

Forest Ecosystems, Protected Land, and Groundwater on Gabriola

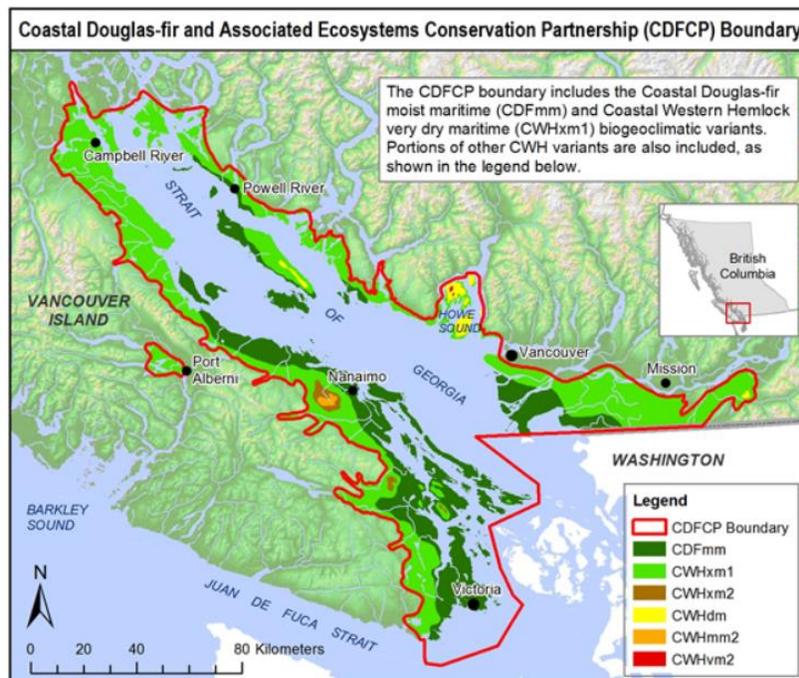
This document provides information about:

1. The Coastal Douglas-Fir Biogeoclimatic Zone
 - Forests and Greenhouse Gas Emissions
2. Land Protected from Development
3. Groundwater Issues
 - Rainfall
 - Groundwater Levels
 - Water Storage
 - Groundwater and Forest Cover

1. The Coastal Douglas-Fir Biogeoclimatic Zone

Gabriola Island lies within the Coastal Douglas Fir (CDF) Biogeoclimatic Zone. According to the Coastal Douglas-Fir Conservation Partnership (CDFCP), this zone is:

“the smallest of B.C.’s 16 major ecosystems covering about 252,000 hectares. The CDF covers part of the lower Fraser Valley (including some of Metro Vancouver), portions of the Sunshine Coast, the southeast coast of Vancouver Island and the Gulf Islands south of Cortes Island. The CDF generally only occurs below 150 metres in elevation.”¹



The Islands Trust notes that:

“The Coastal Douglas-fir (CDF) zone describes a unique set of ecosystems found only on southeast Vancouver Island, the Gulf Islands, and the southwest coast of BC. 100% of Gabriola is within the CDF zone. CDF ecosystems are rare and highly endangered. These ecosystems include Douglas-fir forests, as well as Garry oak woodlands, wetlands, estuaries, and other unique communities of plant, animal, and fungi found nowhere else in the world.”²

The Trust also notes that CDF ecosystems have:

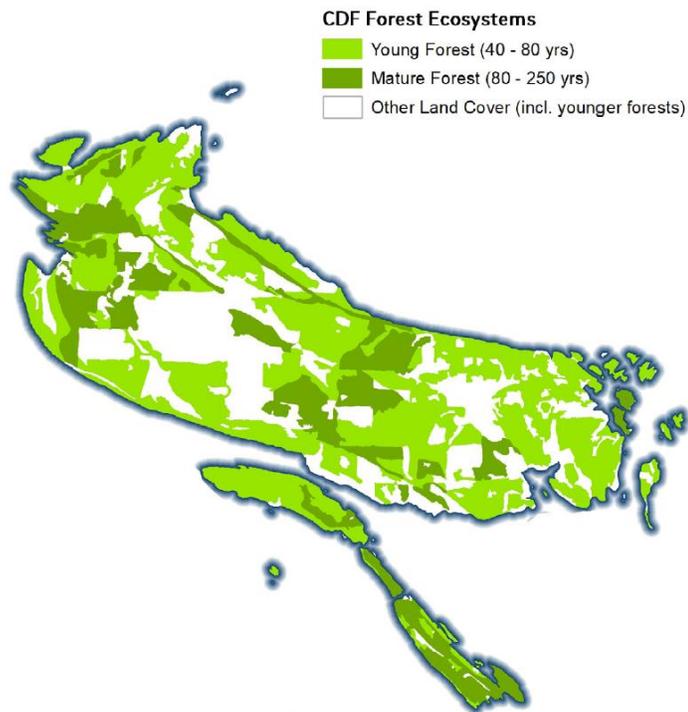
- the highest diversity of plant species in BC
- the highest diversity of overwintering bird species in Canada
- the highest density of species at risk in BC, including 24 globally imperiled species.³

The CDFCP notes that this rare ecosystem is increasingly threatened by

“human pressures, including development, industrial landscape use, increasing numbers and frequency of invasive species, and increased recreational use. Some of the ecosystems associated with the CDFCP Region, such as Coastal Bluffs, Garry Oak ecosystems, and wetland ecosystems, have lost well over 75% of their former area.”⁴

As well, CDF ecosystems are threatened by climate change:

“Climate change will have significant impacts on CDF forests as intensifying summer droughts stress trees. Islander observations indicate that climate change has already impacted western redcedar and other species. It is likely that drought is the primary cause of increased stress, but work needs to be done to understand these changes and adapt conservation of CDF habitats.”⁵



According to the CDFCP:

- Many of the at-risk species and ecosystems in the CDF zone are globally ranked as imperiled or critically imperiled
- The global range of the CDF lies almost entirely within BC, underscoring both its global uniqueness and BC’s responsibility for its conservation
- Less than 1% of the CDF remains in old growth forests and 49% of the land base has been permanently converted by human activities
- Deforestation and urbanization in the CDF zone has resulted in a natural area that is now highly fragmented with continuing threats to remaining natural systems
- Approximately 9% of the CDF zone is protected in conservation areas
- The extent of disturbance combined with the low level of protection places the ecological integrity of the CDF zone at high risk.⁶

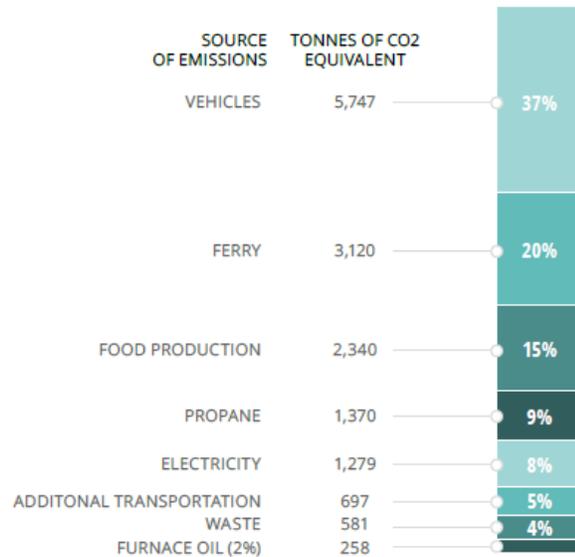
- **Forests and Greenhouse Gas Emissions**

Forest ecosystems play an important role in sequestering the carbon that is such a large part of greenhouse gas emissions. The Coastal Douglas-Fir zone of which Gabriola is part has the highest rate of carbon sequestration of all biogeoclimate zones in BC.

A 2008 Island Futures report found that greenhouse gas emissions on Gabriola totalled 15,392 tonnes from all sources.⁷

Ensuring that forested lands on Gabriola are protected can help reduce the impact of greenhouse gas emissions, in addition to the many other important roles that forests play here as well as for the region and beyond.

GHG EMISSIONS BY SOURCE (GABRIOLA 2008)

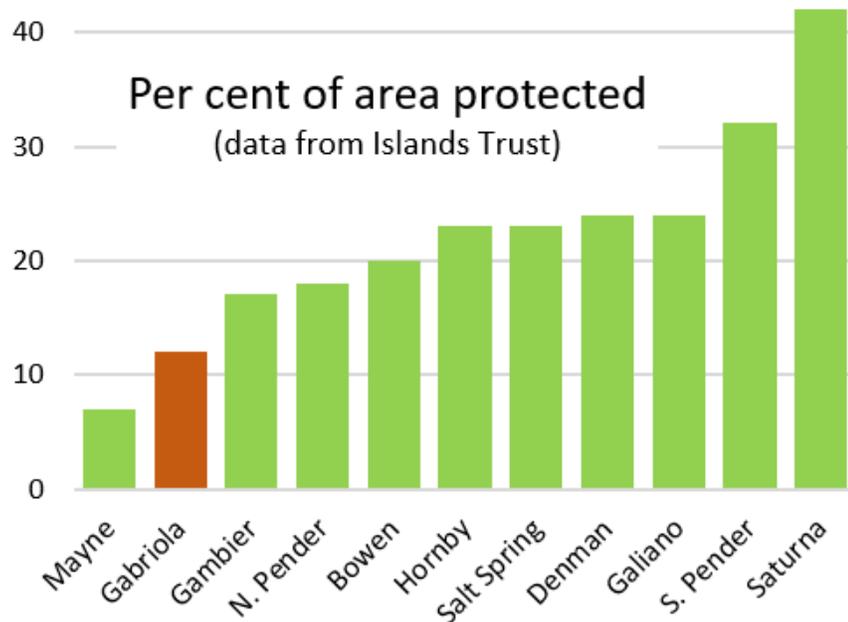


2. Land Protected from Development

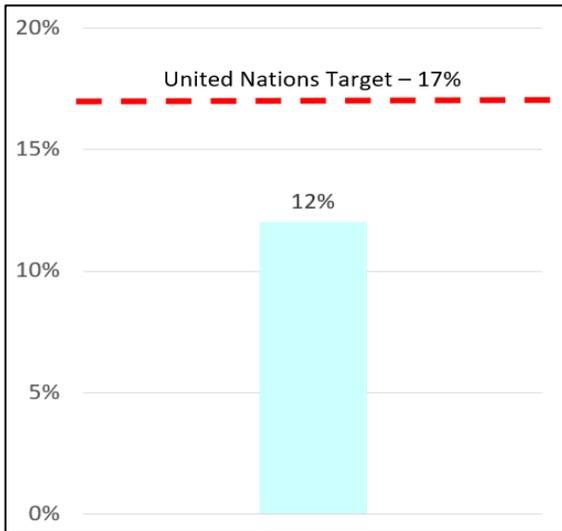
Protected lands can include national parks, provincial parks, regional parks, conservation covenants and nature reserves.

Gabriola is behind most of the other Gulf Islands in terms of the percentage of land that is protected.

As of 2019/20, only about 12% of Gabriola's land is protected.^{8,9}



The United Nations has set a target to improve biodiversity globally by conserving 17% of terrestrial and inland water areas “through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.”¹⁰



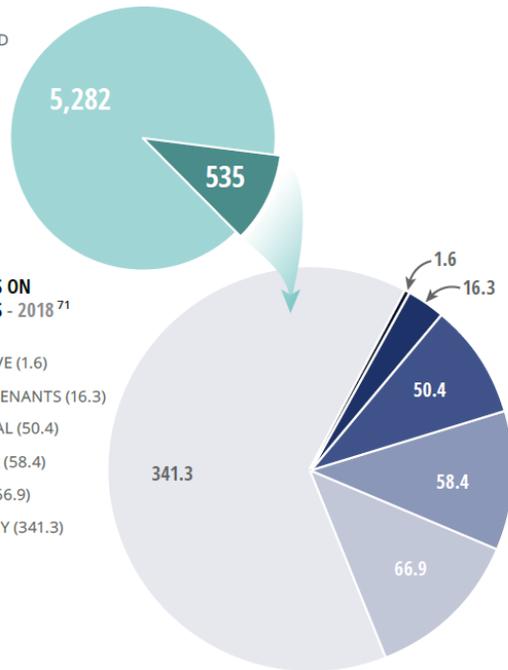
To meet the UN target, an additional 454 hectares (or 1,122 acres) would have to be protected on Gabriola.¹¹

Protection could be achieved through subdivision-related parkland dedication, voluntary donation to parks or nature reserves by individual landowners or non-profits, or through the purchase of ecologically-significant parcels by local governments or conservancies.

Of the 535 hectares of protected land on Gabriola, most is in parks and nature reserves.¹²

PROTECTED AND UNPROTECTED LAND ON GABRIOLA, IN HECTARES - 2018

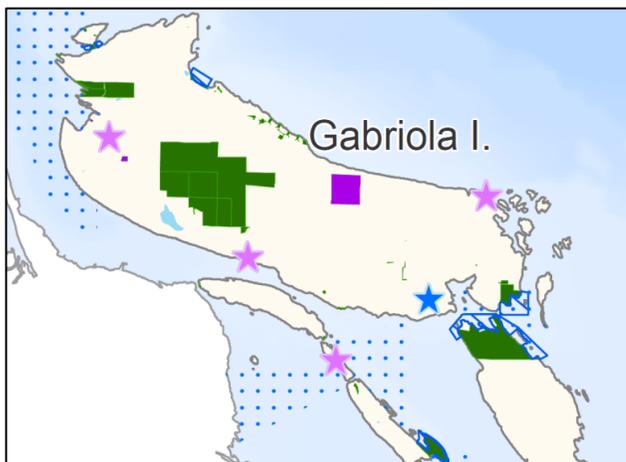
- TOTAL UNPROTECTED
- TOTAL PROTECTED



PROTECTED LAND AREAS ON GABRIOLA, IN HECTARES - 2018⁷¹

- ECOLOGICAL RESERVE (1.6)
- CONSERVATION COVENANTS (16.3)
- PARKS — PROVINCIAL (50.4)
- PARKS — REGIONAL (58.4)
- NATURE RESERVES (66.9)
- PARK — COMMUNITY (341.3)

The map below shows the location of protected lands on Gabriola.¹³



- ★ Islands Trust Conservancy Covenants
- ★ Other Conservation Covenants
- Islands Trust Conservancy Nature Reserves
- Other Parks & Nature Reserves
- Coastal Douglas Fir Protected Area
- Community Forest
- Watershed Management Areas
- ▨ Marine Protected Areas
- ⋯ Rockfish Conservation Area
- Glass Sponge Reef Conservation Areas

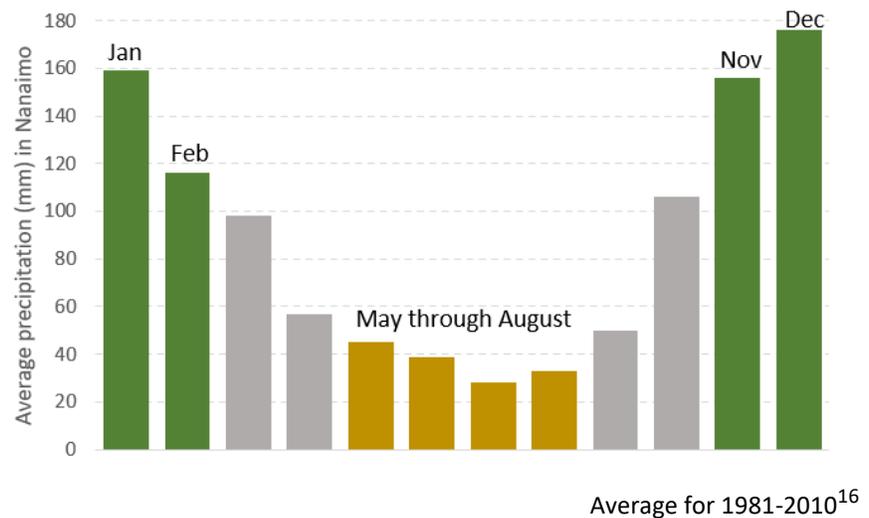
3. Groundwater Issues

Groundwater is “the water found underground in the cracks and spaces in soil, sand and rock. It is stored in and moves slowly through geologic formations of soil, sand and rocks called aquifers.”^{14,15} Most of Gabriola relies on groundwater as the primary source for household consumption and irrigation. Groundwater in Gabriola’s aquifers is recharged from rainwater. Increased development and climate change can put pressure on our groundwater resources.

- **Rainfall and Groundwater Recharge**

57% of Gabriola’s rain falls between November and February. Only 13% falls between May and August.

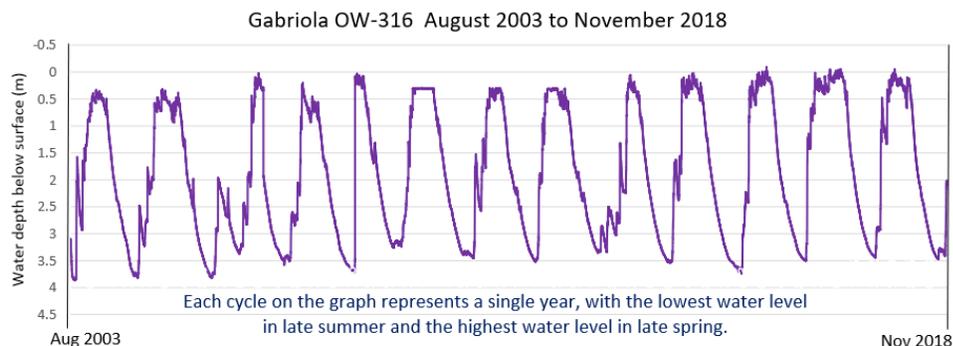
A 2016 report prepared for the Regional District of Nanaimo shows that the amount of groundwater on Gabriola declines between April and September but is recharged between October and January.



The report also shows that a warming climate will increase water evaporation in the summer months, resulting in even drier summers, and increase precipitation in winter, resulting in more overland water flow.¹⁷

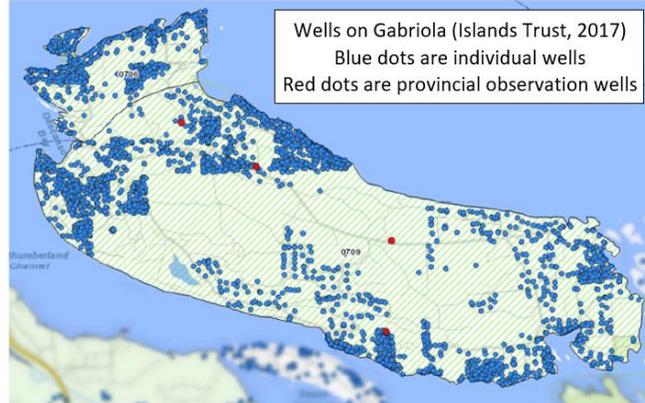
- **Groundwater Levels**

Data from the BC Ministry of the Environment and Climate Change Strategy¹⁸ show that water levels in the four observation wells on Gabriola (OW-196, 197, 316 and 385) have either been stable or have increased slightly over the past decade. As one example, water levels in OW-316 between May 2003 and November 2018 are shown in the graph below.



The water level in this well changes significantly within each year, but both the winter high levels and summer low levels have become higher over the time period shown. In other words, there is no evidence—from this well—that the amount of water stored on Gabriola is decreasing in this recent time period. That could change in future.

These data do confirm, however, that Gabriola experiences big seasonal changes in groundwater levels, as noted in the rainfall data above. Across the 15-year time period, the water table is consistently three to four metres lower in summer than in winter, and this signals a need to consider how to ensure sufficient water resources in the drier months.



- **Water Storage**

It is not currently known how much water storage capacity exists on Gabriola in the form of cisterns (whether the water comes from rainwater harvesting or from wells). We also don't know how many residents rely on rainwater harvesting or only groundwater, or some combination of the two, for their daily water needs. Further, we don't know how many residents rely on purchased bulk water supplies – which typically come from freshwater sources in Nanaimo – for at least part of their annual water needs.

Currently there is only one zone on Gabriola Island that requires rainwater collection for new residential dwellings – the Rural Residential 2 (RR2) zone. This map shows lands zoned as RR2 (which are only in the north end of the island):

<http://www.islandstrust.bc.ca/media/346969/lub-north-nov2018.pdf>

The Regional District of Nanaimo (RDN)'s Rainwater Harvesting Rebate Program is intended to encourage the purchase and use of cisterns. However, as of January 25, their 2021 budget for Area B (Gabriola Island) had already been allocated and applications from Gabriola were no longer being accepted.¹⁹

- **Groundwater and Forest Cover**

Groundwater availability and healthy forest ecosystems are interconnected and support each other. As the Islands Trust's Coastal Douglas-Fir Toolkit notes,

“Water availability directly influences watershed ecological function and sustains healthy forests as a whole. Forests are a mosaic landscape of ecology and geology that maintains water storage and contributes to water quality by filtering through forest soils and biomass. Through capillary processes, nutrient rich water moves from the soil, through roots of trees, and is carried up the tree's trunk to the leaves to contribute to the process of photosynthesis. Tree canopies collect rainfall, releasing it slowly into forest floor that contributes to the health of the forest ecosystems and contribute significantly to sustained groundwater recharge.”²⁰

References

- ¹ Coastal Douglas-Fir Conservation Partnership website: “About the CDFCP”. Accessed 18 January 2021: <http://www.cdfcp.ca/index.php/about-the-cdfcp/faq>.
- ² Gabriola Island Local Trust Area Coastal Douglas-fir Forests. June 2020. Available at: http://www.islandstrust.bc.ca/media/350087/itc_cdf_gabriola_web.pdf.
- ³ *ibid.*
- ⁴ Coastal Douglas-Fir Conservation Partnership website: “Why is the CDF at risk”. Accessed 20 January 2021: <http://www.cdfcp.ca/index.php/about/why-is-the-cdf-at-risk>.
- ⁵ These data and the map are from Gabriola Island Local Trust Area Coastal Douglas-fir Forests. June 2020 (see note 2 above).
- ⁶ Coastal Douglas-Fir Conservation Partnership website: “Why is the CDF at risk” (see note 4 above).
- ⁷ Data from Weller, Fay. 2010. GHG Emissions Gabriola 2008 Report. Gabriola Island: Island Futures. p.14. Available at: <http://www.islandstrust.bc.ca/media/342721/gabrielaghgemissions2008.pdf>. The graph is from the Gabriola Health & Wellness Collaborative 2020 Gabriola Health Report (see note 11 below). Island Futures intends to update this data soon.
- ⁸ Annual Report 2019/20. Islands Trust Conservancy. p.109. Available at: <http://www.islandstrust.bc.ca/media/349929/islandstrust-2020-annual-report-web.pdf>.
- ⁹ Approximately 88% of the land base of Gabriola Island is not within a protected status such as parkland or nature reserve. Note that this figure includes federal crown lands set aside for treaty.
- ¹⁰ United Nations Environmental Programme. 2010. Strategic Plan for Biodiversity 2011-2020, including Aichi Biodiversity Targets. Target 11. Available at: <https://www.cbd.int/sp/>.
- ¹¹ Gabriola Health Report. 2020. Gabriola Health & Wellness Collaborative. p.30. Available at: <https://www.ghcs.ca/2020-Gabriola-Health-Report.pdf>.
- ¹² Data is from Regional Conservation Plan, 2018-2027. 2018. Islands Trust Conservancy. p.67. Available at: http://www.islandstrustconservancy.ca/media/84821/itc_2018-11_rcp-2018-2027-web_final.pdf. The figures are from Gabriola Health Report. 2020 (see note 11 above).
- ¹³ Annual Report 2019/20. Islands Trust Conservancy. p.111 (see note 8 above).
- ¹⁴ Groundwater Foundation website “What is Groundwater?”. Accessed 28 January 2021: <https://www.groundwater.org/get-informed/basics/groundwater.html>.
- ¹⁵ More information about groundwater can be found on the Islands Trust “Wells and Our Groundwater” page at <http://www.islandstrust.bc.ca/trust-council/projects/water-resource-information-for-islanders/wells-and-groundwater/> and the Waterscape Canada website at <https://www.cgenarchive.org/gulf-islands-underground.html>.
- ¹⁶ Canadian Climate Normals 1981-2010 Nanaimo A Station Data. Accessed 24 January 2021: https://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?stnID=192&autofwd=1.
- ¹⁷ Burgess, R. and D.M. Allen. 2016. Groundwater Recharge Model for Gabriola Island. Available at: <https://www.rdn.bc.ca/cms/wpattachments/wpID3175atID8124.pdf>
- ¹⁸ BC Ministry of the Environment and Climate Change Strategy: Groundwater Observation Wells in the West Coast Region. Accessed 24 January 2021: <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/groundwater-wells-aquifers/groundwater-observation-well-network/active-wells/west-coast-region>.
- ¹⁹ Regional District of Nanaimo: Rainwater Harvesting. Accessed 25 January 2021: <https://www.rdn.bc.ca/rainwater-harvesting>.
- ²⁰ Protecting the Coastal Douglas-Fir Zone. 2018. Islands’ Trust. p.13. Available at: <http://www.islandstrust.bc.ca/media/346674/cdf-toolkit-final-web.pdf>

Note: the “Wells on Gabriola” map on page 6 is available on the Islands Trust website: www.islandstrust.bc.ca/trust-council/projects/water-resource-information-for-islanders/wells-and-groundwater/

This document was prepared by the Research Team of the Gabriola Housing Working Group, January 2021