visits and active searching from within the park did not reveal the nest. Ospreys commonly use nest sites intermittently, and will return to previously abandoned nest sites. Ospreys, much like bald eagles, use tall trees within 250 feet of fish-bearing waterbodies, for perching, foraging and nesting. They are very adaptable, and tolerant of people as well as urban structures, often using man-made utility poles and tall buildings as nesting sites, which they will vigorously defend (Kirschbaum and Watkins, 2008).

Osprey are likely to use Meydenbauer Bay and the surrounding vicinity as regular fishing grounds due to the open shallow water and availability of perch trees around the bay.

Red-Tailed Hawk
Red-tailed hawks are exceedingly common all over the Puget Sound, due in part to their high degree of adaptability. They are generalist predators, and will readily consume carrion. Red-tailed hawks are remarkably tolerant of urban habitats and human disturbance as well, and can often be seen perched on freeway light poles (Ehrlich, 1999). Red tailed hawks are likely common visitors to the park, however no nests were seen in the study area. Conservation of the forested areas in conjunction with open space will continue to support red-tailed hawks in the vicinity.

Bats
Four bat species are listed by Bellevue as a Species of Local Importance:

- Keen's myotis,
- Long-legged myotis,
- Long-eared myotis, and
- Western big-eared bat.

Species specific bat usage for Meydenbauer Bay is lacking, however the Puget Sound lowlands often supports several bat species wherever open water is in close proximity to tall native conifers such as Douglas-firs, and the WDFW has recorded each of the four bat Species of Local Importance near Lake Washington (Johnson and Cassidy 1997). Each of these species likely forages insects over Meydenbauer Bay, and may use the largest forest conifers as day roosts (Nagorsen and Brigham 1993). Western big-eared bats and long-legged myotis' are colonial breeders, and no breeding habitat occurs in the vicinity for these species (Nagorsen and Brigham 1993; Woodruff and Ferguson, 2005). Breeding is unlikely to occur in the vicinity for Keen's myotis and long-eared myotis as well, however little information exists for the breeding strategies of these species (Nagorsen and Brigham 1993).

Western Toad
Western Toads are not documented on the site, but were once widespread across the Puget Sound lowlands. Habitat conversion, competition with invasive species and new disease vectors have contributed to reduced populations (AmphibiaWeb 2008). Potential habitat within the study area is currently of low quality, however opportunity exists to greatly improve western toad habitat in the forested ravine and near-shore wetlands, discussed in section 5.0. Western toads are known to occupy riparian habitat during the non-breeding season, where many of their resource needs are met (Bartelt 2000). Given the limited habitat and the influence of the adjacent urban areas, western toads are expected to be relatively rare in the vicinity.

2.3 Restoration Opportunities and Constraints

No opportunity currently exists to connect the existing park forested areas to other forested habitat outside the study area. The forest may be enhanced through a mix of invasive species removal, planting of native understory species and planting of young conifers. Significant Trees, as defined by the Bellevue code (LUC 20.20.900) are protected, although some tree removal is allowed under specific conditions. Thus, any plans for tree removal need to be carefully considered throughout the planning process

3.0 Piped Stream Channel: Current Conditions and Functional Analysis

The steep sloped ravine along the Meydenbauer Beach Park access is a historic riparian channel, with the stream piped underneath 98th Place NE. No riparian habitat currently exists in the ravine, however goals for the park strongly suggest this stream be considered for restoration through the design and planning process.

3.1 Current Conditions and Functional Analysis

Stream channel restoration could increase the amount of riparian habitat, add hydrologic connectivity, and create opportunities for environmental education. It is unlikely that fish should migrate this channel, due to the size constraints and lack of connectivity with a larger stream system; however migratory songbirds, small mammals and raptors would benefit from improved water access, habitat interspersion between forest and aquatic habitats, an increased insect prey base, and the greater diversity of plant species supported by riparian habitats.

The stream is currently piped and disconnected from upland soils, vegetation and groundwater. Current flow rates and sources of flow are unknown at this time, however the rate of flow is likely to be variable and dependant on storm events, similar to other small urban streams (Konrad and Burges, 2001). Reconnection of the stream flow within a natural surface channel would allow opportunities for water infiltration into soils, slowing flow and allowing sediments and contaminants to be taken up by plants. Processes that should be considered before stream restoration takes place include: sediment sources and loads, large woody debris sources, nutrient inputs, light and heat inputs and hydrologic regime (Roni et.al. 2002). Effective techniques for small stream restoration are difficult to measure; however gathering significant information about the specific inputs and processes that maintain stream morphology at this location will significantly improve goal setting for aesthetics and measures of success (Roni et.al. 2002).

3.1 Restoration Opportunities and Constraints

Stream channel restoration should be carefully considered before implementation, to ensure goals are clearly stated and achievable within the processes and inputs available to this creek. WDFW HPA permitting may be time and capital consuming, and impose specific requirements for water quality and flow attenuation to maximize benefits of the project both to the lake and stream channel. Rates and sources of flow should be assessed through hydrology and stream engineering studies. Studies should be requested when a commitment is made to daylight and restore the stream. These will provide information concerning flood potential, mass wasting potential, slope stabilization needs, as well as regular daily and seasonal flow rates and maximum flows the stream may need to accept, among other important parameters. A stream engineer and/or hydrologist should complete these studies.

Outside of habitat value, the riparian corridor may serve as an excellent environmental education opportunity, with potential to engage community support and stewardship. Demonstrations of habitat improvements for forest bird species and aquatic insects, as well as aesthetic values may draw the community to the park, and acknowledge the benefits of stream restoration beyond direct restoration of salmon habitat.

4.0 Shoreline and Nearshore Aquatic Habitat

The following section describes the current conditions of the shoreline and nearshore habitats and the opportunities and constraints associated with implementing a park and land use plan.

4.1 Current Conditions and Functional Analysis

Lake Washington has over 80 miles of lake shoreline and almost all of the area surrounding the lake is developed for residential and commercial uses. Most of the lake shoreline (>82%) is armored (Fresh and Lucchetti 2000;Weitkamp et al. 2000). The shoreline also contains numerous overwater structures (>2,700;Kerwin 2001). Lake Washington is used by chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), and sockeye (*O. nerka*) salmon, steelhead (O. kisutch), and bull trout (*Salvelinus confluentus*) as a migratory and rearing habitat (WRIA 8 Steering Committee 2005). Table 4.1-1 indicates the status of fish listed under the federal Endangered Species Act that occur in the project vicinity.

Table 4.1-1: ESA Listed species in Study Area

Species (*Scientific Name*)	**ESU/DPS**	**Status**	**Listing History**
Chinook salmon (*Oncorhynchus tshawytscha)*	Puget Sound ESU	Threatened	Listed as threatened March 24, 1999
Steelhead salmon *(O. kisutch)*	Puget Sound/Strait of Georgia ESU	Threatened	Designated as threatened May 11, 2007
Bull trout *(Salvelinus confluentus)*	Coastal Washington/Puget Sound DPS	Threatened	Listed as threatened November 1, 1999

Shoreline habitat conditions are important for juvenile salmonids using Lake Washington, especially those from the Cedar River population. Degraded shoreline conditions resulted originally from the lowering the lake water elevations when the Ballard Locks were constructed. Further adverse effects to salmonid habitat resulted from urbanization, armoring of the shoreline, loss of overwater vegetation, and increased stormwater runoff.

Residential development, yards, and bank armoring (bulkheads and riprap) have reduced the amount of riparian vegetation and woody debris contributed to the lake (WRIA 8 Steering Committee 2005). Armoring has modified substrates in shallow areas due to prevention of bank erosion and altering sediment dynamics at the water-land interface. Over-water structures have increased shading and segmented the lake shoreline and nearshore areas, affecting aquatic organisms such as benthic invertebrates, a prey item of juvenile Chinook (Warner and Fresh 1998; Kahler et al.2000; Koehler 2002).

Shading can reduce or eliminate submerged aquatic vegetation (SAV) important for salmonid prey (Loflin 1995, Burdick and Short 1999, Shafer 1999, Nightingale and Simenstad 2001). Height above the water is the most important variable; docks 10 feet and higher have significantly reduced impacts. Shading impacts from floats are more severe that those of structures above the water surface (Burdick and Short 1999). In contrast, small structures (less than 18 ft wide) raised above the water do not alter juvenile fish movement in estuarine habitat (Roni and Weitkamp 1996, Dames and Moore 1994). A comprehensive literature review (Kahler et al. 2000) stated that there was no evidence that raised piers affected juvenile chinook or coho salmon migration in Lake Washington. The addition of overwater structures over the years has reduced the amount and quality of shallow water habitat, an important habitat for rearing juveniles (Tabor and Piaskowsi 2002; Tabor et al. 2003).

The nearshore of the study area is dominated by an armored shoreline with a number of overwater structures. These elements provide little or no habitat value for salmonids in Lake Washington. In addition, the shoreline lacks vegetation that could provide habitat for a number of aquatic wildlife species such as ducks, mink, muskrat, and other species. The overall quality of the shoreline for both fish and wildlife is poor.

4.2 Restoration Opportunities and Constraints

A number of limiting factors are affecting salmonids that occupy Lake Washington including lack of available shoreline habitat, stormwater flows, lack of floodplain connectivity, and interruption of sediment transport mechanisms (WRIA 8 Committee 2005). The greatest opportunity to improve aquatic shoreline habitat in the study area is in the potential removal of shoreline armoring, removing or reducing the amount of overwater structures, and planting of shoreline vegetation.

The WRIA 8 Chinook Salmon Action Plan specifically recommends the following for improvement of salmon habitat in Lake Washington (bolded items are applicable to the study area):

- **Reduce bank hardening by replacing bulkheads and rip-rap with sandy beaches with gentle slopes designed to maximize littoral areas with a depth of less than 1 meter.**
- Reconnect and enhance small creek mouths as juvenile rearing areas. Historically these small creeks had sandy deltas at the creek mouth and were associated with wetland complexes. Restoration efforts should start at the mouth of the Sammamish River, with other high potential reaches around Union Bay and the mouths of Kelsey and May Creeks.
- **Protect and restore water quality in small tributaries.**
- Juvenile Chinook in the North Lake Washington (NLW) population are less shoreline-oriented than juveniles from the Cedar River. More information

is needed about the trajectories of NLW juvenile Chinook in Lake Washington, particularly when they move offshore.

- **Shoreline processes of Lake Washington have been changed by the regulated maximum one foot rise and fall of the lake. Therefore, the removal of bank hardening structures may not be sufficient to create sandy beaches and**
- **Augmentation of sediment supplies may be necessary.**
- **The out-migration of juvenile chinook would benefit from improved shoreline connectivity. The use of mesh dock surfaces and/or community docks would reduce the severity of predation on juvenile chinook.**
- Habitat in the smaller Lake Washington tributaries (Tier 3 streams such as Thornton, McAleer, and Lyon) should be restored for coho so that production of cutthroat trout, which prey on juvenile chinook in Lake Washington, is reduced.
- Consider increases in fishing limits for cutthroat trout.
- **In addition to these measures the land use plan should consider planting of native vegetation along restored shoreline areas to improve both terrestrial and aquatic habitat.**

Measures such as the removal of shoreline armoring will require permits for in-water work from the U.S. Army Corps of Engineers, Washington Department of Fish and Wildlife, and coordination with Bellevue planners regarding adherence to the CAO.

5.0 Wetlands

Three small wetlands were delineated within the park boundary using standard methods developed by the U.S. Army Corps of Engineers and Ecology (USACOE 1987, 2008; Ecology 1997). All three wetlands are within 100 feet of the Meydenbauer Bay shoreline, and in close proximity to one another. The combined wetland area is approximately 1,976 square feet, and all wetlands are dominated by herbaceous vegetation (EDAW 2008). A wetland rating was performed using the Wetland Rating System for Western Washington, Revised (Hruby, 2004). Results of the rating exercise indicate that the wetlands are a mosaic, and should be considered a single Category IV wetland unit, Wetland A, the lowest of the four wetland categories.

Wetland A is maintained in landscaped grasses with some weedy vegetation, most native vegetation in the wetland is removed through maintenance practices. The wetland has no standing water or woody stemmed vegetation, no woody debris and no other features that would make it suitable for wildlife use distinct from a residential lawn extending to the armored shoreline. The wetland is providing some hydrological function by storing storm run-off, and water quality is improved somewhat to the extent that residency time allows grasses to uptake nutrients and contaminants. Sedimentation occurs only minimally from the upslope and lake-fringe flows, therefore the wetland provides little sediment removal function. These wetlands present substantial opportunities for enhancement of habitat, water quality and hydrologic functions.

5.1 Habitat Connectivity

Wetland A surface flow is disconnected from the shoreline due to the rip-rap armoring at the OHWM. Shallow groundwater associated with the bay does reach the wetland at times of high lake levels and during storm events when run-off saturates soils. Vegetation is maintained for aesthetics in and adjacent to the wetland and does not provide continuity between the near shore aquatic habitat and the wetland. Substantial opportunities for enhancement of the hydrologic and vegetative connections between the wetland and shoreline exist. Use of native riparian plants and softening of the shoreline through removal of the rip rap and re-grade of the soils would result in improved functions and connectivity for both the wetland and shoreline.

5.2 Species of Local Importance & Other Wildlife

Habitat quality for amphibians, waterfowl, aquatic mammals and insects is low in wetland A. Improvements to the hydrologic connectivity and vegetative community would substantially improve habitat quality for many species by providing cover, food and forage sources, and by providing movement corridors among the near shore, shoreline, wetlands and adjacent upland habitat. Raccoons (*Procyon lotor*), American mink (*Neovison vison*), beaver (*Castor*

canadensis) and muskrat (*Ondatra zibethicus*) often use riparian habitat for foraging, as travel corridors, and as denning habitat (Budd et.al. 1987).

Wetlands and nearshore areas are the prime forage areas for great blue heron. Enhancement of the wetland vegetation and the creation of a habitat corridor between the wetland and nearshore increases habitat complexity for fish and amphibians, two prime food sources of great blue heron. Vegetation provides cover and structural complexity for prey species, in contrast to the rip rap and grass lawn shoreline that currently exists (Quinn and Milner, 1999).

6.0 Recommended Design Options

Design options were developed to support the stated goals of a memorable waterfront park that is supportive of local ecology, including habitats, species, and processes. The following list of restoration options are ordered from relatively simple and less expensive, to large, complex and potentially costly.

Upland Significant Tree and Continuous Canopy cover

- Retain significant trees and continuous canopy closure to support species of local importance
- Remove Invasive vegetation (English ivy) under continuous canopy significant tree cover.
- Plant native trees, shrubs and herbaceous plants under the existing canopy to enhance habitat and maintain forest canopy closure over time.
- Reduce impervious surfaces near continuous canopy cover, and plant with native species.

Stream Channel

- Carefully consider hydrology, contaminant and woody debris sources and loads to incorporate into specific goals and plans. (Hydrologic and Engineering studies may be required)
- Restore the riparian channel with hydrologic and water quality improvement goals
- Daylight the existing piped stream
- Provide Information boards and trails for environmental education

Wetlands

- Enhance wetlands with native plants
- Improve hydrologic connections between wetlands and shoreline
- Consider hydrologic connectivity spanning a restored stream, the existing wetlands and the shoreline

Shoreline & Near Shore area

- Install native riparian plants at shoreline
- Remove Shoreline Armoring
- Reduce or remove the amount of overwater structures. Use light penetrating materials where overwater structures are necessary

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APPENDIX A

Representative Photos

Appendix A: Representative Photos: Habitat and Vegetation Features
Meydenbauer Bay Park and Land Use Plan

Standing dead wood, English Ivy and Contiguous Canopy

Pacific Madrone (*Arbutus menziesii*)

Hazelnut and Western Red Cedar

Raptor perch trees

Shoreline and near shore fish habitat

Marina Shoreline

Right of Way Shoreline

Two Southernmost Significant Trees