ATTACHMENT 2

Municipality of North Cowichan

Biodiversity Assessment Report

June 2023 - DRAFT

DIAMOND HEAD

MUNICIPALITY OF NORTH Cowichan

Executive Summary

The Municipality of North Cowichan is characterized by a mix of urban and rural neighbourhoods framed by a diversity of natural areas including lakes, wetlands, marine coastline, and forests. These environmentally sensitive areas support high levels of biodiversity, provide high-value recreation opportunities, and are deeply valued by the community for the range of benefits they provide. These natural areas, however, are being put under increasing stress from their popularity as well as development and the impacts of climate change including drought, pests, and diseases.

This document is the first of two reports seeking to identify and quantify existing biodiversity in North Cowichan, and to explore opportunities to protect, restore and enhance these important natural assets into the future. This report summarizes the current state of natural areas in the Municipality. This assessment includes a biophysical inventory, a ranking of biodiversity value, the identification of critical habitat and wildlife corridors, and the identification of threats to these important areas.

It is recognized that much of this information comes from a Western science perspective. Consultation work is ongoing to identify, highlight, and incorporate First Nations perspectives and knowledge into this report and the future Biodiversity Protection Policy. This knowledge is critical for understanding how natural areas in North Cowichan have historically been managed, and how this can inform future management.

Key findings from the Biodiversity Assessment Report

- 635 km of watercourses were identified using a flow model that analyses LiDAR data, this is approximately 37% more watercourses than were previously mapped.
- Over half (52%) of North Cowichan's land base is forested. The next highest vegetated land use is agriculture which covers 15% of North Cowichan.
- Most of North Cowichan is within the Coastal Douglas-fir biogeoclimatic zone (CDF) which is the province's smallest and most at-risk climatic zone.
- Large forests found on Mt. Prevost, Big and Little Sicker Mountains, Mount Richards and Maple Mountain, Mount Tzouhalem, and Somenos Lake and its associated marshland and support the highest levels of biodiversity in North Cowichan.
- There is a significant difference between the levels of biodiversity supported inside and outside of the Urban Containment Boundary.
- Core habitat hubs include many of North Cowichan's largest contiguous forests. Habitat sites include smaller natural areas and ones which are more fragmented by urban influences. There are more corridors connecting these habitat areas in rural areas compared to more developed urban areas.
- Agricultural fields and the Agricultural Land Reserve separate many of the large natural habitat areas.
- The natural environment in North Cowichan is changing and is threatened by many interrelated agents including climate change, invasive species, and urban development pressure.
- Opportunities exist to protect, restore, and enhance biodiversity in North Cowichan. These will be explored in Phase 2 of this project.

Acronyms

BCCDC – British Columbia Conservation Data Centre
BEC – Biogeoclimatic Ecosystem Classification
BPP – Biodiversity Protection Policy
CDF – Coastal Douglas-fir
DEM – Digital Elevation Model
DHC – Diamond Head Consulting
EDRR – Early Detection Rapid Response
LiDAR – Light Detection and Ranging
QEP – Qualified Environmental Professional
SAR – Species at Risk
SEI – Sensitive Ecosystem Inventory
TEM – Terrestrial Ecosystem Mapping

Photo 1: View of North Cowichan from Mount Prevost.

Glossary

Biodiversity	Biodiversity is a term used to describe the variety and variability of life on Earth. Biodiversity encompasses all living species and their relationships to each other. This includes the differences in genes, species and ecosystems.
Biogeoclimatic Ecosystem Classification (BEC)	An ecosystem classification system developed specifically for BC's ecosystems. BEC classifies specific ecosystem types in the province based on climate, soils, and ecology.
Early Detection Rapid Response (EDRR)	A management approach used to find, identify, and systematically eradicate, contain, or control new invasive species before they can widely reproduce beyond their initial entry.
Ecosystem Services	The many and varied benefits to humans provided by the natural environment and from healthy ecosystems. Carbon sequestration, recreation potential, shade, water filtration, and pollination are all examples of ecosystem services associated with the urban forest.
Invasive Species	A species which is not native or is outside of its natural distribution and which is negatively impacting the environment, people and/or the economy.
LiDAR	Acronym for 'light detection and ranging'. An active remote sensing technology which can measure vegetation height and elevation using laser scanning.
Native Species	A species which is present without direct or indirect human intervention, and which is present within its natural range and limited by its natural dispersal.
Natural Area	Any physical area that contains sufficient native species, ecological communities, or habitat features to support native biodiversity.
Protected Areas	Lands which have legal protections or with limitations on use, specifically safeguard the natural environment, such as natural state covenants, conservation areas and parkland. For this assessment, all parkland was included as a protected area, regardless of park use.
Sensitive Ecosystem Inventory (SEI)	A standardized mapping approach and an associated dataset specifically designed for mapping sensitive ecosystems.
Species and Ecosystems at Risk	A specific species or group of species which have been identified as extirpated, endangered, threatened, or of special concern.
Terrestrial Ecosystem Mapping (TEM)	A standardized mapping approach and an associated dataset providing site-specific classifications and descriptions of ecosystem units in BC.
Threatened	Likely to become endangered if limiting factors are not reversed.
Tree	For the purposes of this report, a tree is any woody plant with a height of at least 2 m, including all native and non-native species

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1.0 Introduction

1.1 What is Biodiversity? Why Does it Matter?

Biodiversity refers to the variety and variability of life on Earth. This includes every living thing, ranging from microorganisms in the soil up to the tallest trees in our forests and all the flora, fauna, and fungi that inhabit these natural areas. This is often measured as the number of species that live in an area, which can indicate ecosystem health and function.

Highly biodiverse areas are inherently valuable for protecting the many species that live there, but also for providing valuable ecosystem services to humans, our community, and the landscape. These healthy and well-functioning ecosystems can help buffer some of the impacts the built environment can have on surrounding areas. Natural areas provide visual barriers, reduce pollution, dust, and noise, while also capturing and storing atmospheric carbon dioxide through plant growth. Watercourses and wetlands retain water, reducing the potential for flooding, while also purifying freshwater. This helps to decrease pollution, and to reduce the stress on stormwater management systems while also providing habitat and recreational benefits. Trees and shrubs provide shade to residences on hot days, tempering the urban heat island effect and reducing energy consumption.

Photo 2: North Cowichan has an expanse of diverse ecosystems that support a wide range of biodiversity.

1.2 First Nations

This project recognizes the rich and important influence First Nations have had on the land and the plants and animals which inhabit North Cowichan. The ecosystems described in this report have been shaped in some way by land stewardship from these nations for time immemorial. A significant portion of this report uses methods and approaches rooted in Western science; however, to develop a comprehensive understanding of biodiversity and its role on the landscape, there is ongoing consultation and collaboration with First Nations.

Incorporating the knowledge and perspectives of those who have been intimately living with these natural ecosystems for thousands of years will provide a more comprehensive understanding of biodiversity and how to protect it. **Consultation for this project is ongoing, and therefore additional information and ideas will be integrated into the final version of this report once available.** Collectively, this knowledge will form the foundation of the Biodiversity Protection Policy, which will aim to use "two-eyed seeing" to view biodiversity through both western and First Nations lenses for the policy development phase of the project.

Photo 3: Biodiversity is the variety and variability of life on Earth and encompasses every living thing.

1.3 North Cowichan's responsibility to protect biodiversity

North Cowichan is on the transition between the Coastal Douglas-fir (CDF) and the Coastal Western Hemlock (CWH) biogeoclimatic ecosystem classification zones (BEC). The CDF subzone is among the smallest and most at-risk BEC zones in our region. The natural areas in North Cowichan are home to some of BC's most rare and unique plant communities and provide habitat for many wildlife species at risk.

North Cowichan is located along the Pacific Flyway and is home to two significant migratory bird areas, Somenos Marsh and the Cowichan River Estuary. Both areas provide globally significant habitats for congratory species such as the trumpeter swan (*Cygnus buccinator*), and the Iceland gull (Thayer's, *Larus glaucoides thayeri*).

1.4 Purpose of this report

North Cowichan recently updated its OCP which identified the protection of the natural environment as a key objective. As part of this update, existing policies and plans were reviewed. This review found that biodiversity protection was not adequately addressed in current policy. The purpose of this Biodiversity Assessment Report is to provide North Cowichan with a detailed overview of what biodiversity exists within North Cowichan. This report will reflect technical data, as well as results from engagement with First Nations and the public. A second phase is planned which will determine how to protect flora and fauna through the development of a Biodiversity Protection Policy.

2.0 Public Engagement

The Biodiversity Protection Policy will affect other municipal strategic plans and operational programs and must therefore be developed in consultation with municipal staff, stakeholders, First Nations, and the community. The public was invited to provide input through an online mapping tool (StoryMap) hosted from December 2022 to February 2023 on the project webpage. This StoryMap provided background information on this project and solicited feedback from participants. It enabled the public to leave detailed information about places they value within the municipality as well as places that could use improvement or that are threatened.

Through the StoryMap we heard how biodiversity plays a role in the community, including unique environmental, economic, and social values. The purpose of the StoryMap was to learn about the public's opinion on opportunities and challenges for biodiversity management. This will be used to inform goals that capture the community's perspective on the management of biodiversity within North Cowichan. Respondents were asked to identify places in the municipality they value and places that could be improved. A total of 65 locations were identified using the mapping tool. 38 (58%) were places of value and 27 (42%) were places needing improvement. This feedback will be used to inform project goals that capture the community's perspective on the management of biodiversity within North Cowichan.

2.1 Places of Value

Across the municipality, 68% of valued places were in parks or natural spaces (26 locations). Hotspots were located on Mount Prevost, the Chemainus River, and Stoney Hill Regional Park. 12 locations were in other contexts across the Municipality, including unprotected greenspace or natural areas, streetscapes, and along the marine shoreline.

> *"Stoney Hill area has a unique and diverse forest (arbutus/fir) and the views towards Salt Spring Island are outstanding. We need to keep our forests intact to help battle climate change, as well as keeping the forests for the wildlife that call them home."*
> *(quote from StoryMap respondent)*

The most common reasons for valuing locations included strong ties to a specific park, greenspace, or otherwise biodiverse area. Most people indicated that they valued the intrinsic biodiversity that nature corridors, wetlands, rivers, and unique ecosystems provide. Other reasons included seeing/supporting wildlife, recreation opportunities, and the general beauty and aesthetic value that areas provided.

2.2 Places needing improvement or are threatened

A significant portion (58%) of locations submitted for places to improve (15) were in developed areas including residential, agricultural, and commercial property. Responses highlighted the concern for the impact development is has had on existing wildlife corridors, biodiversity hotspots, Garry oak ecosystems, and the introduction of invasive species.

> *"All the lands around Quamichan Lake - remnants of Garry Oak Ecosystem are endangered and wildlife/biodiversity is threatened - these lands are worthy of conserving and rehabilitating to retrieve some of these lost ecosystems."*
> *(quote from StoryMap respondent)*

The most common suggestions for improvements were protecting natural spaces from the impacts of development, reducing the number of unsanctioned trails resulting from recreational activities, and managing invasive species.

What we heard	How it will be considered

• Recreational, ecological, and environmental benefits are highly valued by respondents.
• Respondents envision biodiversity having a larger role in the planning of future development in North Cowichan.
• Mapping tool participants:
  ○ Value parks and greenspaces for their recreational benefits and the habitat they provide for wildlife,
  ○ Want more natural areas to be protected and restored, with more proactive management of natural areas and invasive species,
  ○ Desire additional protection and management of Garry Oak ecosystems and riparian areas.
	• Many of the threats and concerns voiced by the community are echoed in this report, including the influence of development, invasive species, wildlife corridors and preserving Garry oak ecosystems.
	• The project team will incorporate this input when drafting the Biodiversity Protection Policy's vision and goals. The policy will emphasize the protection of benefits most valued by the community and will seek to address the issues cited by participants as needing improvement.

3.0 Methodology

This Biodiversity Assessment Report was developed by combining existing provincial and municipal datasets to understand biodiversity across the Municipality. These include Sensitive Ecosystem Inventories (SEI), North Cowichans Municipal Forest data, and Terrestrial Ecosystem Mapping (TEM). These were used to stratify forest polygons with similar ecological and stand characteristics. This information was further refined through LiDAR analysis, recent orthophotos, and targeted site assessments. The resulting dataset was then analyzed to rank biodiversity within the Municipality and to identify a Green Infrastructure Network (GIN).

3.1 LiDAR Analysis

LiDAR (Light Detection and Ranging) technology was used to improve our understanding of topography across the municipality. This included the development of a Digital Elevation Model (DEM) and hillshade layer. This detailed topographic information was then used to improve mapped creek channel locations. A flow accumulation model was run to identify previously unmapped watercourses, ditches, other potential areas of overland flow, as well as remnant creeks. This dataset was also used to improve our understanding of connected and disconnected lakes, wetlands, and pond features. The existing watercourse layer was refined using the detailed locations identified through this model. Some previously unmapped watercourses were included in the ground-truthing, however, not all could be visited.

LiDAR was also used to determine accurate tree canopy extents throughout the municipality. This provides a detailed understanding of the extent of forest edges, as well as the location of trees throughout the urban areas of North Cowichan. This canopy layer was used to identify unique forest polygons.

3.2 Ground truthing

Ground truthing was completed by three qualified Registered Professional Biologists (RPBios) to confirm the accuracy of compiled spatial data, and to collect additional data on the current state of understories and other relevant data. Due to access concerns, only public land was ground truthed. Comprehensive field assessments across the municipality were not possible, however, locations were strategically identified to create a representative understanding of biodiversity in North Cowichan, and to assess potential watercourses identified through the flow accumulation model. Natural areas assess on the ground included forests, rock outcroppings, bluffs, wetlands, and riparian habitats. The following information was collected at each site:

- Terrestrial habitat type
- Stand structural stage
- Tree species composition
- Average and maximum tree height and diameter
- Tree densities for each structural layer (stems/ha)
- Crown closure
- Soil texture, moisture, and nutrient regime
- BEC units to the site series level
- Stand health concerns
- Dominant ground vegetation and cover
- Invasive species and coverage
- Stand condition
- Restoration opportunities
- Wildlife habitat features and observations
- Garry Oak ecosystem characteristics
- Species at Risk observed
- Evidence of excessive deer browse

3.3 Biodiversity Ranking

Biodiversity is influenced by numerous factors, many of which are dynamic, complex and influence each other. Generally, areas which are large, provide a variety of habitat including water features and well-connected to other natural areas support high levels of biodiversity. A list of higher-order wildlife was analyzed to gain an understanding of the relative value of biodiversity within North Cowichan. This list includes 251 species of mammals, fish, birds, and amphibians. It is assumed that if these high-order species are present in an area, lower-order species (microbiota, and insects) that are part of their food chain are likely present.

This assessment included pervious areas of North Cowichan and divided them into habitat types. This ranges from natural areas with mature forests to lakes and wetlands as well as agricultural areas, urban trees, and turf grass. These habitats are ranked out of 100 relative to each other based on the number of species that are expected to inhabit them if in a natural state.

Modifiers were then applied to specific habitat polygons. Patches that are closely connected were grouped together. The overall habitat ranking of these areas were then modified to reflect their size and fragmentation. Another modifier accounts for the access to freshwater. Area with water and riparian habitat (the interface between terrestrial and aquatic ecosystems) were ranked higher. These modifiers were applied to each polygon to calculate its relative biodiversity level.

3.4 Building a Green Infrastructure Network

A network of important habitat areas has been identified within North Cowichan, called the Green Infrastructure Network (GIN). This is a connected system of natural corridors, streams, shorelines, and natural areas which provides a range of habitat features. This network includes core habitat hubs. These are large areas that provide protected interior habitat which is isolated from the influences of urban development and activity. Major habitat hubs are refuge areas where wildlife that is less tolerant of urbanization can live. Smaller habitat patches are also included and called habitat sites. These areas are smaller in size and generally do not provide protected refuge areas for wildlife. They do, however, act as important steppingstones across an urban landscape.

Linear habitat features that connect these hubs have also been identified which are called Corridors. In general, these corridors aim to be greater than 30 m wide. They are often not continuous and may be fragmented by barriers such as roads and development. In urbanized landscapes, local corridors have been identified. These are narrower and more fragmented but still support the movement of certain species.

In North Cowichan, a substantial portion of the land base is within the provincial Agricultural Land Reserve (ALR). These areas are important for preserving food security and agricultural communities in the province and can still support biodiversity in the region. These are included as features of the GIN. These areas tend to be dominated by monocultures of plants, with few barriers and can facilitate the travel of species between adjacent natural habitat areas.

Photo 4: Riparian areas can act as movement corridors for certain species.

Habitat features within urbanized areas are identified in the GIN as the Urban Matrix. These include small patches of habitat, single or small groups of trees as well as non-native habitat features such as garden areas. These features collectively provide habitat for species that are tolerant of human disturbances.

4.0 Natural features of North Cowichan

4.1 Climate

The Biogeoclimatic Ecosystem Classification System (BEC) was developed to understand how and where different ecosystems occur in BC. This system classifies the province into areas with similar climatic conditions (zones), which are then subdivided with increasing site specificity into subzones and site series. North Cowichan lies along the transition between the Coastal Douglas-fir (CDF) zone, and the Coastal Western Hemlock (CWH) zone. The CDF has the driest and one of the mildest climates and is considered the most at-risk BEC zone in BC.[i] CWH has a similar climate but is characterized by a slightly wetter climate and is the dominant zone along much of BC's coast.

4.2 Topography

Over the last 15,000 years, retreating glaciers have created and exposed a distinct combination of topographical features across Vancouver Island. Scoured rocky outcrops, knolls, mountains, and flat lowlands combine to form the unique landscape of North Cowichan. Steeply-sided mountains such as Mount Prevost and Big Sicker Mountain reach heights of nearly 800m, overlooking the network of lakes, streams, and estuaries below. Figure 1 illustrates North Cowichan's varied topography.

Photo 5: Steep cliffs along the Chemainus River are examples of the varied topography found within North Cowichan.

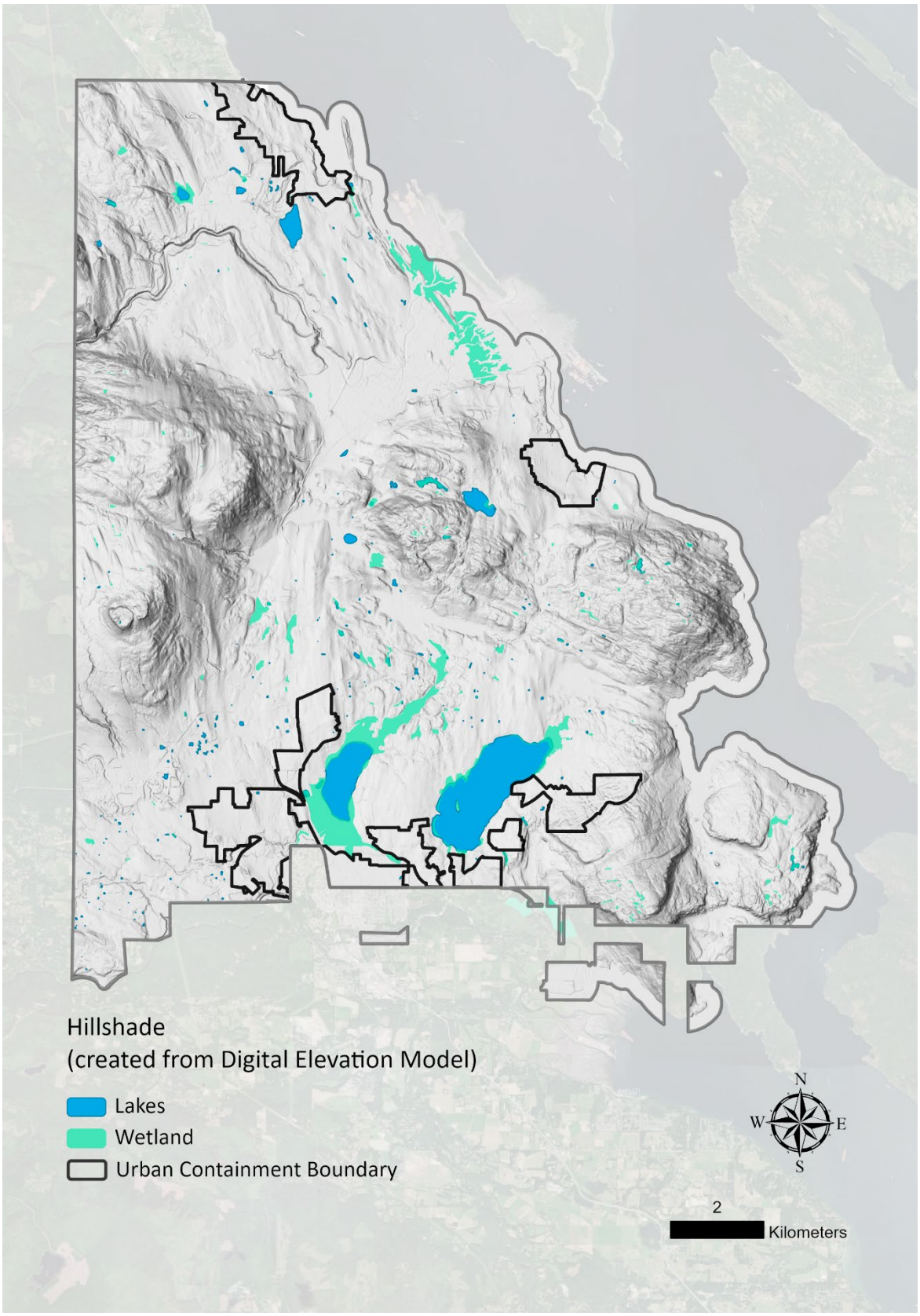

Figure 1: Hillshade map of North Cowichan.

4.3 Aquatic Systems

Water is a driving force in shaping North Cowichan's landscape, as well as what species and ecosystems have evolved there. Aquatic systems and their riparian areas support some of the highest concentrations of biodiversity in the region but are also among the most sensitive to disturbances and change. The scope of aquatic systems in North Cowichan extends beyond the surface lakes and rivers. Underground aquifers are relied upon by the Municipality's residents for drinking water and irrigation for agriculture. They are also responsible for supporting many wildlife species through upwellings in springs and wetlands. These can be an important source of freshwater particularly during dry periods of the year. Threats such as pollution, overuse, landscape level loss of permeable surfaces, and climatic shifts all threaten these important reservoirs of freshwater.

Photo 6: An intricate network of watercourses drain tidewater in the Cowichan River estuary.

4.3.1 Watercourses

The topography of North Cowichan results in a complex array of watercourses that weave throughout the Municipality. A braided network of smaller streams flow across the knolly landscape to connect with larger watercourses such as Asker, Whitehouse, Bonsall, Richards, Averill, and Somenos Creeks. These natural waterways provide habitat for a healthy aquatic ecosystem including rich fish populations. The Cowichan River is the Municipality's largest river, however the Chemainus River has the largest interface with North Cowichan. The Chemainus River drains water from Copper Canyon in the Vancouver Island Ranges, through North Cowichan, and into the Salish Sea via the Chemainus Estuary. The Cowichan River passes through the south and connects with Tzouhalem Creek before entering the Salish Sea via the Cowichan Estuary.

Figure 2 shows LiDAR-derived watercourses in North Cowichan by stream order. Stream order is a relative measure of the size of streams and where they exist in the watershed. The stream reaches that are smallest and highest up in the watershed are called first order streams. These converge as they flow down the landscape into the largest streams which are the higher order streams. This map helps

visualize the significance of the Municipality's varied topography in feeding 635 km of (LiDAR-predicted) watercourses (Table 1). The Municipality had previously mapped 465 km of streams (Table 2); an additional 170 km of potential watercourses have been identified through this process. The majority of these may be small, ephemeral streams. Knowing where watercourses are in North Cowichan is important for ensuring property owners and land managers understand where regulations apply such as North Cowichan's Natural Environment Development Permit Area (DPA3) applies, well as provincial regulations such as the *Riparian Areas Protection Regulation* (RAPR) and the *Water Sustainability Act* (WSA).

Table 1 Length of LiDAR predicted streams based on stream order.

Stream order	Total Length (km)
1 (smallest)	353
2	165
3	66
4	34
5	15
6 (largest)	2
Total	**635 km**

Table 2 Length of municipally mapped streams based on type.

Type	Total Length (km)
Creek (smaller)	95.9
River (larger)	31.8
Others*	337.6
Total	**465.3**

*Others include a variety of unclassified watercourses

Photo 7: Access to freshwater is vital for all species.

4.3.2 Lakes and Wetlands

Freshwater resources including lakes, wetlands, and floodplain areas are abundant in North Cowichan covering a combined area of 1,075 ha across the Municipality. These water features provide habitat for aquatic and terrestrial species and are significant contributors to the Municipality's overall biodiversity. Most watercourses south of Mays Road drain into North Cowichan's largest lakes, Quamichan Lake and Somenos Lake, before flowing into the Cowichan River downstream. North of Mays Road, watercourses drain into the Chemainus Estuary which is a rich coastal habitat for dozens of shorebirds. Many agricultural fields flood seasonally providing water features used by many waterfowl.

4.3.3 Shoreline

North Cowichan's varied and expansive coastline covers 88.8 km of unique ecosystems along the transition between the terrestrial and marine environments. This shoreline ranges from sandy coastal beaches to rocky bluffs with little vegetation. Expansive tidal estuaries span the Cowichan River and the Chemainus River deltas. These estuaries provide important habitats for many terrestrial and marine species which make use of these unique ecosystems.

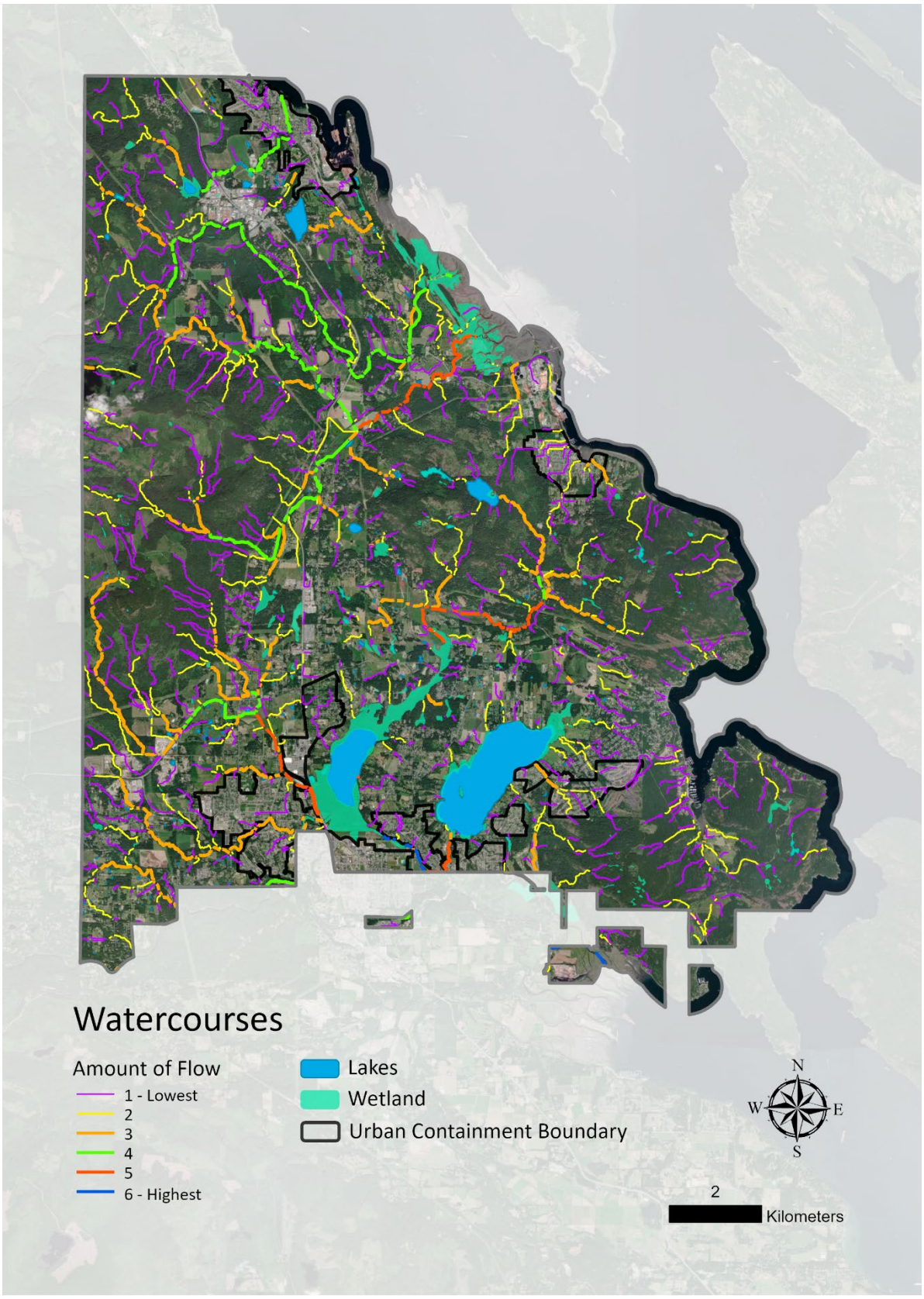

Figure 2: Map of watercourses, lakes, and wetlands in North Cowichan by amount of flow in the model.

4.4 Vegetation Types

North Cowichan is defined by a variety of natural and modified ecosystems ranging from intact forests to wetlands and agricultural fields (Figure 3). Forests are the most common natural habitat type found in the Municipality largely due to the Municipal Forest Reserves (MFR). The MFR includes forests on Big Sicker Mountain, Mount Tzouhalem, and Maple Mountain. These forests account for over 57% of North Cowichan's vegetated area (52% of Cowichan by area). Recently harvested forests cover an additional 5.9% of vegetated areas. Grass, shrub, and herb plant communities combine to include 11% of the vegetated areas in North Cowichan. These are concentrated within the Urban Containment Boundary. Agriculture covers 16.8% of the vegetated area in North Cowichan. These areas, while not in a natural state, contribute to important processes such as groundwater infiltration and provide habitat, cover, and travel corridors for many wildlife species.

Table 3: Vegetation types in North Cowichan by area.

Vegetation Type	North Cowichan-wide			Urban Containment Boundary (UCB)		
	Total Vegetated Area (ha)	% of Total Vegetation Cover	% Total Cover	Total Vegetated Area (ha)	% of Total Vegetation Cover	% Total Cover
Agriculture	3,259	17%	15%	67	7%	4%
Forests	11,084	57%	52%	227	22%	12%
Golf courses	83	<1%	0%	<1	<1%	<1%
Grass/Shrub/Herb	2,255	12%	11%	602	59%	32%
Harvested Forests*	1,148	6%	5%	-	0%	0%
Individual trees	231	1%	1%	120	12%	6%
Intertidal	187	1%	1%	-	0%	0%
Lake	479	2%	2%	<1	<1%	<1%
Right-of-way	216	1%	1%	-	0%	0%
Shoreline	26	<1%	<1%	-	0%	0%
Wetland	418	2%	2%	3	<1%	<1%
TOTAL	**19,386**			**1,019**		

* Recently harvested stands were identified as shrub communities in the LiDAR analysis and filtered for those areas outside of right of ways, natural clearings, and urban areas. They were then refined using an orthophoto. They do not correspond to a certain age classification.

North Cowichan's Urban Containment Boundary (UCB) concentrates urban development into three areas which surround the communities of Chemainus, Crofton, and the south end of Quamichan Lake. Vegetated areas within the UCB are generally dominated by grass, herb, and shrub communities, which account for 59% of the vegetation within the UCB. These plant communities characterize the urban trees, backyards, playgrounds, and fields found within these urbanized landscapes. Forests are the next most common vegetation class covering 22% of the UCB. This includes areas surrounding Holmes Creek, Quamichan Creek, and Averill Creek, as well as the lower slopes of Mount Tzouhalem and other smaller, fragmented forested areas scattered through this developed landscape.

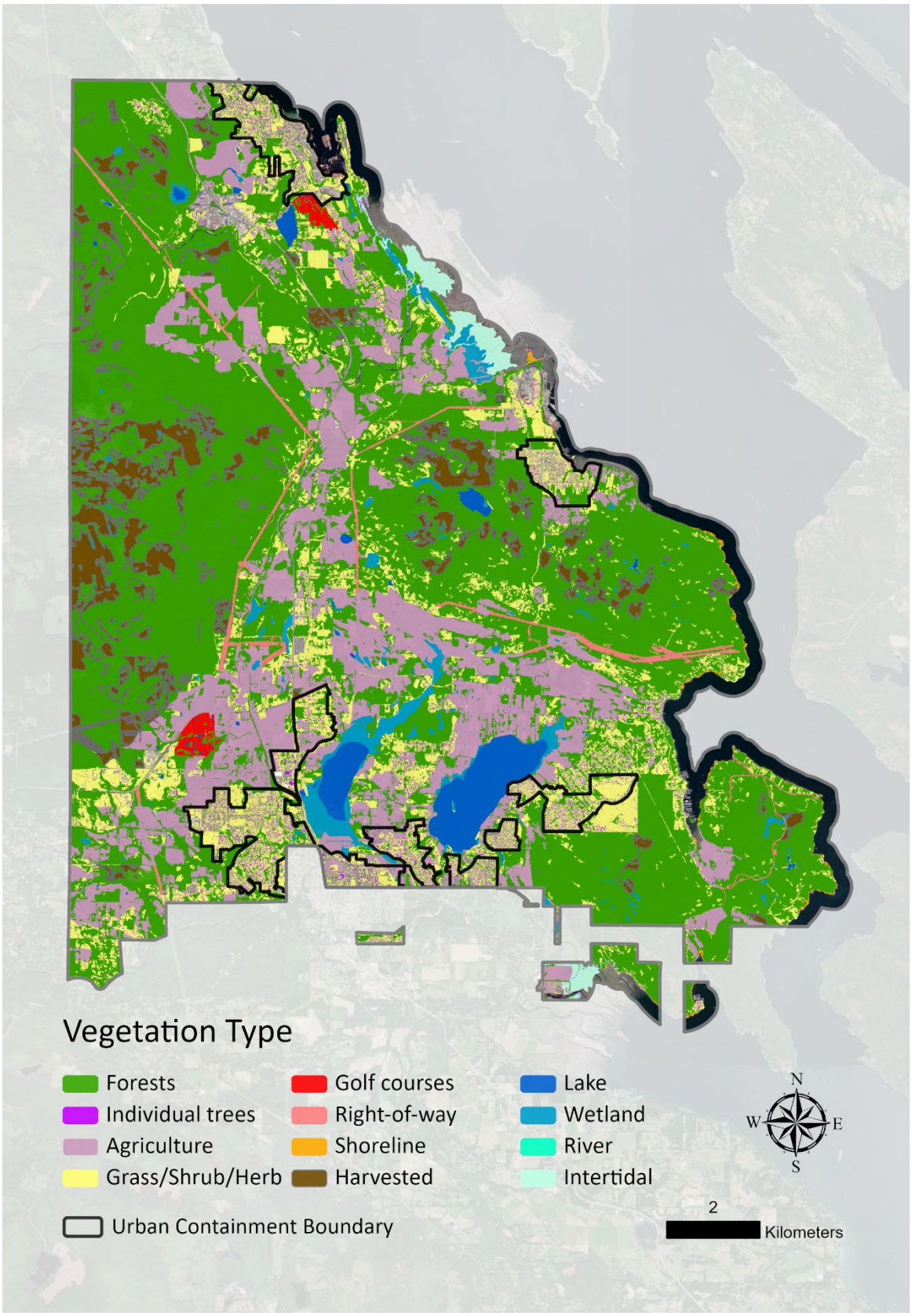

Figure 3: Vegetation types identified in North Cowichan.

4.5 Tree canopy

Despite its rich history of farming and growing urban centres, North Cowichan is still heavily forested (Figure 4). This is in part due to its topography which limits where farming and urban development can occur, as well as policies such as the Urban Containment Boundary (UCB) which concentrates denser neighborhoods. Over half (53.5%) of the Municipality is covered by tree canopy. This includes the steep slopes of Big Sicker Mountain, Mount Tzouhalem, and Maple Mountain which are largely undeveloped. Smaller tracts of forest and individual trees are found interspersed throughout the Municipality. Neighbourhood trees outside of forests make up about 12% of vegetation cover within the UCB. Combined, tree canopy covers approximately 25.5% of the total area within the UCB. Canopy Coverage within ALR land averages to 41.5, though this is variable across North Cowichan, as most actively farmed ALR lands are sparsely treed, while other ALR lands are forested.

Photo 8: North Cowichan features a diverse mixture of coniferous and deciduous forests.

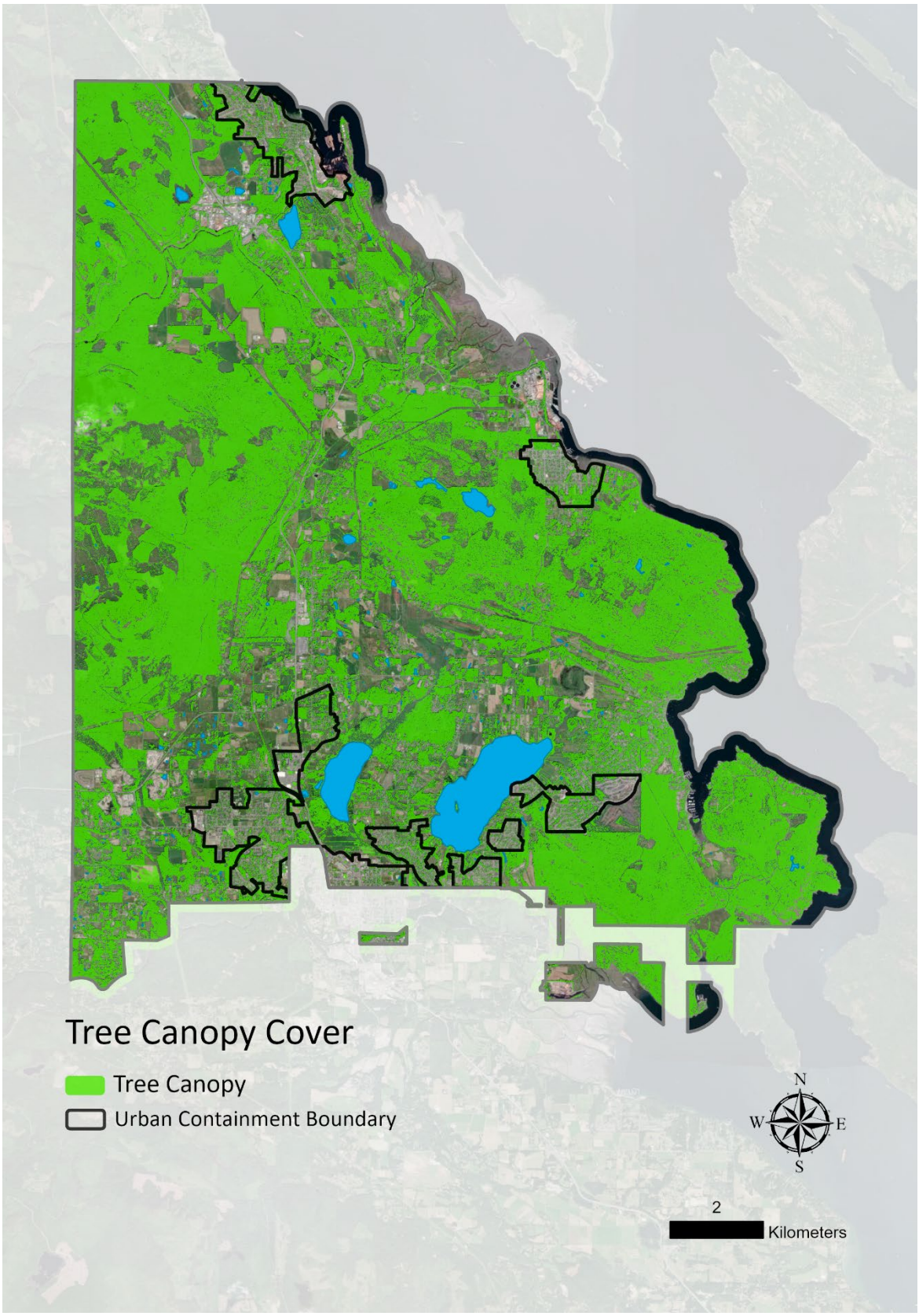

Figure 4: Tree canopies cover 58% of North Cowichan.

5.0 Species and Ecosystems at Risk

North Cowichan is home to many rare and threatened species and ecosystems. The BC Conservation Data Centre (BCCDC) maintains a colour-coded database of species and ecosystems which are ranked as being secure or not at risk (Yellow), of special concern (Blue), or at risk of being lost (Red). The inclusion of a species or ecosystem on these lists does not provide legal protection in the Province. The Federal *Species At Risk Act* (SARA) also ranks species as extirpated, endangered, threatened, or not of concern. SARA protects endangered species, although the *Act*'s applicability is limited to federal lands (except for migratory birds), and the list is non-exhaustive. SARA also does not include ecosystems at risk.

Many of North Cowichan's plant communities are considered at risk of being extirpated, threatened, or endangered. Sensitive habitats that have been particularly impacted include old forests, rocky bluffs, wetlands, estuarine habitats, shorelines and Garry oak ecosystems with their associated meadows and grasslands.

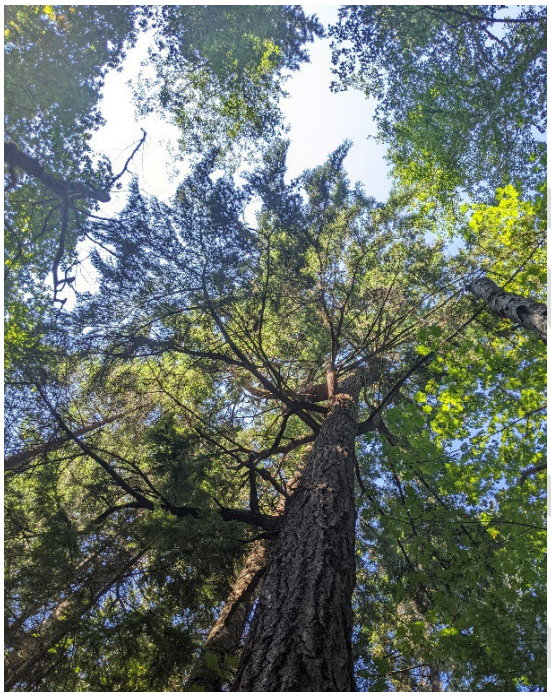

Photo 9: Coastal Douglas-fir forests are BC's smallest climatic zone.

5.1 Coastal Douglas-Fir Ecosystems

The Coastal Douglas-fir (CDF) biogeoclimatic zone is the province's smallest climatic zone and is considered the most at-risk[ii]. The CDF lies within the rain shadow of Vancouver Island and the Olympic Mountains, resulting in warm, dry summers and mild, wet winters. Historical and current logging and development pressure continue to threaten these natural ecosystems. Other stressors include the suppression of forest fires which historically controlled the growth of competing trees and moderated fuel accumulation.

The CDF zone encompasses dry woodland forests dominated by Douglas-firs and Garry oak ecosystems. These forests have been used, relied on, and shaped by Coast Salish peoples for thousands of years. Natural forests in this CDF zone are often disconnected from one another and unprotected by formal means.

The BCCDC classifies 45 of the 48 distinct plant communities in the CDF as being Red or Blue listed. Protecting these ecosystems is important to preserve the ecological and cultural values not only in the Salish Sea but on a global scale. These ecosystems host over 280 BCCDC-listed species, 24 of which are considered imperilled worldwide.

5.2 Garry Oak Ecosystems

Garry oak ecosystems were once common across this landscape. Historical climate records show that the extent of their distribution was greatest around 8,000 years ago[iii] when they covered much of southeastern Vancouver Island. Historical changes in the climate caused these forests to transition to coastal Douglas-fir dominated stands. These Gary oak ecosystems were re-established in some places by

small-scale fires used to clear underbrush and competitor species. This was done by indigenous peoples to maintain these open woodland meadows and the food, medicines, and tools they provided. These ecosystems would not have been as widespread without this repeated burning and careful management by Indigenous peoples.

Photo 10: Garry oak meadow at Mt. Tzouhalem Ecological Reserve.

Mature Garry oak trees are resilient against small-scale fires because of their deep roots and thick bark which help them to survive surface fires. Native Garry oak-associated plant species like camas, sea blush, and western buttercup (among many others) have also evolved and adapted to this regular occurrence of low-intensity surface fires. Their presence today is a reminder of their cultural significance.

Garry oak ecosystems support over 150 animal species and over 800 known insect species which have evolved to rely on Garry oak trees.[iv] The Garry Oak Ecosystem Recovery Team (GOERT) has mapped historic and current (2004) extents of Garry oak ecosystems in the Cowichan Valley and on Salt Spring Island. This assessment concluded that 22% of historic (circa 1800) Garry oak ecosystems remain[v]. Deep Soil Garry oak ecosystems are most impacted, with less than 4.5% remaining. These ecosystems occur on flatter terrain which is more desirable for agriculture and residential uses. Most remnants are in isolated areas which are disconnected from other Garry oak communities.

Rapidly spreading invasive plant species are a threat to these ecosystems. These aggressive non-native plants outcompete native species for light, space, and water. They can also change the chemical composition of the soil, making the restoration of these Garry oak ecosystems challenging. Over 100 Garry oak ecosystem species are at risk of extinction, which emphasizes the need to protect and restore these ecosystems. Groups such as the Nature Conservancy of Canada, Garry Oak Ecosystems Recovery Team, and Cowichan Valley Naturalists' Society conduct valuable research and restoration work in the Cowichan Valley. Examples of this work can be found in Mount Tzouhalem Ecological Reserve, Somenos Garry Oak Preserve, and Cowichan Garry Oak Preserve. The results from the StoryMap engagement tool echoed the importance of these ecosystems to the community.

5.3 Wildlife and Plant Species at Risk

North Cowichan is home to a variety of at-risk plant and animal species. 103 occurrences of red or blue-listed plants, animals, macrofungi, and lichens have been recorded by the BCCDC in North Cowichan. Such as the Band-tailed pigeon, deltoid balsamroot and blue-grey taildropper. Numerous and often compounding stressors have caused these species to become endangered. Habitat loss due to land development and climate change continue to put pressure on these species. Maintaining biodiversity in the Municipality requires that these endangered species have access to their critical habitat.

Photo 11: Band tailed pigeon (*Patagioenas fasciata*) is a blue listed species found in North Cowichan.

6.0 Biodiversity ranking

The biodiversity ranking provides a relative measure of which areas support more biodiversity within the municipality, and which support less (Figure 5). The highest-ranked areas, which support the greatest diversity of species, include the large forests of Mt Prevost, Big- and Little Sicker Mountain, Mount Richards and Maple Mountain, Mount Tzouhalem, and Somenos Lake with its associated marshland and forest habitats. Riparian corridors provide high levels of biodiversity within forested landscapes and urbanized neighbourhoods.

Photo 12: Riparian areas are among the most biodiverse areas in North Cowichan

The findings of this analysis emphasize the effects that the UCB has on biodiversity. Habitat features within the UCB include mostly modified and small habitat features such as lawns, gardens, and urban trees. High-ranking areas within the UCB include riparian corridors and ravines, as well as undeveloped areas along the margins of these neighbourhoods. Outside of the UCB, North Cowichan is dominated by lower ranking agricultural fields as well as large natural areas in the Municipal Forest Reserve which support high levels of biodiversity. While areas within the UCB are generally ranked lower, concentrating development within the UCB has limited development pressure on areas outside the UCB, contributing to their higher ranking.

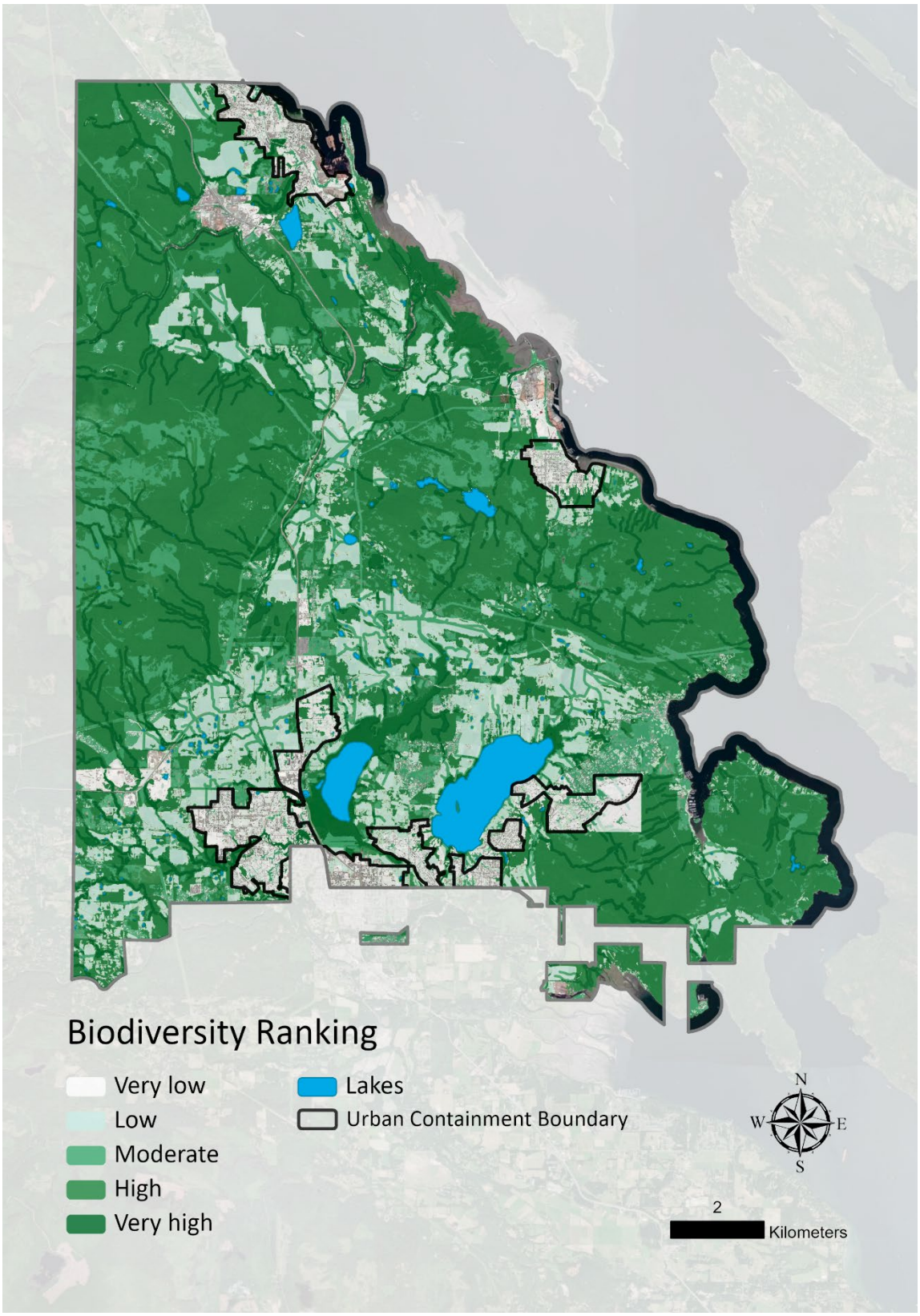

Figure 5: Results of the biodiversity ranking. The most highly ranked areas tend to be large, continuous natural areas with access to freshwater.

7.0 Green Infrastructure Network

As urban areas expand, the loss of natural habitats and the resulting fragmentation disrupt the once connected network of ecosystems. Maintaining connectivity throughout landscapes is crucial for wildlife, enabling them to access suitable habitats and facilitating interbreeding among populations. Isolated populations face risks at a genetic level, leading to developmental abnormalities and heightened vulnerability to diseases and growth deficiencies. Moreover, the isolation of specific habitats can disrupt the delicate balance between predators, prey, and food sources.

Green infrastructure networks (GIN) encompass a linked system of essential remaining core habitats, serving as vital wildlife habitats and providing passageways for wildlife to reach these areas. Wildlife hubs are comprised of expansive, undisturbed natural spaces, like the Municipal Forest Reserves, boasting diverse habitat types. These hubs are capable of supporting wildlife species that have lower tolerance towards urban environments. Wildlife corridors consist of various linear features such as streams, riparian zones, forest patches and coastal areas that allow species to move relatively safely through urban landscapes.

The establishment of this Green Infrastructure Network in North Cowichan will help to prioritize resources towards the protection, enhancement, and restoration of critical habitats (Figure 6). Safeguarding and improving these areas will not only preserve biodiversity but also promote climate resilience and enhance social well-being.

The primary focus of this network is land-dwelling species and their mobility throughout the landscape. It comprises several elements, with the key components being the habitat hubs and the connecting corridors. Agricultural areas and features within the urban environment are also recognized for providing some habitat; however, they are not considered high-priority components of the green infrastructure network (GIN).

Photo 13: Natural corridors such as creeks and rivers provide a migratory path for some species.

7.1 Major Habitat Hubs

These are large areas that provide protected interior habitat which is isolated from the influences of urban development and activity. Major habitat hubs are refuge areas where wildlife that is less tolerant of urbanization can live. These refuge areas are typically greater than 100 m away from urbanization. Major habitat hubs include some of the rural areas that have residences intermixed with forested landscapes. These are the areas that are the most likely to maintain biodiversity because of their size and lower levels of disturbance. These include many of the large mountains and lakes of North Cowichan, as well as the Chemainus River and the Cowichan Rivers Estuaries.

Photo 14: Major habitat hubs include large natural areas which provide habitat for species less tolerant of disturbance.

7.2 Minor Habitat Hubs

Minor habitat hubs are smaller in size and generally do not provide protected refuge areas for wildlife. They do, however, act as important steppingstones across an urban landscape. They can also provide habitat features that are unique or important for certain species such as a wetland or Garry oak plant community. These areas may or may not be connected by corridors. If they are isolated as islands, they may be used by species that can travel by flight and those terrestrial species that are more tolerant of disturbed habitat.

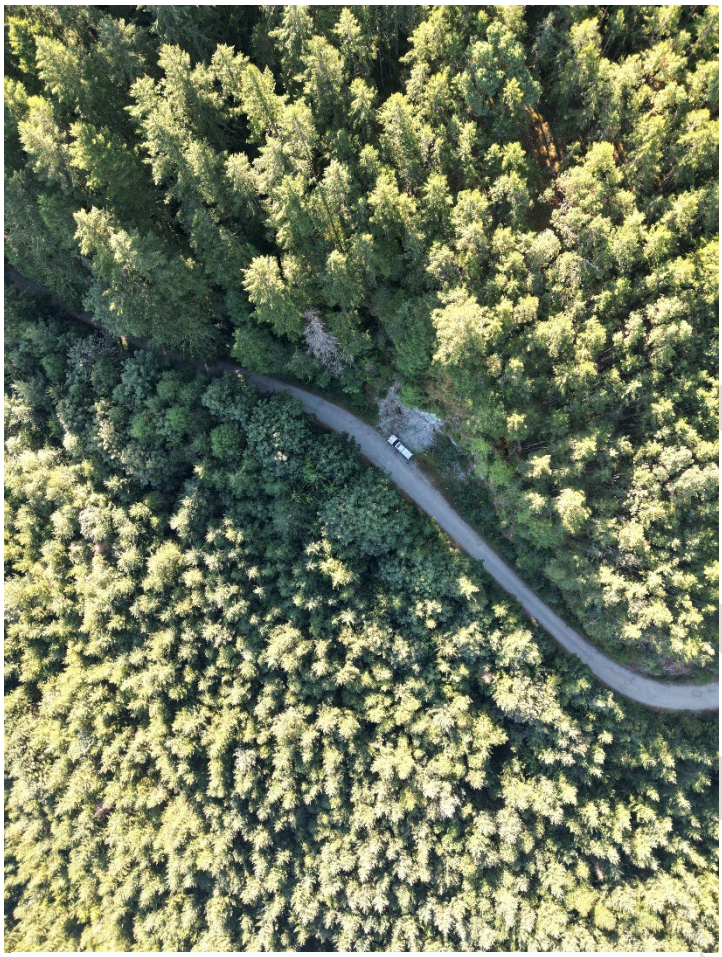

Photo 15: Even small roads and trails can be movement barriers for some species.

7.3 Habitat Corridors

Wildlife populations which inhabit core habitat areas need to be able to move between them. Ideally, corridors include linear natural habitat areas that provide a connection between major habitat hubs. Effective corridors must be wide and continuous enough to support the movement of species that are intolerant of urban influences. A species' ability to move successfully between habitats depends on species specific behaviour, speed of travel, and their ability to remain undetected by predators.

In general, corridors should aim to be greater than 30 m wide; the recommended width for effective wildlife corridors is 50-100 m. However, in urbanized landscapes it is often not possible to protect wide and continuous natural corridors. In these areas there are often linear natural features that are narrower and more fragmented but still support the movement of certain species. These corridors provide natural cover for mammals tolerant of urban activity as well as birds and flying insects.

As corridors extend through the urbanized landscape, they are often not continuous and may be fragmented by barriers such as roads and development. Corridors often follow streams and their riparian setbacks that must be protected by Provincial regulations. Legal right of ways and linear infrastructure also provide opportunities to protect habitat corridors.

Corridors have been identified through urbanized landscapes that connect the larger habitat areas together. Corridors in North Cowichan follow a number of significant watercourses including the Chemainus River, Bonsall Creek, Elkington Creek, Woodgrove Creek, Tzouhalem Creek, Somenos Creek, Menzies/Binge Creek, Inwood Creek and some unnamed streams. Corridors also include some forested patches that connect Mount Richards to Little Sicker Mountain and Maple Mountain to Mount Tzouhalem.

7.4 Agricultural Land Reserve

Areas that are used and protected for agricultural use play a unique role on the landscape. These areas tend to be dominated by monocultures of plants that are harvested regularly. These areas can facilitate the travel of species between adjacent natural habitat areas, however, movement of larger mammals such as deer and elk can be limited by fencing. In some cases, agricultural fields, hedgerows, and perimeter ditches can facilitate the movement of some wildlife although it is recognized that not all wildlife is welcome in all agricultural settings. They also can provide food sources for certain species, although there are risks associated with foraging in agricultural areas. Toxins may also be present in these environments, including pesticides and herbicides.

A significant portion of rural North Cowichan includes land designated within the ALR. Some of this land is actively farmed, while other areas remain as natural areas. North Cowichan also has farmland outside of the ALR, which while being used for agriculture, could be formally incorporated into a GIN. While there are limitations on how these lands are formally incorporated into a GIN, the scale of ALR lands in North Cowichan requires that they be considered as part of the GIN in some form. How these areas could be used to help support biodiversity will be explored in the Biodiversity Protection Policy.

Photo 16: Agricultural land plays an important role in connecting habitats for certain species.

7.5 The Urban Matrix

Areas identified as the Urban Matrix includes the natural areas and features that are intermixed within an urbanized landscape. These include small patches of habitat, single or small groups of trees, as well as non-native habitat features such as garden areas. These features collectively provide habitat for species that are tolerant of human disturbances. These include mostly birds and flying insects as well as small mammals.

Photo 17: Urban trees, and non-native habitats such as gardens make up the urban matrix.

The Green Infrastructure Network (GIN) was developed and informed using the biodiversity ranking polygons as a foundation. Other datasets, such as ALR boundaries, the UCB, land ownership, industrial area mapping, watercourses and orthophotos were also considered to identify areas that provide the greatest value and are most likely to be preserved (Figure 6).

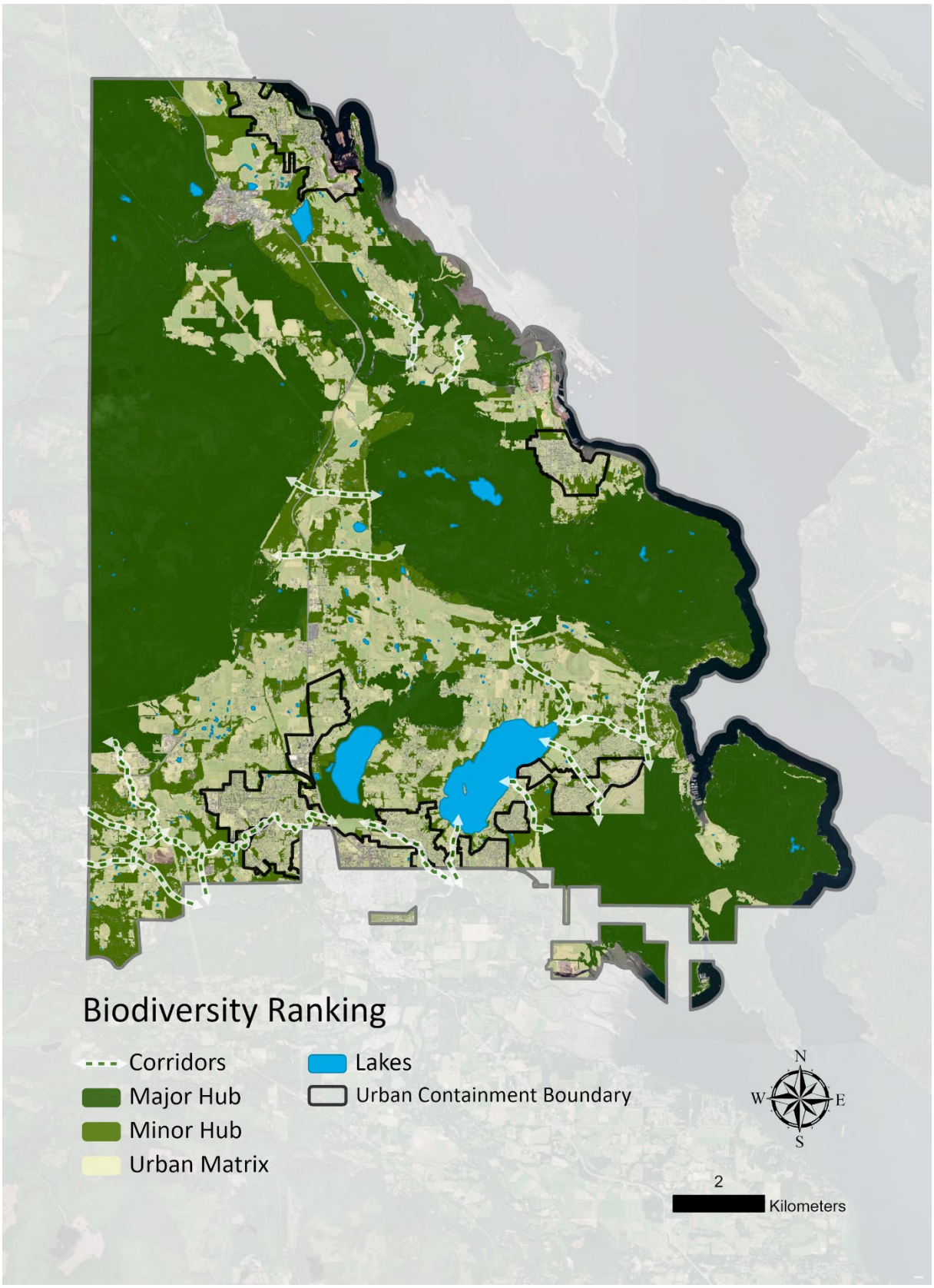

Figure 6. The GIN network identifies major wildlife areas and important connections between them.

8.0 Threats to biodiversity

The delicate equilibrium of ecosystems and the valuable services they provide are intricately tied to the interactions between species and the state of their physical surroundings. Threats to the functioning of these ecosystems include changes to the landscape such as urban development, changes to growing conditions from a changing climate, and changes to species assemblages caused by invasive species. The temporal scale of these threats is also important to consider. Urban development can result in seemingly permanent alterations to the landscape, while other changes such as tree harvesting may be temporary and offset through active management, proactive planning, or the passage of time.

These threats can act synergistically, posing challenges to mitigating their combined impacts. An example of this compounding effect is the relationship between disease spread and climate change. The range that pest and disease can spread to depends on climate conditions. Coupled with global transportation, this can lead to the introduction and survival of pests and diseases in regions where they previously did not exist.

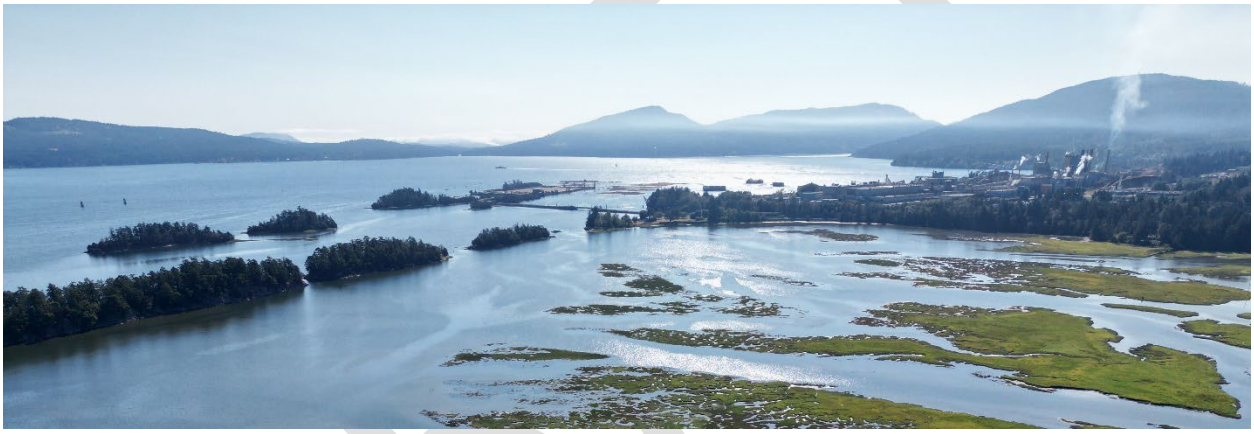

Photo 18 Growing industrial operations put pressure on nearby ecosystems and the species that inhabit them.

8.1 Urban Development

Urban and rural development result in the permanent loss or degradation of natural habitat due to displacement, disturbance, and landscape alterations. These features often lead to fragmentation of remaining natural areas, which are retained as urban parkland or linear features such as right of ways or riparian corridors. Roads are often barriers to wildlife movement and severely fragment the landscape. The development of industry along the coast has caused the loss of valuable foreshore and intertidal ecosystems.

The retained natural areas within urbanized landscapes are often disturbed by people and pets. This includes vegetation trampling caused by off-leash dogs, outdoor lighting, noise from vehicles, mortality from outdoor cats, and invasive plant species. These disturbances are collectively referred to as edge effects, which when combined can have major impacts on biodiversity. Pre-clearing of vacant lots, soil movement and contaminated machinery can also facilitate movement of invasive species into new areas. With increasing populations and density in urban natural areas, the integrity of these ecosystems is increasingly threatened.

Photo 19. Urban development has a variety of impacts on natural areas.

8.2 Climate change

Climate change is a threat to biodiversity worldwide[vi]. The impact of this threat is already being felt in many ways including altered growing seasons, increased droughts and floods, and sea level rise. The BC Ministry of Forests classifies our province's forests into biogeoclimatic zones – geographic areas that share a similar climate, vegetation, and soil types. Climate modelling is predicting that these biogeoclimatic zones are shifting as climatic conditions change. These shifts are generally predicted to result in biogeoclimatic zones shifting upward in latitude and elevation. Based on these models, Coastal Douglas-fir forests (CDF, the biogeoclimatic zone occurring throughout southern Vancouver Island and the Gulf Islands) will be squeezed to higher elevations along the coast by 2040[vii]. By 2070, CDF forests will be limited to the highest elevations in the Gulf Islands (such as Mt. Maxwell and Mt. Tuam on Salt Spring Island). The low-lying areas of North Cowichan are projected to shift to a novel, undescribed biogeoclimatic type by 2040, with CDF only remaining on smaller knolls such as Mt. Tzouhalem, Maple Mountain, and Mt. Richards.

Southern and coastal areas of BC are projected to experience warmer weather, which will be moderated to some degree by the ocean[viii]. Nighttime lows are anticipated to increase at a greater rate than daytime highs. The spread of daily highs and lows will narrow during the winter and increase in the summer. More frequent heavy rainfalls and overall precipitation are projected to increase annually. This will cause increased waterflows which will have implications for stormwater infrastructure and natural stream integrity.

Sea level rise is also anticipated to be a major risk factor for coastal areas. Natural changes to our sea level typically occur over long timescales and are associated with large changes to the landscape such as glacial retreat. The expected pace of sea level rise is associated with thermal expansion of warmer water cause by climate change, an increase in water quantity caused by ice melt, and isostatic rebound. As this trend continues, low-lying areas of North Cowichan such as estuaries, beaches, and wetlands are at risk from flooding, tidal impacts, and erosion.

Photo 20. Coastal areas are particularly vulnerable to impacts from climate change such as sea level rise.

8.3 Loss of Indigenous Knowledge and Practices

Photo 21: Bark stripped western redcedar.

Land stewardship and management by Indigenous communities have influenced plant and animal communities across North Cowichan. The Quw'utsun Nation which includes Cowichan Tribes, Halalt, Lyackson, Penelakut, and Stz'uminus peoples are among Vancouver Island Indigenous peoples who have historically used cultural practices involving periodic burning to remove shrubs and trees to create and maintain Garry oak ecosystems[ix]. Discontinuation of this cultural practice from the landscape has resulted in the overall loss of these valued ecosystems in natural areas. Impacts such as development and land conversion have accelerated this trend by continuing to put pressure on the remaining Garry oak ecosystems. Fire suppression and removal of cultural burning from these ecosystems as well as the loss of indigenous knowledge has resulted in significant changes to ecosystem dynamics and biodiversity in North Cowichan.

In recent years, efforts have been made to increase collaboration and consultation amongst the Municipality and Indigenous groups to build a relationship based on trust, mutual support, open communication, fair dealing, and mutual respect. For the Municipal Forest Reserve, this intent was codified through a Memorandum of Understanding between Cowichan Nations and North Cowichan[x]. Lessons learned from ongoing engagement with these nations and the Memorandum of Understanding are intended to be incorporated into this project. The Biodiversity Assessment Report, and accompanying Biodiversity Protection Policy will be informed by the ongoing First Nations engagement. This phase is ongoing. Notification letters to the 5 First Nations (Cowichan Tribes, Halalt, Lyackson, Penelakut and Stz'uminus) have been submitted. Discussions are ongoing with 4 of these nations on a preferred form of engagement such as workshops, and what topics will be discussed. Feedback will be provided for comments on what was heard and how this knowledge can be incorporated into the assessment reporting.

9.0 Current Monitoring and Management Work

North Cowichan is striving to become a leader in environmental policies and practices. Efforts are ongoing to manage invasive species, monitor ecosystem health, and further engage the public and stewardship groups on the importance of these natural areas.

North Cowichan has had an active invasive plant management program for over 10 years. The Nuisance and Abatement Bylaw was updated in 2021 to include seven regionally specific plants that are now prohibited on private land. Plants prohibited under this bylaw include blueweed (*Echium vulgare*), garlic mustard (*Alliaria petiolate*), giant hogweed (*Heracleum mantegazzianum*), gorse (*Ulex eropaeus*), knotweeds (*Fallopia spp. and Polygonum spp.*), poison hemlock (*Conium maculatum*), and wild chervil (*Anthriscus sylvestris*)[xi]. Some of these species can pose a high risk to infrastructure and public safety. Giant hogweed and poison hemlock for example, can both pose serious health risks. Japanese knotweed (*Reynoutria japonica*) can damage building foundations and infrastructure as well as pose a risk to

riparian areas and salmonid habitat by eroding stream banks and limiting nutrient inputs via leaf litter and insect drop. The prevalence of these seven species on public land has been in decline due to the management efforts made by the Municipality. The Biodiversity Protection Policy will explore additional methods and measures North Cowichan can take to manage invasive species on private lands.

The invasive aquatic plant parrot's feather (*Myriophyllum aquaticum*) has been spreading rapidly since it's introduction almost a decade ago. This plant has had a significant impact on watercourses such as Somenos Creek, where in places it covers up to 70% of the creek[xii]. A great deal of research is currently underway on this plant in North Cowichan, to explore options to limit the spread of parrot's feather and reduce its presence in waterways.

Photo 22: Yellow flag iris is an invasive species that invades shallow watercourses. It is prevalent in the S'amunu Wildlife Management Area south of Somenos Lake. It is very difficult to remove once established as it can disperse through broken roots

While many of the invasive species in North Cowichan are not in the introduction phase, (e.g. scotch Broom, blackberry) North Cowichan has been relatively successful in monitoring and managing regionally specific emergent invasive species that are trying to establish locally (E.g. Poison Hemlock, Knotweeds, parrots feather). Continuing to focus resources on these high priority species is critical to eradicate or keep infestations at a manageable level of control. It is recommended that staff continue to work with the provincial and regional governments to actively map, prioritize and treat invasive plants while following the principals of EDRR.

A variety of natural features within the Municipality including coastal bluffs, riparian areas, mature forests, woodlands, and wetlands are key components to regional diversity, which are partly protected through existing parks and development permit areas. The Chemainus River, Somenos Marsh, Chemainus Lake, and Mount Tzouhalem are highly productive areas which provide aspects such as conserving and recharging water supplies, fostering and conserving biodiversity, allowing wildlife to move across the landscape, and recycling nutrients. The Municipality recognizes the importance of local ecosystems such as Garry Oak meadows and Arbutus groves due to their high biodiversity values and is working to retain stands of the greatest value.[xiii]

Conservation partners including Cowichan Valley Naturalists' Society, Cowichan Land Trust, Quamichan Stewards, and Somenos Marsh Wildlife Society work to monitor and assess ecologically sensitive areas. They help to ensure that human uses of these areas avoids, or mitigates, impacts on ecological values while promoting restoration efforts. The municipality has restored approximately 40 wetlands and ponds to date and has developed a service agreement with the Somenos Marsh Wildlife Society to monitor and manage water quality, plantings and wetland restoration. The Municipality is striving to consider arrangements and incentives to convert, purchase, exchange, or create easements on private lands for the restoration and protection of riparian zones and wetland ecosystem corridors.[xiv] This includes water quality monitoring and management in Quamchian Lake which has been subject to blue-green algae (Microsystis sp.) which have proliferated in response to heightened phosphorous levels.[xv]

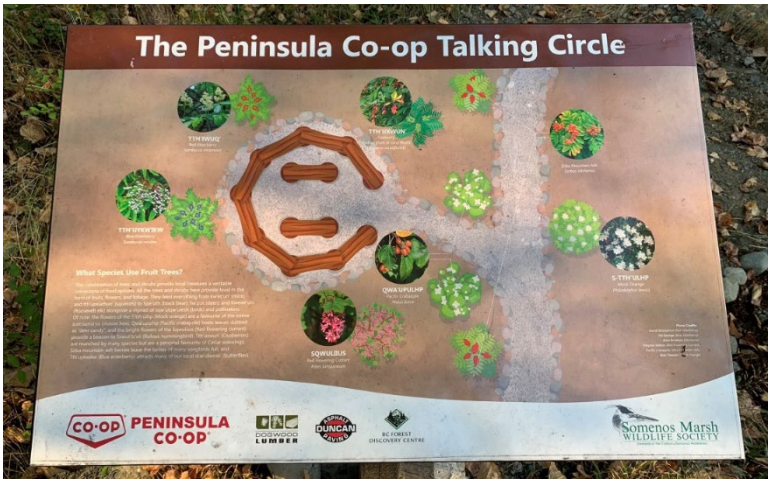

Photo 23: Example signage from the Somenos Marsh Wildlife Society that educates visitors on native plants and a local First Nations language.

Interpretive signage is used in parks to educate visitors on the region's rich First Nations history, unique ecosystems and biodiversity, and local restoration efforts. The Environmental Education Program was established in 2000 and offers workshops bringing awareness to environmental issues. This program engaged several hundred students in education programs between 2021 and 2022.

The Municipal Forest Reserve (MFR) makes up roughly 25% of North Cowichan's land base and consists of approximately 5,000 ha of fee-simple, municipal owned land which is managed by the Forestry Department. Currently, its management follows the "Management of the Forest Reserves – An Investment in the Future" 1981 report, also known as the Forest Management Plan (FMP). Forest reserve management practices are undergoing review to better reflect current community values and conditions, and to better consider First Nations interests. To best meet market opportunities, a modified sustained yield management program has been used that fluctuates the yearly annual allowable cut to reflect the current timber market. Harvesting systems in place include selective cutting, clearcutting, and commercial thinning. Reforestation through natural or artificial means is completed within two years of harvesting using the highest quality local seed available.[xvi]

The Municipal Forestry Program also treats invasive plants to reduce fire hazards, improve sightlines along roads, and help juvenile trees get established within the MFR.[xvii] Management practices are bolstering the potential economic return of future harvesting while making improvements to recreational resources, aesthetic values, and water and wildlife values.[xviii]

10.0 Data Limitations & Next Steps

10.1 Data Gaps and Limitations

While this biodiversity assessment seeks to be as rigorous as possible, some data gaps exist due to limitations in scale, time, and budget. These limitations did not allow for all polygons and natural areas within the municipality to be visited on the ground. Since forest polygons are an amalgamation of various inventories, assessments and desktop spatial analyses, some inconsistencies and data gaps are inevitable. This assessment also does not include freshwater, intertidal and marine biodiversity. Similarly, detailed wildlife surveys were not included as part of this assessment. Threats to biodiversity such as invasive species, pollution and other factors of the urban environment were also not mapped. It is the intention that this information and mapping will be continually improved over time.

10.2 Next Steps

This report provides a summary of the natural areas within the Municipality and their contribution towards supporting biodiversity. This was done using available datasets, supplemented by LiDAR and ground truthing. The next phase of the project includes the development of a Biodiversity Protection Policy (BPP) to identify and prioritize measures for protecting biodiversity in North Cowichan. This Biodiversity Assessment Report will serve as a foundational document, informing phase 2 and guiding policy recommendations. The BPP will include a review of North Cowichan's current policies and procedures to identify policy opportunities, develop recommendations for implementing the GIN, and provide a framework for a monitoring program to track progress on biodiversity conservation.

The BPP will also explore recommendations and opportunities for various education, monitoring, and management programs which can be implemented by the municipality. This will include identifying ways to better understand which native and invasive species exist in North Cowichan and monitoring systems to track their health in the future. This is anticipated to include programs which can be implemented through stewardship organizations, citizen science programs, and municipal staff.

Opportunities to enhance biodiversity in the municipality will also be investigated. This will consider existing municipal policies, bylaws, and best management practices to identify where expanded efforts or new policies can be implemented to enhance biodiversity. Engagement with local First Nations is ongoing and is expected to inform future iterations of this report and the BPP.

Photo 24. Natural corridor along Somenos Creek, bordered by Tzouhalem Rd and North Cowichans wastewater treatment lagoons.

Appendix 1 Footnotes

[i] Government of Canada, “Priority Places for Species at Risk - Canada.Ca.”

[ii] “Taking Nature’s Pulse: The Status of Biodiversity in British Columbia.”

[iii] Marlow G. Pellatt and Ze’ev Gedalof, “Environmental Change in Garry Oak (Quercus Garryana) Ecosystems: The OccurrenceEvolution of an Eco-Cultural Landscape,” Biodiversity and Conservation 23, no. 8 (July 1, 2014): 2053–67, https://doi.org/10.1007/s10531-014-0703-9.

[iv] Garry Oak Ecosystem Recovery Team, “Why Are They Important?”

[v] Garry Oak Ecosystem Recovery Team, “What Remains of Garry Oak Ecosystems?”

[vi] News, “Climate Change Is Becoming a Top Threat to Biodiversity.”

[vii] Wang et al., “Locally Downscaled and Spatially Customizable Climate Data for Historical and Future Periods for North America.”

[viii] “Indicators of Climate Change for British Columbia.”

[ix] Barlow, Pellatt, and Kohfeld, “Garry Oak Ecosystem Stand History in Southwest British Columbia, Canada.”

[x] Cowichan Nation and Municipality of North Cowichan, “Memorandum of Understanding.”

[xi] Municipality of North Cowichan, “Invasive Species Management.”

[xii] Dewar, “2021 Somenos Creek Parrot’s Feather Report.”

[xiii] Municipality of North Cowichan, “Municipality of North Cowichan Official Community Plan.”

[xiv] Municipality of North Cowichan.

[xv] Municipality of North Cowichan Environmental Services, “Quamichan Lake Health.”

[xvi] Forest Advisory Committee, “Management of the Forest Reserve - An Investment in the Future.”

[xvii] Municipality of North Cowichan, “Invasive Species Management.”