Wetland Assessment Guidance for the Central West Coast of Vancouver Island

Version 1.0

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Clayoquot Biosphere Trust

Front cover image credit: B. Beasley

Figure image credits: B. Beasley

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1.0 Introduction

Acknowledgements

This document was developed following a wetland science workshop hosted by the Clayoquot Biosphere Trust in February, 2025. The workshop brought together provincial and local government staff, wetland practitioners, and ecologists to share information on wetland science and management and to identify ways to improve uptake of best practices within provincial and local regulatory contexts. We thank professionals from the following organizations for participating and sharing their invaluable knowledge and perspectives: Alberni-Clayoquot Regional District, District of Ucluelet, District of Tofino, British Columbia Ministry of Water, Land and Resource Stewardship West Coast Region (WCR) Ecosystems Section and WCR Water Authorizations, British Columbia Wildlife Federation, Redd Fish Restoration Society, Association of Wetland Stewards for Clayoquot and Barkley Sounds, Boreas Environmental Management, EcoFish Research, and the Canadian Chapter of the Society of Wetlands Scientists.

This document was developed cooperatively by S. O'Regan, J. Dornstauder, B. Beasley, K. Kistowska, and O. Currie.

This document incorporates local knowledge and the direct experience of those who regularly navigate the central west coast of Vancouver Island's unique environment. We gratefully thank all those who contributed.

Purpose

Wetlands on the central west coast of Vancouver Island are diverse in form and function and generate substantial ecological and socioeconomic benefits. From wildlife habitat for amphibians, birds, and mammals to carbon sequestration, water storage, and flood mitigation, wetlands are critical natural assets.

The pace and spatial scale of development in the region is increasing, and with it comes increasing pressure on aquatic ecosystems, including wetlands. It is critical to be able to correctly identify and delineate wetland boundaries and apply appropriate mitigation and planning measures to protect them. Beyond having adverse impacts on wetlands and the wildlife and ecological communities they support, failure to properly identify wetlands may exacerbate flooding, drought and risk of wildfire with climate change, and compromise community water security. For project proponents, failure to properly protect wetlands may lead to poorly informed plans, unauthorized impacts and enforcement action, project delays and increased costs.

This guidance document was created to provide general guidance to practitioners working on projects that may impact wetlands in the Clayoquot Sound Biosphere Region and, more broadly, within the central west coast of Vancouver Island (hereafter referred to as 'the region'). The region encompasses the territories of the Nuu-chah-nulth First Nations.

The intended audience for this document includes project proponents (e.g., developers, government agencies, utilities, etc.), qualified professionals (e.g., professional biologists, agrologists, foresters, etc.), and policy and planning authorities (e.g., First Nations, local governments, and local organizations).

This document will be updated as new science, protocols, best management practices, or policies are released.

2.0 Understanding Wetlands

What is a Wetland?

Wetlands are important and uncommon ecosystems in British Columbia, covering only approximately 7% of the province's total land area. They are defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions.

Wetland specialists identify wetlands by looking for the presence of three primary indicators: wetland hydrology, hydrophytic vegetation, and hydric soil.

Wetland Classes

Wetlands include a range of ecosystems, which fall into five general classes, as per the Canadian Wetland Classification System.

Bog Wetland: Bogs are shrubby or treed, nutrient-poor peatlands with distinctive communities of ericaceous shrubs and hummock-forming *Sphagnum* species adapted to highly acidic and oxygen-poor soil conditions. Bogs develop in basins where peat accumulation has raised the wetland surface above groundwater flow, or, less commonly, where groundwater is very low in dissolved nutrients. See Figures 1 and 2.

Fen Wetland: Fens are peatlands where groundwater inflow maintains relatively high mineral content within the rooting zone. These sites are characterized by non-ericaceous shrubs, sedges, grasses, reeds, and brown mosses. Fens develop in basins, lake margins, river floodplains, and seepage slopes, where the watertable is usually at or just below the peat surface for most of the growing season. See Figure 3.

Marsh Wetland: A marsh is a shallowly flooded mineral wetland dominated by emergent grass-like vegetation. A fluctuating watertable is typical in marshes, with early-season high watertables dropping through the growing season. Exposure of the substrate in late season or during dry years is common. The substrate is usually mineral but may have a well-decomposed organic veneer derived primarily from marsh emergent plants. Nutrient availability is high (eutrophic to hyper-eutrophic) due to circumneutral pH, water movement, and aeration of the substrate. See Figure 4)

Swamp Wetland: A swamp is a forested, treed, or tall-shrub, mineral wetland dominated by trees and broadleaf shrubs on sites with a flowing or fluctuating, semipermanent, near-surface watertable. Tall-shrub swamps are dense thickets, while forested swamps have large trees occurring on elevated microsites and lower cover of tall deciduous shrubs. Both types of swamps have abundant available nutrients from groundwater and often have surface standing water. Swamps may be underlain with peat but this is well decomposed, woody, and dark. See Figures 5 and 6)

Shallow-water (Aquatic) Wetland: Shallow-water wetlands are dominated by rooted, submerged and floating aquatic plants. These communities are always associated with permanent still or slow-moving waterbodies such as shallow potholes or deeper ponds and lakes. Shallow-water sites are usually permanently flooded; rarely they may become exposed during extreme drought years. Shallow-water communities most commonly occur where standing water is less than 2 m deep in midsummer. Aquatic plants may root in mineral soils or in well-humified sedimentary peat. See Figure 7.

Common wetland plant communities (i.e. site associations) by wetland class are described in Land Management Handbook 52 (LMH 52) *Wetlands of British Columbia: A Guide to Identification*[1]. Not all wetland plant

communities will match the plant communities in LMH 52. Wetlands may have distinct plant communities that do not match the descriptions or may appear as a variation of a described site association. The B.C. Conservation Data Centre is actively recording new wetland plant communities that may not be included in this handbook. Further, many wetland plant communities have been altered by human activities.

See below for examples of wetland classes in the region:

Figure 1. Bog wetland near Tofino Connector Trail. Wetland coordinates: 49.146039°,-125.902756° scale 1:2500

Figure 2. Bog wetland near Ty-Histanis. Wetland coordinates: 49.078443°,-125.793503° scale 1:2500

Figure 3. Fen wetland at Swan Lake. Wetland coordinates: 49.000853°,-125.595952° scale 1:3500

Figure 4. Marsh wetland in Lost Shoe system. Wetland coordinates: 49.001697°,-125.588333° scale 1:2500

Figure 5. Swamp wetland near Thunderous Creek. Wetland coordinates: 48.942712°,-125.565245° scale 1:2500

Figure 6. Swamp wetland near Ucluelet industrial park. Wetland coordinates: 49.035283°,-125.537828° scale 1:2500

Figure 7. Shallow-water (Aquatic) wetland at Woods Lake. Wetland coordinates: 48.991578°,-125.579283° scale 1:2500

Hydrogeomorphic Groups

Wetlands can form in many different locations across a landscape. The *Wetlands of British Columbia: A Guide to Identification*[1] defines six different hydrogeomorphic groups that describe the topographic position and hydrology of the sites in which wetlands may occur.

Estuarine: Sites at the confluence of fluvial and marine environments affected by tides. See Figure 8.

Fluvial: Sites associated with flowing water and subject to flooding, erosion, and sedimentation. See Figures 9 and 10.

Lacustrine: Sites at lakeside, directly affected by lake hydrological processes (e.g., wave action, flooding, and sedimentation). See Figures 11 and 12.

Palustrine – Ponds and Potholes: Sites associated with small waterbodies. See Figure 13.

Palustrine – Basins and Hollows: Sites in depressions and other topographic low points with the water table near or at the surface; these receive water mainly from groundwater and precipitation. See Figure 14.

Palustrine – Seepage Slopes: Sloping sites with near-surface ground-water seepage.

See below for examples of hydrogeomorphic groups in the region:

Figure 8. Estuarine wetland at Olsen Bay estuary. Wetland coordinates: 48.991578°,-125.579283° scale 1:2500

Figure 9. Fluvial wetland at Thunderous Creek. Wetland coordinates: 48.951205°,-125.576837° scale 1:2500

Figure 10. Fluvial wetland at stream feeding into Olsen Bay. Wetland coordinates: 49.035361°,-125.537462° scale 1:2500

Figure 11. Lacustrine wetland at Kennedy Lake. Wetland coordinates: 49.037475°,-125.541283° scale 1:2500

Figure 12. Lacustrine wetland at Maggie Lake. Wetland coordinates: 49.015617°,-125.43242° scale 1:2500

Figure 13. Palustrine wetland at Swan Lake. Wetland coordinates: 49.000853°,-125.595952° scale 1:3500

Figure 14. Palustrine wetland complexes on Ucluelet's outer coast. Wetland coordinates: (A) 48.940125°.-125.571595°, (B) 48.93992°.-125.571158°, (C) 48.93903°.-125.569887° scale 1:2500

Wetlands on the Pacific West Coast

The region is unique in its wetland topography and is characterized by gently undulating terrain where wetlands (often bog and swamp) are interspersed within forested areas, forming a complex mosaic of forest and wetland ecosystems. These matrices include a mixture of bog, swamp and forest ecosystems of variable sizes. Bogs with relatively little tree cover are often adjacent to bogs with extensive tree cover. Swamps typically exhibit pronounced microtopography that supports a well-developed tree stratum dominated by Western redcedar and

Western hemlock, along with diverse shrub, herbaceous, and moss layers. The varied microtopography facilitates the coexistence of upland species alongside obligate or facultative wetland plants, like skunk cabbage, which typically occur in wet microsites where water accumulates around elevated features. The transition between bog and swamp to forest is not only spatial, but also temporal. There is evidence for wetland development from forest as well as forest development from wetland depending on how climatic and hydrologic conditions change over time (Banner *et al*. 1985)[2].

The complexity of these dynamic ecosystems, combined with high levels of precipitation much of the year, can make it challenging to identify wetlands and delineate their boundaries. In some areas, forest and wetland ecosystems are so intricately interwoven that distinguishing and delineating the boundaries of individual forest and wetland units becomes impractical. In such cases, it is both more feasible and more appropriate—ecologically and hydrologically—to define and delineate the area as a unified wetland–forest complex. See Figure 19 for an example of mapped wetland-forest complexes under sensitive ecosystem inventory (SEI) categories in the District of Tofino.

In some cases, human activity has enhanced or restored wetland function, while in others it has degraded wetland function (see Figures 15, 16, 17, and 18). Recognizing the influence of these human-induced changes, and mitigating future impacts is important for effective assessment and planning.

See below for examples of Human-altered wetlands in the region:

Figure 15. Estuarine wetland impacted by yellow flag iris (*Iris pseudacorus*), a noxious weed under the BC Weed Control Regulation. Wetland coordinates: 48.923963°,-125.533128° scale 1:2500

Figure 16. Swamp wetland impacted by road building and urban development. Wetland coordinates: 48.943695°,-125.562460° scale 1:1250

Figure 17. Human-made stormwater wetland at a golf course. Wetland coordinates: 49.085438°,-125.786051° scale 1:2500

Figure 18. Human-made stormwater wetland along a roadside. Wetland coordinates: 49.113376°,-125.887258° scale 1:2500

Why are Wetlands Important?

Wetlands support diverse and rare plant communities and provide habitat value disproportionate to their size. Amphibians, reptiles, mammals, birds, and fish all use wetlands or require wetlands to complete their life cycle. As well as supplying nutrients and food for fish and wildlife, wetlands are also key components of watershed hydrological systems and valuable natural assets.

With climate change, prolonged and severe drought are more frequent, along with intense fall and winter precipitation, resulting in more severe storms and runoff events, and decreased snowpack and snowpack contribution to late spring flows. As the population of British Columbia grows, water security with climate change is and will increasingly be a concern in many regions. Protecting wetlands is a cornerstone of climate change mitigation and adaptation because they help buffer climate change effects. They store floodwaters and maintain surface water flow during dry periods, trap sediments and stabilize soils, and preserve water quality and groundwater levels. Shady wetland–forest complexes in particular buffer extreme weather by retaining water during high precipitation events and releasing water back into the system gradually during droughts.

Lastly, peatlands are vital to reducing climate change, as they store significant amounts of carbon. Their degradation via human development activities releases this stored carbon, thereby contributing to global warming.

3.0 What Legislation Protects Wetlands?

Proponents and their contracted Qualified Professionals are responsible for understanding their obligations to protect wetlands under applicable legislation and to obtain the necessary regulatory approvals. Wetlands receive protection under local, provincial, and federal statutes and regulations, including, but not restricted to, the following:

Water Sustainability Act (WSA)

Protects 'streams' even when they do not contain water. The WSA definition of 'wetland' includes a swamp, marsh, fen, or prescribed feature. The WSA also protects groundwater by regulating activities that could alter groundwater flow or quality, ensuring that underground water resources are not adversely impacted by development or other land use changes.

WSA Section 11 prohibits 'changes in or about a stream' (CIAS) without authorization. Any work or activity, regardless of location, that may modify the nature of a stream or the flow of water in a stream may constitute a change in and about a stream that must be authorized under the WSA. For example, forest harvest and urban development in or around wetlands may modify the nature of a wetland or the flow of water by disrupting surface or groundwater flow, compacting soils, or impacting water quality. This means the input and output of water and water features should be considered, not just within the footprint of the development but also how and what features this may affect downstream of a proposed development.

Some types of CIAS are considered lower risk and are pre- 'authorized changes' if they conform to the specifications under Part 3 of the Water Sustainability Regulation[3]. CIAS that do not conform to these specifications require a Section 11 Change Approval. Change Approvals are required to infill or modify a wetland. For example, bisecting a wetland with a road without a clear span bridge that can span the width of the wetland requires a Change Approval because this constitutes a loss of wetland area and modifies the hydrology and plant community(ies) of the wetland ecosystem. Change Approvals applications require an environmental management plan, and may require other plans and assessments, potentially including but not limited to engineered drawings, hydrologic/hydrogeologic assessment, planting plans, and environmental impact assessments. The environmental management plan should include mitigation measures and best management practices for how the works will be completed in a way that reduces or removes risk to the environment. Refer to the *Requirements and Best Management Practices for Making Changes In and About A Stream in British Columbia (2022)*[4] for provincial best management practices (BPMs). These BMPs are not exhaustive and provincial authorizations specialists or decision makers may request additional measures at their discretion.

For further information about permitting under WSA, refer to *A User's Guide for Changes In and About a Stream in British Columbia*[5].

Fisheries Act

Protects fish-bearing wetlands or wetlands that connect to watercourses that support fish at some point in time during the year. The riparian vegetation adjacent to these wetlands is typically protected. Changes that alter, disrupt or destroy fish habitat must be authorized by Fisheries and Oceans Canada (DFO) by submitting a Request for Review form[6].

Local Government Act

Under British Columbia's *Local Government Act*[7], regional districts and municipalities can enact bylaws that protect and conserve wetlands and sensitive ecosystems like wetland–forest complexes. For example, the

District of Tofino, District of Ucluelet, and Alberni-Clayoquot Regional District have designated riparian setbacks and other environmental protections as part of the development permitting process. Development Permit Areas (DPAs) are designated in Official Community Plans (OCPs) and include the special conditions and objectives that justify the designation.

Municipalities and regional districts may also adopt land use bylaws to address stormwater management which could, for example, require proponents to assess the potential effects of their project on wetlands and avoid and mitigate impacts to wetlands.

Proponents need to check with the applicable local government for more information.

Other Legislation

Qualified professionals also need to adhere to all other applicable legislation that protects wildlife living within wetland habitats, including British Columbia's *Wildlife Act*[8] and Canada's *Species at Risk Act*[9].

4.0 Environmental Mitigation Policy and Wetlands

Proponents of development proposals that may affect wetlands in the region are advised to follow the British Columbia *Environmental Mitigation Policy* and associated procedures[10] to demonstrate how they will avoid and minimize wetland impacts to the maximum extent possible. The mitigation sequence under this policy is as follows:

1. Avoid impacting environmental values and components.
2. Minimize adverse impacts to values and components by implementing mitigation measures.
3. Rectify the impacts by repairing, rehabilitating, or restoring the affected environment.
4. Compensate for residual adverse impacts to values and components. If applicants cannot fully avoid or minimize impacts, they must demonstrate how they will compensate for the loss of wetland habitat and functions (also known as offsetting).

To determine how best to avoid and minimize impacts to wetlands during site layout, project design, construction and operation, a thorough assessment of the site should first be completed to delineate and characterize all wetlands on the site.

Following a complete examination of the available databases and mapping tools, the site should be investigated on the ground. Though mapping resources and previous studies provide important background information, many wetlands and streams are unmapped. Some sites may also have threatened or endangered plants or animals that are not shown on any existing maps.

Following an initial assessment, more detailed vegetation or species at risk or hydrological assessments may be required to make decisions about what types of land uses are acceptable adjacent to the wetlands.

5.0 Recommendations for Wetland Assessments

When land use planning, it is essential to first accurately identify and delineate the boundaries of wetlands and/or wetland complexes that may be impacted by land use decisions and, then, evaluate the wetland functions.

Who is Qualified to Delineate and Evaluate Wetlands?

British Columbia's *Professional Governance Act*[11] governs the regulatory bodies that oversee Professional Foresters, Applied Biologists, Engineers and Geoscientists, Agrologists, and Science Technicians and Technologists. These professionals are legally required to adhere to their regulatory body's code of ethics and standards of conduct and competence. Professionals can only legally undertake assignments and offer opinions in areas where training and ability make them competent.

Delineating wetland boundaries and evaluating wetland function can be complex and should be undertaken or supervised by a Wetland Scientist. For the purposes of this guidance, a Wetland Scientist is someone who has the training and ability to identify, delineate, and classify wetlands, or take responsibility for (professionally sign off on) a wetland assessment carried out by a team of professionals. The Wetland Scientist should be in good standing with a regulatory body specified under the *Professional Governance Act* and act as per their body's code of ethics. Whether acting alone or with a team of professionals, they should be able to do the following:

- Correctly assess wetland soils, hydrology, and vegetation.
- Correctly use and interpret aerial/satellite imagery, LiDAR or National Topographic System-derived digital elevation models and hillshade functions, and other remotely-sensed information to aid in identification of wetland boundaries, area, and vegetation.

It is a proponent's responsibility to hire a qualified professional with this expertise and it is a professional's responsibility under the *Professional Governance Act* not to accept this work if they do not have this expertise. Professionals inexperienced in wetland delineation may, for example, falsely identify a swamp wetland as 'forest', 'riparian vegetation' or 'unconfined stream channel'.

To help locate a Wetland Scientist for your project, we recommend referring to the member lists of the following professional bodies as a starting point:

The Society of Wetland Scientists[12] (SWS): An up-to-date list of SWS British Columbia members can be obtained by contacting the Canadian Chapter of the SWS.

The British Columbia Institute of Agrologists[13]: Registrants can be filtered by 'Area of Practice' to select those with 'Wetland and riparian area evaluation, conservation planning, and management' experience. Note that this is a broad area of practice and not all registrants who have identified this area of practice will be Wetland Scientists.

The College of Applied Biology[14]: maintains a directory of Registered Professional Biologists but does not presently allow users to filter for wetland delineation and function evaluation or wetland restoration as practice areas.

Proponents are encouraged to learn about the work of local non-profit organizations that are engaged in wetland and stream conservation in the region. These groups often possess valuable knowledge of local watershed conditions, historical land use, and culturally significant ecological features. These organizations may be contracted to assist in accessing locally available data such as wetland inventories, species-at-risk records, Indigenous knowledge, and past environmental assessments, which are critical for accurate and context-sensitive evaluations. Collaborating with local organizations not only strengthens the scientific and cultural relevance of the assessment but also fosters community relationships and ensures that project planning aligns with regional priorities and stewardship initiatives.

Local organizations can also help connect proponents with qualified professionals who have specialized training in west coast wetland ecosystems and are familiar with the region's unique ecological characteristics. By engaging qualified professionals with this regional expertise early in the project planning process, proponents can proactively reduce risks of non-compliance and expedite project timelines.

Local and provincial government officials cannot recommend specific qualified professionals. The Clayoquot Biosphere Trust may be able to support in connecting project proponents and qualified professionals to local organizations and resources.

Wetland Delineation

Wetland delineation establishes the location and physical boundaries of a wetland. Existing maps and other sources of information that can be used to predict where wetlands occur are available on-line. Field assessments are needed to verify wetland locations and delineate boundaries.

Initial Desktop Analysis

When planning a project, proponents are advised to first check LiDAR BC[15] to see if there are LiDAR point cloud data or a digital elevation model (DEM) for the area of interest. The DEM can subsequently be converted to a hillshade image, which typically reveals the likely location of wetlands, streams, and ditches. Next, review publicly available spatial data to view any previously mapped wetlands in the area of interest. Data are available through the British Columbia Geographic Warehouse Data Catalogue[16] or through organizations outside of the provincial government. Provincial wetland spatial datasets should not be considered complete representations of all wetlands in the landscape and wetland boundaries should be field verified for accuracy.

Local governments and First Nations often maintain additional wetland, stream and riparian datasets not available through provincial or federal sources. Proponents should consult with local governments and First Nations, which may have sensitive ecosystem mapping, DPA guidelines, and floodplain mapping. These datasets may be viewed using municipal or regional interactive maps or by contacting planning departments directly. Accessing this local information early can help identify site-specific considerations and streamline project planning.

The following sources of wetland data are available through the British Columbia Geographic Warehouse Data Catalogue:

- British Columbia Freshwater Atlas – The atlas defines watershed boundaries and includes a connected network of streams, lakes, and wetlands.
- Terrestrial Ecosystem Mapping (TEM) Project Boundaries – Contains study areas and attributes describing TEM projects, and links to the locations of other data associated with the projects (e.g., reports, polygon datasets, plotfiles, field data, legends).
- Sensitive Ecosystem Inventory (SEI) Project Boundaries – Contains attributes describing SEI projects and includes links to the locations of other data associated with the projects.

The following are examples of wetland data sources available through other organizations:

- British Columbia Wetlands Atlas[17] – citizen-science wetlands mapping led by the British Columbia Wildlife Federation.
- Canadian Wetland Inventory[18] – wetlands mapping in the southeast portion of Vancouver Island completed by Ducks Unlimited Canada.

- Municipal and regional district interactive maps, such as ACRD iMap[19].

For further information on locally available resources such as ecosystem mapping, DPAs, and floodplain mapping, see Appendix A.1. Local Government Planning References.

Field Verification

A desktop analysis cannot be relied upon to confirm wetland presence/absence or wetland boundaries as wetland mapping in British Columbia is limited and incomplete. Field verifications are necessary to confirm the locations and extent of wetlands.

The Province of British Columbia has not yet released its own wetland delineation methodologies. As such, it is recommended that qualified professionals conduct these assessments using the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)*[20] (to be used with *Corps of Engineers Wetland Delineation Manual*[21]). These methodologies are suitable for assessing the soils, hydrology and vegetation of the west coast of Vancouver Island.

It is advised that the qualified professionals complete the Wetland Determination Data Form[22] (located in the Regional Supplement) to transparently show their assessment of soil, hydrology, and vegetation and how this led to their wetland determination and boundary delineation.

Note that the maximum extent of a wetland is ideally delineated after groundwater recharge. Evaluators should survey a sufficient number of paired wetland/upland plots to confidently characterize the wetland vs non-wetland boundary, evaluating the presence of soil, vegetation, and hydrology indicators in each plot. Larger or more complex wetlands may require more plots to support a wetland boundary delineation. It is usually necessary to assess a given wetland more than once per year to capture seasonal changes in water level or vegetation.

West Coast Wetland Complexes

In many areas, you may find closely spaced wetlands that range in size and share biological and hydrological functions. Such groupings of wetlands are referred to as ‘wetland complexes’. Wildlife in these areas often depend on the complex as a whole. It is advised that wetland complexes be identified and delineated as well as each wetland. Two examples of protocols for identifying and delineating wetland complexes are the section 5 of the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)*[20] and the *Ontario Wetland Evaluation System Manuals*[23].

West Coast Wetland-Forest Complexes

If the proposed work overlaps a wetland-forest complex, it is advised that these be delineated and considered. The scope of this work may include several sub-basins and it may be necessary to consult with planning departments. Wetland-forest complexes are not well defined in policy but these complexes are important in function (i.e. extreme weather buffering). See Figure 19 for an example of mapped wetland-forest complexes under sensitive ecosystem inventory (SEI) categories in the District of Tofino. The full report can be found in Appendix A.1.2.

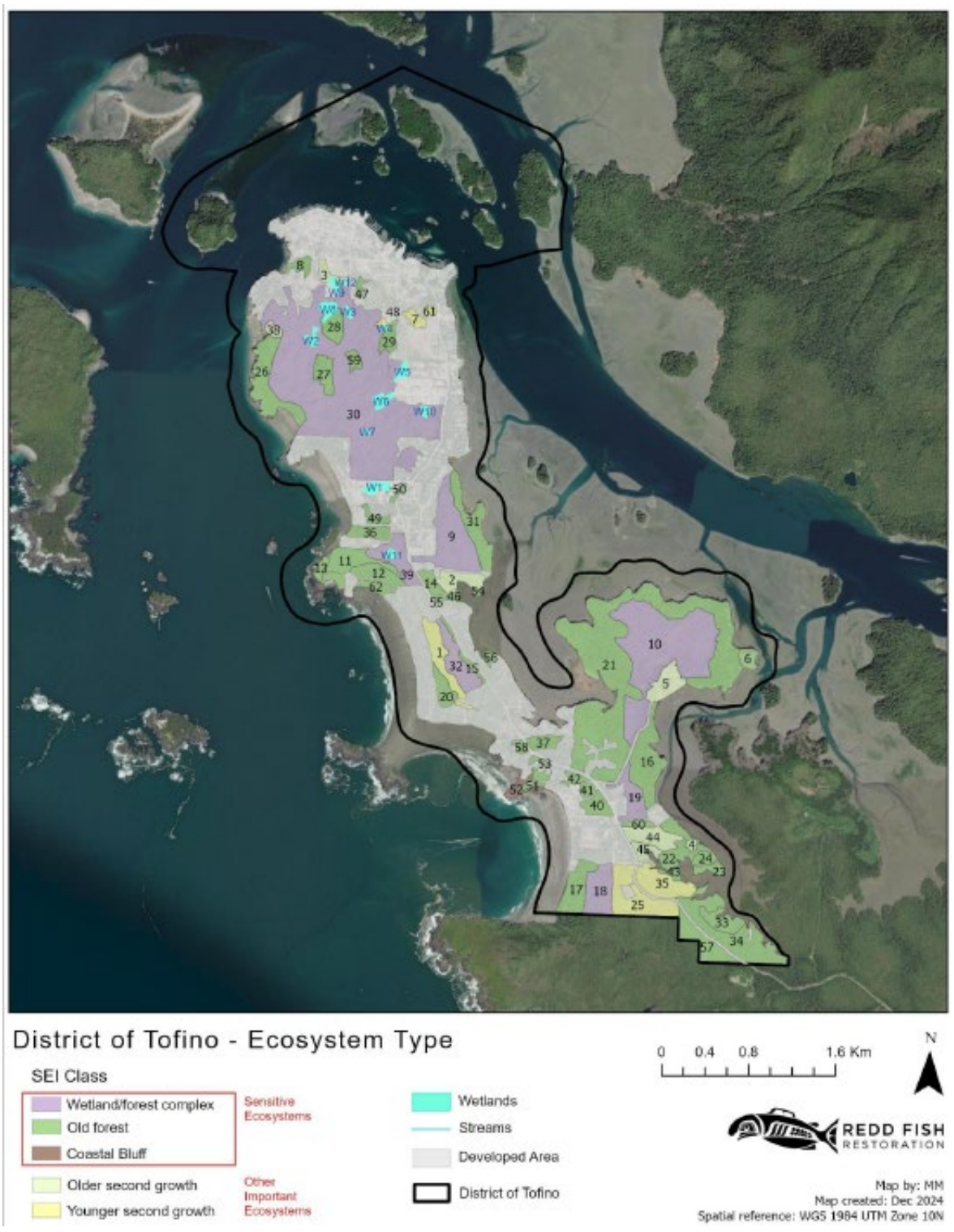

Figure 19. Ecosystem types by SEI class in the District of Tofino. Note that riparian and estuarine/tidal SEI classes are not included. The full report can be found in Appendix A.1.2.

Outer Coast Wetland Complexes

If development work is proposed along the outer coastline, its influence on the hydrology of estuarine marshes and small brackish pools along bedrock shorelines should be considered. Of special note, several species of amphibians breed in fresh to brackish pools within the spray zone (the area above the highest high tide-line of the upper intertidal zone). Many of these breeding pools are fed by wetlands, seeps, and small creeks flowing from the forested slopes above them. These water sources and the pools that they feed should be delineated and assessed. See Figure 14 for examples of outer coast wetlands fed by seeps.

Wetland Condition and Function Evaluation

Wetlands vary widely in their condition, functions, and ecological, economic, recreational, or aesthetic values. Some types are common while others are rare. Some are in relatively pristine condition whereas others are heavily disturbed. Wetland functions may include, to varying degrees, flood attenuation, maintenance of watershed water quality, carbon sequestration, groundwater recharge or discharge, and the provision of habitat for wildlife (e.g., breeding site for amphibians, fish overwintering habitat, waterfowl stopover, staging, or nesting, etc.).

Function evaluation and rating systems exist to differentiate between wetlands based on several factors:

- Sensitivity to disturbance
- Rarity
- Our ability to replace them
- Functions they provide

Wetland function evaluation is necessary to help you decide the following:

- Permitted land uses in and around the wetland.
- The width of buffers needed to protect the wetland from adjacent development.
- The mitigation needed to compensate for impacts to the wetland.
- What would be required to offset/compensate for the loss of the wetland and the functions it performs in the watershed.

It is advised that wetland function evaluation be done in accordance with or in a manner consistent with one of the three methodologies below:

Washington State Wetland Rating System[24]

Ontario Wetland Evaluation System Manuals[23]

Forest and Range Evaluation Program (FREP) Wetland Management Routine Effectiveness Evaluation[25] – For use on forestry lands to support forestry operations.

These evaluation methodologies combine landscape-level desktop and field assessment methods to identify and measure wetland values through the examination and ranking of several wetland functions. Wetland boundaries must be identified before applying these methods.

Wetland Assessment Deliverables

A complete wetland assessment should involve field visits at different times of the year. The assessment report should include, but is not restricted to, the following:

- A description of wetland delineation methods followed;
- A completed *Wetland Determination Data Sheet – Western Mountains, Valleys and Coast Region (ENG 61169)* Regional Supplement field form from the U.S. Army Corps of Engineers manual;
- A description of the site topography;
- A map of the wetland boundary and plant communities (as per *Wetlands of British Columbia: A Guide to Identification*[1]), overlaid on aerial/satellite imagery and LiDAR or National Topographic System derived hillshade imagery (if available);
- Map and georeferenced photographs of plant communities and soil samples (photo locations should be cross-referenced on a map and sometimes it can be helpful to embed photos in the map);
- Map of location, and the nature and direction of water flow at all inflows and outflows;
- Map of any surface or groundwater monitoring sites;
- A wetland function evaluation;
- Documentation of sources of information (e.g., list reports, remote imagery and other geospatial data used, include year of air photos, etc.).

Evaluators should also document the following features:

- Active beaver lodges/dams
- Locations of rare or at-risk species (note habitat, abundance)
- Wildlife observations
- Human-related 'disturbances' (e.g., infill, old forestry service roads, houses, cattle grazing, etc.)
- Locations of seeps or springs (these are protected under the *Water Sustainability Act*)
- Surrounding topography (e.g., flat, rolling, hilly, steep)
- Fish habitat (low or high marsh, seasonal or permanent swamp, fish or habitat observed)
- Locations of invasive species
- Wetland hydroperiod (must check wetland during different times of the year to see its different states and evaluate its function)

6.0 Implementing Wetland Mitigation

After delineating and evaluating the functions of wetlands, applicants with projects that are likely to affect wetlands will need to follow the mitigation sequencing process to demonstrate how they will avoid, minimize, or compensate for impacts to the wetlands.

Avoidance

Avoidance is the first mitigation step in project design. Authorizing agencies have the authority to require applicants to document how they have avoided impacts to wetlands. These agencies may require an analysis of practicable alternatives and modifications to designs and may also deny the project if avoidance is not demonstrated. Many applicants can save considerable time and money and reduce liability by completely avoiding wetland impacts and the associated mitigation requirements.

Every attempt should be made to avoid impacts to wetlands that are rare, sensitive, or difficult to replace (e.g., bogs, fens, mature forested swamps, and habitats for unique or at-risk species) as it is unlikely that these wetland types can be successfully replaced using compensation.

Minimization

Minimization reduces the extent of wetland impacts. Applicants should describe what unavoidable impacts their project will have on wetlands. The area of wetland impacted, the degree of alteration, and resulting effects on functions can vary widely; all these factors influence the requirements for mitigation to minimize impacts.

Most of the techniques used in avoidance can also be used to minimize impacts. Examples include implementing low impact stormwater management techniques, removal of invasive weeds, and preserving riparian buffers. Preserving adequate riparian buffers is a crucial element to protecting wetland functions. Conversely, loss or reduction of wetland buffers is an indirect impact to wetland functions.

Scientific understanding about wetlands and how best to protect them is continually evolving. Project proponents and their contractors should use the best available science in their management of wetlands (see Mitigation Resources section, below).

Compensation

When impacts to wetlands cannot be fully prevented through avoidance and minimization, the next step in the wetland mitigation sequence is to compensate for the loss of wetland functions and habitats through on-site wetland restoration (enhancement, rehabilitation), on-site wetland creation, and/or off-site wetland enhancement or creation, in that order.

Agencies often require a larger compensatory wetland area than what was lost because of the length of time it takes to successfully create, restore, or enhance a wetland and due to the risk that the compensatory project will fail. The compensation will typically be sufficient only if the functions expected to be generated at the compensation site equal or exceed those lost at the impact site.

It is advisable for applicants developing a conceptual compensation plan to obtain feedback from regulatory agency staff early on and to use the resources provided below on how to develop a compensation approach that appropriately offsets losses in wetland functions. The following principles should be applied in developing a compensation plan:

- Enhanced or constructed wetlands should look like naturally occurring wetlands, with gently sloping gradients and varied water depths and vegetation zones (see Figure 20).
- When infill will result in loss of riparian vegetation, it is ideal to factor the loss of this riparian vegetation into offsetting plans as well, through greater retention of riparian or upland vegetation.
- If offsetting off-site is required to meet target areal ratio, it is ideally in the same watershed to ensure no net loss of aquatic ecosystem function and benefits in that watershed.
- Newly created aquatic features should maintain pre-existing surface flow to fish-bearing watercourses and should restrict development if it has the potential to damage riparian vegetation and its ability to provide fish habitat and control erosion and sedimentation.
- Detailed wetland design drawings and planting prescriptions should be submitted with the compensation plan.

Monitoring Compensation Projects

When compensation/offsetting is required to compensate for unavoidable impacts to wetlands, a monitoring plan should be included in the compensation plan. Monitoring is required to ensure that a compensation project achieves its stated objectives and complies with permit conditions. It provides key information about whether a

site needs maintenance or whether the applicant needs to take corrective actions. It also provides information about the utility and appropriateness of compensation techniques, which can be applied to future projects.

The monitoring plan should specify objectives, performance indicators, metrics, and targets to evaluate compliance and success. The monitoring plan should also outline the monitoring duration, frequency, and methods. It is typically recommended that monitoring be required for a duration of 10 years. The monitoring duration may be extended if performance targets are not being met.

The permittee is responsible for meeting the terms of any authorization and the applicable regulator is responsible for ensuring that the permittee is compliant with the terms of authorizations.

See below for an example of a compensation project in the region:

Figure 20. Compensation project near Forbes Road, Ucluelet, B.C. Wetland coordinates: 48.939353°,-125.565125° scale 1:2500

Mitigation Resources

For detailed guidance on wetland mitigation, please refer to the resources below.

Protecting wetland functions based on syntheses of the best available science:

Wetlands in Washington State - Volume 2: Guidance for Protecting and Managing Wetlands[26]

Update on Wetland Buffers: The State of the Science, Final Report[27]

Stormwater Management Manual for Western Washington[28] (particularly those sections and appendices pertaining to wetlands)

Additional avoidance and mitigation guidance specific to different types of development activities:

Wetland Ways: Interim Guidelines for Wetland Protection and Conservation in British Columbia[29]

Wetland compensation and effectiveness monitoring:

Wetland Mitigation in Washington State – Part 1: Agency Policies and Guidance (Version 2, 2021)[30]

Wetland Mitigation in Washington State – Part 2: Developing Mitigation Plans (Version 1, 2006)[31]

How to Build a Wetland that Will Last Forever, with Tom Biebighauser[32] – a 1 hour 22 minute virtual presentation by Thomas Biebighouser, a Wetland Scientist, on wetland restoration techniques that have proven successful in British Columbia. Also note, T. Biebighouser has published two books: *Wetland Restoration and Construction–A Technical Guide Second Edition*[33] and *Wetland Drainage, Restoration, and Repair*[34].

7.0 Further Training and Resources

There are many training resources available to those who are interested in wetland science and wetland restoration. We highly recommend any qualified professionals engaged in identifying and delineating wetlands and/or developing wetland offsetting or compensation in support of project permitting in the region to obtain hands-on wetland training.

Hands-on Courses

University of British Columbia Wetland Delineation and Assessment[35] – Micro-credential training course on the assessment and delineation of wetland boundaries, with topics including wetland classification, functions and values, impact assessment and wetland policy.

British Columbia Wildlife Federation's Wetlands Institute[36] – an intensive 7-day hands-on wetland restoration workshop that educates participants about wetland stewardship, restoration, and construction.

Wetland Training Institute Basic Wetland Delineation[37] – a hybrid course that satisfies the requirements for basic wetland delineation training as specified by the United States Army Corps of Engineers (USACE).

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Appendix A: Local Planning Resources Impacting Wetlands

A.1. Local Government Planning References

A.1.1: District of Tofino Official Community Plan 2021

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A.1.2: District of Tofino Reports, Projects, Plans & Strategies

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A.1.3: District of Tofino Bylaws and Policies

https://tofino.civicweb.net/filepro/documents/2/

A.1.4: District of Ucluelet Official Community Plan 2020

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A.1.5: District of Ucluelet Bylaws and Policies

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