

MEMORANDUM

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TO: John Freeman, Project Facilitator II

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SUBJECT: Marine Rocky Intertidal Design Guidelines

The development of Vancouver's shoreline land areas present a unique and once in a generation opportunity to reimagine and restore the community's shoreline. Restoration of urban marine foreshore areas is not a common practice in Canada, and strategies and technologies are evolving. Local examples of innovative restoration efforts may be found within the City of Vancouver and Metro Vancouver. Examples of foreshore restoration include Habitat Island in South East False Creek, New Brighton Park, Jericho Beach in Kitsilano, and coastal sand dune restoration at Metro Vancouver's Iona Beach Regional Park.

Background

Intertidal Zone

The intertidal zone is the area of the marine shoreline that is exposed to air at low tide, and covered with seawater when the tide is high. Intertidal "zones" or "zonation" refers to the tendency of plants and animals to form distinct communities between the high and low tide waterlines. Intertidal zonation may also be referred to as "banding"; that is, communities of seaweeds and invertebrates tend to congregate in bands according to their habitat preferences and stress tolerances.

The grade of the intertidal zone affects banding in terms of width, species abundance and diversity. Steeper grades tend to have narrow bands with less individuals and lower diversity. Step-wise gradual grades provide habitat "benches" which creates more space for species to establish.

Rocky Intertidal Ecosystems

A variety of ecosystems exist within the intertidal zone. These ecosystems are typically classified by the dominant substrate, e.g. material, that most commonly occurs within a specific intertidal area. For example, sand and small pebbles are the predominant material along Kits Beach and Jericho Beach. Those intertidal zones would be identified as sandy beach intertidal

ecosystems. Along Stanley Park and parts of False Creek rocks and rocky outcroppings are more common and so those areas would be identified as rocky intertidal ecosystems.

Rocky shorelines are composed of solid bedrock with very little sediment. Rocky intertidal ecosystems are divided into zones, each one experiencing different levels of submersion and exposure to air, and include:

- The upper (landward) end of the intertidal zone, dominated by barnacles, limpets, chitons, and other encrusting species;
- The mid-intertidal zone, where furoid algae and mussels provide structure and habitat; and
- The low-intertidal zone is made up of kelps, fleshy seaweeds, and seagrasses.

Marine Birds

The federal Fisheries Act affects and shapes most marine restoration projects through the lens of salmonid habitat. Within the context of Vancouver's shoreline and nearshore there are also a diversity of marine birds and overwintering migratory waterfowl. In fact, False Creek and the surrounding areas are part of the globally significant English Bay - Burrard Inlet Important Bird Area (IBA).

Marine birds (also known as sea ducks) are sensitive indicators of marine ecosystem health because they depend upon both aquatic and terrestrial features of the landscape, are sensitive to climate change impacts, and are easily identifiable. Many marine birds rely on riparian area plants and intertidal seaweeds and invertebrates for food. Similarly, marine birds require shoreline features to nest in.

Marine birds use a variety of areas and habitat in their daily lives. These habitat areas may be defined as follows:

- 1) Urban Shorefront: This includes any land that is not directly influenced by the ocean but is near to the shore. Examples are parks, sidewalks, trees, and buildings within sight of the observation points.
- 2) Docks: This includes any manmade structure floating in the water and the watercraft anchored to the structure but not the water between the boats or in the marinas.
- 3) Shoreline: This is beachfront, sand, or gravel that is in direct contact with the ocean.
- 4) Nearshore: This is the region within approximately 30 m to the shoreline that tends to be more sheltered and isolated from boat traffic and shoreline disturbances.
- 5) Offshore: This is the region in the center of False Creek in the open water farthest away from the shore.

Bird sub-families are groupings of species with similar niches. This means that they occupy similar habitats, have similar diets and perform the same characteristic functions (Table 1). As

such, these groupings are useful to simplify analyses and make conclusions about related species. Table 1 outlines common bird sub-families and species found in Vancouver.

Sub-family	Species	Characteristics
Diving Birds	-Bufflehead duck -Barrow's Goldeneye -Common Goldeneye -Common Loon -Horned Grebe -Hooded Merganser -Pied Billed Grebe -Red Breasted Merganser	-Feed on algae, insects and small fish by diving beneath the surface of the water
Dabbling Ducks	-Mallard Duck -American Wigeon	-Feed on algae at the surface, stick their tail feathers out of the water
Cormorants	-Pelagic Cormorant -Double-breasted Cormorant	-Dive down to catch small fish from deep water
Gulls	-Gulls	-Highly versatile scavengers
Aerial Divers	-Belted Kingfisher	-Swoop down from a perch to catch prey
Ground Foragers	-Canada Goose	-Eat grass & other vegetation
Stalking Birds	-Great Blue Heron (BC Blue listed)	-Feed in the intertidal on fish & small invertebrates

Table 1.0 Common bird sub-families and species found in Vancouver.

City of Vancouver Policy

The Greenest City Action Plan under the Access To Nature goal area includes a target of restoring or creating 25 ha of habitat by 2010 to 2020. Van Play, the Biodiversity Strategy and Bird Strategy also encourage and support the restoration of land and water based ecosystems within the City of Vancouver's natural environment.

Other policies and frameworks related to healthy marine and aquatic systems in development, e.g. Vancouver Waterfront Initiative motion (2017), False Creek Water Quality Improvement Initiative (2018-x), Shore to Core: Vancouver's Watershed Revival Plan motion (2019), Aquatic Environments: Mobile Pump-out Service Delivery (2017-2024) and the Aquatic Environments Action Plan (2020), support the City's ecological restoration intentions.

Other Regulations to Consider

The proponent must also comply and/or reflect the provincial and federal regulations current at the time of development permit. These include, but are not limited to:

- Fisheries Act
- Migratory Birds Convention Act
- Navigation Protection Act
- Species at Risk Act
- Water Sustainability Act
- Other acts, regulations or duties to consult

Marine Rocky Intertidal Design Guidelines

To achieve rocky intertidal ecosystem and marine bird habitat objectives:

- The shoreline project concept should include the landward area that is within 15 m of the top of bank to the lower limit of the intertidal zone (subtidal) and, horizontally, along the footprint of the hardened shoreline. Where possible, upland designs such as landscaping and freshwater ponds, if installed, should be planned in such a way that benefit marine birds.
- The riparian area (top of bank to 15 – 30 m landward) should include native vegetation that can provide shade for the upper intertidal area as well as habitat for terrestrial species such as song birds.
- The design should reflect the dynamics that occur within a tidally influenced urban marine environment. These areas are complex and consist of tide pools, “nooks and crannies”, the deposition of suspended material, erosion, dogs etc.
- The intertidal zone should be designed to support the establishment of rockweed, blue mussel, barnacles and limpets as well as other rocky intertidal species using the appropriate rocky substrate, appropriate rock size, placement and grade.
 - It is recommended that large, rugged boulders (diameter > 63.0cm) be used to support rocky intertidal outcomes.
 - To ensure stability of the large boulders a shoreline with a gradual slope is recommended.
- The offshore should be considered through the lens of habitat for marine birds throughout the planning process. While restoration activities may not directly affect or take place in the offshore activities planned for within the offshore, e.g. passive boat recreation, may affect marine bird use of that area and impact habitat values of the offshore and restored area.
- The design should include structures suitable for perching birds like cormorants, great blue herons and sea ducks.

- Parts of the design should be inaccessible to people. Some intertidal habitat should be off limits for dogs. In areas inaccessible to people and dogs perching and resting structures should be situated.
- Removal of contaminated soils and/or structures may be necessary to achieve project objectives.
- An operational and maintenance needs of the design should be clearly identified and designated. If maintenance is required then the design should be accessible to accommodate maintenance equipment and activities.
- The design should be created and approved by a Qualified Environmental Professional who has expertise in the field of marine biology, urban ecology, species at risk, marine birds, water quality, contaminated sites and land use planning.
- At a high level the shoreline may look like a collection of step-wise naturalized rocky outcroppings, e.g. like those found along Second Beach, with some areas for perching and some habitat benches. Habitat benches are flat horizontal planes at specific elevations. They can add complexity and areas for specific species to live/rest/eat in. The primary species to recruit through design and seeding are rockweed, blue mussels, barnacles.