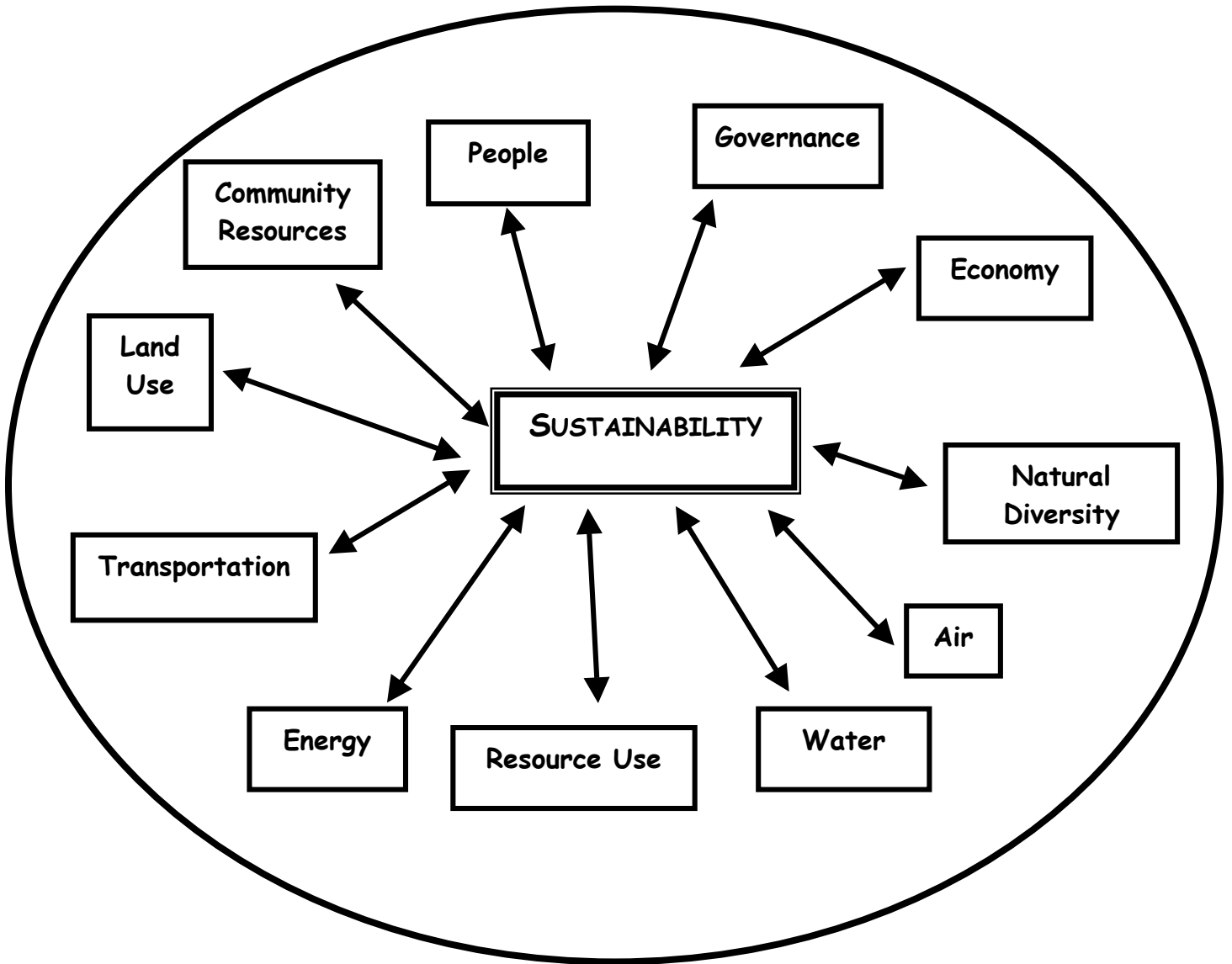


The State of Bowen Island



Volume 1: Report
Bowen Island Sustainability Project
February 2001

1.0 Introduction

It was a late Friday afternoon in mid-December. Maggie and I were walking back to the office when we passed two young Islanders waiting for a ride. The weather was wet and cold and so we asked them if they wanted to wait in the office until they saw their dad's car. They obliged and they headed up the stairs to the top floor of the Old General Store. The kids looked around the office telling us about school and what they liked doing. Finally, one of the kids asked, "So what do you guys do up here?"

"Well, we are writing a report all about Bowen Island. We are writing down things like what kind of animals live here, where people work, what we know about water, how many community activities there are and where we get our energy to heat our homes."

A moment passes as the two eight-year-olds digest this information. Then, "Oh I get it. You guys are scientists."

"Sort of." The conversation about what we do is over.

The Bowen Island Sustainability Project was developed with the mandate to report on the State of Bowen Island. And that is what has been done - the pages of this document contain a wealth of statistics and general information on the Island. As "scientists" we have documented what is happening on Bowen Island. Additionally, we have developed indicators to measure how well we are moving towards a particular goal.

The easy part of the project is over. The challenges of creating a healthier, more sustainable community are before us. It is hoped that the knowledge gained from reading the report is transformed into action. The information in the report (the trends, data, and statistics) can contribute to a civic dialogue aimed at making Bowen a more sustainable place. By understanding the state of the Island, citizens, whether they are Municipal Councillors, developers, or eight-year-old kids, can make decisions and choices that will make Bowen Island a better place to live.

This report is organized into the following chapters (see *Figure 1-1: Framework for the State of Bowen Island Report*):

Water:	Climate, precipitation, geology, water systems, wells, ground water, streams, lakes, wetlands, recharge, salt water intrusion, vegetation, aquifers
Air:	Air quality
Natural Diversity:	Biodiversity, vegetation, keystone species, introduced species, biodiversity index
People:	Demographics, birth and death rates, ethnic diversity, employment, income, education level, health
Community Resources:	Institutions, organizations, activities, facilities, education, health and social services, emergency services
Governance:	Greater Vancouver Regional District, Municipality, Islands Trust
Economy:	Formal economy, informal economy
Energy:	Energy supply, energy use
Land Use:	Land use policy, changing land use, planning initiatives
Transportation:	Cars, bikes, pedestrians, buses, ferries
Resource Use:	Resource consumption, waste, recycling
Conclusion:	Conclusion, recommendations, next steps

This report seeks to enhance the understanding of these issues in order for Bowen Island to move towards a more sustainable future, based on the values and ideas of Islanders.

Please note the supporting maps for the State of Bowen Island, Volume 1: Report are contained in a separate volume, **Volume 2: Maps and Supporting Information**.

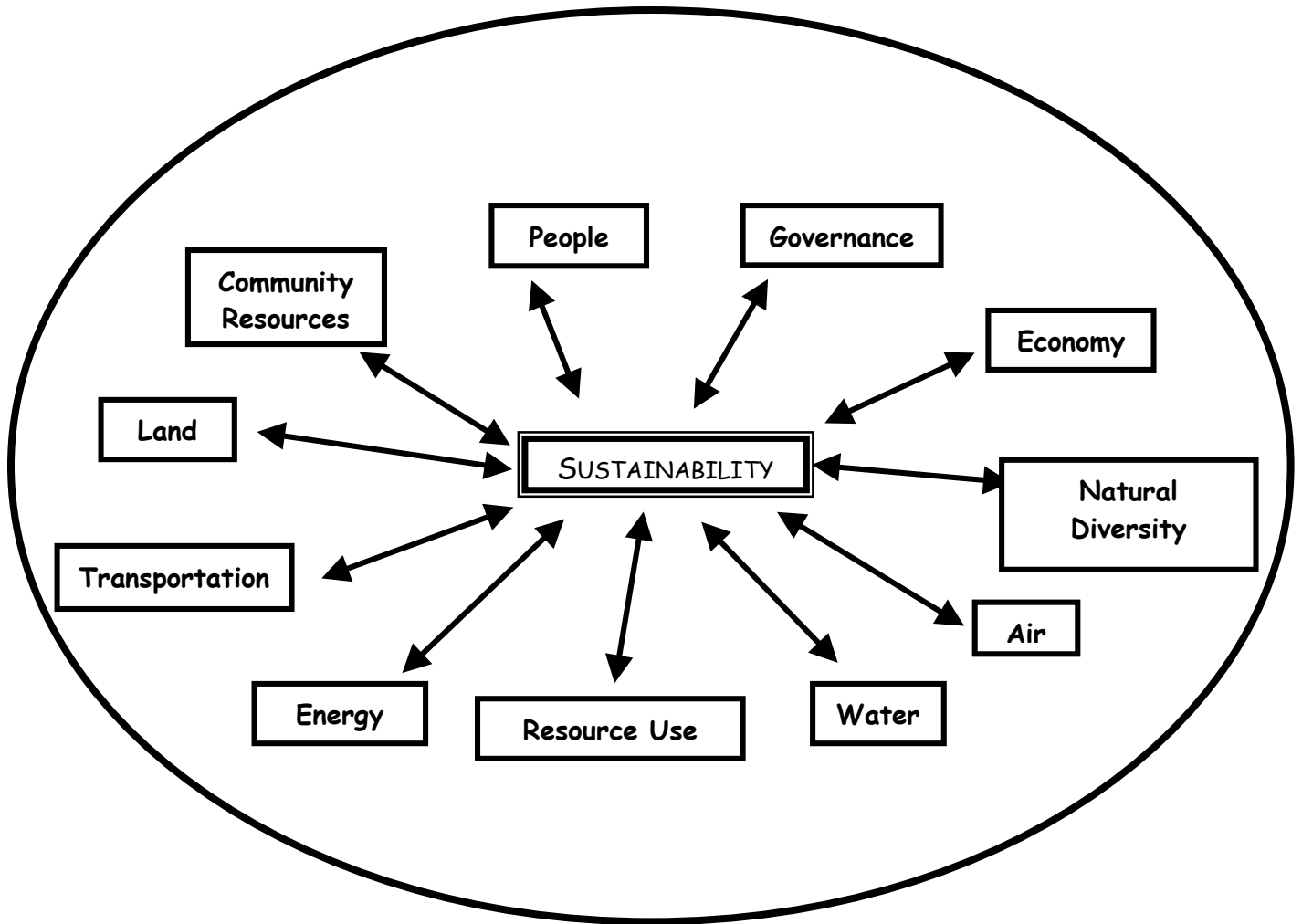


Figure 1-1: Framework for the State of Bowen Island Report

The State of Bowen Island

Volume 1: Report

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February 2001

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Archived copies of The State of Bowen Island Volume 1 and 2 are available at:

Bowen Island Library
Bowen Island Community School
Bowen Island Museum and Archives

Cite as:

Julian, M., and R. Bailey. 2001. The State of Bowen Island Volume 1: Report. Bowen Island Sustainability Project, Bowen Island Municipality, Bowen Island. Multiple pages.

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1.1 Acknowledgements

The Bowen Island Sustainability Project would not have been possible without the generous support of:

- **The Real Estate Foundation**
- **Capilano College**
- **The Geological Survey of Canada**
- **Bowen Island Municipality**

Many people made significant contributions to this project, and their assistance and support are gratefully acknowledged:

- **David Bernard (Capilano College) as a project manager**
- **Murray Journeay (Geological Survey of Canada) as a project manager**
- **Clay Carl was a research analyst with the Bowen Island Sustainability Project for 3.5 months in fulfillment of the practicum component of the post-baccalaureate program in Environmental Science at Capilano College.**
- **Julian Dunster (Bowen Island Forest and Water Management Society) as a project advisor**
- **Steering Committee members included: Berni Claus, Terry Cotter, Julie DeGroot, Wolfgang Duntz, Anne Franc de Ferriere Chollat, Richard Goth, Anne Ironside, Jean-Michel Krief, Jean Jamieson, Karen Levy, Eric Sherlock, Bob Turner, and Alan Whitehead**
- **Bowen Islanders who shared time and information, too many to individually name! Special thanks to Sue-Ellen Fast, Alan Shatwell, Bruce Howlett, Sue Barr, Allan Still, and Dave McIntosh.**
- **The staff at Bowen Island Municipality, especially Kathy Lalonde, Candace Sorrentino, Sandi Laudrum, Cristina Rucci, Felicity Adams, and Isabell Hadford.**
- **Bowen Island Municipal Council, especially Peter Frinton, Bob Turner, Mayor Lisa Barrett, and Alison Morse.**

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1.6 Foreword

As a newly incorporated municipality, Bowen Island was fortunate indeed to have the contributors to this report come forward with a proposal to supply us with the very information we need to involve the community in an effective decision-making process dealing with social, economic and land use issues. Both volumes of the report are important components of, and lay the groundwork for an on-going education of ourselves with regard to the environment in which we live.

The availability of the information to all of us is an important feature of this report. Accessibility to information, and the sharing of knowledge between members of the community enhance participative democratic decision-making processes. It is a two-way street. The collection of data and maps is an evolutionary process, and as we see changes in patterns of consumption, for instance, it will be interesting to document the changes in behaviour in our community in response to those changes. The things the community may find value in mapping may tell us something of the underlying values we share.

The report introduces the concept of sustainability indicators. This is another venue for our participation. The priorities set, and the target-setting and benchmarks celebrating our progress towards a goal of sustainability are ways in which we may all contribute and share in the end result. Local public policy can become a mirror reflecting the values inherent in our collective work toward those community sustainability objectives.

Our thanks to David Bernard, Maggie Julian and the team behind this good work.

Lisa Barrett
Mayor of Bowen Island
February 2001

2.0 Context

2.1 Sustainability

Rees and Wackernagel (1996, 32) define sustainability as "living in material comfort and peacefully with each other within the means of nature." This statement implies that human behavior must exist within the biophysical limits of the natural world.

Why Should We Care About Sustainability?

The concept of sustainability has been discussed in many places on Bowen Island from municipal to informal chats at the dinner table. Why all the fuss about sustainability? Why should we care? For reasons both practical and moral.



Disclaimer: Academic discussion follows!

What are we *really* saying? **We should care about sustainability because....**

- We depend on nature
- We need to look after our kids and future generations and all the other critters and living things around us

Practical Reasons - We Depend on Nature

Human beings are not only connected to nature, but rather we are nature. People are not entities separate from nature, instead, we are part of a sphere of natural processes that provides requirements for life, waste absorption capacity, and life support services.

This assumption has not been considered in conventional economic theories on human behavior. Instead, conventional economic approaches treat the environment as something "out there," unrelated and detached from human interactions (Rees and Wackernagel, 1996). This assumption of conventional analysis, quite simply, is dead wrong. Humans are not detached from the ecosphere. Rather, "the earth is a thermodynamically closed and non-materially growing system, with the human economy as a subsystem of the global ecosystem" (Costanza et al., 1997, 79).

This conceptualization of ecosystems and of human interactions with ecosystems implies that if the ecosystems in which we live collapse, then part or all of human civilization will collapse as well. From a utilitarian, anthropocentric point of view, our survival is immediately and undeniably reliant upon the

existence of a healthy ecosystem. Therefore, it is in our best interest to preserve and protect the environment in order to ensure our survival.

Moral Rationale

The concept of sustainability, as manifested in the Brundtland Report (1987) moves beyond a utilitarian justification for preserving and protecting the environment. "The Brundtland Commission starts from the assumption that the needs of others place moral demands on us: if someone is ill or in pain, or, more generally, has a low quality of life, and we are able to improve their quality of life, we have a moral duty to do so" (Hurka, 1992).

The egalitarian view related to sustainability states that people are morally obligated to pass on the benefits of the environment (wealth of the natural world) to future generations, and therefore, we are morally obligated to protect the environment via effective planning strategies. It is in the best interest of humanity to preserve and protect our environment and social systems in order to ensure that future generations have access to the same levels of natural capital as present generations. In other words, we need to look after our kids.

Thinking About Sustainability

Many would argue that it is important to define what sustainability is, or might be, before any actions can be taken towards setting up more sustainable ... practices. We do not necessarily subscribe to the need to define sustainability to practice it, but the exercise of definitions is one useful way to understand perspectives and to understand competing views.

Source: Gibbon, et al, 1995

There Are Many Different Definitions

Sustainability is difficult to define. Nevertheless, "sustainability" persists as a popular idea, applied to a variety of contexts and situations. Schaller (1993) notes: "As a destination, sustainability is like truth and justice - concepts not readily captured in concise definitions." Of course, all people want truth and justice, but the meanings of these concepts and their applicability can vary considerably between individuals and societies.

Perhaps the flexibility in understanding and describing sustainability is what has allowed the concept to gain such popularity. A single definition for sustainability could prove to be not useful and potentially dangerous in a world typified by a multitude of different environmental, social, and economic conditions. Indeed some argue that "there is not, and should not be, any single definition of sustainability that is more logical and productive than other definitions" (Kidd, 1992).

Describing Sustainability

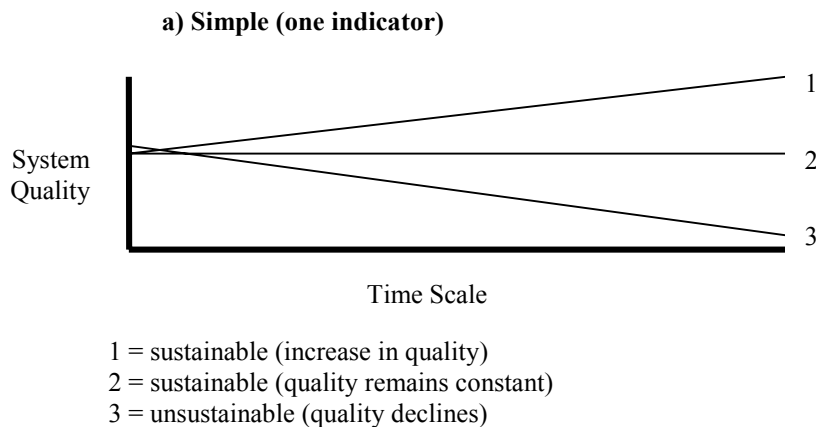
There are reasons behind different understandings of sustainability - differences that occur, in large part, to various interpretations related to system quality. How is this relevant for communities that want to work towards sustainability as a goal?

Bell and Morse (1999) develop a scenario that is very useful in describing sustainability. In the scenario, sustainability is represented by a change in a property referred to as system quality (figure: System Quality and Sustainability). System quality is recognized as an extremely subjective term that is open to a wide variety of value judgements. Bell and Morse (1999) characterize the system as follows:

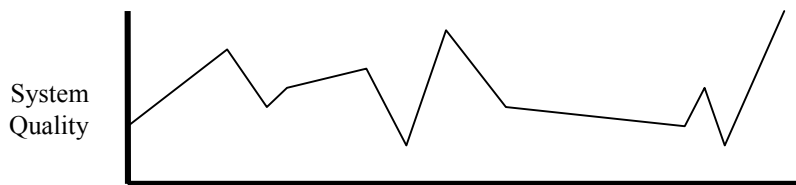
- When quality remains the same or increases, the system is said to be sustainable.
- When quality decreases, the system is unsustainable.

However, while this concept may be clear by analyzing the figure (System Quality and Sustainability), Bell and Morse (1999, 11-12) note that several problems necessarily arise:

1. *What exactly is the system we are ascribing some notion of quality to? Who is in this system and who isn't? This may equate in a rather crude sense to the spatial dimensions of the system being evaluated, and one can ask where the system 'boundary' resides. Indeed, is there really a boundary at all?*
2. *What do we take as a time scale across which quality is being gauged? For example, in part b of the figure system quality fluctuates with time, but taken across the whole length of the time axis it remains more or less the same (=sustainable). If one only looked at small segments of the time axis rather than the whole length, the picture could be quite different. Some segments show a marked unsustainability as quality declines rapidly while other segments show a rapid increase.*
3. *What is meant by system quality and how is it determined? This problem is probably the most intractable. Quite frankly, given the same system and time scale it is possible for two people to arrive at very different views depending on what they see as important components of quality (part c of the figure). To one person the quality may be increasing while to someone else it is decreasing. This point can be illustrated from another angle - the costs of achieving sustainability or what some call 'profitability versus environment debate' (Schely and Laur, 1996). In the literature there is frequent reference to two types of sustainability ... depending on the costs incurred in attaining them (Common and Perrings, 1992; Rennings and Wiggering, 1997): strong sustainability and weak sustainability.*



b) Complex (one indicator)



c) Simple (two indicators)

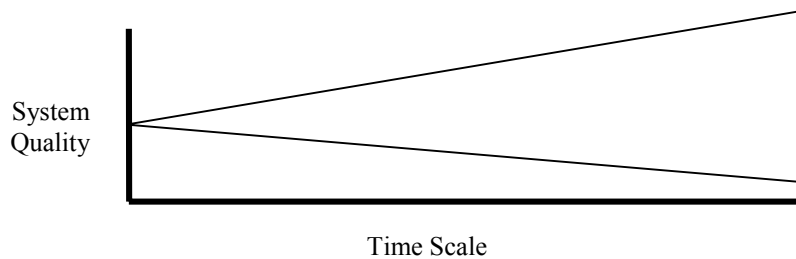


Figure 2-1: System Quality and Sustainability Source: Bell and Morse, 1999.

An understanding of the concepts of strong and weak sustainability will elucidate how the concept of "system quality" needs to be resolved within a community before indicators can be created and sustainability can be worked towards.

Strong Sustainability and Weak Sustainability

"Strong sustainability recognizes the unaccounted ecological services and life-support functions performed by many forms of natural capital and the considerable risk associated with their irreversible loss" (Wackernagel and Rees, 1996, 37). For example, trees do not only provide lumber for building homes, but they provide a host of non-market functions including erosion control, heat distribution, and wildlife habitat. *The concept of strong sustainability requires that natural capital stocks (forests) be held constant or be enhanced separately or independently of human made capital (logs for homes).* Indeed, some authors further argue that manufactured human-made capital needs to be held constant so that there is no capital depreciation of any kind. When this scenario is achieved, the condition of strong sustainability will exist.

In contrast, weak sustainability argues that "society is sustainable provided that the aggregate stock of manufactured and natural assets is not decreasing. In other words, weak sustainability allows the substitution of equivalent human made capital for depleted natural capital" (Wackernagel and Rees, 1996, 37). For example, the loss of potential income caused by cutting down a forest is not a problem

as long as the proceeds of liquidation are re-invested in other means of income earning potential. Weak sustainability refers to an economic sustainability in which financial value, determined by the allocation of resources and levels of consumption, is the key element of system quality.

Pearce and Atkinson (1993) argue that the concept of weak sustainability is ecologically meaningless. By analyzing data associated with trade flows, they demonstrate that weak sustainability fails to recognize that the manufactured and financial capital in rich countries comes from the depletion of other countries' natural capital and from common pool assets. Transferring this concept to a provincial scale, the "sustainability" enjoyed in many parts of British Columbia (Vancouver for example) comes at the expense of a massive and unaccounted ecological deficit with other parts of the province and world.

Communities need to recognize the difference between strong and weak sustainability in their planning processes. In order to be truly sustainable, policies need to reflect the principles discussed in the aforementioned definition of strong sustainability. Weak sustainability simply involves a spatial and temporal reallocation of unsustainable behaviour.

2.2 Indicators

Sustainability must be made operational in each specific context (e.g. forestry, agriculture), at scales relevant for its achievement, and appropriate methods must be designed for its long-term measurement.

(Heinen, 1994)

The previous section outlined some of the questions and quandaries surrounding the concept of sustainability. Sustainability shares much with the concepts of truth and justice - values, judgements, and ethics influence it significantly. Nevertheless, regardless of one's vision of sustainability, once a goal has been set, a mechanism needs to be devised to figure out whether that goal has been attained. However, before a mechanism is invented (such as indicators), criteria need to be established to analyze the potential effectiveness of that mechanism.

How Do We Get to a More Sustainable Future? - Key Principles

Below is a list of principles for measuring progress towards sustainable development.

Box 2-1: A Summary of Ten Bellagio Principles for Gauging Progress Towards Sustainable Development

1. What is meant by sustainable development must be clearly defined.
2. Sustainability should be viewed in a holistic sense, including economic, social, and ecological components.
3. Notions of equity should be included in any perspective of sustainable development. This includes access to resources as well as human rights and other 'non market' activities that contribute to human and social well being.
4. Time horizon should span 'both human and ecosystem time scales', and the spatial scale should include 'not only local but also long distance impacts on people and ecosystems'.
5. Progress towards sustainable development should be based on the measurement of a 'limited number' of indicators based on 'standardized measurement'.
6. Methods and data employed for assessment of progress should be open and accessible to all.
7. Progress should be effectively communicated to all.
8. Broad participation is required.
9. Allowance should be made for repeated measurement in order to determine trends and incorporate the results of experience.
10. Institutional capacity in order to monitor progress towards sustainable development needs to be assured.

Source: Adapted from Hodge and Hardi (1997).

Building upon The Bellagio Principles and integrating concepts from the literature related to indicator development, (Resilient Community Manual, 1999; Bell and Morse, 1999; Gregory, Julian, and Woolliams, 1999; Lafferty and Eckberg, 1998; OECD, 1998; Hart Website, 1996; Kline, 1997) the following criteria are necessary for the establishment of useful sustainability indicators. Indicators must be:

1. **Relevant to Definition of Sustainability:** Ecological, social, and economic sustainability needs to be considered in developing appropriate indicators.
2. **Highlight Equity:** Intergenerational equity is a key component of socioeconomic sustainability and is linked to ecological sustainability. Future generations must not have their needs compromised by decisions undertaken at present.

3. **Transferable:** The indicators must be designed so that they can be applied to a variety of communities so that progress among and within those communities can be compared.
4. **Consider Time as a Constraint:** The indicators must be responsive and able to recognize what is happening in communities before it is too late for planners and policy makers to take the appropriate action.
5. **Broad in Scope:** The indicators must consider a variety of factors and reflect a mix of long and short-term measures of sustainability.
6. **Comprehensive:** The indicators need to examine the community as a whole. The application of indicators needs to also consider the relationship of the community with the surrounding region.
7. **User Friendly:** The indicators must be easily accessible and easy to use by the planning body, organization, or individual that is using them.
8. **Practical:** It is important the use of the indicators is feasible in terms of measurability and implementation.
9. **Participatory:** The ideas and values of the community need to be assimilated into the construction and use of the indicators. The indicators need to reflect the priorities of the community as a whole. People in the community need to accept and understand the development and use of the indicators. Understanding will foster greater participation in the use and administration of the indicators.
10. **Measurable:** In most cases, indicators need to be measurable in some way. However, in some cases, indicators may need to be adapted to consider personal, anecdotal information, such as ideas and opinions expressed through the oral traditions of First Nations people.

Within the aforementioned criteria, three issues are of special importance with regards to determining sustainability. *First, there needs to be a clear definition and understanding of sustainability at the community level. Secondly, there needs to be an integrated, holistic approach when considering issues of sustainability. The inter-relationship between ecological, social, and economic factors needs to be addressed. Thirdly, temporal and spatial scales need to be considered when considering sustainability.*

Developing Sustainability Indicators – Process and Community Participation

In developing a set of indicators to measure progress towards sustainability, the community is instrumental in determining two things:

1. A definition of sustainability that is derived from the community and reflects the values of the community.
2. A set of indicators that reflects this agreed upon definition of sustainability.

Providing a list of indicators for a community to use is not good enough. Groups that have worked with indicators note that the process associated with developing indicators is just as important as the indicators themselves (Tyler Norris Associates, *Redefining Progress, Sustainable Seattle*, 1999). It is important that communities derive the indicators themselves, to reflect the values of the community.

However, while every community needs to develop their own system (process) for developing indicators (product), it does not necessarily have to start at the beginning. Several groups have charted possible paths towards indicator development and several groups have established indicators that would be useful in a variety of contexts. Our process for developing indicators drew upon past

work. We developed a first set of indicators based on research about the various systems on Bowen. The indicators were developed and built upon with input from the community and steering committee. The indicators should continually be utilized and modified to meet the needs and values of the community.

It is essential that indicators be integrated, through formal processes, into the planning process of the community. For example, the OCP of Bowen Island could be designed so as to include targets, related to their community goals, that uses indicators to track progress towards those targets.

Finally, it needs to be recognized that developing and integrating indicators into planning practice will take time. The development of indicators are designed to be pieces of civic infrastructure that will persist over many years, being refined and improved with experience, changing values, and the engagement of new people. "Creating a vision of a healthy community can take a day. Creating an initial report card to measure your progress can be done in a matter of months. But realizing the vision may take a generation" (Tyler Norris Associates, Redefining Progress, Sustainable Seattle, 2000, 9). The indicators are listed throughout the report and a summary list can be found in Appendix B.

2.3 Bowen in the Regional And Global Ecosphere

This report will outline "The State of Bowen Island." At first glance, the title of the report implies an examination of a very small part of the earth. Geographically speaking, the Island community is insulated from the rest of the world by the Pacific Ocean. However, activity on Bowen Island influences, and is influenced by, the local region and the entire planet. For example, the groceries we buy, the pollutants we emit through our exhaust pipes, and the materials we use to build our houses, all to some degree, have an impact on the region and the planet. The implications of our choices and lifestyles are profound. Consider the ideas of sustainability and how they relate to something as simple as Alan enjoying a cup of coffee:

Box 2-2: The Ghost of Coffee's Past

My name is Alan and I'm a compulsive drinker. Coffee is my brew. I used to drink it daily, sometimes hourly. I drank it by the pot... cappuccinos, frappacinos, even Folger's drip. Now I'm on the wagon, drinking locally grown herbal tea. You see, this terrible thing happened. A dream straight out of Scrooge. I saw where my coffee comes from.

It started one morning in the kitchen. As I poured the beans into the grinder, I suddenly found myself in a clouded forest on a mountain above the Cauca River in Columbia. The lush vegetation was disappearing all around me as a coffee plantation grew. Farm workers were spraying the trees with pesticides made in the valley of the River Rhine in Europe. I began to choke on the poisonous fumes when I was transported... to New Orleans. Burlap sacks of coffee beans were being unloaded from a freighter burning oil from the Orinoco River Valley of Venezuela. It was like a spin on the house that Jack built: the freighter was made in Japan out of steel forged in Korea from iron mined in the lands of Australian aborigines. Workers were pouring the beans into a roaster, which was fuelled with natural gas piped in from Oklahoma. Out of the other end, my beans poured into bags of nylon, polyester, and polyethylene - plastics from New Jersey - and aluminum foil from a smelter in Oregon. That smelter was powered by electricity from dams that have nearly wiped out the wild salmon in the Columbia River.

Suddenly, I was in my kitchen again, but hovering by the ceiling, looking down. My beans now disintegrating in the grinder had come to my home inside a brown paper bag made from pines in the Northern Rockies. On the trip from the supermarket, my car had burned a sixth of a gallon of gasoline, spewing carbon monoxide, carbon dioxide, nitrogen oxides, and volatile organics into the air. The gas had come from Alaska's North Slope by way of Prince William Sound and a refinery in northern Washington.

Hovering above myself in the kitchen, I watched as I took that first sip of the day. But from the cup came pesticides, oil, molten steel. My ecological wake. And it wasn't just the coffee. My T-shirt. My newspaper. My radio. The wake of it all washed over me. I buckled under its weight. Then, my bathroom scale appeared, flashing 115 pounds. My daily consumption of natural resources. I fell to the floor, crushed and bloated. I can't shake this dream. I've gotta get off this consumption kick. And I'm starting with java. I don't know how to do it, but I gotta find a way of using less. Can we make things better? Figure out better ways of getting around? Get stuff from closer to home? I don't know, but I do know this, my name is Alan, I'm a compulsive coffee drinker, and there's a world in my cup.

While this report will focus on Bowen Island, it is critical to think about the linkages between Bowen Island and the larger regional and global community.

2.4 History

When stepping off the ferry, a weight seems to lift from one's shoulders - the crisp clean air, green forest, and sparkling water tantalizing the senses. Howard writes of Bowen as "...one of those legendary paradises where the sun always shines, fields and trees produce in abundance, and no father ever has to go on relief or do pick-and-shovel work on the government roads..." Talk to anyone on Bowen and they will speak with pride about their community, the Island's natural endowments, and the relaxed non-urban lifestyle. However, that same Islander might also express a fear of more

people coming from Vancouver to the Island, resulting in increased development and the associated pressures that would undoubtedly change the nature of the Island. It is this sentiment that captures the history of Bowen Island - "land 'like the gift of sunlit air' opposed to land for profit; peace and freedom invaded by public regulation and private unhappiness; neighbourliness and community spoiled by bureaucratic busyness" (Howard, 1973, 9). This conceptual conflict inherent in contemporary and historical Bowen Island is succinctly captured up by the expression, "utopia in conflict with reality."

This chapter will provide a brief and general summary of Bowen Island's history in order to provide an overall context for the content and ideas expressed in the remainder of the report. The discussion of the history of the Island will be divided into four parts: the geological history, industrial history, First Nations history, and settlement history. The history associated with each of these components of Bowen's development has implications for the future of the Island.

2.4.1 Importance of History

"Culture, the shared meanings, practices, and symbols that constitute the human world, does not present itself neutrally or with one voice ... There is no privileged position, no absolute perspective, no final recounting" (Rainbow and Sullivan, 'The Interpretive Reader').

Understanding your community and understanding the history of your community are important parts in the process of advancing civic relationships. By knowing "what was" and "what is" in a community, people can contribute to a civic consciousness that influences the health and strength of that community.

In recounting "what was" and "what is" on Bowen, it is important to remember that the information has come from people with different backgrounds, beliefs, and priorities. In this sense, the historical and present-day assessment of Bowen Island is not an "objective truth," but rather a collection of diverse opinions related to the place. Of course, some information and data are more quantifiable than others (for example, the number of deep wells of Bowen), yet the meaning of that information as it relates to the community is open to subjective and varied interpretation.

2.4.2 Geological History

The Quaternary history of Bowen Island is well documented by Block (1978) who draws upon past research related to the Fraser Lowland and Georgia Depression (Armstrong, 1956, 1957, 1961, 1975; Armstrong and Brown, 1954; Clague, 1976; Hicock, 1976; and Leaming, 1968).

Block (1978) notes that the topography of Bowen Island is controlled by the underlying bedrock. Roddick (1965) explains that Bowen Island bedrock is composed of Coast Plutonic hornblende diorite and granodiorite granitic rock that intrude a relatively thick sequence of modified volcanic rocks and minor interbedded sediments. Overlying bedrock are surficial sediments (sand, gravel, rubble, till) of

variable thickness. A description of the historical evolution of the glacial, fluvial, and marine sediments is discussed in the following paragraphs.

During the last 150 thousand years, the Fraser Lowland and Georgia Depression was subject to repeated glacial events, separated by corresponding non-glacial intervals (Block, 1978). Changes in sea level during this period exceeded 200 meters. These glacial events resulted in the repeated deposition and subsequent erosion of very thick Quaternary sediments from diverse origins (Hicock, 1976).

The "majority of surficial deposits on Bowen Island were laid down during and after the last major advance of glacier ice, the Fraser Glaciation" (Block, 1978, 13). The prominence of exposed bedrock on Bowen Island suggests that the surficial materials are not very thick. Nevertheless, Block (1978) notes that drill records demonstrate that several isolated and fairly deep pockets of unconsolidated sediment exist on Bowen, exemplified by one well near Grafton Lake that was drilled through eighty meters of surficial materials before reaching bedrock.

What follows is laden with geological jargon, but captures the geological history of Bowen Island. Block (1978) explains the presence of sediments in the region in detail. Twenty-six thousand years ago, with the Fraser Glaciation, pro-glacial Quadra Sand was deposited in front of advancing glaciers. At the same time, medium grained sand was deposited as distal outwash aprons running Northwest to Southeast in the Georgia Depression. The land was isostatically depressed and high outwash streams deposited coarse gravel outwash as forset beds into the sea as the Vashon ice advanced off of the Coast Mountains (Block, 1978). Overtime, this ice covered the area, being continually deposited and re-deposited as lodgement, outwash, and flow tills. Dropstones were deposited in small meltwater ponds and caused laminated stony silt and fine sand lenses in the till to be formed. The major landscape, that was nearly identical to the landscape that we see today, was developed by the Vashon Drift (Block, 1978).

Deposition and erosion continued. Thirteen thousand years ago, the mean temperature increased and the Fraser Deglaciation began. What resulted was significant downwasting and the retreat of the ice mass. Ridges and peaks emerged through the ice first, like the peaks that we see to the North as we peer out of Snug Cove. Valley glaciers resulted and stagnant ice remained in some of the deeper, wider valleys (Block, 1978). Alley (1975) notes that lacustrine sediments at different elevations and the different levels in deltas resulted from various stages in this thinning process. As the Vashon ice retreated, the sea followed, and Capilano fossiliferous marine and glaciomarine sediments were deposited at least 70 meters above sea level (Block, 1978). These sediments are marine drift. In part, these sediments were also deposited as a result of submarine erosion in the littoral and sublittoral zones during uplift (Armstrong and Brown, 1954).

As the Vashon ice retreated further into the mountains, the land isostatically rose faster than the eustatically rising sea level. The melting ice released huge amounts of water, depositing outwash fans, deltas, and channels. As sea levels continued to fall, these outwash deposits were eroded and redeposited at lower elevations (Block, 1978). Storm waves and spray reworked the Capilano glaciomarine sediments and Vashon drift. Supralittoral lag gravel and sand was formed up to 175 meters above sea level by this wave activity (Hicock, 1976). In relatively recent times, streams, gullying, mass wasting, and human activity have significantly influenced the erosion and deposition of sediment on the present day landscape (Block, 1978).

2.4.3 First Nation History

Historical data suggest that the Squamish First Nation inhabited Bowen Island before European contact. The Island and the surrounding waters were originally used as a hunting and fishing area for the Squamish people and the Island may have served as a summer village site for the Salish First Nation (Official Community Plan, 1999). Information also suggests that Bowen Island served as a neutral meeting ground for the Squamish and other Indians, as well as a stopover point on journeys up and down the coast.

The First Nation way of life would be dramatically transformed by the arrival of Europeans. In 1791, Spanish explorer Narvaez sailed across the entrance to Howe Sound. Oral history of the Squamish First Nation tells of the Squamish people being able to smell the Europeans coming, because they were unable to bathe in seawater (Aberley, 1999). During the 19th century, the Squamish and Salish were decimated by a myriad of diseases and sickness that wiped out whole villages and families. Near the end of the 1880s, smallpox spread through the Squamish people, killing nearly twenty percent of the population.

Early settlers say that First Nation People (Salish) had shake dwellings and a smokehouse in Snug Cove. Members of the Cowan family told of Indians that arrived on the beach in big canoes, built a fire, celebrated, and slept over night (Howard, 1973).

Canadian anthropologist Charles Hill-Tout includes Qole'laqom on Bowen Island in his list of village site for the SK'qo'mic People - a branch of the Salish First Nation (Howard, 1973). However, this village was, like other inlet sites, only a summer camp (Howard, 1973). Hill-Tout provides First Nation place names for other areas on the Island - Naych-Chail-Kun for the south coast from Cowan Point to Cape Roger Curtis and Kwumch-Nam for Hood Point.

The cultural and social degradation of the First Nation People that resulted from European contact is well documented. Disease and social integration resulted in the loss of the traditional First Nation way of life. The first recorded documentation of European settlement refers to the enslavement of First Nation women for the purpose of prostitution: " ... They [settlers] also had two Kloochemen

[Indian women] whom they offered to some of the men in the camp for twenty dollars each but there being a glut on the market at the time, no sale was made ..." (George Ward DeBeck in Howard, 1973).

Many early settlers, who were almost always male, took First Nation women as brides and would establish permanent residency on Bowen. Many of these families would participate in whaling activities around Bowen Island. Mrs. James Walker recalls "All the women had little cabins; all the Indian girls who were white men's wives. Harry Trim's wife was an Indian; Peter Smith's wife was an Indian, and my father's wife was an Indian. All had little houses, nice little houses, and they built the wharf for the [whaling] schooner to land..." (Walker in Howard, 1973). Whaling activities occurred among the islands to the west of Tunstall Bay. Worlcombe Island was called "Swus-pus-Tak-Kwin-Ace," meaning "where they catch the whales" (Howard, 1973).

2.4.4 Industrial History

2.4.4.1 Logging

The first settlers on Bowen Island were loggers who pre-empted land under the Land Ordinance Act (1870). Logging operations on Bowen were extensive. Before 1865, land could be purchased outright for the timber on it. However, following 1865 a system of timber leasing had been legislated (Howard, 1973). Regionally, three large sawmills were buying up timber rights in the Howe Sound area. Bowen Island was seen as an attractive source of timber due to its proximity to mills in Vancouver and because of its relatively gradual slopes.

Logging on Bowen Island, especially in the Tunstall Bay region, fell into the general pattern of development in which American lumber companies, having harvested their timber resources in the Pacific Northwest, were moving north into Canada. In 1889, Croft and Angus, a provincial logging company that had acquired 850 acres on Bowen, was sold to Victoria Lumber and Manufacturing Company, that was owned by Humbird of Wisconsin and Palmer of Weyerhaeuser in Seattle. In general, the logging industry was susceptible to external market forces. The output of mills on Bowen, in places like Tunstall Bay and Cowan Point, was determined by prices fetched on the market. In addition to logs being milled on Bowen, they were sent across Georgia Strait to Chemainus for processing.

The logging camps on Bowen provided work for settlers. People would work for \$1.75 or \$2 per day as swampers, barkers, sawfilers or cooks. Others would make up to \$2.50 as skidroad bosses, fallers, or teamsters (Howard, 1973). However, by the early 1900s, the logging activity had begun to wane. Tourism was providing income and industrial activity was beginning to shift. For example, Joseph Chew Logging Company, who had acquired the land around Tunstall Bay in 1907 sold their property holdings in 1909 to Western Explosive Ltd., because the forest around Tunstall Bay had all been harvested.

2.4.5 Secondary Industries

An important part of Bowen's industrial history was the establishment of a dynamite plant. This explosives factory, located in Tunstall Bay and owned by Western Explosives Ltd., consisted of the following characteristics: "a dynamite plant, capacity 400 cases a day; a black powder plant, capacity 400 kegs; a magazine a mile or so farther down the shore and connected with the plants by a little railroad; office and store; a few dwellings for plant personnel and workers with families; two bunkhouses, and special quarters for Chinese and Japanese workers. An estimated 80 men were employed" (Howard, 1973, 28). Several Japanese and Chinese workers as well as their European supervisors were killed in a series of blasts at the plants. During the First World War, in an attempt to consolidate their holdings, the company moved the operation to Victoria.

The building of Vancouver required bricks and the sixty to eighty acres of blue clay at Deep Bay was a valuable ingredient in making those bricks. The brick business dwindled at the end of the nineteenth century and the old brickyard was used as a prize-fighting ring for urban combatants. In addition to brick making, slate was quarried on the Island, and shipped to San Francisco for roofing (Howard, 1973). However, most economic and industrial endeavours on the Island came to an end during the early 1900s.

2.4.5.1 Fishing

Salmon were caught in the waters around Bowen Island and sold in Vancouver. Additionally, oil from dogfish and cod livers were sold for 25 cents per gallon to logging companies for greasing the skids to help oxen draw the logs. In recent years, salmon fishing has been more relevant for the tourist industry.

2.4.5.2 Tourism

As most industrial activity came to an end at the beginning of the 1900s, the opening of Bowen Island as a resort for day excursionists had lasting influence on the subsequent development of the Island. Much of the development of Bowen Island as a recreational resource is owed to Captain John Cates. Cates was responsible for bringing picnic excursion crowds to Bowen Island from Vancouver and the Lower Mainland in the 1900s. The Union Steamship Company bought Cates' interests and established the first hotel and resort lands on Bowen. Bowen Island, now conceived of as an "idyllic island paradise," became not only a place to visit, but also a place to live. Improved road services were developed in the post war period. Car ferry service was introduced in 1956, further augmenting the potential for residential development. In the early 1960s, the hotel was demolished and most of the resort land was transformed to residential land. Residential development was now the primary land use on Bowen.

2.4.6 Recent Settlement History

Bowen Island, like the rest of British Columbia, experienced increased pressure from residential development in the post-war years. In order to address the challenges afforded by growth, the provincial government passed the Regional District Act in 1965 and by 1968 Bowen Island became part of the Greater Vancouver Regional District (GVRD).

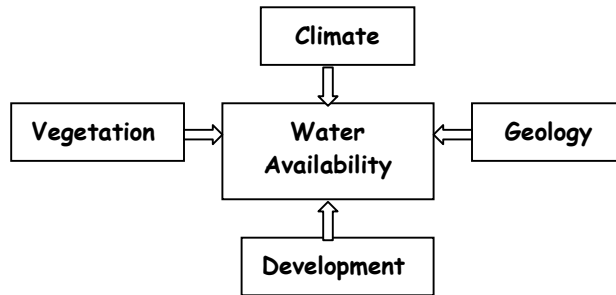
The 1999 OCP notes that increased and continued development prompted the provincial government to implement a ten-acre freeze on all of the Islands in Howe Sound and the Straight of Georgia in 1970. In 1972, the GVRD attempted to introduce a zoning bylaw that would have removed the ten acres freeze, but it was not until 1977, when an Official Community Plan was adopted on Bowen, that the ban was lifted and zoning and subdivision control was finally adopted.

In 1974, in recognition of the uniqueness of the Islands of southwest BC, the province passed the Islands Trust Act. The Bowen Island Local Trust Committee has administered this Act that resulted in the adoption of GVRD bylaws since 1974. The Official Community Plan was reviewed in 1982 and since then several amendments have been made to the OCP. In 1999, Bowen Island gained further autonomy by becoming a municipality and is now undertaking strategic action to manage its affairs. The history of Bowen Island has resulted in a community succinctly characterized by the Official Community Plan:

"The Bowen Community is characterized by a strong sense of stewardship and reliance upon the natural resources of the Island and a lifestyle rooted in tourism, recreational cottage development, and rural island living. Today the Island is a popular recreational destination for Lower Mainland inhabitants and accommodates a mix of year-round and seasonal residents with a broad range of incomes and lifestyles" (Official Community Plan, 1999, 6).

3.0 Water

This section begins by discussing several key factors that influence water availability on Bowen Island. These factors (climate, geology, development, and vegetation) are inter-related and have significant implications for water management strategies. A discussion of issues in water quality important to Bowen Island follows. Finally, an inventory of the fresh water sources and the various mechanisms for accessing water on the Island is discussed.



Key Factors Influencing Water Availability on Bowen Island

The availability of water for human consumption is governed by several key factors:

- 3. Climate
- 4. Geology
- 5. Vegetation
- 6. Development

While all of these factors influence water availability, it is necessary to conceive of these factors as linked and part of a larger system.

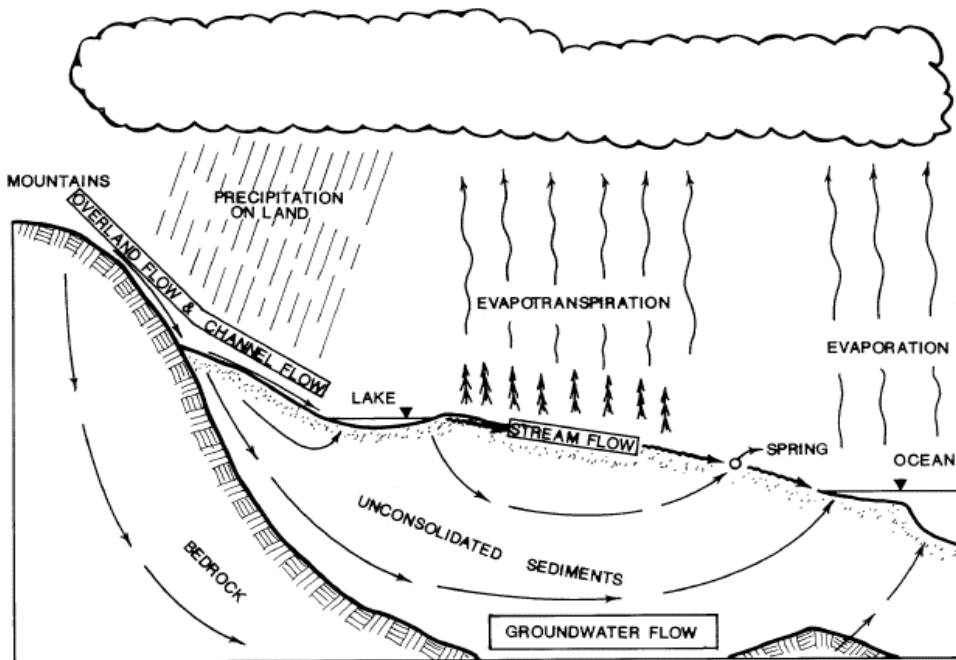


Figure 3-1: The Hydrologic Cycle

Water that participates in the hydrologic cycle includes rainwater, river and lake water, and groundwater.

Out of the total amount of water that evaporates from the ocean and land, about 20% falls as precipitation back onto the land (the remaining 80% falls as precipitation over the ocean). Looking at the land-based portion of the hydrologic cycle, water enters this part of the hydrologic system as precipitation (rain and snow) and most (68%) leaves as evapotranspiration back to the atmosphere. The rest leaves as surface water discharge (31%) and groundwater discharge (1%), returning to the ocean.

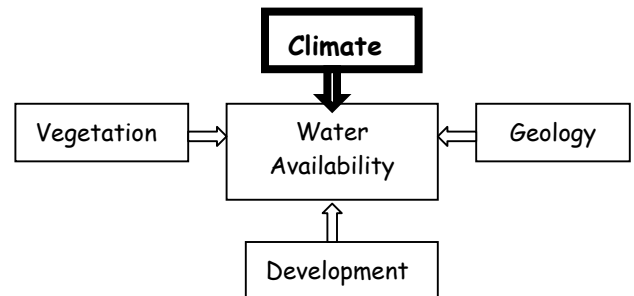
Within the system, water travels through different routes. Some flows overland into channels and eventually into streams before discharging to the ocean. Some water infiltrates into the ground and travels as groundwater and discharges into the ocean or back to the land surface into lakes and streams. Water commonly travels both surface and subsurface routes through the system.

Source: M. Wei, Ministry of Environment, Lands, and Parks,
http://www.elp.gov.bc.ca/wat/gws/gwbc/CO2_origin.html

3.1 Climate

There are several climatic factors that affect the hydrology on Bowen Island. These factors include:

- Seasonal fluctuations in the amount of precipitation characterized by a wet winter and a summer drought. Approximately 80 percent of precipitation falls between October and April.
- Little to no annual snowfall with insignificant spring storage of snow and corresponding snowmelt release. Increased levels of snowfall occur at higher elevations and on the northern portion of the Island due to a reduction in coastal climate influences.
- Precipitation levels increase noticeably from the moderately dry south coast to the wetter upland interior and north coast (Block, 1977). Two factors contribute to this variation in precipitation levels: (1) elevation effects and (2) the Island's position relative to the Coast Mountains.



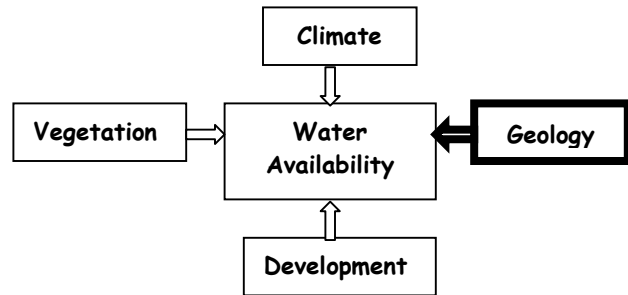
See Map 2¹ for the different levels of precipitation on Bowen and the associated biogeoclimatic zones.

¹ For maps please refer to Appendix A in State of Bowen Island Volume 2: Maps and Supporting Information

Due to the lack of precipitation in the summer months, storage is an important factor in water availability on Bowen. Wetland, lake, and groundwater storage are of particular importance for year round water use. However, as the following section will indicate, the Island's geological regime is dominated by bedrock, and the characteristics of the bedrock are relatively unknown.

3.2 Geology

Geology is important to water on Bowen Island insofar as it contributes to groundwater storage. The following discussion will highlight what is known about Bowen Island geology as it relates to water. However, it will become apparent that what not known is equally critical for understanding water use and management on the Island.



is

On Bowen, the availability of groundwater is controlled by the geographic (area and topography of land surface) and hydrological characteristics (permeability and storage coefficient) of the bedrock combined with the rate of recharge from precipitation and surface runoff. Groundwater availability is controlled by storage in bedrock and surficial sediments that overlie the bedrock. The prominence of bedrock is important for two reasons:

- Open fracture zones in the bedrock are important, as they constitute zones for groundwater storage and movement.
- Major faults may play an important hydrogeologic role locally, either as preferred conduits or as relative barriers to groundwater flow resulting in short circuiting of deep and shallow groundwater flow systems.

3.2.1 Topography and Water

Bowen's topography has been significantly modified from the processes of glaciation and post-glacial marine transgression. The terrain has been influenced little by present day fluvial processes. Day (1972) recognizes that within this terrain setting the surface drainage network, such as streams and creeks, has formed as small channels in the thin layer of surficial deposits. Additionally, sediments have been deposited in depressions and benches along the base of steep slopes (Block, 1972). All of these factors indicate the prominence of bedrock and the lack of surficial materials on Bowen Island. The longitudinal profiles of streams are dominated by irregular "stepping" formations associated with channels developed on heavily glaciated landscapes. Block (1977) notes that the stepping is the result of outcrops of bedrock along the channels. Terminal creek, the largest channels system on Bowen Island is strongly controlled by the irregularity of the underlying bedrock regime. Steeper gradients associated with this landform pattern tend to correspond with channels that have been entrenched into the surface of the land. Shallower gradients tend to correspond with local depositional channels.

Additionally, small channels on steep slopes where bedrock is at or near the surface, develop surface gullies or washes and are unable to develop any significant entrenchment. As a result, it becomes apparent that bedrock is also very influential in the development of streams and surface watercourses.

3.2.2 Estimating Groundwater

The following equation outlines key factors important in determining the amount of groundwater on Bowen Island:

$$[\text{PRECIPITATION (mm)} - (\text{EVAPOTRANSPIRATION} + \text{SURFACE RUNOFF})] * \text{AREA OF BOWEN ISLAND} * \text{THICKNESS OF WATER BEARING ZONE} * 10^{-4} = \text{AVAILABLE GROUNDWATER.}$$

The value 10^{-4} is defined as a storage coefficient that has been used to determine the availability of groundwater for a number of Gulf Islands. A recent study on Galiano Island (1998) concluded the storage factor could be as high as 10^{-3} . However, it should be recognized that until the proper research determines the thickness of the water bearing zone and the characteristics of the bedrock geology, this equation is functionally useless on Bowen Island. However, the equation provides a useful conceptualization of the factors that are important on the Island's hydrological regime.

The lack of knowledge about the bedrock geology (especially the nature of fracture systems) on Bowen indicates an important gap in key information required to manage water. However, studies have been undertaken on some of the Gulf Islands that provide a crude understanding of available groundwater based on geological and hydrological characteristics.

The following is information provided by studies on Galiano Island (Kohut et al.) that may prove useful in thinking about water availability on Bowen:

“In a given year, some 11 billion litres of water falls on the island in the form of rain and snow (based on annual precipitation of 856 mm). Most of this amount either runs off the land or is evaporated, utilized by vegetation and transpired while a small percentage is available for groundwater recharge. Halstead, (1967) estimated that 2 inches (50mm) or 6 percent of the annual precipitation may be available for groundwater recharge.

Based on studies of Mayne Island, Foweraker (1974) estimated that 1 inch (25mm) of precipitation or 3 percent may be available but concluded that on an annual basis, storage and permeability and not precipitation appear to be the limiting factors controlling groundwater availability on the Gulf Islands. Other investigations in the Gulf Islands and east coast of Vancouver Island including: Piteau Associates (1994a), Piteau Associates (1994b) and Hardy BBT Ltd. (1991), have estimated that from 6 to 12 percent of the annual precipitation may be available for groundwater recharge. The effect of long-term climate change on groundwater recharge has not been assessed.”

The large uncertainty in estimates of water availability makes groundwater management very difficult. Additionally, the studies listed above were based on hydrological variables that were better understood than they are on Bowen. Indeed, Journey (2000) notes that the geology of Bowen is far less predictable than on other Gulf Islands and that additional research needs to be undertaken.

3.2.3 Groundwater in Sediments

Water availability in surficial sediments is irregular and unreliable. There has been very little success developing wells with substantial capacity from surficial aquifers located in floodplain or alluvial fan sediments on Bowen (Cowan Point Study, 1999). In fact, Halsted (1967b) notes that surficial sediments are generally thin (less than 18 m in thickness) or absent on the Islands. Therefore, bedrock consequently is widely exposed and hence the major target for groundwater exploration.

An important and extensive **aquifer** occurs in sediments that underlie the Terminal Creek Valley in the vicinity of the Meadowbrook Garden Center (junction of Grafton and Adams Road).

3.2.4 Groundwater in Bedrock

The majority of groundwater on Bowen Island is obtained from deep bedrock wells that withdraw groundwater from randomly distributed rock fractures. However, the characteristics of the bedrock geology Bowen Island are largely unknown.



Journey notes that the bedrock framework is not at all predictable. The presence of well-defined, predictable aquifers is unlikely. An additional factor in determining water availability in bedrock is the presence of faults. The fault valley is a principal control of groundwater availability on Bowen, but once again, its characteristics are not completely known.

3.3 Vegetation

Forested land plays an important role in terms of water quality and water quantity on Bowen Island. Vegetative cover in water recharge areas controls the rate in which Rainfall, fog precipitation, and snowmelt reach the ground (Dunster, 2000). Different forms of vegetative cover provide different roles in the hydrological regime:

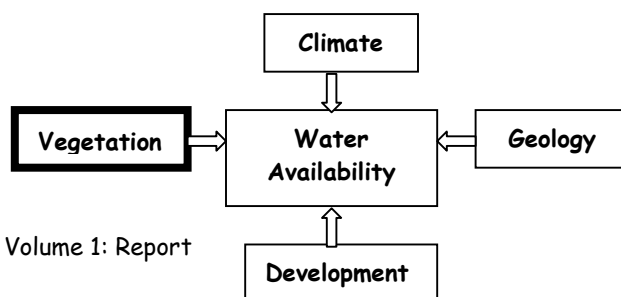


Table 3-1: Vegetation and Water Inception

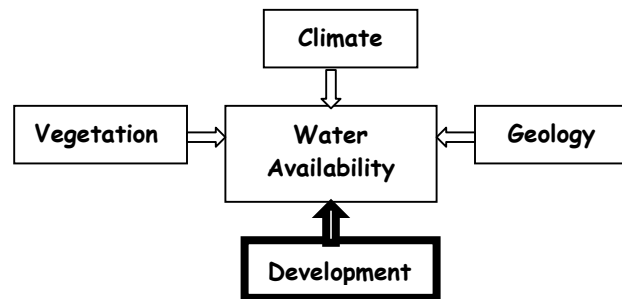
Type of Vegetation	Role it Plays in Water Interception
Trees	Foliage and branches "slow down" the impact of water.
Groundcover and roots	Groundcover further slows down impact of falling water and tree roots and groundcover knit together the soil reducing the groundwater flows and soil erosion.

Creeks form in areas where surface water flows have exceeded the capacity of the groundcover to "sponge" the water and prevent erosion. Unconsolidated rocks and soils are flushed downhill, the water cuts through the soil, and over time, well defined creek beds are formed. Vegetation also tends to even out the low and high flow periods.

What are the implications for water quantity and quality on Bowen? Under vegetative cover, the soil remains wet for longer periods of time and water has a longer time to seep into bedrock fractures. The forest holds water like a sponge, slowly releasing it into bedrock fractures that can be utilized as water sources. When vegetation is removed (for example, through logging) the sponge effect disappears, erosion increases, and water penetration into bedrock fractures diminish. Additionally, vegetative cover acts as a filter, having significant implications for water quality and temperature.

3.4 Development

Development on Bowen Island is constrained by natural factors such as climate (precipitation), vegetation, and geology. Additionally, the pressure that current development imposes on natural systems is a significant barrier to population expansion on Bowen Island.



Admittedly, knowledge concerning the capacity of available water to support certain levels of development is limited. There has been no overall assessment of what human population could be supported by the water resources of Bowen Island.

The data provided in the charts sheds some light on the topic, but in general, further research is needed to assess the degree to which water availability can support development. However, based on information from previous studies, anecdotal information from Island residents, and interviews with the managers of the various water districts, two important conclusions can be reached:

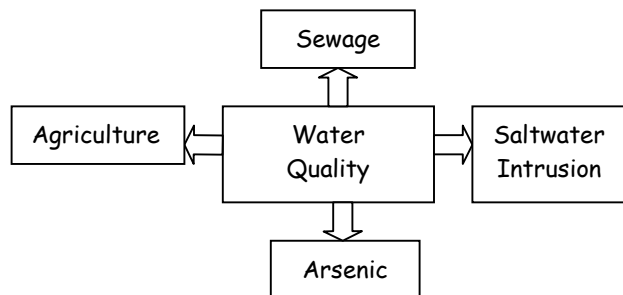
1. Many regions on the Island experience, to varying degrees, water shortages in the summer as population levels rise, water demand increases, and precipitation levels fall.
2. The amount of water allocated by different licenses is not an accurate reflection of the water that is available from various sources.

The Cowan Point Land Report (1999) provides some insight into the relationship between development and water use. In the GVRD, residential water demand ranges between 650 to 750 liters per capita per day (l/c/d). Based on their research, the Cowan Point study concluded that an average domestic demand of 724 l/c/d, or 1882 liters / lot was an appropriate measure of average annual domestic demand on Bowen Island (assuming an average of 2.6 persons per average household). The BC Ministry of Environment, Lands, and Parks uses a rate of 500 lgal (2273 litres) per dwelling unit for the purposes of calculating water licenses. In many regions on Bowen Island, it makes sense to infer that the water use allocated by various licenses overshoots the reality of available water.

3.5 Issues in Water Quality

Water is the lifeblood of the environment, essential to the survival of all living things – plant, animal and human – and we must do everything possible to maintain its quality for today and the future. Environment Canada (2000)

As discussed earlier, there are several challenges and constraints related to water availability on Bowen Island. These challenges affect the quality of life for people living on the Island and affect the potential for future development. Just as water quantity issues affect life on Bowen, so do water quality issues. This section will outline key issues related to water quality and will discuss the implications for human settlement. Once again, it should be recognized that water quality issues are all inter-related and co-dependent.



North Shore Health tests the water in various water districts every two weeks. In general, they report that the water quality is very good, although arsenic levels are sometime relatively high. Additionally, they note that boil orders are infrequent, with only one being issued in the past year.

3.5.1 Arsenic

Some Bowen groundwater in bedrock is naturally contaminated with arsenic and constitutes a health hazard. Water wells that supply much of the Queen Charlotte Heights area contain elevated arsenic levels and the water has been condemned for household use. Elevated arsenic levels in well water occur elsewhere on the Island.

3.5.2 Agriculture

The materials used in agriculture such as fertilizer, livestock manure, and pesticides can cause water contamination when improperly stored, applied, or disposed of. Agriculture Canada notes that "high concentrations of organic matter, phosphorus and nitrogen in surface water can lead to its eutrophication and deoxygenation, which in turn destroy aquatic habitat and produce taste, odour and aesthetic problems. Intensive agriculture in areas of high soil permeability and high water tables may cause groundwater contamination from the percolation of chemicals and nutrients through the soil profile. There is also concern that where certain bacterial or nitrate concentrations exceed drinking water guidelines in surface or groundwater, there may be negative health effects"

http://www.agr.ca/policy/environment/eb/public_html/ebe/water.html

Based on information from Bowen Island residents, it has been demonstrated that there are agricultural activities located near important water supply areas on Bowen Island. For example, livestock operations exist on some of the land in close proximity to Grafton Lake. During extreme precipitation events, livestock waste could be washed into streams potentially affecting drinking water supplies. (Daily precipitation levels of 60mm have been recorded on Bowen Island).

3.5.3 Sewage

With the exception of a sewage system that services the Snug Cove area, every home on Bowen Island has its own septic field. Information regarding individual septic fields is limited. Waste water and sewage from the Snug Cove System is pumped into the Strait of Georgia via an outfall pipe at the south east end of the Island. North Shore Health reports that septic field failures do occur on the Island, but due to matters of privacy, they are unable to provide details on locations and number of failures.

Conversations with Island residents suggest that limited surficial materials, high water tables, and the prominence of bedrock can cause septic field wastewater to be near, or at times on, the surface of the land. Further research is needed to understand the relationship between wastewater, groundwater supplies and the rate of recharge in different locations on the Island.

3.5.4 Salt Water Intrusion

Interviews with the managers of the various water systems on Bowen indicate that salt-water intrusion, at present, is not an issue on Bowen Island. However, as groundwater reserves continue to be utilized, salt-water intrusion is very real. If, for example, the amount of water taken from a given

groundwater source exceeds the rate of recharge, then salt water can invade the space left by the used freshwater. Currently, water managers on the Island have no way of knowing how close they are to reaching a point where water use exceeds the rate of recharge. Unfortunately, they will only know this point once it has been reached and salt-water intrusion becomes a reality.

3.6 Bowen Island Water – From the Island to the People

Freshwater is accessed via several methods on Bowen Island:

1. Through water districts with different technologies and various levels of sophistication,
2. Deep wells,
3. Registered water licenses in streams and lakes, and
4. Non-registered surface water intake systems.

The relationship between these methods for accessing water is summarized in the following diagram.

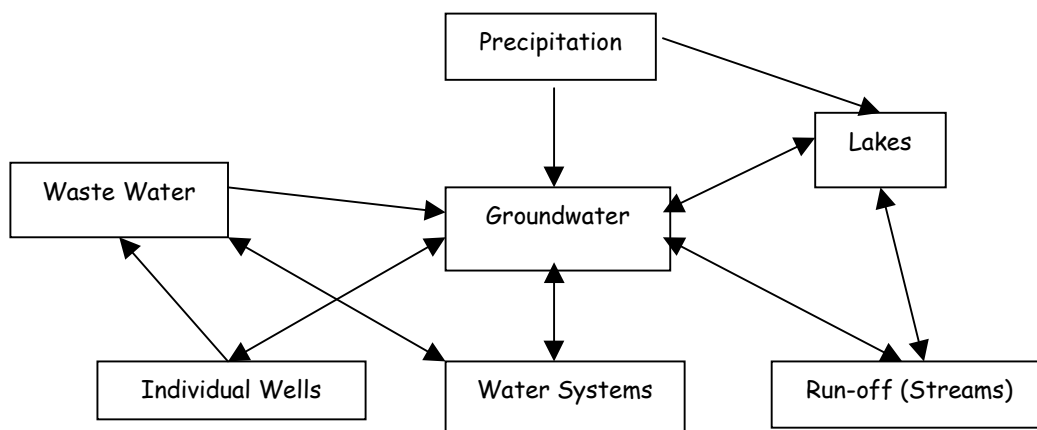


Figure 3-2: Water Sources and Access

3.6.1 Water Districts on Bowen Island

A water system, or water works, is defined by the Ministry of Municipal Affairs as “a water supply and distribution system for two or more service receivers.” Currently, there are 14 water districts on Bowen Island. Their characteristics vary dramatically and are outlined below. The information provided in this table comes from interviews with the respective managers of the water system. In some cases, information was not available at the time of publishing. Any input or information from Bowen Island citizens would be very useful. In the case of Cove Bay and Cowan Point Water Systems, information was summarized from the district’s respective water studies. For a more detailed analysis of Cove Bay and Cowan Point, one should refer to the studies.

Table 3-2: Water District Descriptions

Name and Location	Characteristics	Quantity	Quality	Rate of Recharge	Issues
Bluewater Doug Sinkenson	<ul style="list-style-type: none"> • Fed by two creeks - Eddie and Beyer • Gravity fed system • In the winter, water is fed right into Hunter Reservoir (1 million gallons), in the summer it is diverted directly to a chlorination tank (19 thousand imperial gallons). • 3 additional wells used from July to September (about 250 feet in depth) • 135 homes on the system 	<ul style="list-style-type: none"> • Hunter Reservoir is 1 million gallons • Tank is 19 thousand imperial gallons. • Yearly average of 17000 gallons per day used. Can be as high as 22000 gallons in the summer. • The water they use is under the amount stipulated by the license. 	<ul style="list-style-type: none"> • All testing done by North Shore Health - no problems or issues. 	<ul style="list-style-type: none"> • The whole tank can be recharged overnight. • There is new water in the system every 24 hours. • With wells they can keep up. 	<ul style="list-style-type: none"> • In the summer, creeks are run just about dry - they get only nine gallons per minute, which is not enough
Bluff Creek Water Users Harold Petty	Information not available				

Name and Location	Characteristics	Quantity	Quality	Rate of Recharge	Issues
Bowen Bay Holdings Bob Johnson	<ul style="list-style-type: none"> Property held by the group is 100 acres. Bowen Bay Road separates the property. 20 acres of the property is on the waterfront and 80 acres is on the back. The deep well is on the waterfront side. The well is 360 feet deep - accesses the aquifer, but they have no idea of the location or actual extent of the aquifer. The water is not metered because they have never run out of water and they do not sell the water so there is no rationale in monitoring. 	<ul style="list-style-type: none"> Currently, there are 12 users on the water system, however, the water is not metered, so there is no idea of how much water is used. If the well ran all day it would handle 20 homes at current usage rates. 	<ul style="list-style-type: none"> No problems . Since 1979, there has been no change in water quality results. Coliform counted every two weeks and they have an annual chemical analysis. 	<ul style="list-style-type: none"> Rate of recharge in the well is between seven to ten gallons per minute. 	<ul style="list-style-type: none"> Water use changes because half of the people living here only live here in the summer. Houses are 60-70 feet above sea level, and the well is 260 feet below sea level, on the downside of Mt. Gardner. They know where they can access the aquifer - there is no problem getting water.

Name and Location	Characteristics	Quantity	Quality	Rate of Recharge	Issues
Bowen Bay David Yaeger	<ul style="list-style-type: none"> • There is a reservoir and two wells for the system. • There are 56 users or property owners on the system. • The reservoir is fed by Malkin Creek. • The wells are 200 - 300 feet deep, drilled into bedrock. • The system runs off of the reservoir in the winter and the wells in the summer because the water gets very swampy in the summer. • The reservoir holds approximately 500 thousand imperial gallons. • The system is gravity fed. 	<ul style="list-style-type: none"> • On average, the system uses 5 to 8 thousand gallons of water per day in the winter. • In the summer, they use 14 to 17 thousand gallons per day. 	<ul style="list-style-type: none"> • The water is tested every two weeks by North Shore Health, and more extensively every year. • No problems with saltwater intrusion with present system. • Switch to the wells in the summer (direct feed) 	<ul style="list-style-type: none"> • In the winter, the reservoir never empties and the level is always high. • In the summer, the reservoir will drop one or two feet during a dry spell. • In the fall, if the reservoir is completely drained, it takes, at the most, one week to fill it up completely. 	<ul style="list-style-type: none"> • Wells are in bedrock - concern if there was an earthquake. • If 640 acres behind the region was developed, they would have to move the reservoir to a higher location and develop a sand filtration system. • Very self-sufficient group of people that run the water board.

Name and Location	Characteristics	Quantity	Quality	Rate of Recharge	Issues
Cove Bay Water System Sandi Laudrum <i>Refer to Cove Bay Water System Long Range Plan!</i>	<ul style="list-style-type: none"> The water source is Grafton Lake, artificially raised by a storage dam that consists of an earth fill berm with that is 35m in length, 4m wide, and 2m high. A beaver screen keeps beavers from blocking the pipe. In the 1980s a chlorination station and metering facility were built in the vicinity of the lake. Refer to Figure 2-1 in Planning Document. The system serves Snug Cove, and extensions have been made to service the Scarborough area, Millers Landing, and Queen Charlotte Heights. The Cove Bay Water System Long Range Plan should be referred to for further information. 	<ul style="list-style-type: none"> In 1996, total volume of water used was 45 million gallons. 1995 - 42 million gallons. 1994 - 36 million gallons. 1993 - 43 million gallons. In 1996, litres per service connection per day (lpscpd) was measured at 1487. 1995 - 1391 lpscpd. 1994 - 1246 lpscpd. 1993 - 1518 lpscpd. 	<ul style="list-style-type: none"> Treatment is by disinfection by chlorination The treatment facility is located 550m from the intake. 	<ul style="list-style-type: none"> Refer to study. 	<ul style="list-style-type: none"> Refer to study.

Name and Location	Characteristics	Quantity	Quality	Rate of Recharge	Issues
Cowan Point Dan Grimal - was referred to the Cowan Point study	<ul style="list-style-type: none"> For further information, refer to Cowan Points Land Study (available online). Water sources include Josephine Lake, flow augmentation from upper Josephine Creek tributary, Lower Josephine Creek, Lee and No-name creeks, and potential groundwater - for future development. Water is pumped from Josephine Lake from the south end of the lake and put into a reservoir at the top of the hill. The system is gravity fed. 	<ul style="list-style-type: none"> The maximum quantity of water that may be stored in the reservoir is 29.6 ha-m per year. The maximum quantity of water that may be diverted for waterworks purposes is 30,122,500 imperial gallons (13.6 ha-m) per year. The proposed development would increase water demand to 28.3 ha-m/year without water metering and 23.1 ha-m / year with water metering. These numbers are estimates based on the study by Kerr Wood Leidal Associates Ltd. Currently, 3.7 ha-m per year is the average annual demand from all existing water licenses. 	<ul style="list-style-type: none"> Do their own in house testing once a month and there are no problems . Water quality is good and meets Health Canada's standards. 	<ul style="list-style-type: none"> Refer to study. 	<ul style="list-style-type: none"> See Cowan Point water study for pressures and issues associated with new development. New development would rely on assumptions that there are significant groundwater supplies and that water conservation measures would be adhered to.

Name and Location	Characteristics	Quantity	Quality	Rate of Recharge	Issues
Eaglecliff Improvement District Don Carrol	Information not available				
Fairweather Point Strata Corporation Alan Morse	<ul style="list-style-type: none"> • System installed in 1980 • Water is gravity fed from of Josephine Creek and is piped over to the water tank. • There, it is treated and chlorinated and distributed to 18 households via a series of pipes. 	<ul style="list-style-type: none"> • Use 2.8 million US gallons per year, and the license is for 3.2 million US gallons per year. 	<ul style="list-style-type: none"> • The quality of the water is good, no change in the last five years and no change in usage. 	<ul style="list-style-type: none"> • Unknown. There is a constant flow from the dam to the tank. 	<ul style="list-style-type: none"> • There is always water going down the creek. As far as he knows, there is no problems with the water availability
Honeymoon Creek Water Users Association Barry Adams	Information not available				
Hood Point Improvement District R. Smith	<ul style="list-style-type: none"> ▪ Water is taken from Honeymoon Lake and piped down to Hood Point. ▪ The system is gravity fed. ▪ At the first reservoir there is a chlorinator and a sand filter that can clean 50 gallons of water per minute. ▪ The water is then piped back up the hill to a 60,000 gallon tank, then gravity fed to approximately 81 houses or service connections. 	<ul style="list-style-type: none"> ▪ Generally unknown, but the summer and winter populations vary dramatically. In the winter, there are only households that use the water. ▪ The 60,000 gallon tank is always full. 	<ul style="list-style-type: none"> ▪ North Shore Health tests the water every two weeks. ▪ This year, they had to issue a boil order because the system failed and the water was not properly chlorinated. 	<ul style="list-style-type: none"> ▪ 50 gallons / minute. ▪ The 60,000 gallon reservoir is always full. 	<ul style="list-style-type: none"> ▪ They are undertaking a major upgrade in the system, sinking their pipes to five feet below the ground instead of the pipes that previously were positioned on the surface.

Name and Location	Characteristics	Quantity	Quality	Rate of Recharge	Issues
Mt. Gardner Water Users Group Ken Shaw	Information not available				
Rock Moyne Water Users Association George Welsh	<ul style="list-style-type: none"> ▪ There are three open ponds that feed into one pond, approximately 1000 feet above Rock Moyne. ▪ The ponds were dug out to approximately eight feet and are artesian. ▪ One small creek flows into one of the ponds. ▪ There are ten houses on the system. ▪ The water is gravity fed down the hill via four-inch pipes, to two-inch pipes further down, and to quarter inch pipes at the bottom. ▪ Each house has its own filtration system and UV lights. 	<ul style="list-style-type: none"> ▪ The quantity used is unknown. The water level in the pond goes down about eighteen inches in the summer. 	<ul style="list-style-type: none"> ▪ Quality is tested by North Shore Health. ▪ In the beginning, they had some quality issues - the pond was not fenced and fecal matter from animals got into the water. 	<ul style="list-style-type: none"> ▪ The level of the ponds is always at the top from October to the end of July. However, in August and September the level of the pond falls about eighteen inches. 	<ul style="list-style-type: none"> ▪ This year, they put control valves in the system in order to close the system when work needs to be done. ▪ Users are generally happy with the system and involved in the maintenance and upkeep.
Sealeigh Park Water Society Harro Wegner	Information not available				

Name and Location	Characteristics	Quantity	Quality	Rate of Recharge	Issues
Tunstall Bay Improvement Association Gerry Sear	<ul style="list-style-type: none"> • There are just over 100 users in this district. • Six wells in total, but they do not all operate at the same time. • Deep well system, no surface water. • Wells are up to 200 feet deep, into fractured bedrock (controlled fractures). • 2 reservoirs at the top of the hill - hold 75 thousand imperial gallons. • Water goes from wells to tanks to homes via series of pipes. 	<ul style="list-style-type: none"> • They can run short of water in late summer. • Users have learned to conserve. • Meter their water and daily use rates range from 15000 to 25000 gallons per day. 	<ul style="list-style-type: none"> • Quality is good. • Tested every two weeks and a more in depth test twice a year. 	<ul style="list-style-type: none"> • They never use all six wells. • With three wells running 50% of the time, they can recharge the 15 to 25 thousand gallons in twenty-four hours. 	<ul style="list-style-type: none"> • Concerned that new development might eat into their water source causing shortages.

3.6.2 Deep Wells

Most domestic and community water supplies on Bowen Island come from deep wells drilled into bedrock that withdraw water from randomly distributed rock fractures (Cowan Point Study, 1999). Presently, data on the location of deep wells on Bowen Island is only available to 1993. This data is derived from the Ground Water Section of the Water Management Branch. Currently, there is no legal requirement for water wells drilled in British Columbia to be registered with the government. When a deep well is drilled, the driller writes up a "driller's log." One log is given to the property owner and another is kept by the driller. This log may be submitted, on a voluntary basis, to the Water Management Branch of the Ministry of Environment, Lands, and Parks. Up to date well logs have been requested by members of the Bowen Island Forest and Water Management Society (BIFWMS), but the information has not been provided. Nevertheless, it has been suggested that since 1993 approximately twenty new wells have been drilled.

As of 1993, 215 individual deep wells were recorded on Bowen Island, (separate from wells in the various water districts). Geological information associated with the wells was gathered for 110 of those wells. The location of the wells is demonstrated on the Map 3. While this data set is incomplete, the location of wells may allude to the location of groundwater resources.

3.6.3 Registered Water License

A registered water license is a legal document that allows a property owner to use an allocated amount of water from a **creek, spring, or lake**. See Map 12 (Water Districts and Location of Water Intake) for the location of water licenses and Map 4 for the location and extent of surficial water. Currently, there are 471 water licenses on Bowen Island, allowing for 4,228,364 Galons per day on average, although some licences are not calculated per day². The ability for streams, creeks, and lakes to provide adequate water supplies to Island residents given present and future levels of development is unknown. Relevant and important research has been undertaken for the Cove Bay and proposed Cowan Point Lands. Below, the research results are summarized in terms of how water licenses relate to development.

3.6.3.1 Examples: Cove Bay and Cowan Point

Two water districts that utilize water licenses as part of their water provision schemes are Cowan Point and Cove Bay. These areas are useful for exemplifying the pressures that water systems, through registered water licenses, can exert on the aquatic resources of Bowen.

The Cove Bay Water System Long Range Plan (1997) notes that "the present Grafton Lake storage capacity of 222,000 m³ is capable of supplying about 300 service connections at Cove Bay Water System's present rate and pattern of water demand under a 1:10 estimated summer inflow volume and conservative rainfall distribution pattern" (p4-16). However, development beyond this point would not be possible given the constraints afforded by a lack of water provided by Grafton Lake. Indeed, water availability is a key constraint to growth and development on Bowen!

The Cowan Points development is not going ahead as originally proposed, but extensive study of the area was undertaken. Based on the *Cowan Point Lands Report*, the maximum quantity of water that can be diverted for waterworks purposes is 30,112,550 imperial gallons (13.6 ha-m) per year as per Conditional Water License C102210 (1989). However, based on research that considers precipitation levels, runoff, evaporation, and evapotranspiration the report estimates that the sustainable long-term yield of Josephine Lake is 10.5 ha-m per year. By considering factors that contribute to lake levels and water availability, it becomes apparent that development needs to recognize the biophysical limits of water use and water licenses need to reflect this reality.

The point of introducing these facts is to illustrate that there are limits to the amount of water that the lakes can produce given normal biophysical constraints. Additionally, in many cases, managers of water systems have noted that in the summer, creeks run dry, the bedrock regime for deep well drilling is relatively unknown, and that shallow wells in surficial deposits are unreliable.

² For more information on water licenses please contact the Bowen Island Forest & Water Management Society at 947-0016.

3.6.4 Non - Registered Surface Water Intakes

Another source of fresh water on Bowen Island comes from non-registered surface water intakes. In 1993, the Bowen Island Forest and Water Management Society (BIFWMS) initiated an informal survey that sought to “discover” the number of non-registered water intakes on the Island. In total, sixty-one of these intakes were found to be in operation, but their discovery was based on volunteer reporting. The volume of water produced is not known. As a result, the data are incomplete. A non-registered surface water intake is any system dug to the water table to access groundwater. This system is not necessarily licensed by the Groundwater Management Division and these systems have no legal protection.

3.7 Indicators

Indicator: **Number of boil orders**



What does this indicator tell us?

This indicator tells us the number of times that the water on Bowen Island, in different areas, is unfit for human consumption.

Where do the data come from?

Northshore Health

Indicator: **Per capita water use within water districts**



What does this indicator tell us?

How much water is used by the people of Bowen Island? You can modify this indicator to consider specific water districts. Additionally, by dividing by the number of people in the district (or households) one can ascertain per capita water use.

Where do the data come from?

Various water districts on Bowen Island keep track of their water use. The ability to monitor water use could be considered a priority for the various water suppliers who do not monitor water use as development increases.

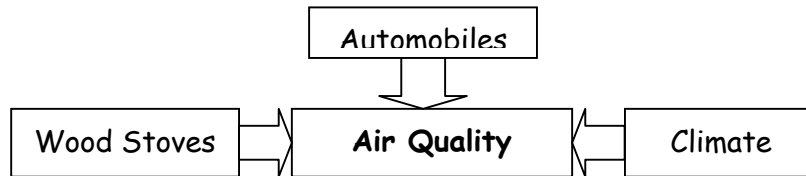
4.0 Air

Why should we care about air quality?

"There is a strong link between air pollution and health problems, especially for the elderly, children, and for those who suffer from respiratory and cardiac problems. Research demonstrates that air pollution can lead to premature death, increased hospital admissions, more emergency room visits and higher rates of absenteeism"

(Website: www.mb.ec.gc.ca/index.en.html Environment Canada).

Reducing emission levels to acceptable standards for all pollutants throughout the year in the Greater Vancouver Regional District, including Bowen Island, would save a significant amount of dollars in direct health care costs. Lowering emissions would reduce the incidence of colds, headaches, coughing, asthma attacks, sore throats and eye irritation that are the short-term effects of air pollution. It would also help reduce the time and productivity lost from work due to these symptoms.



Inter-related air quality issues on Bowen Island.

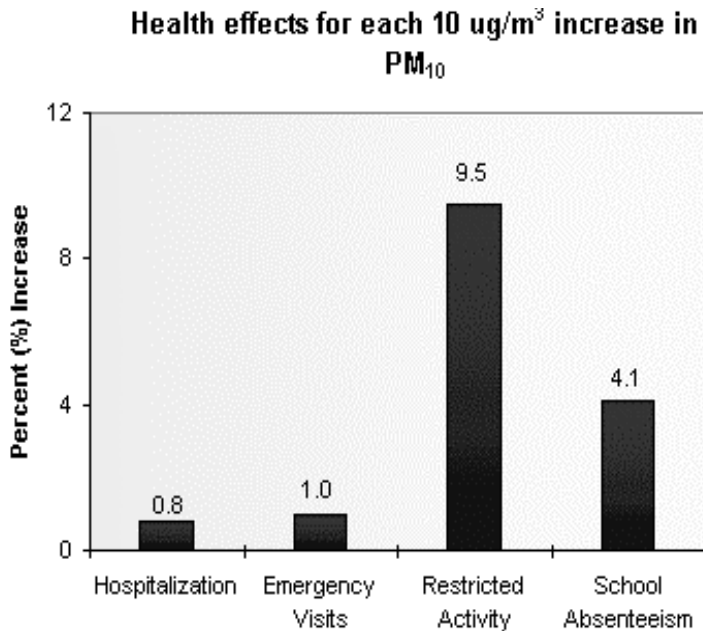
There are numerous studies in Canada and the United States that indicate a direct relationship between air pollution and the amount of illness in a population. These studies have shown that children in polluted cities suffer more colds and respiratory infections than their counterparts in cities where the air is cleaner.

The benefits of clean air to health, the environment and the economy are substantial. The economic savings and increased quality of life that comes with cleaner air are significant but hard to quantify. Nevertheless, these benefits are well worth the effort.

4.1 Air Quality and Your Health

Smog is made up of a mixture of pollutants in the atmosphere. Two of the primary pollutants that make up smog are ground-level ozone and fine airborne particles called particulate matter (PM). On

Figure 4-1: Health Effects of Increased Particulate matter in the Air



Bowen, these pollutants come primarily from cars and wood burning stoves. The more smog you breathe in, the more likely you are to experience adverse health effects. Sensitive people may experience symptoms after only one or two hours outdoors.

The people most at risk from smog are elderly people, those with heart or lung disease as well as children, because they breathe faster and spend more active time outdoors. Even healthy young adults breathe less efficiently on days when the air is heavily polluted.

In 1995, a UBC researcher estimated that increases in fine particle pollution cause 82 premature deaths in BC every year, 146 hospitalizations due to asthma, lung and heart disorders and 354 extra emergency room visits for asthma, chronic bronchitis or emphysema (Vedal, 1995). For each 10ug/m³ increase in PM₁₀ (fine particulate matter) there is an estimated 0.8% increase in hospitalizations, a 1.0 %

increase in emergency room visits, a 9.5% increase in days of restricted activity and a 4.1% increase in school absenteeism due to respiratory symptoms.

Ground-level ozone affects the body's respiratory system and causes inflammation of the airways that can persist for up to 18 hours after exposure ceases. It can cause coughing, wheezing and chest tightness. It can also aggravate existing heart and lung conditions. There is evidence that exposure heightens the sensitivity of asthmatics to allergens.

Of greatest health concern are very fine particles that can penetrate deeply into the lungs and interfere with the functioning of the respiratory system. These fine particles have been linked to increases in asthma symptoms, hospital admissions and even premature mortality.

4.2 Is Reduced Air Quality An Issue on Bowen Island?

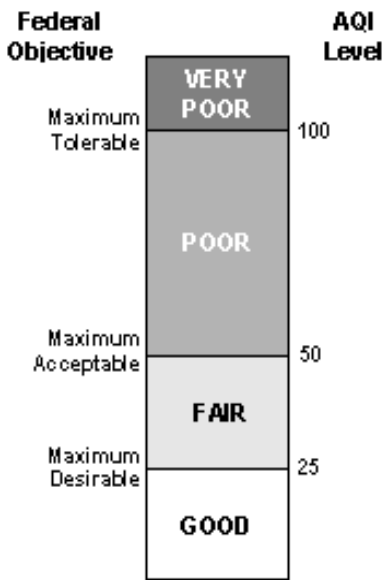
The answer is yes. While Bowen Island is blessed with relatively clean air, there are areas of localized concern. Ken Stubbs, air quality manager with the GVRD, identifies the major air pollution issues on Bowen Island as being automobiles and wood stoves. He further specifies the need for air quality testing on Bowen Island (personal communication, August 24, 2000).

❖ *Key Information Gap: Air Quality Testing Data- no testing has been undertaken*

4.2.1 Features of Air Quality Testing

One feature of the testing in the GVRD is the federal Canadian Environmental Protection Act, which provides for three levels of air quality objectives: Desirable, Acceptable and Tolerable. The objectives are based on the following definitions.

Figure 4-2: Air Quality Index



Maximum Desirable: defines the long-term goal for air quality and provides a basis for an anti-degradation policy for the country and for the continuing development of control technology.

Maximum Acceptable: is intended to provide adequate protection against effects on soil, water, vegetation, material, animals, visibility, and personal comfort and well-being.

Maximum Tolerable: denotes time-based concentrations of air contaminants beyond which, due to a diminishing margin of safety, appropriate action is required without delay to protect the health of the general population.

The Air Quality Index is available by dialing **436-6767** or **1-800-665-1118**. It is also published daily in the Vancouver Sun and Province.

4.2.2 What are the Key Factors Influencing Air Quality on Bowen Island?

- Wood Burning Stoves
- Climate
- Automobiles

4.2.2.1 Wood Burning Stoves

When combustion is not efficient (due to damp wood, poor stove design, insufficient air supply) the burning of wood can have negative impacts on both indoor and outdoor air quality. Smoldering fires that produce a plume of blue-gray smoke from the chimney are the main cause of wood related air pollution. The problem is most pronounced in the older, more densely populated neighborhoods where wood burning stoves are the main source of winter heat. Local topography and wind conditions, as well as whether the users incinerate garbage, influence how severe smoke pollution can be in a particular area. **Wood smoke can be harmful when it is inhaled!**

The following substances and their associated health problems are listed below:

Harmful Gases In Wood Burning Stoves:

- *Acrolein* - irritation of the eyes and respiratory tract.
- *Formaldehyde* - headaches, respiratory tract irritation. Probably carcinogenic.
- *Carbon Monoxide* - angina in people with heart disease, lethal at high concentrations.
- *Nitrogen Oxides (NOx)* - bronchial congestion, fluid congestion and fibrotic changes in the lungs.
- *Volatile Organic Compounds (VOCs)* - respiratory irritation and illness; some VOCs (e.g. benzene) are carcinogenic.
- *Dioxins and Furans* - probably carcinogenic.

Harmful Particulates in Wood Burning Stoves:

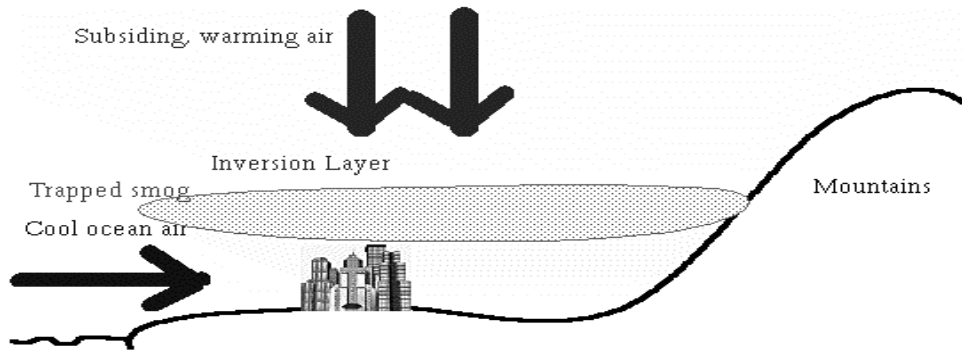
- *Fine Particulate Matter* - increased respiratory illness, cardiovascular stress, aggravation of asthma and other lung diseases, and early mortality.
- *Polycyclic Aromatic Hydrocarbons (PAHs)* - prolonged exposure is believed to pose a cancer risk.

The issues associated with wood stoves are compounded by the climatic regime of Bowen Island, that frequently experiences inversions that "trap" air in the lower part of the atmosphere, making the air noticeably smoky.

4.2.2.2 Climate

Temperature inversions, in which a layer of cold air is trapped next to the ground by a higher layer of warm air, are common on Bowen Island. Inversions limit ventilation of the area by forming a "lid" over the air basin. Poor ventilation can lead to a situation where successive days of motor vehicle emissions accompanied with smoke from burning wood accumulate. Air quality becomes worse as the

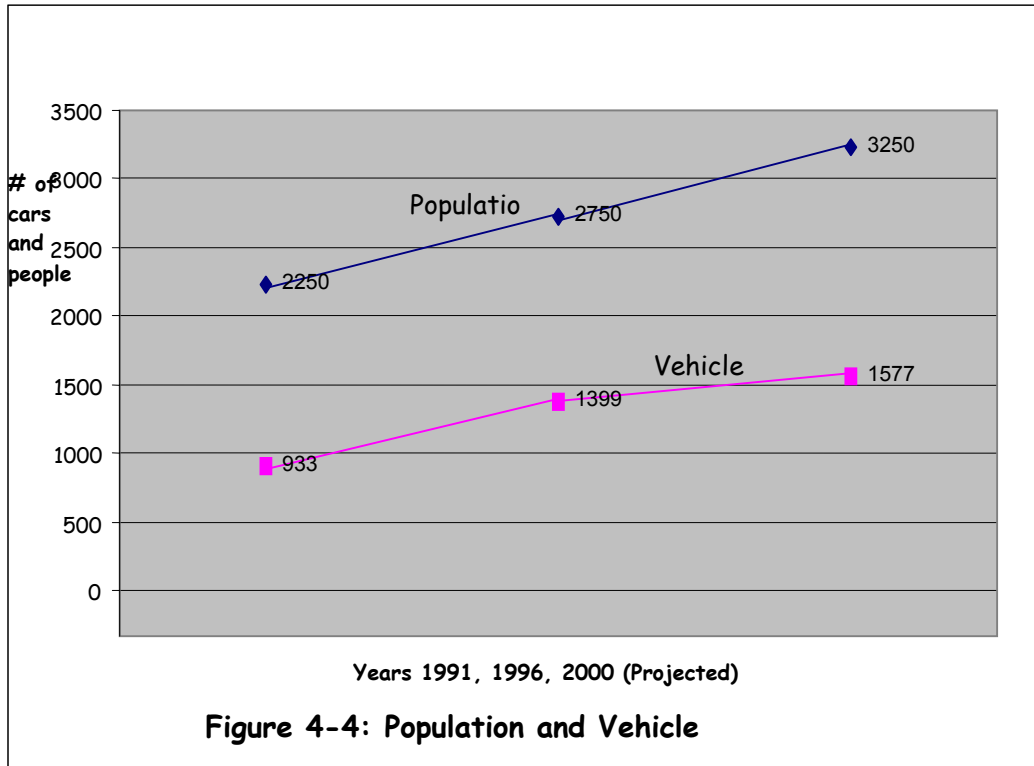
Figure 4-3: A Temperature Inversion



atmosphere is unable to cleanse itself, resulting in higher pollution levels. Both vehicle emissions and the smoke from wood burning stoves can envelop the different areas on Bowen Island. Automobile emissions, especially in Snug Cove, are another important air quality issue.

4.2.2.3 Automobile Emissions

Ken Stubbs, air quality manager with the GVRD, suggests that one of the most pressing issues with respect to air quality on Bowen Island is vehicle emissions in the Snug Cove area. In 2000, there were 226,000 vehicles that came and went from Bowen Island, using the ferry and passing through Snug Cove. The localized accumulation of cars in the Snug Cove area is a considerable source of air pollution. In many cases, people waiting in the ferry line leave their cars running, further adding to unnecessary air pollution. While trip distance and cars usage on the island is minimized by the island's geographic restrictions, the Snug Cove area is a significant source of pollution. Testing would allow Bowen Island to determine the exact impact of automobile emissions on the air quality in Snug Cove.



There is a positive relationship between population growth and vehicle growth rates on Bowen Island. As the population gets larger, the number of cars grows, bringing associated issues in air quality. It is interesting to note that it is estimated that 200 trees are needed to absorb the average annual emissions of carbon dioxide (CO₂) from a typical family car.

What comes out of my car's tail pipe?

The following harmful emissions come from cars and pollute the air we depend on. We may not see them, but they are there!

Carbon monoxide (CO)

A colorless, odorless and tasteless gas released primarily by incomplete combustion of fossil fuels (mainly cars). In low doses, CO impairs reflexes and perception. In very high concentrations, it can cause unconsciousness and death.

Volatile Organic Compounds (VOCs)

Organic gases such as propane and benzene. Also found in the vapors of substances such as gasoline, numerous solvents and oil-based paint.

Nitrogen Oxides (NO_x)

A group of gases released by the combustion of fossil fuels and natural sources such as forest fires, lightning and decaying vegetation. Nitrogen dioxide (NO₂), a reddish-brown gas with an irritating odor, is one of the key ingredients in smog.

Sulfur Oxides (SO_x)

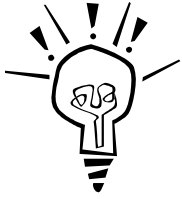
A group of gases released by the combustion of fossil fuels containing sulfur and natural sources such as volcanoes. Sulfur dioxide (SO₂), a colorless gas with a pungent odor, irritates the upper respiratory tract in humans, and leads to acid rain.

Particulate Matter

Anything that can be filtered from the air (e.g. dust, soot, ash, and pollen). Large particles, such as road dust or pollen, can irritate the eyes, nose and throat.

Motor vehicles (and many industrial sources) produce all five of these pollutants. In 1998, mobile sources accounted for about 79% of the total emissions of all five pollutants. Over 62% came from light-duty vehicle exhaust (cars and small trucks); three per cent comes from heavy-duty vehicle exhaust (large trucks); and about fourteen per cent comes from other forms of transportation such as ships, railways, aircraft and off-road equipment. This means that the major polluter of our air in the GVRD (including Bowen Island) is the private automobile.

4.3 Indicators



Indicator: **Air quality rating on Bowen Island**

What does this indicator tell us?

This indicator tells us about air quality how many potentially harmful substances are in the air on Bowen Island.

Where do the data come from?

Presently, there is no air quality testing done on Bowen. This is a serious and important information gap. The GVRD provides air quality testing for other communities within the regional district.



Indicator: **Number of cases of asthma on Bowen Island**

What does this indicator tell us?

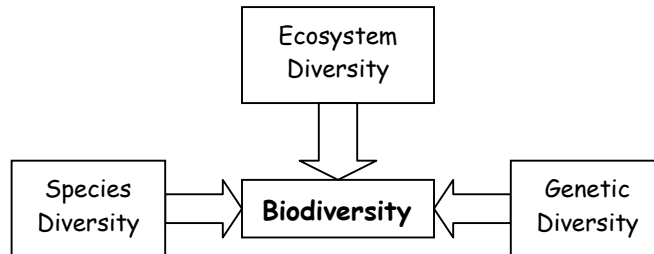
Air quality directly affects health. The number of cases of asthma will increase as air quality decreases.

Where do the data come from? Not currently available for Bowen Island.

5.0 Natural Diversity

5.1 What is biodiversity?

Biodiversity - according to the World Conservation Union is the variety of life in all its forms, levels, and combinations. It includes ecosystem diversity, species diversity, and genetic diversity.



5.1.1 Why is biodiversity important?

- People are not entities separate from nature, instead, we are part of a sphere of natural processes that provides requirements for life, waste absorption capacity, and life support services (Rees and Wackernagel, 1996).
- As will be explained in more detail in this section, more biodiversity = greater ecosystem health, species health, and genetic health.
- Since people are part of nature, more biodiversity = greater human health.

5.1.2 Thinking About Biodiversity

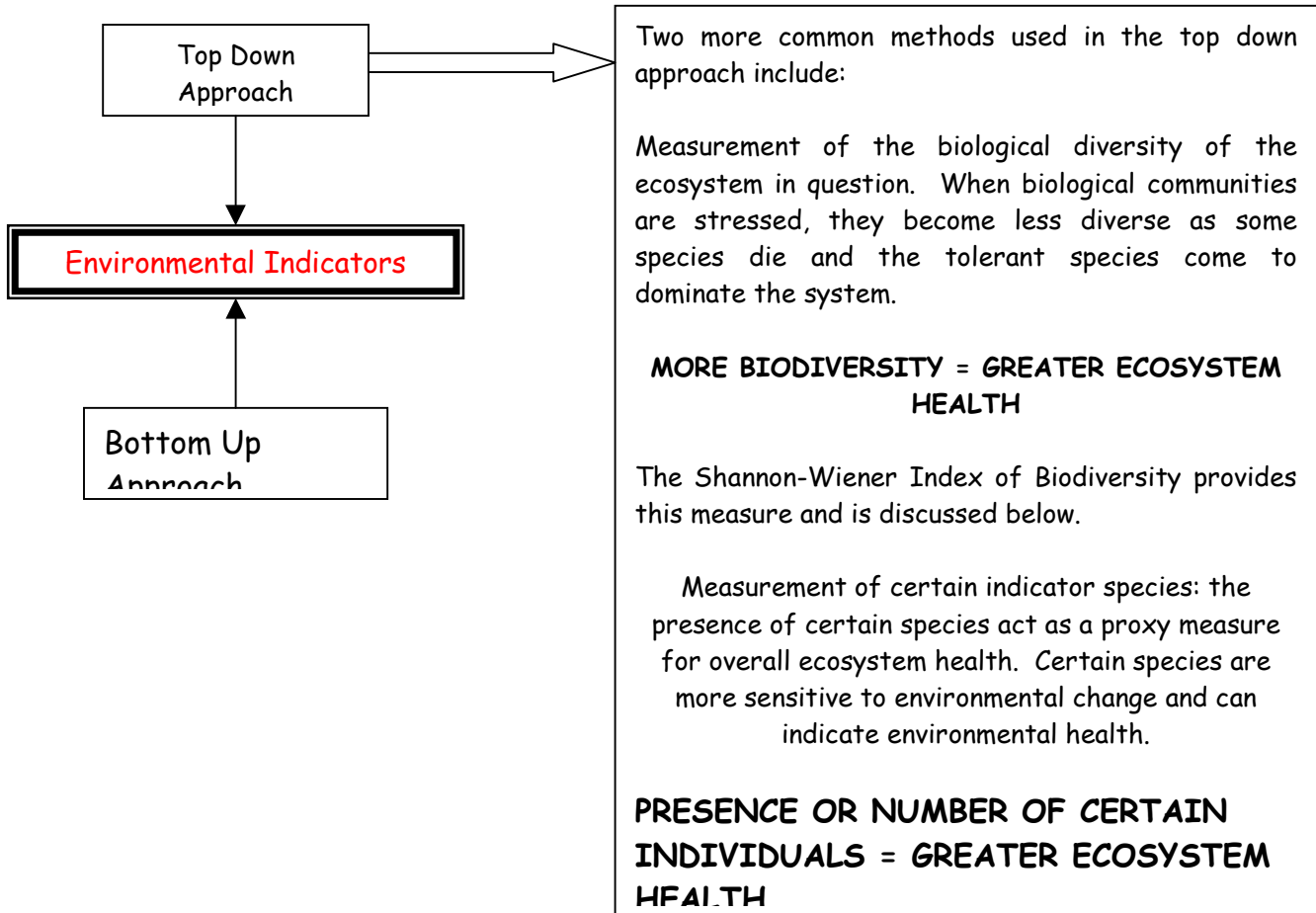
Biodiversity, in essence is a measure of environmental health.

There are two ways that people can approach the measure of biodiversity:

1. *Bottom-up Approaches:* Bottom-up approaches involve using the results of controlled studies to model potential changes in the ecosystem.
2. *Top-down Approaches:* Top-down approaches involve looking at "what exists" in the environment and using this information to recognize and diagnose problems. This will be the approach of this report.

This project is a State of Bowen Island Report. As such, the Report utilizes a top down approach to describe what exists on Bowen Island. A further description of top-down approaches follows, including a description of some of the limitations of the approach.

Figure 5-1: Top-Down and Bottom-Up Approaches to Measuring Biodiversity



Measuring Biological Diversity - The Shannon - Wiener Index (H) of Biodiversity

$$H = - \sum(p_i) (\log_2 p_i)$$

Where

Σ = sum of

S = number of species

p_i = the proportion of total sample belonging to the i th species

$p_i = n_i / N$, where n_i is the number of individuals in species i and N is the total sample size

\log_2 = logarithm to the base 2

The higher the value of H , then the greater the biodiversity of the sample.

The Shannon-Wiener index (H) illustrated above is a technical measure for considering biodiversity. In the index, the higher the value of the H value, the higher the biodiversity of the sample. This index is useful theoretically and conceptually in that it simplifies complexity into a value that readily allows comparison between regions (Bell and Morse, 1999). However, the index has many practical challenges in terms of its application. Bell and Morse (1999) summarize these challenges as follows:

- The index can be used only when the total number of species in the ecosystem is known. Realistically speaking, on Bowen Island, the total number of all species is not known. For example, in October 2000, an exploration of the fungi on Bowen Island revealed the presence of approximately 50 new species. Considerably more research is required to create an inventory of all known species on the Island. In fact, some ecologists note that determining the exact number of species on Bowen is exceedingly difficult, almost impossible.
- There is no qualitative element in the index. A shift in species composition is not considered. The index measures biodiversity without considering variations in species that compromise that biodiversity.
- The index is technical in nature.

The index does provide a useful mechanism for thinking about biodiversity within the bounded knowledge of the species that exist on Bowen Island. Considering the potential use of this index, it becomes apparent that further research is needed into the number and distribution of species on the Island. Additionally, this index could be used to consider certain defined regions on the Island, instead of the Island as a whole. To be useful, the index must be used in a comparative sense, comparing the values obtained on Bowen with those obtained elsewhere in healthy and degraded ecosystems. The index can be applied to better inventoried subsets (*e.g.* plants or birds) of all species.

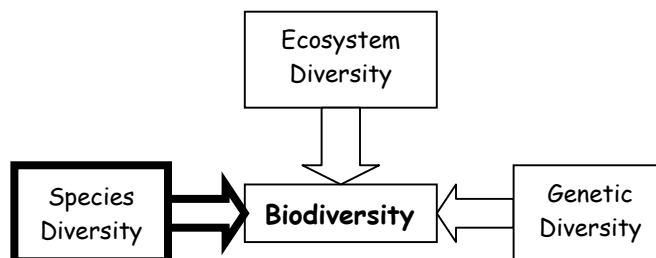
5.1.3 Biodiversity - Considering Key Indicator Species

Another way of measuring biodiversity is to consider the use of certain indicator species to illustrate how species composition reflects ecosystem health. It is important to realize that any consideration of indicator species and overall biodiversity are necessarily linked. Usually, the indicator species will be the first to be lost (or noticeably adversely affected) when a stressed system displays reduced biodiversity.

Based on the assumption that species composition reflects ecosystem health, it is useful to consider "key" indicator species that exist on Bowen Island. This report suggests that the preservation of these species is essential in maintaining the ecological integrity and biodiversity of the Island. Having introduced the concept of biodiversity and important factors related to its measurement, the section will now introduce and discuss three important "pillars" of biodiversity - species diversity, ecosystem diversity, and genetic diversity.

5.2 Species Diversity

Knowledge about the number and distribution of species on Bowen Island is limited, but ever expanding. In reality, we are a long way off from using the Shannon-Wiener Index to measure biodiversity in all regions on the Island. As a result, biodiversity, and overall environmental health can be considered by looking at what we do know - key species that can provide an indication of our environmental health.



The Crown Lands Report (Dunster and Associates, 2000) provides an excellent inventory of all known species on Bowen Island. This report, released in the Fall of 2000 is a valuable tool that planners, citizens, and scientists should refer to for an up to date and concise list of species and their habitats on the Island's Crown Lands. Some of the key findings of that report are highlighted below, listing key species on the Island whose presence, numbers, and distribution indicate, to varying degrees, our overall environmental health.

Included in the following list are several key mammal species, bird species, and plant species. These species are considered to be rare, habitat sensitive, and / or relatively significant in sensitive ecosystems on Bowen Island (see Dunster and Associates, 2000).

Table 5-1: Key Mammal, Bird and Plant Species on Bowen Island		
	"Listed" Species	Habitat Sensitive Species
Mammals	<ul style="list-style-type: none"> • Townsend's Big Eared Bat (blue listed) 	<ul style="list-style-type: none"> • Cougars
Birds	<ul style="list-style-type: none"> • Brandt's Cormorant (red-listed) • Common Murre (red-listed) • Marbled Murrelet (red listed) • Western Grebe (red-listed) • Double-crested Cormorant (blue-listed) • Great Blue Heron (blue-listed) • Surf Scooter (blue-listed) • Bald Eagle (yellow-listed) • Harlequin Duck (yellow-listed) 	<ul style="list-style-type: none"> • Anna's Hummingbird • Barred Owl • Blue Grouse • Common Raven • Cooper's Hawk • Hutton's Vireo • Merlin • Mew Gull • Northwestern Crow • Pigeon Guillemot • Pileated Woodpecker • Red Tailed Hawk • Sharp-shinned Hawk • Turkey Vultures • Varied Thrush • Warblers • Western Screech Owl
Fish		<ul style="list-style-type: none"> • Salmon and trout
Amphibians and Insects	<ul style="list-style-type: none"> • Blue dasher dragonfly (blue-listed) 	<ul style="list-style-type: none"> • Long-toed salamander • Mole salamander • Northwestern salamander • Pacific tree frog • Red-legged frog • Rough skinned newt

5.2.1 Plants (Flora)

In addition to animals (fauna), various plant species (flora) contribute to the biodiversity of Bowen Island. Like with animals, this report will list only key plant communities that are threatened or sensitive. For a detailed inventory of their location and role, refer to the recent Crown Lands Report (Dunster and Associates, 2000). Additionally, for a current inventory of plant species on Bowen, refer to the Crown Lands Report.

5.2.2 What do the different designations mean?

Red List: Includes any indigenous species or subspecies (taxa) considered to be extirpated, endangered, or threatened in British Columbia. Extirpated taxa no longer exist in the wild in British Columbia, but do occur elsewhere. Endangered taxa are facing imminent extirpation or extinction.

Blue List: Includes any indigenous species or subspecies (taxa) considered vulnerable in British Columbia. Vulnerable taxa are of special concern because of characteristics that make them particularly sensitive to human activities or natural events. Blue-listed taxa are at risk, but are not extirpated, endangered, or threatened.

Yellow List: Any indigenous species or subspecies (taxa) that is not at risk in British Columbia. The Conservation Data Center (CDC) at the British Columbia Ministry of Environment, Lands and Parks tracks some Yellow listed taxa that are vulnerable during times of seasonal concentration (e.g. breeding colonies).

5.2.3 Plant Communities

Threshold communities are natural plant communities considered rare on a provincial or national level. These plant communities are found in various environmentally sensitive areas throughout the Island.

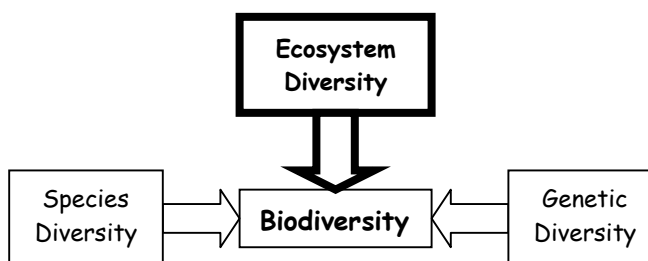
- Western Hemlock / Flat Moss - *Tsuga heterophylla* / *Plagiothecium undulatum* (red-listed),
- Douglas Fir / Shore Pine / Oceanspray / Reindeer Lichen - *Pseudotsuga menziesii* / *Pinus contorta* / *Holodiscus discolor* / *Cladina* (red-listed),
- Douglas Fir / Sword Fern - *Pseudotsuga menziesii* / *Polystichum munitum* (red-listed)
- Western Red Cedar / Salmonberry - *Thuja plicata* / *Rubus spectabilis* (red-listed)
- Western Hemlock - Douglas Fir / Oregon Beaked Moss - *Tsuga heterophylla* - *Pseudotsuga menziesii* / *Kindbergia oregana* (red-listed)
- Douglas Fir / Shore Pine / Roadside Rock Moss - *Pseudotsuga menziesii* / *Pinus Contorta* / *Rhacomitrium canescens* (red listed)
- Western Hemlock / Flat Moss - *Tsuga heterophylla* / *Plagiothecium undulatum* (red-listed)
- Sitka Spruce / Salmonberry - *Picea sitchensis* / *Rubus spectabilis* (red-listed)

5.2.4 What About Invasive Plant Species?

Dunster and Associates (2000, 88) note that another key measure of ecosystem health related to biodiversity is the “extent to which exotic invasive plant species have invaded, dispersed, and displaced the native flora within the ecosystem.” The relative lack of invasive species on Bowen Island is an excellent indication of the high quality habitat to be found on the Island. On the Island, there is the minor presence of fox glove and certain hair grasses, but native forbs, grasses, mosses, and lichens dominate. Bowen Island Crown Lands have not been invaded with invasive species such as Scotch Broom like other Islands in the Islands Trust Area.

5.3 Ecosystem Diversity

There are several key ecosystem types on Bowen Island. The more diverse the ecosystems on the Island, the greater the ecological health of the Island. Several key sensitive ecosystems on Bowen Island that are important in terms of biodiversity and ecological habitat values are identified. This report will draw from the Crown Lands Report, highlighting key characteristics of sensitive ecosystems on the Island. For a complete summary of Bowen Island ecosystems, refer to the Crown Lands Report (Dunster and Associates, 2000). Not only does the report provide an inventory of ecosystems found in the Crown Lands, but also it discusses guidelines for the sustainable management of those ecosystems.



This report will draw from the Crown Lands Report, highlighting key characteristics of sensitive ecosystems on the Island. For a complete summary of Bowen Island ecosystems, refer to the Crown Lands Report (Dunster and Associates, 2000). Not only does the report provide an inventory of ecosystems found in the Crown Lands, but also it discusses guidelines for the sustainable management of those ecosystems.

The East Vancouver Island and Gulf Island study area (refer to Dunster and Associates, 2000) describes seven sensitive ecosystem types and two ecosystem types that are important for their wildlife and habitat values. These ecosystem types are found on Bowen Island with the exception of Seasonally Flooded Agricultural Fields. Many of these ecosystem types are identified and mapped as polygons on air photos administered by the CDC. Below is a summary of the ecosystem types, taken directly from the Crown Lands Report (Dunster and Associates, 2000, 110 - 111).

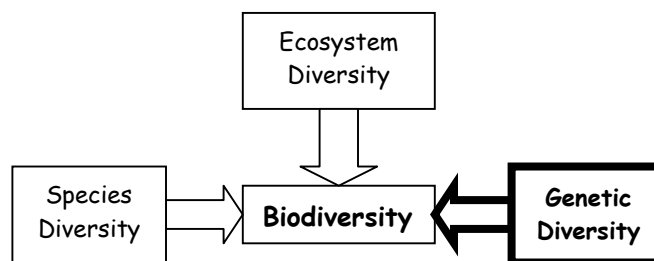
Table 5-2: Ecosystem Types on Bowen Island

Ecosystem Type	Characteristics
Coastal Bluff	Vegetated rocky islets, rocky shoreline / grassland, rocky shoreline / moss or coastal cliff.
Sparsely Vegetated	Sand dunes, gravel spits, and inland cliffs with sparse vegetation.
Terrestrial herbaceous	Mosaics of rare coastal grassland and / or moss-covered rock outcrops. Typically occur as openings in forested areas or adjacent to Garry Oak woodlands. Note that Garry Oak does not occur on Bowen Island.
Wetland	Wet soil and moisture dependent plants include bogs, fens, marsh, swamps, shallow water, and wet meadow.
Riparian	All stages of floodplain vegetation including riparian ecosystems associated with lake shorelines, streams and gullies.
Woodland	Open stands of Garry Oak, mixed stands of Garry Oak / Arbutus, Douglas-fir / Arbutus, Trembling Aspen. Note that trembling aspen does not occur on Bowen Island.
Older Forest	Older than 100 years coniferous, or mixed with broadleaf species
Older Second Growth Forest	Larger stands (>25 hectares) or 60 - 100 year old Coniferous forest, or mixed with broadleaf component.
Seasonally Flooded Agricultural Field	Fields regularly flooded in winter months.

5.4 Genetic Diversity

A key underpinning of biodiversity is genetic diversity. As an environment inevitably changes, a species must adapt to those changes or it will become locally extirpated or extinct. The species survives due to its ability to adapt through variations in its genetic inheritance. Genes control variation. Genes, acting within the parameters defined by the natural environment, control variation in living things.

Genes are made up of nucleic acid (e.g., DNA), a complex chemical molecule that encodes information that determines particular traits or characteristics. The amount of information stored within the genes of a single organism is huge because it contains all the characteristics that have enabled the species to survive since its beginning as a distinct species. When a species is lost, or numbers are drastically reduced, it is like losing a whole library of books of which there are no other copies.



Why is genetic diversity important? If individuals are genetically identical, then their responses to external stimulus will be identical. If everyone is sensitive to a particular disease, they could all succumb to it. However, with genetic diversity, individuals that are not susceptible to the otherwise fatal environmental stresses survive and keep on reproducing. This is known as natural selection. The more choice (or higher variation) the greater the chances of survival at the population level.

Species loss, including reduction in overall numbers of individuals within a particular species, results in corresponding decreases in natural genetic variation. Numerous and diverse populations make it more likely that a species will be able to adapt to environmental change, and persist over time. It becomes apparent how genetic diversity, species diversity, and ecosystem diversity are all inter-related. Higher levels of ecosystem diversity results in higher levels of species diversity. Higher species diversity equals higher genetic diversity. Higher genetic diversity equals a greater ability for species to adapt to changing external stimuli within a given ecosystem or environment. All of the pillars of biodiversity are inter-related and important for overall ecological and human health.

What do we know about genetic diversity on Bowen Island? Research about genetic diversity is specifically related to knowledge about species and ecosystems diversity, as explained in the previous paragraph. However, further research could examine the specific implications of species loss on genetic diversity on Bowen Island. How biodiversity relates to the human population is discussed below.

5.5 Considering Some Important Ecological Realities

This section has outlined biodiversity in terms of ecosystem, species, and genetic diversity. However, while research is teaching us more about the Bowen Island environment, our knowledge is limited and incomplete. Nonetheless, there are important principles that should be considered when thinking about biodiversity and ecological health. These principles are not management techniques, but rather "environmental realities" that capture the reality of biodiversity on Bowen. The principles are as follows:

Humans are Dependent On the Environment (natural capital) for Survival

"Natural capital refers to any stock of natural assets that yields a flow of valuable goods and services into the future" (Rees and Wackernagel, 1996). For example, a stock of fish provides an annual yield of new fish (through reproduction) that can be sustained (and potentially harvested) from year to year. The sustainable flow of fish is the natural income and the stock that yields that flow is the natural capital (Costanza and Daly, 1992). Additionally, Costanza and Daly (1992) recognize that natural capital may also provide services such as water catchment and erosion control, which are also counted as natural income. It should also be noted that the relationship between different components of natural capital provides an organizational integrity that is necessary for the

maintenance of the global system itself (Costanza et al., 1997). People must consider how much natural capital that they can afford to lose in order to maintain our ecological life support systems.

There are Limits to Environmental Carrying Capacities

Carrying capacity, as is used for defining animal populations and range areas, is defined as the "maximum population of a given species that can be supported indefinitely in a specified habitat" (Rees and Wackernagel, 1996, 49). If we assume that human activity is a subsystem of the global ecosphere, in which humans are dependent upon nature for survival, then it makes perfectly good sense to ask if there are limits to the carrying capacity of the earth system for human populations. The answer is YES and the same principles apply to Bowen Island! There are ecological limits to human activity.

Ecosystems Have Several Equilibrium Points

Ecosystems are not characterized by a given state of preferred equilibrium (Holling, 1978). Ecosystems have several "equilibrium points" that are constantly evolving and changing over time. As a result, thinking about ecosystems involves a component of uncertainty in terms of patterns of ecosystem behaviors. The problem is not just in the actual existence of uncertainty, but rather in the mechanisms that science and policy have designed to deal with the uncertainty and in the lack of adequate knowledge about ecosystems to enable policy makers to deal with uncertainty. For this reason, it is important for policy makers to apply what is known as the "precautionary principle" (to err on the side of caution) when planning for activities that cause significant environmental change.

These ideas should be considered when creating strategies for moving towards a "more sustainable" Bowen Island. However, creating strategies or suggesting management techniques is beyond the scope of this report.

5.6 Natural Diversity Indicators



Indicator: State of certain keystone species as determined by the community.

An excellent keystone species might be the Great Blue Heron, Pileated Woodpecker, or Salmon.

What does this indicator tell us?

This indicator tells us the health of species that are important to the overall natural diversity of Bowen Island.

Where do the data come from?

Annual bird counts, Department of Fisheries and Oceans

Indicator: Percentage of protected land on Bowen Island

What does this indicator tell us?

This indicator tells us the amount of land that is available to support species and ecosystems that contribute to the overall health and natural diversity of Bowen Island.

Where do the data come from?

Crown Lands Report (Dunster and Associates, 2000)



6.0 People

Understanding who the people of Bowen Island are is critical in terms of understanding the state of Bowen Island today. What we know about Bowen Islanders in terms of income level and consumption patterns, education, and health has critical implications in a number of areas.

- The *economy* of Bowen Island: what the on-island economy can support, where and how money is spent
- How and where *water, energy, food* and *goods* are consumed
- How *land use* has developed and continues to change including the development of *transportation* networks
- What *social resources* (housing, health care, social services, social networks) exist and others that may be needed in the community.

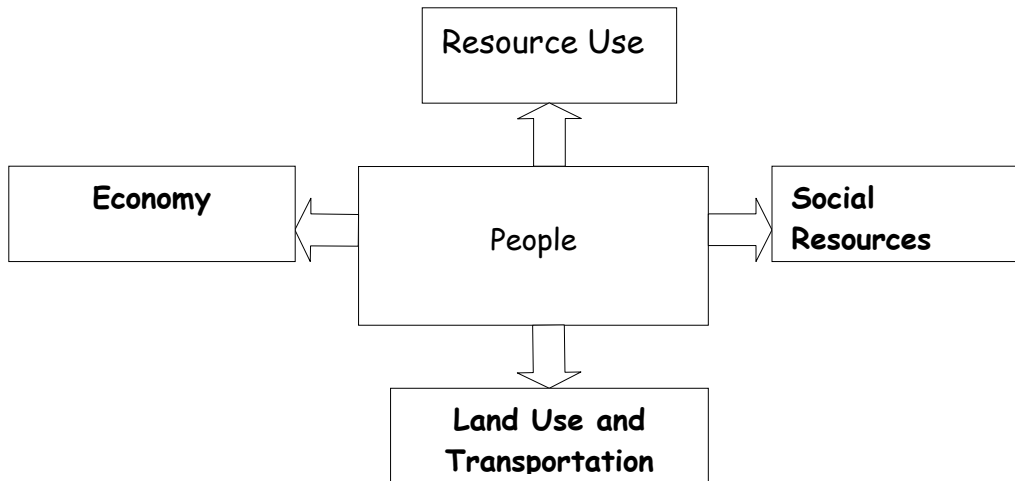


Figure 6-1: Connections Between People and Other Issues on Bowen Island Population

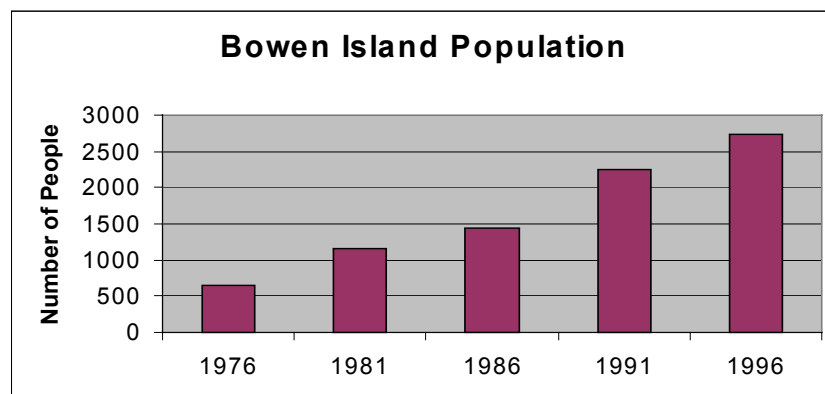


Figure 6-2: Bowen Island Population Source: Reid Crowther & Partners Ltd, 1999

6.1 Population

Population growth on Bowen Island has been significant in recent years and the human population impacts every other area described in the State of Bowen Island Report. Between 1976 and 1996 the census population increased by about 2,000 people. The 20-year average annual population growth rate is estimated at **14%**. From 1986 to 1996 the average annual population growth rate was **9%**³. According to the Islands Trust, there were two boom periods of growth, from 1976 to 1981 and from 1986 to 1990⁴. The 1996 census indicates that 2,738 people are living on Bowen.

6.1.1 Seasonal Population

The population of Bowen Island also changes seasonally. In 1988, 40% of the population was estimated to be seasonal and 60% year round. By 1997, this ratio had changed to 20% seasonal and 80% year round⁵.

6.1.2 Birth

6.1.2.1 Birth Rates

The birth rate is calculated by taking the number of live births, dividing it by the population and multiplying by 1,000.

Year	Live Births	Population	Birth Rate per 1,000 population
1991	34	2,065 (Statscan)	16.5
1996	36	2,730 (Statscan)	13.2
1999	26	3,100 (estimate)	8.4

6.1.2.2 Low Birth Weight

Low birth weight babies (babies below 2,500 grams or 5.5 pounds) have an increased risk of physical and mental disability and death. Most low birth weight babies are due to premature delivery. The low birth weight rate for the North Shore, for 1000 live births is 42.9, the third lowest in BC.

³ Reid Crowther & Partners Ltd. (1999). Bowen Island Road Strategy Planning Study. R. C. P. Ltd. Burnaby BC.

⁴ Islands Trust. The Changes and Growth on Bowen Island. Notes from 1990.

⁵ Sussex Consultants Ltd. Bowen Island Restructure Study. April 1999.

Low birth weight numbers for Bowen Island are:

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1	0	2	3	1	1	1	3	2	1

6.1.2.3 Mode of Delivery

The mode of delivery statistics come from B.C. Vital Statistics. They include all births where women list their home residence with a Bowen Island postal code. On the North Shore most births were spontaneous vertex (79%) with the rest being delivered by cesarean section (21%). Of these, 39% were repeat cesareans. The five-year cesarean rate for the North Shore (1994-1998) is one of the lowest five for the Province⁶. For Bowen, the repeat cesarean rate is higher. There were 30 cesareans between 1990 and 1999 and 21 repeat cesarean deliveries, or 70%.

Year	S	F+ V	B	1	2	3~9	Unknown
1990	26	3		2	4		1
1991	26	2		5	1		
1992	21			4	1		
1993	26	7	1	5	5		
1994	21	4		4	1		
1995	27	2		2	1		
1996	25	6		3	1		1
1997	26	1	1	2	2		
1998	23	3		2	1	1	
1999	20	1		3	3		

Source: B.C. Vital Statistics, 2000

S: Spontaneous

F + V: Forceps/Vacuum

B: Spontaneous Breech

1: 1st Cesarean Section

2: 2nd Cesarean Section

3-9: 3rd or more Cesarean Section

⁶ North Shore Health Region (NSHR) Community Health Profile 2000

6.1.2.4 Teen Pregnancy

The North Shore teen fertility rate is one of the lowest in the province and the number of teen pregnancies have declined since 1991. Bowen Island has had no teen births since 1990.

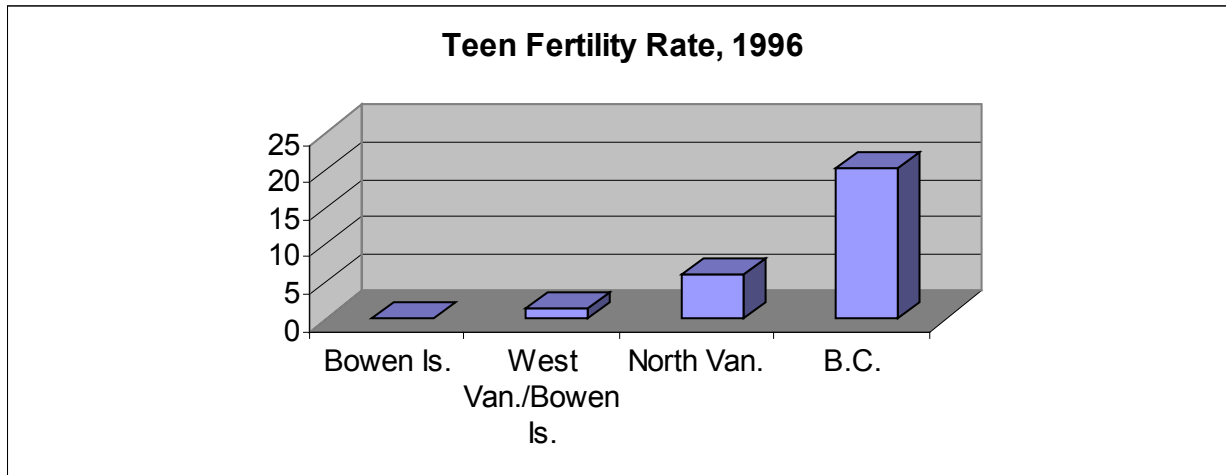


Figure 6-3: Teen Fertility Rate, 1996

Source: North Shore Health, 2000

6.1.3 Death Rates

Table 6-4: Selected Causes of Death, Bowen Island 1990-1999⁷

Description	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Decade Totals
Cardiovascular disease	3	1	2			3	7	7	1		24
Ischemic heart disease	3	1	2			2	4	5			17
Cerebrovascular disease (includes stroke)	1		1	1	1	1		1			6
Malignant cancers	6	3	7	3	4	6	1	4	4	9	47
Respiratory diseases	1	1					2	1		1	6
Accidental injuries				1	1	1	1	1			5
Suicide											0
Infant Death (age < 1 yr)	1										1

Source: BC Vital Statistics, 2000

⁷ This data may not be 100% accurate as geographical information on birth and death documents can be flawed.

6.1.4 Family Size

In 1996 there were 1030 private households. The breakdown of how many people per household are shown below. In terms of lone parent families there were about 100 lone parent families on Bowen Island, 20 of them were male parents, and 80 female. One and two person households make up 56% of the total number of households. This figure is dropping. In 1991, one and two person households made up 59.2% and 62.7% in 1986.

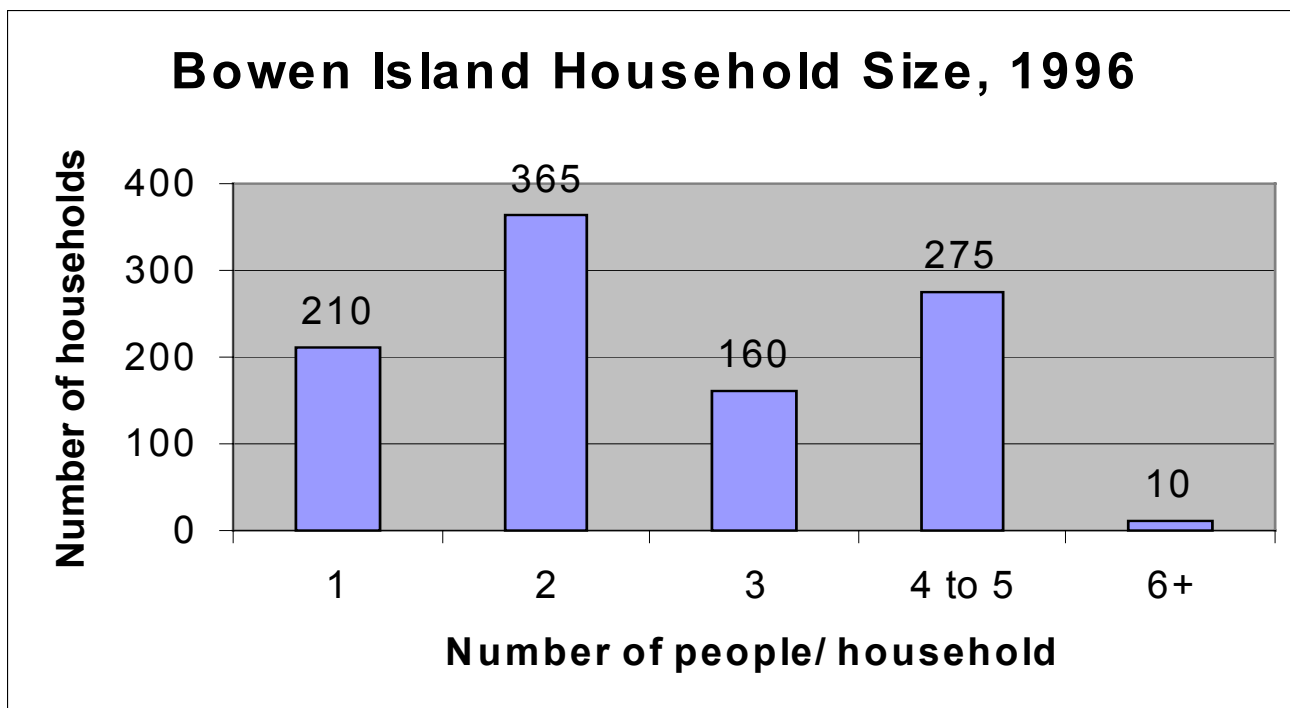
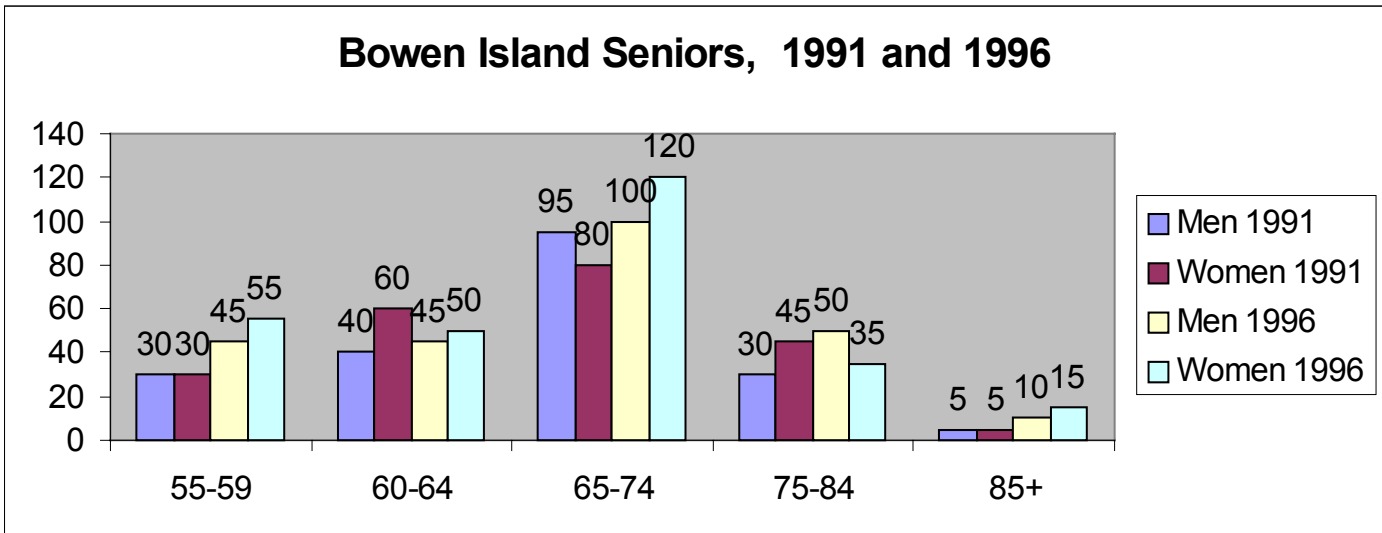


Figure 6-4: Bowen Island Household Size, 1996 Source: Statistics Canada, Census 1996

6.1.5 Seniors

There was not a lot of change in the senior population from 1991 to 1996. Demographics have shifted more significantly with the adult and youth population. It is interesting to note the jump in population in the 65-74 cohort. This is unusual compared with other areas, and reflects the influx of retirees to the island. It is likely that the drop in population in the 75-84 is due in part to death but also to people who move off the island to be closer to medical care.

Figure 6-5: Bowen Island Seniors, 1991 and 1996 Source: Statistics Canada, Census 1996



6.1.6 Adults

In the demographic profile of Bowen Island, there tends to be a loss of people moving away in their late teens and twenties, but the numbers rise again in the 25-35 and 35-44 age ranges. 1996 was the first time that the 45-54 age range surpassed the 24-34 group. In 1996 there was not the same drop from the 35-44 to 45-54 as there was in 1991.

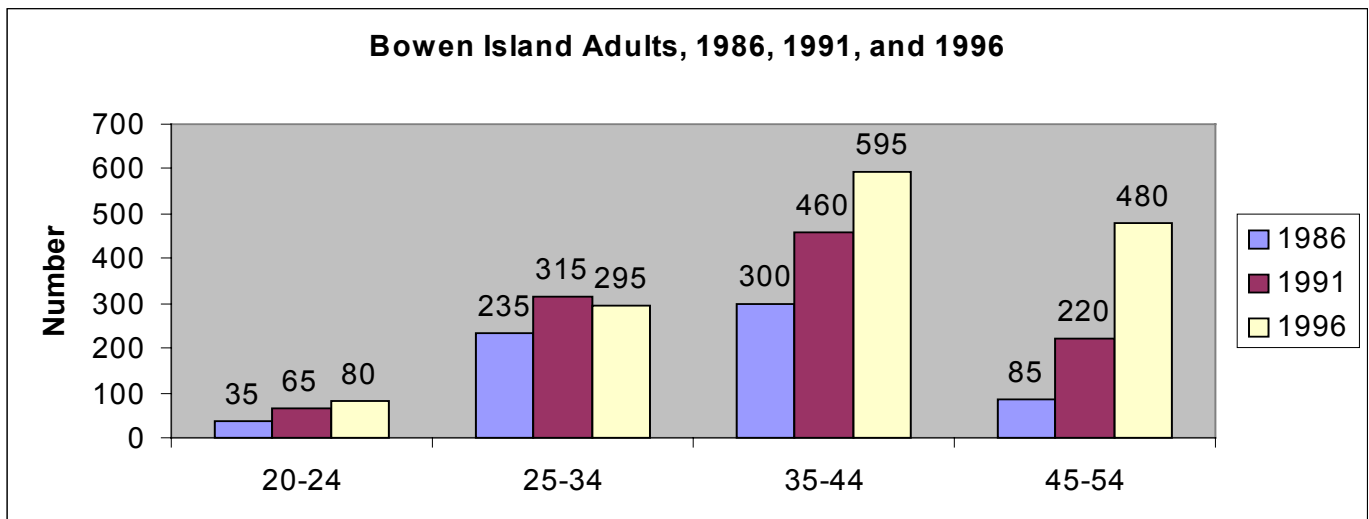


Figure 6-6: Bowen Island Adults, 1986, 1991, and 1996 Source: Statistics Canada, Census 1996

6.1.7 Youth

From 1986 to 1996, the 0 to 4 year old population increased by 25%, the 5-9s by 260%, the 10 to 14s by 253% and the 15 to 19s by 245%.

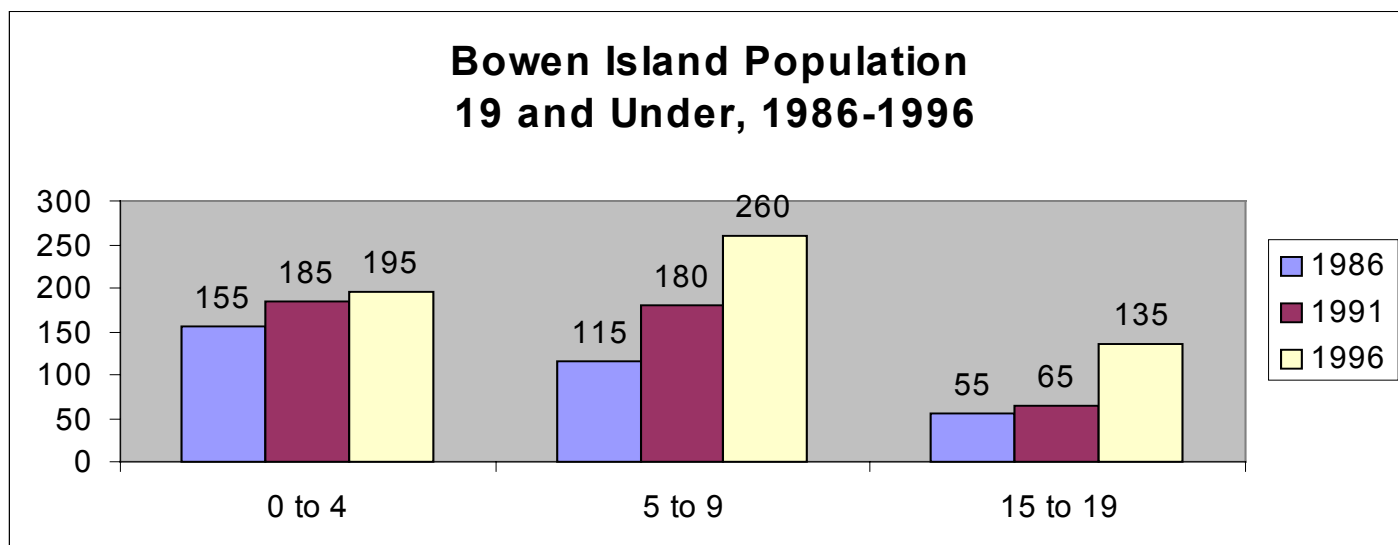


Figure 6-7: Bowen Island Population 19 and Under, 1986-1996

Source: Statistics Canada, Census 1996

One of Bowen Island's claim to fame is the number of young people and families that live here. In 1996, 29.5% (805 people) of Bowen Island's population was under 19, and 24.5% of the population (670 people) was under the age of 15.

How does this compare to the rest of the Lower Mainland? Bowen Island has a higher percentage of children under 15 than Port Coquitlam (23.9%), Abbotsford (23.2%), Surrey (23%), Delta (21.9%), the Sunshine Coast (21.8), North Vancouver Municipality (20.7%), Coquitlam (20.8%), and Vancouver (13.9%). The BC average is 19.5%.

6.1.8 Population Indicators



Indicator: Population growth rate and change in population under 15.

What does this indicator tell us?

This indicator tells us about how fast the population is growing, and how the youth population is changing.

Where do the data come from?

Statistics Canada, every 5 years (1991, 1996, 2001)



Indicator: Visible minorities as percentage of total population.

What does this indicator tell us?

This indicator tells us about the ethnic diversity of Bowen Island, and can be compared to other municipalities in the Greater Vancouver Regional District.

Where do the data come from?

Statistics Canada, every 5 years (1991, 1996, 2001)

6.2 Ethnic Diversity

Of Bowen's 1996 population of 2715, 2110 (77%) were born in Canada and 1365 of these (65%) were born in B.C. The following two graphs show the number of Bowen residents born outside of Canada and the breakdown of non-English first languages. The number of English as a second language speakers is low, compared to other communities.

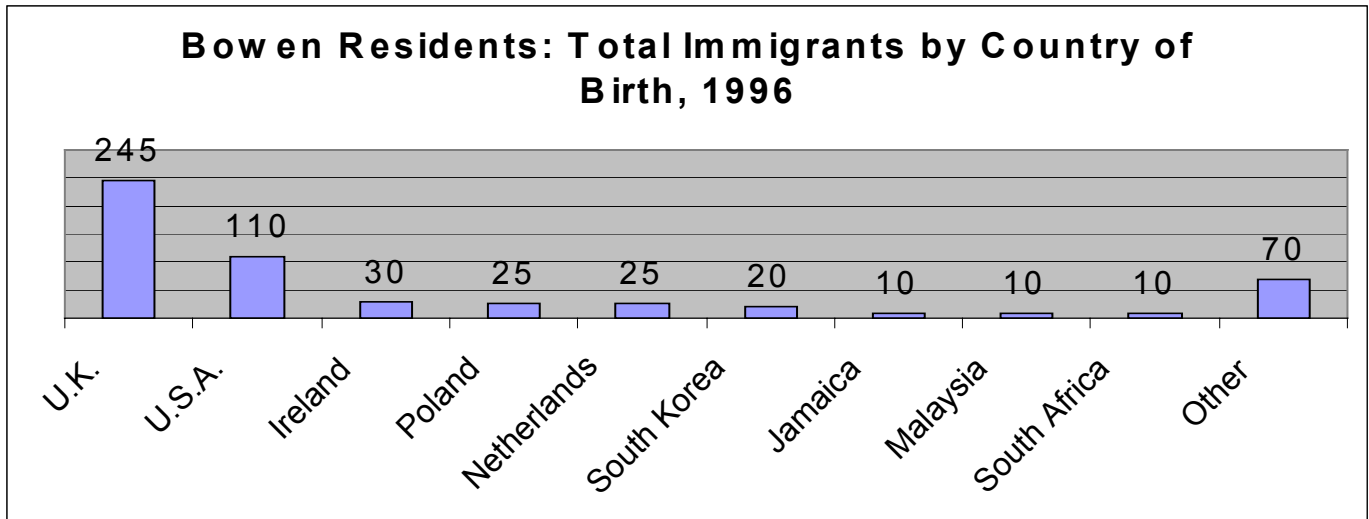


Figure 6-8: Bowen Residents: Total Immigrants by Country of Birth, 1996 Source: Statistics Canada, Census 1996

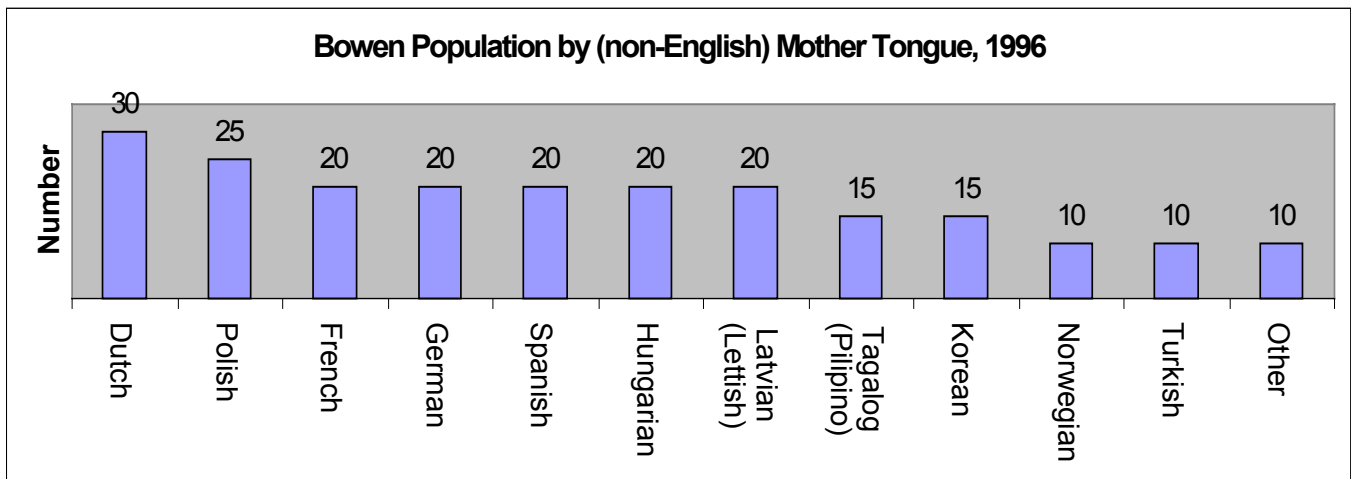


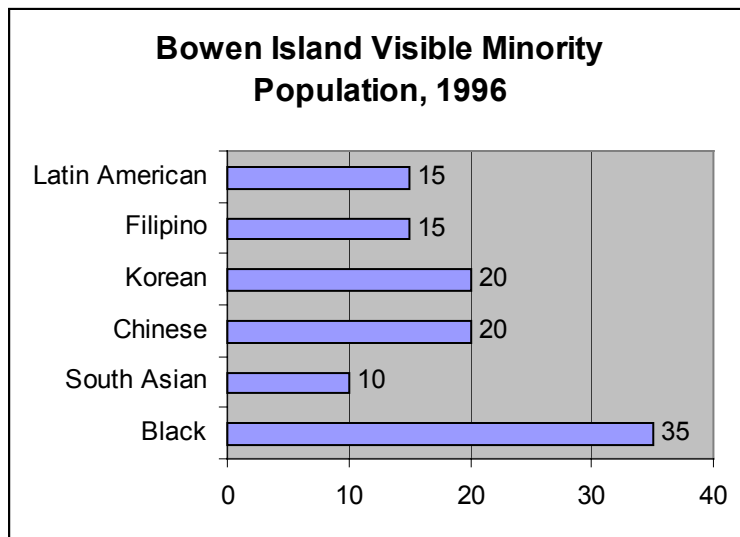
Figure 6-9: Bowen Population by (non-English) Mother Tongue, 1996 Source: Statistics Canada, Census 1996

6.2.1 Aboriginal Population

Statscan 1996 also asks respondents to identify if they are aboriginal. The total aboriginal population on Bowen Island in 1996 was 55 people, with 20 people identifying themselves as "North American Indian single response", meaning they identify themselves as one of North American Indian, Metis or Inuit. Thirty people answered with "multiple Aboriginal response", with a combination of North American Indian, Metis and Inuit ancestry.

6.2.2 Visible Minorities

The following graph shows the Bowen Island population identified as visible minorities, approximately 4.2% of the population. How does this compare to other municipalities in the Greater Vancouver Regional District? Visible minorities make up 28.8% of Surrey, 44.7% of the City of Vancouver, 15.8% of North Vancouver, and 8.3% of West Vancouver. The average visible minority population for British Columbia is 17.9% .



Source: Statistics Canada, Census 1996

Figure 6-10: Bowen Island Visible Minority Population, 1996

6.3 Education

The following chart shows the education levels of Bowen Islanders, from the 1996 census. It reveals that Islanders are highly educated. Over 50% have some university, and more than a quarter of the island has a university bachelor's degree or higher. Eighty-five percent of the island has completed high school.

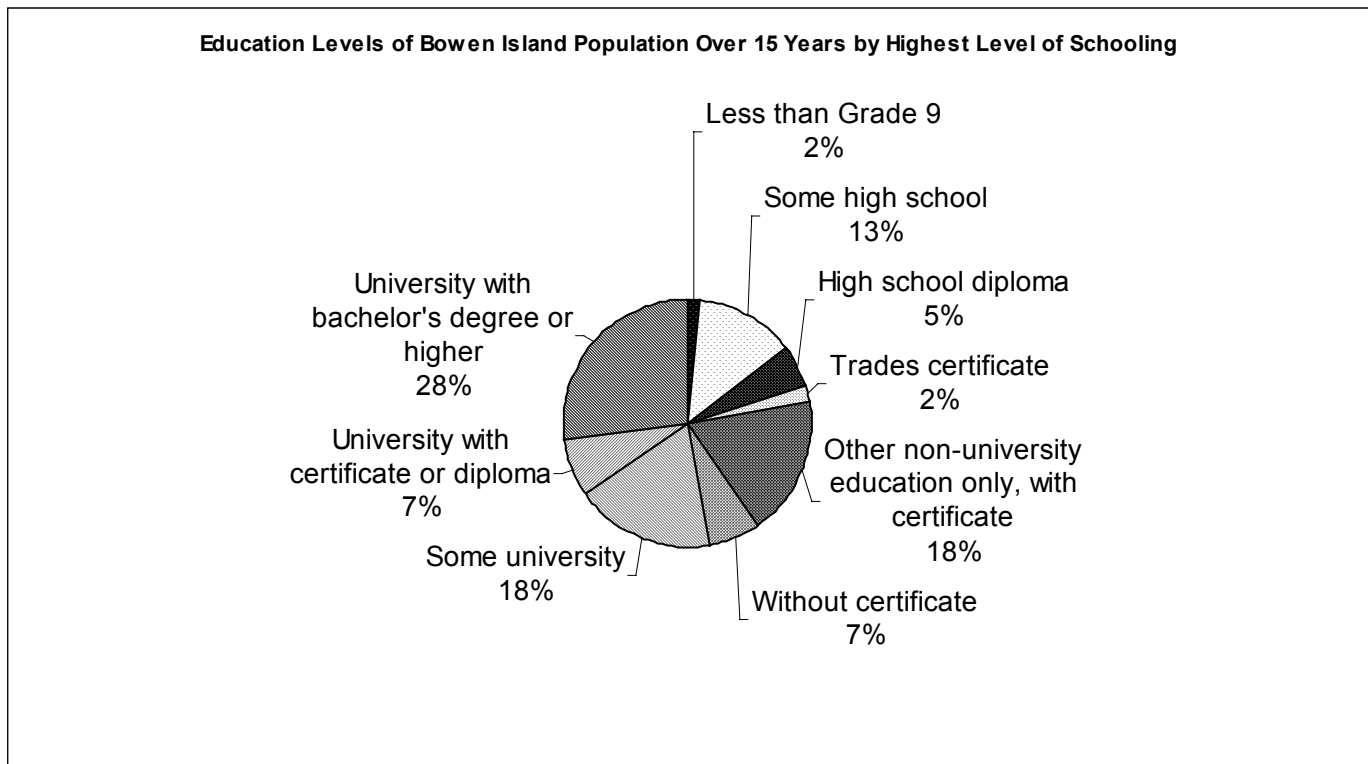
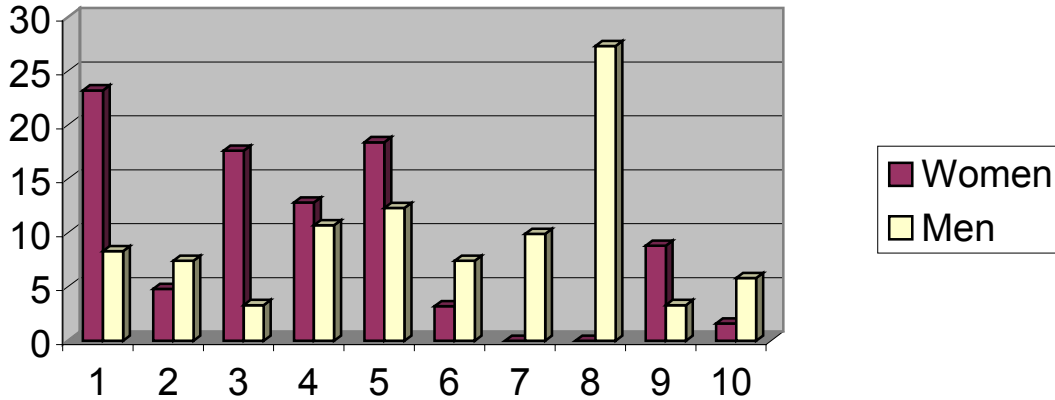


Figure 6-11: Education Levels of Bowen Island Population Over 15 Years by Highest Level of Schooling
Source: Statistics Canada, Census 1996

Figure 6-12: Major Field of Study for Men and Women with Postsecondary Qualifications



- 1 Educational, recreational and counseling services
- 2 Fine and applied arts
- 3 Humanities and related fields
- 4 Social sciences and related fields
- 5 Commerce, management and business administration
- 6 Agricultural and biological sciences
- 7 Engineering and applied sciences
- 8 Engineering and applied science technologies and trades
- 9 Health professions, sciences and technologies
- 10 Mathematics and physical sciences

Source: Statistics Canada, Census 1996

6.3.1 Education Indicators



Indicator: Percentage of population who has completed high school and percentage of population with university education.

What does this indicator tell us?

This indicators tells us the education level of Bowen Islanders.

Where do the data come from?

Statistics Canada, every 5 years (1991,1996, 2001)

6.4 Income

The following charts show the income and employment income for Bowen Island residents, taken from the 1996 census. In terms of average income, Bowen Island falls somewhere between North Vancouver and West Vancouver.

Segment	Average 1995 Income	Average 1995 Income- Men	Average 1995 Income- Women
All People over 15 years	\$35,486	\$44,934	\$26,214
15-24 years	\$8,432	\$8,689	\$3,957
24-44 years	\$39,193	\$49,138	\$29,425
45-64 years	\$42,602	\$54,935	\$31,275
65+	\$24,983	\$30,678	\$15,257

How do the incomes of Bowen Islanders compare to other areas for the same period (1995)?

- The provincial average income is \$26,295 (\$32,457 for men and \$20,028 for women).
- The city of **Vancouver** average income is \$25,913 (\$29,816 for men and \$22,001 for women).
- For the municipality of **West Vancouver**, the average income is \$48,728 (\$68,651 for men and \$30,869 for women).
- For the city of **North Vancouver**, the average income is \$27,452 (\$32,066 for men and \$23,208 for women).

Population	Average 1995 Employment Income	Average 1995 Income- Men	Average 1995 Income- Women
Population over 15 years	\$34,168	\$43,095	\$24,563
15-24 years	\$8,407	\$9,122	\$3,770
24-44 years	\$38,023	\$47,599	\$27,015
45-64 years	\$37,209	\$46,504	\$28,115
65+	\$6,296	\$8,147	\$2,388

Average family income	\$75,823
Family income of husband-wife families	\$67,499
Average household income of 1-person households	\$30,061
Average household income of 2 or more person households	\$77,685

Source: Statistics Canada, Census 1996

How has income changed over time?

In 1991, the average income for men was \$35,363 and \$16,943 for women.

6.4.1 Income Indicator



Indicator: Average income for total population, men and women

What does this indicator tell us?

This indicators tells us about the income of Bowen Islanders, and can be compared to change over time, as well as the income level of nearby municipalities.

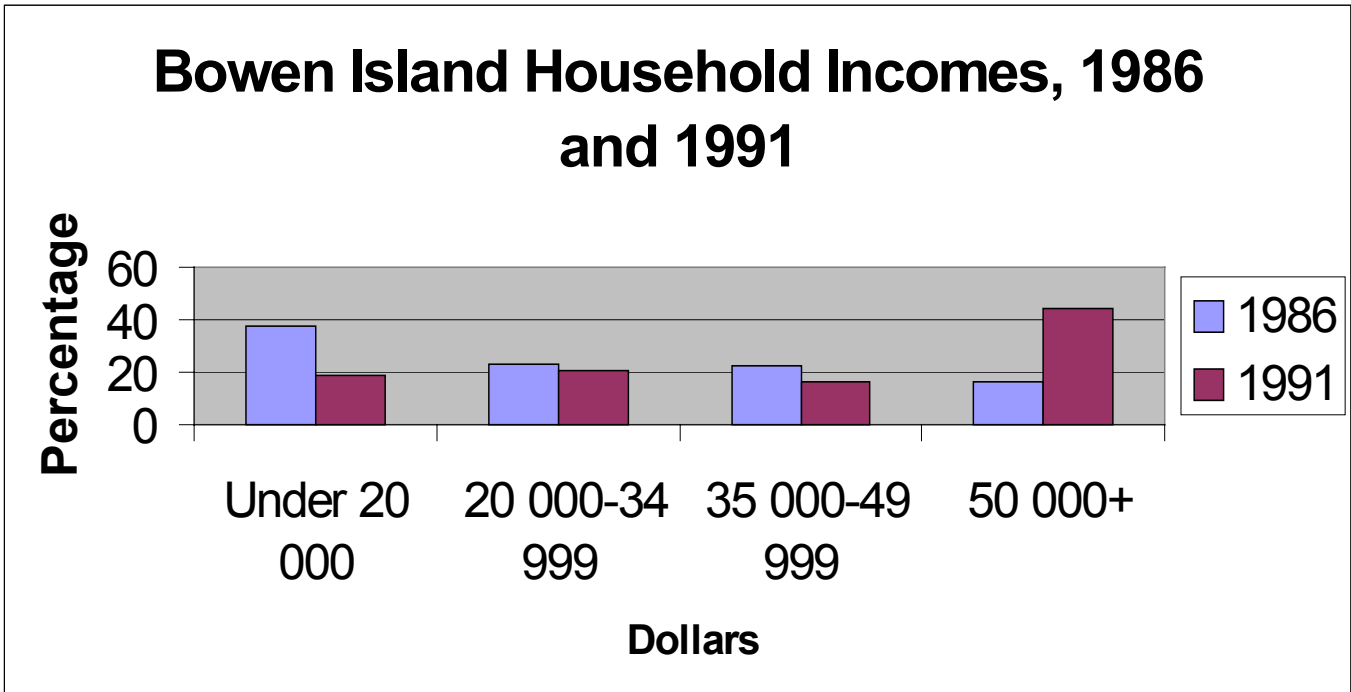
Where do the data come from?

Statistics Canada, every 5 years (1991,1996, 2001)

6.4.2 Income Disparity

The following graph shows the range of household incomes and how they changed between 1986 and 1991. The data for 1996 is not available. In 1991, 13.3% of people were in low income family units.

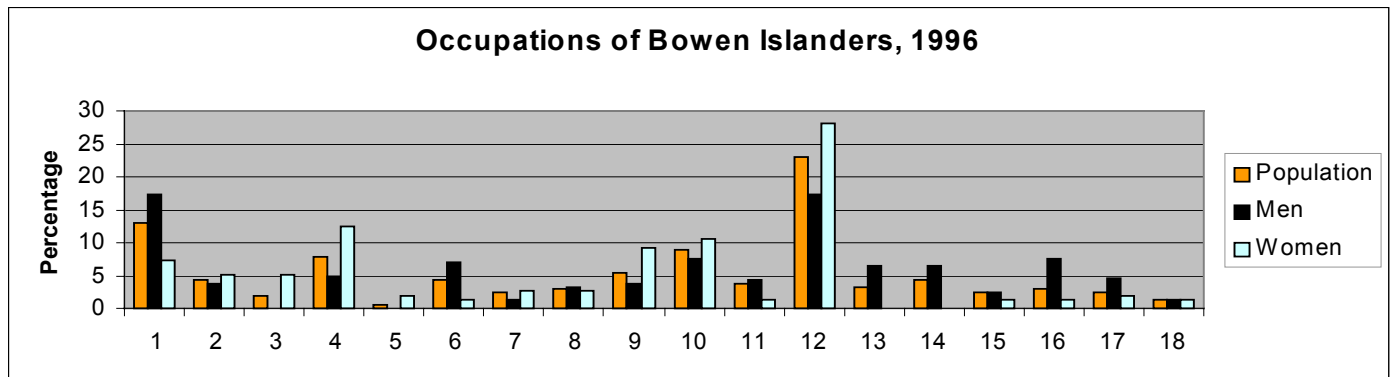
Figure 6-13: Bowen Island Household Incomes, 1986 and 1991 Source: Statistics Canada, Census 1996



6.5 Employment

What do Bowen Islanders do? The following graph provides the occupations of Island residents.

Figure 6-14: Occupations of Bowen Islanders, 1996 Source: Statistics Canada, Census 1996



1. Management occupations
2. Professional and administrative occupations in business and finance
3. Secretaries
4. Clerical occupations
5. Other financial occupations
6. Natural and applied sciences and related occupations
7. Health occupations
8. Judges, lawyers, psychologists, social workers, ministers of religion, and policy and program officers
9. Teachers and professors
10. Professional occupations in art and culture
11. Technical occupations in art and culture, recreation and sport
12. Sales and service
13. Contractors and supervisors in trades and transportation
14. Construction trades
15. Heavy equipment and crane operators
16. Other trades, transport and equipment operators
17. Primary industry
18. Processing, manufacturing and utilities

The following chart shows the employment rate of Bowen Islanders for the total population, and the breakdown by men and women over 25.

<i>Table 6-8: Employment Rate of Bowen Islanders by Age, 1996</i>			
Segment	Participation Rate	Employment- population ratio	Unemployment Rate
Total Population 15-24 years	62.6%	58.6%	20.4%
Total Population (25+)	75.5%	73.6%	2.5%
Males 25+	80.4%	78.6%	0%
Females 25+	72.4%	70.0%	6.5%

Source: Statistics Canada, Census 1996

6.5.1 Employment Indicator



Indicator: Unemployment rate for the total population, 25 and over

What does this indicator tell us?

This indicator tells us about the employment level of the Bowen Island adult population.

Where does the data come from?

Statistics Canada, every 5 years (1991,1996, 2001)6.6

6.6 Health

What do we know about the health of Bowen Islanders?

Health records are kept by Health Region- Bowen Island is part of the North Shore Health Region (NSHR). It is not possible to get specific reliable Bowen health information for a couple of reasons- the population is small and disease numbers are even smaller; some information could be a breach of confidentiality. The only way to extract this information is with address data and this is usually inaccurate.

6.6.1 Communicable Disease

6.6.1.1 Vaccine Preventable Disease

The **Hepatitis B** rate for the North Shore Health Region in 1997 was **46.4 per 100,000**. This was the fifth highest rate in B.C. The North Shore Health Region has implemented a voluntary, new infant Hep B immunization program. This program supplements the *Grade 6 Hep B immunization program*⁸.

The **Pertussis** rate was **44.1 per 100,000** in 1997, the third highest rate in B.C. (most cases occur in the Lower Mainland). This likely reflects not just an increase in cases but improved testing and an increase in surveillance by doctors and health officials⁹.

6.6.1.2 Sexually Transmitted Diseases

Three sexually transmitted diseases are reportable by law: chlamydia, gonorrhoea and infectious syphilis. Chlamydia and gonorrhoea can result in female infertility if left untreated, and syphilis can cause major tissue and organ damage.

STD	North Shore (per 100,000)	B.C. (per 100,000)
Chlamydia	47.7	104
Gonorrhoea	5.1	11.6
Infectious syphilis	1 case total	

1997 Disease Rates	North Shore Health Region	British Columbia

⁸ NSHR. *Community Health Profile 2000*.

⁹ Ibid.

¹⁰ Ibid.

Active TB	5.05	10.43
New AIDS cases	2	44
Person newly testing positive for HIV	4.48 per 100,000	14.17 per 100,000

Source: NSHR, Community Health Profile 2000.

<i>Table 6-11: Enteric Foodborne and Waterborne Diseases</i>		
1999 Disease Rates per 100,000	North Shore	British Columbia
Campyobacteriosis	114.5	69.6
Giardiasis	35.0	27.2
Salmonellosis	20.0	16.6
Cryptosporidiosis	2.2	3.5
E. coli O157:H7	2.2	4.51
Shigellosis	9.5	6.3
Hepatitis A	6.1	10.2
Yersiniosis	106.2	29.4
Amebiasis	14.5	8.6

Source: NSHR, Community Health Profile 2000.

6.6.2 Hospitalization

<i>Table 6-12: Top Five Reasons for Hospitalization, North Shore Health Region, 1997/1998</i>		
Age Group	Cause of Hospitalization	Number of Cases
0-24	Disease and disorders of the ear, nose, mouth and throat	222
	Multiple significant trauma	196
	Disease and disorders of the respiratory system	189
	Disease and disorders of the digestive system	168
25-64	Pregnancy and childbirth	1,658
	Disease and disorders of the digestive system	700
	Disease and disorders of the circulatory system	583
	Mental disease and disorders	416
65+	Disease and disorders of the female reproductive system	375
	Disease and disorders of the circulatory system	1,122
	Disease and disorders of the digestive system	555
	Disease and disorders of the respiratory system	456
	Disease and disorders of the nervous system	352
	Other reasons for hospitalization	315

Source: NSHR, Community Health Profile 2000.

6.6.3 Injuries

The North Shore Health Region has relatively low hospitalization rates due to external causes compared to the province. In a few areas, list below, the rates are higher.

Injury Type	Age Group	North Shore	B.C.
Motor Vehicle-Bicycle	10-14 years	10.60	8.29
Non Motor Vehicle-Bicycle	10-14 years	80.50	46.61
Drowning	1-4 years	12.55	8.67
Poisoning	80-84 years	178.62	88.34

Source: NSHR, Community Health Profile 2000.

6.6.4 Cancer

Cancer Type	1998 (actual) New Diagnosis	Rate per 100,000
Breast	124	135
Prostate	117	136
Trachea, Bronchus, Lung (M)	63	73
Trachea, Bronchus, Lung (F)	56	61
Total	812	456

Source: NSHR, Community Health Profile 2000.

6.6.5 Diabetes

Information on Diabetes for the North Shore is based on a provincial average- 3% of people in B.C. have diabetes and so about 3% of the North Shore population, or 4,800 people would have diabetes. For Bowen Island, 81 people are estimated to have diabetes.

6.6.6 Mental Health

Mental health statistics are estimated from national percentages. Many factors affect the rates of mental illness such as gender, support networks and physical health.¹¹ Given the national average, the Bowen Island estimated rates would be: 27 people (1%) with schizophrenia, 270 people (10%) with mood disorders, and 324 people (12%) with anxiety.

¹¹ Ibid.

6.6.7 Substance Misuse

In a 1993 *General Social Survey*, 1 in 10 adult Canadians were estimated to have problems with alcohol. This is about 13,000 North Shore residents, and 270 Bowen Islanders. BC has the highest reported rate of drug use in Canada, with the most common drugs used being cannabis, LSD, heroin (speed) and cocaine.

6.6.8 Health Indicator



Indicator: Hours of exercise per week per capita

What does this indicator tell us?

Exercise can positively affect the health of individuals in a number of areas. The exercise level of Bowen Islanders is a useful window onto the health of the population.

Where do the data come from?

Survey (to be conducted)

7.0 Community Resources

Telling the story of community life on Bowen Island...

One of the biggest challenges in a *State of Bowen Island Report* is describing the 'state' of community life. The story is much more complex and only part of the story can be told by recorded information and data. This first part of this chapter focuses on *community life*: diverse and numerous community groups, events, and activities. The second part of this chapter looks at *community resources*: health and social services, housing, and emergency services.

What about changes in community life that cannot be measured?

Here are some INDICATORS of community interaction that are interesting to think about, although they have not been 'measured' in any way. If understanding the SOCIAL CAPITAL that exists is important, we need to continue to ask how we CAN capture how things are changing...

Community Life Indicators:

- Eye contact and greetings on the road and trails
- Time spent waiting to get picked up hitchhiking
- Ratio of people on Bowen you see each day who you know and don't know
- Ability to walk down the middle of the road without fear of cars
- Volunteer hours for community events
- Number of people who leave their houses unlocked
- Number of 'characters' on the island
- What else?

Box 7-1: Lieben- a Cultural Legacy?

The property known as "Lieben", 3.82 acres in the Eaglecliff area of Bowen Island, was purchased around 1941 by Einer Nielson. It became a retreat for a number of artists, writers, and musicians who came from Vancouver and beyond. A number of important pieces of work began their life at Lieben. Visitors included many well-known Canadian writers : Malcolm Lowry, Earle Birney, Lister Sinclair, Eric Nicol, Watson Thomson, Margaret Hutchinson, Arthur Hill, Gordon Woodward, Mario Prizek, and Charles Wasserman. In 1977 it was donated by Einar and Muriel Nielson to the provincial Greenbelt Inventory with the intention of it continuing to "remain in perpetuity as a nature reserve with controlled public use and habitat management". The Crown Lands report suggests that the site should be considered as a site of "National cultural significance" (Dunster, J. 2000. *Crown Lands Report*).

7.1 The Arts

7.1.1 Bowen Island Arts Council

Bowen Island has an active, diverse and vibrant arts community. In 1987 the Bowen Island Arts Council (BIAC) was formed to support the community of Bowen Island artists, and to nurture opportunities for creative development. The Cultural Resources Directory lists a number of activities since the Council began. These include sponsorship of Island arts groups in theatre and music presentations, bringing touring music and theatre groups to the island, publication of *Howe Sounds*, a collection of Island writing, and fund-raising to acquire a grand piano for community use.

The Bowen Island Arts Council has produced two editions of the Bowen cultural directory. Over 400 dancers, fiber artists, film and video makers, writers, broadcasters, musicians, and visual artists are listed in the directory. The Gallery at Artisan Square has been operating since 1997 as a multi-purpose facility for the arts, including visual arts and theatre, music, and dance presentations.

7.1.2 Bowen Island Arts Festival

The Bowen Island Arts Festival started in 1996. It is a joint project of the Bowen Island Music Association and the Bowen Island Arts Council. The goal is to showcase Island musicians and artists. This need was recognized as there was very little space for artists from the community to showcase their work. The first of the now annual show was at the Bowen Island Community School. The cost of the festival is covered by donations and artist fees. As well, for several years grants have been secured from Human Resources Development Canada for the coordinator of the festival. The festival has managed to break even every year.

Box 7-2: Theatre on the Isle

Theatre on the Isle was begun in 1977. Five plays were performed at Evergreen Hall, which at the time was untenanted and virtually abandoned: *The Drunkard*, *Tom Jones*, *Divorce me Darling*, *The Mousetrap*, and *A Midsummer Night's Dream*. The setting was ideal, with three performances virtually the entire island population of 600 or 700 people could be accommodated. The Theatre on the Isle was not active from 1982 until 1988 when it put on a performance at the restored Union Steamships Company Store. Over the years Theatre on the Isle has put on more than twenty full-scale productions and put more than 200 islanders on stage and behind the scenes.

Source: Theatre on the Isle History by Edythe Hanen, *Bowen Island Gold Pages*.

7.2 Media and Communication

7.2.1 The Undercurrent

The *Bowenian*, published by the Bowen Island Alliance, was a periodic publication previous to the *Undercurrent*. However *The Undercurrent* was the first regular newspaper of Bowen Island. It began publication in 1972. It used to be published every two weeks, but has been weekly for over a decade. For many years one person worked on the paper. In 1989, a second person was added, and for the last two years a part-time reporter and part-time ad salesperson have also been added to the staff. It is sold for 50 cents on the ferry, and at a number of locations on the Island. Its distribution is about 1600, and has remained constant for at least 5 years.

7.2.2 The Island News

The Island News, a Forum for Innovation in the Bowen Island Community, is a free newspaper put out by the Island News Network. It is published on a volunteer basis with advertising sales covering costs. The paper has been in operation since November 1999. It is published once a month and has covered such themes as sustainability, energy, cooperatives and the municipal election.

7.2.3 Cooperative Radio

A recent initiative has focused on getting a cooperative radio going on Bowen Island.

7.3 Institutions and Organizations

Box 7-3: Services on Bowen Island

Alcohol and drug services

BC Ambulance Service,
community services

BC Assessment

Bowen Island Building Inspection

Bowen Island Fire Department

Bowen Island Public Library

Bowen Island Teen Centre

Cove Bay Improvement District

Cove Bay Water Service Area

Noise control

Bowen Island North Shore

North Shore health board

Royal Canadian Mounted Police

Snug Cove Sewer Service Area

Joint Management Committee

Garbage collection and disposal

Dog Licensing and Control

7.4 Activities

7.4.1 Parks and Recreation Programs

In 1984 about 15 on-going programs were offered by the Bowen Island Recreation Commission, and about 6 one-day workshops. These were offered as 'Family and Children' (6 programs), 'General' (4 programs), 'Fitness and Recreation' (6 programs) and 'Health and First Aid' (3 programs). Bowen Island Parks and Recreation have a separate but shared facility with the Bowen Island Community School.

Table 7-1: Recreation Programs Offered by the Bowen Island Parks and Recreation Commission¹²

	1997	1998	1999
Number of programs	240	271	312
Registered	4711	2873	3156
Participant hours/session	29148	37,646	46,383
Preschool	962	614	730
Children	1556	1777	1616
Youth	399	482	307
Adults	1893	1256	893
Seniors	121	85	62

7.4.2 Bowen Traditions

A number of traditions have become part of Island life and some have faded away. Some in recent memory include:

- The Labour Day Sendoff- a number of younger men would go down to the dock dressed as women on Labour Day and moon the ferries in a symbolic good-bye to the tourist season (this was discouraged by the RCMP several years ago)
- The all-ages community dance at Halloween at Evergreen Hall (now a private home)
- The Coffee House tradition comes and goes. They have been held in various locations including Collins Hall and at Gavin's Place- the event fits to the venue.
- The ferry as a political space, doing skits on the ferry to advertise community events and plays
- Community wide casting calls for community productions such as Shakespeare
- There are many garage sales and they remain an important part of community life

¹² Bowen Island Parks and Recreation Commission Summary Statistics

7.5 Events

A number of important events and activities occur throughout the year on Bowen Island. Some have been around for many years such as the Remembrance Day Ceremonies. There are other are 'new traditions' such as the Haunted House at the Old General Store. Rita Greenlaw started this creative community event in 1992. The *People, Places and Plants* tour started in 1993 as a fundraiser for the Museum and Archives. The calendar below shows a number of activities throughout the year 2000.

❖ *Information Gap: What did the calendar of 1990 look like? 1980? 1970?*

January	February	March
April	May	June
July	August	September
October	November	December

Figure 7-1: 2000 Calender

<p>January</p> <ul style="list-style-type: none"> • Polar Bear Swim 	<p>February</p> <ul style="list-style-type: none"> • Annual Heritage Days (National Heritage Week) 	<p>March</p>
<p>April</p>	<p>May</p> <ul style="list-style-type: none"> • Annual Spring Festival of Plays • Wine Festival 	<p>June</p> <ul style="list-style-type: none"> • Coho Bon Voyage • Round Bowen Yacht Race
<p>July</p> <ul style="list-style-type: none"> • Annual People, Plants and Places Tour 	<p>August</p> <ul style="list-style-type: none"> • Dog Days • Arts Festival • Bush Golf • Run for the Ferry & Bowfest 	<p>September</p>
<p>October</p> <ul style="list-style-type: none"> • Annual Apple Festival • Haunted House 	<p>November</p> <ul style="list-style-type: none"> • Remembrance Day ceremonies • David Suzuki talk 	<p>December</p> <ul style="list-style-type: none"> • Honour a Life Service • Christmas Craft Fair • Community Choir Concert • Island Light Up • New Years drumming circle

Box 7-4: Groups on Bowen Island

Adult Learning Centre
BC Camping and Recreation Guild for Christian Scientists
Bowen Anti-Nuclear Group (1982)
Bowen Citizens Coalition
Bowen Island Alliance Association
Bowen Island Arts Council (1987)
Bowen Island Book Group
Bowen Island Community Care Society (1994)
Bowen Island Community Choir Society
Bowen Island Community Forum (1992)
Bowen Island Community School Association
Bowen Island Conservancy (1997)
Bowen Island Emergency Preparedness Group (1991)
Bowen Island Family Place Association (1988)
Bowen Island Fish and Wildlife Club
Bowen Island Forest & Water Management Society (1992)
Bowen Island Garden Club (1980)

Bowen Island Golf Association (1988)
Bowen Island Heritage Preservation
Bowen Island Historians
Bowen Island Improvement Association (1947)

Bowen Island Nature Club
Bowen Island Parks and Recreation Commission
Bowen Island Ratepayers Association (1974)
Bowen Island Recycling Depot
Bowen Island Resource and Christmas Hampers
Bowen Island Rod and Gun Club (1967)
Bowen Island Senior's Housing Coop
Bowen Island Softball Association (1986)
Bowen Island Trails Committee
Bowen Island Volunteer Firefighters (1969)
Bowen Island Yacht Club
Bowen Users Group (c. 1980)
Boy Scouts of Canada
Memorial Garden Society (1987)
Seniors Keeping Young (c. 1980)
St. Gerrards Mission
Theatre on the Isle (1977)

Tir-na-gog Theatre School (1989)

Box 7-5: Bowen Island Alliance Association
From the *Bowenian*, February 1993

"In 1947 a group of devoted Bowen Islanders established the welfare of this Island and called the Bowen Island Rate Payers Association (sic). As the sole public association on Bowen Island at that time, it was active in promoting better ferry service, working to improve Bowen's roads and to expand telephone and hydro service.

In the early 1970s when several land owners were pressing for unregulated development on Bowen Island, this group, now called the Bowen Island Improvement Association and under the leadership of Bert Moring and Joe Malkin, worked for a freeze on small lot development until studies of water, sewage, transportation and social impact were completed. The Association helped to get some of that basic information through provincial studies....

"In 1991, the Bowen Island Improvement Association (1947) directors reorganized to become the Bowen Island Alliance Association- a name chosen to better reflect the role the Association plays in the community: dedicated as a group to the wonderful sense of community and the large areas of undisturbed natural forest and seashore that are presently so characteristic of Bowen Island and cherished by Islanders.

As Bowen Island population has grown, numerous specialized committees have taken on the more detailed work of investigation of Bowen's need. There are a number of committees operating under the auspices of the Advisory Planning Commission- Open Space and Recreation, Trails and Crown Land, for example. Groups such as the Forests and Water Management Society, the Bowen Island Heritage Preservation Association and the Nature Club each have objectives that the Alliance supports. Alliance members are active in these and other community organizations."

Box 7-6: The Legion

Branch 150 of the Royal Canadian Legion received its charter in 1936. In 1972, it had a membership of 110 members and two life members. The hall located on Scarborough Road, was built in 1968. While the Legion has not been as active in recent years, it once played a key role on the island, both in the provision of social life and social services. Howard (156, 1972) writes "it is the only organization which looks after the sick or needy, whether veterans or not. It also sponsors a soft ball team, gives financial and other support to children's sports and to other community affairs. In this work it has the help of the Women's Auxiliary which indefatigably raises money, visits patients in nursing homes on the North Shore, cooks and serves turkey dinner to single old age pensioners every Thanksgiving, and at one time operated a lending library".

7.5.1 Spiritual and religious communities on Bowen Island

In 1993, an estimated 250 Bowen Island residents attended one of the four established Churches, with an undetermined number attending churches on the mainland, or with alternative religious practices (Community Services and Facilities Task Force Report, 1993). The religious and spiritual communities are an important part of community life.

- **Bowen Island United Church**

The United Church was built in 1932 on a lot donated by Mr and Mrs. Jim Collins. The adjoining Collins Hall was built and dedicated in 1964.

- **St. Gerard's Catholic Church**

A campaign to raise money to erect the Catholic Church was begun in 1966. The land was donated by the Union Steamship Company. The new building was blessed on June 18, 1972¹³, and has a crucifix crafted from driftwood.

- **Cates Hill Chapel**

This interdenominational Christian Brethren Church came together in 1991. About 75-80 people attend the church regularly. The chapel is about a year old, and is leased from the Smoothstone Foundation.

- **Bowen Island Community Church**

The Bowen Island Community Church came into being in 1989, with a group of former United Church members. They hope to be able to build a church.

- **Bowen Island Unitarians**

"Liberal religion for the open minded and searching heart" Sunday services are held in West Vancouver with occasional gatherings on Bowen.

- **Religious Society of Friends (Quakers)**

A Quaker worship group, under the care of the Vancouver Monthly Meeting. Meets every second Sunday evening. About 6-8 regular attenders.

- **Jewish community.**

About 50 people of Jewish descent are estimated to live on Bowen Island. The nearest synogogue is in North Vancouver.

¹³ Howard, 1972.

7.5.2 Other spiritual communities on Bowen Island...

- Vipassana Buddhist meditation group (Theravadan tradition)
- Tibetan Buddhist tradition
- Bah'ai community

7.5.3 Community Facilities

Table 7-2: Community Facilities and Programs (adapted from Lees and Associates, 1999)

Organization	Facilities	Programs
Bowen Island Fitness Centre	Weight room, boxing ring, pool tables, batting cages, video games. 3,500 sq. ft.	Weight training, personal training, fitness, small cast plays
United Church of Canada	Collins Hall. 800 sq. ft.	BIPRC programs
Bowen Island Parks and Recreation Commission	BIPRC programs use: shared space in the BICS; Union Steamship Store; Collins Hall; Artisan Square; Bowen Island Teen Centre; Total area = 7275 sq. ft.	Wide range of community based recreation programs; performances at BICS, OGS; children's theatre at Bow Isle in Fall, Spring- programs limited due to parking
Bowen Island Arts Council	The Gallery at Artisan Square 1,350 sq. ft.	Performance and visual art classes; body movement classes
Legion Building	3,200 sq. ft. in the Legion Hall	Theatre performances, rehearsals
Bowen Island Pre-school and Daycare	2,700 sq. ft	Preschool programs
Tiggy Winkles Preschool/Family Place	Artisan Square 1,050 sq. ft.	Preschool age programs; Little Tykes day camp programs
Bowen Island Teen Centre	2,700 sq. ft.	Casual drop-in
Canadian Institute for the Blind	1,500 sq. ft.	None at present- music productions in the past
Seniors Keeping Young	Bowen Court	Fitness and wellness programs for seniors
Camp Bow-Isle	Outbuildings, ropes course	Children's theatre, Low ropes course
Evergreen Acres	Riding ring, stables	Riding lessons, shows
Bowen Island Horse Owners and Riders Association	Riding ring in Crippen Park (GVRD)	Riding lessons; horse shows
Bowen Island Public Library Board	Rental space at Cates Corner	Small library
Island Pacific School	Facility under expansion	2 D art classes
Cates Hill Chapel Society	Sq. ft.	Church gatherings; available for rental
West Vancouver School Board	BICS for continuing education, community meetings	Adult continuing education
Vineyard Bed and Breakfast	20' x 40' swimming pool	Partnership with BIPRC for swim lessons
"The Barn"	Private Residence	Music workshops

Organization	Facilities	Programs
"Meadow Lawn"	Private Residence	Music workshops
"Benson House"	Private residence	Chamber music performances
Tunstall Bay Clubhouse	25' x 45' swimming pool	Partnership with BIPRC for swim lessons

Box 7-7: Community Centre Referendum

In 1997 there was a Bowen Island-wide referendum regarding a proposed 4,400 square foot community centre, proposed for Cates Hill lands at the corner of Trunk Road and Artisans Lane Road. Of the residents and non-resident property owners who voted, 45% (446) voted in favor and 55% (536) voted against.

7.5.4 Informal Recreation Opportunities

Table 7-3: Current Informal Recreation Activities (Source: Lees and Associates, 1999)

Activity	Location	Specialized Equipment Required	Specialized Facility Required	Presently Available on Bowen Island
Walking	Trails and Roads	No	Safe roads, trails, beach access points	Yes
Hiking	Trails, beaches	Sturdy footwear	Signed trails	Yes
Biking	Trails, roads	Road bicycle	Safe roadways	Yes
Mountain biking	Trails	Mountain bike	Mountain trails	Yes, Crippen Park on designated trails
Motorized trail bike riding	Trails	Dirtbike, motorized	Trails, non-sensitive lands	This activity does occur on Bowen, not always sanctioned
Horseback riding	Trails, roads	Horse, tack	Signed trails, equestrian ring	Somewhat
Swimming	Ocean	No	Swimming pool, ocean access	Yes
Outdoor rock climbing	Steep rock	Climbing equipment	Routes with anchors, hike in access	No
Birdwatching, wildlife viewing	Varied	Binoculars, reference books	Undisturbed and/or enhanced natural areas	Sponsored by the Bowen Island Nature Club
Kayaking/canoeing	Ocean	Kayak, canoe	Easy beach access	Operated by contractor at Dallas Marina
Skateboarding	Hard surfaces, bowls	Skateboards, protective equipment	Street-style and/or bowl	No
Outdoor basketball	Hard court	Basketball hoops	Basketball court	1 court at BICS; 1 court at Island Pacific for their use only

Activity	Location	Specialized Equipment Required	Specialized Facility Required	Presently Available on Bowen Island
Stargazing	Areas obscured from night time lights	Telescope	Dark areas open to the night sky	Crippen Park and others
Scuba diving	Ocean	Scuba gear	Beach accesses, boat ramps	Mt. Gardner Dock
Gardening	Varied	Outdoor clothing, shoes	Sunny, fertile, well-drained soil	No public gardening places

7.5.5 Softball

Softball has been a very popular activity on Bowen Island for many years. In the 2000 season there were 6 men's teams, 4 kids teams and 2 dozen women involved with the fastpitch team.

7.5.6 Community Life Indicators



Indicator: Percentage of people who volunteer for Island projects or attend community meetings for 50 hours or more per year

What does this indicator tell us? This indicator tells us how involved people are in volunteering with on-island activities.

Where do the data come from?

Information needs to be collected through a survey



Indicator: Attendance at art events or cultural facilities

What does this indicator tell us? This gives an indication of the level of support and interest in the arts and community events on Bowen Island.

Where do the data come from?

Data from key annual events could be tracked: Bowfest, Arts Festival

7.6 Housing

Some housing statistics from the 1996 census on size, cost and tenure of homes on Bowen Island:

Total number of occupied private dwellings	1030
Average number of rooms per dwelling	6.66
Average number of bedrooms per dwelling	2.54
Average value of dwelling	\$329,499
Owned	800
Rented	200

(Data Source: Census 1996)

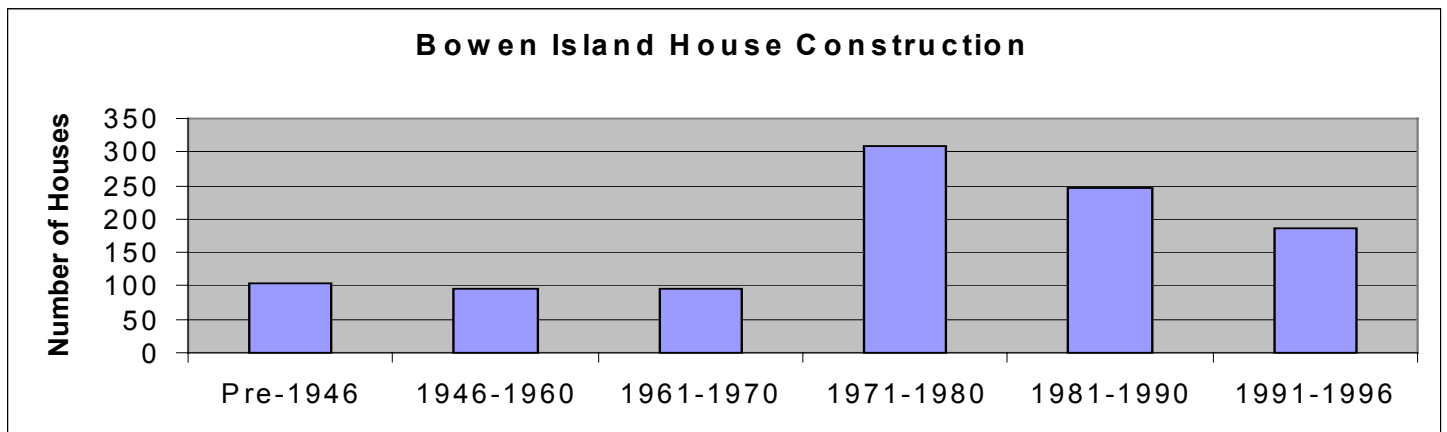


Figure 7-1: Bowen Island House Construction Source: Statistics Canada, 1996

Concern for adequate and affordable housing opportunities for Bowen Islanders has been an on-going island concern. Reasonably priced real estate has been a key factor in attracting people to Bowen Island. Traditionally relatively cheap cottage property was available for seasonal occupation. These could be renovated for full-time occupation. The *Cowan Point Social Impact Review (1999)* identifies three factors that have impacted housing stock and prices.

- "An increase in average cost of all housing. As the price of housing in the Lower Mainland has increased, so has it on Bowen.
- The availability of services on and to the island have made it increasingly viable option for a broader spectrum of the population to live on the island thereby creating increasing demand
- The previous inventory of cottages which could be acquired cheaply seem to have virtually all been sold"

The Cowan Point Social Impact Review identifies the following groups as having difficulty finding reliable and affordable housing on Bowen Island.

- Seniors with fixed income
- Seniors who need some assistance or care and cannot live on their own
- Single parent families
- Children of homeowners who have moved out on their own (students and working)
- Women over 55 without pension benefits
- Low and minimum waged workers
- Special needs people with mental or physical handicaps
- Young families
- People in the service industry

For more information on housing prices and sales on Bowen Island, see the *Land Use Section* (11.0).

7.6.1 Housing Indicator



Indicator: Mix of housing by type, tenure, and cost

What does this indicator tell us?

This indicator tells us about housing availability and affordability, and is a window onto the changing demographics the Island.

Where does the data come from?

Statistics Canada could provide some data, supplemented with a survey.

7.7 Education

7.7.1 On-Island Schooling

7.7.1.1 Early Schooling on Bowen Island

The first school on Bowen Island was where the Works Yard is now and was open from 1893 to 1936. The second school was on the current site of Bowen Court on Miller Road, from 1936 to 1957, when it burned down. A new school was built on the same site which ran from 1957 to 1979. In 1979 the Bowen Island Community School opened in its present location.

The enrollment numbers for 1893 to 1970 were as follows:

1893	10 students
1901	19 students
1910	17 students
1920	16 students

1931 22 students
1940 38 students
1950 19 students
1960 29 students
1970 10 students

7.7.2 Daycare and Preschools

Bowen Island Pre-school and **Bowen Island Community Daycare** are located in Cates Hill. The pre-school was established more than 25 years ago. In 1998, a day care was established and is the only licensed day care on Bowen. The pre-school has 55 children registered for 1999, with a capacity of 80. It operates 3 classes, but could accommodate four classes. The Day Care has three services-time service, kindergarten and after school care. It has 5 staff, and 20 spaces. Not all children attend every day, so the 20 spots are filled by 55 families, with about 16 children coming every day on average¹⁴.

Tiggy Winkles Pre-school is a second pre-school on the island. It is located at Artisans Square and has been operating for 3 years. It offers pre-school and operates Family Place for parents and pre-school age children. Family Place operates as a not-for-profit society.

There are no other licenced day care facilities on the island, although some **in-home day care** is offered. Provincial regulations restrict the number of unrelated children who can be provided care in an unlicensed home setting to two.

7.7.3 Elementary and High Schools

There are 650 Bowen Island children and teens in the public school system- 400 in kindergarten to Grade 7, and 250 in Grades 8 to 12. Therefore there are 13.3 elementary school students and 8.33 high school students for every 100 residents.

7.7.3.1 Bowen Island Community School

Bowen Island Community School serves the island for grades one to seven. In 1985, Bowen Island became part of School District #45 (West Vancouver), instead of School District #46 (Sunshine Coast). Bowen Island Community School is currently operating at capacity. In September of 1998 six new classrooms were added and two portables are in use at the school¹⁵

"In 1978, the Greater Vancouver Regional District, on behalf of the Bowen Island community, entered into agreement with the School District of Sechelt to contribute funding of \$180,000 towards the

¹⁴ Cowan Point Lands Social Impact Review, 1999.

¹⁵ Cowan Point Lands Social Impact Review, 1999.

BICS expansion project. Repayment of the debenture debt will be complete by December 2000. The purpose of the funding was to enable the construction of a full-size gym and community-use room to enable community use of the school facility for recreation purposes. The agreement was transferred to West Vancouver School District when Bowen Island came under their jurisdiction. Recreation programs are held in the gym, the community-use room and classrooms at the school. School population requirements and functions take priority over community use. In recent years, availability of the school facilities has been reduced due to the increased student enrollment, resulting in fewer program offerings or cancellation of some recreation programs. When appropriate, rental space has been secured at private owned facilities within the community to meet recreation program needs. Many of these facilities are small with the layout and size often constraining program offerings". (Source: Lynda Floyd, Electoral Area Administrator, quoted in Lees, 1999).

7.7.3.2 Island Pacific School

Island Pacific School is a 'university stream' grade 6-9 private school. It was started in 1995, and was originally situated on Artisan Lane. It outgrew the first building and is now in a new, larger building. The school currently offers grade 6/7 and 8/9 split classes of 28 students each. 95% of the students are from Bowen. The plans for 2001 include single grade classes of 15-19 students for each of the four grades. There are over 30 families applying for 14 grade 6 spots for 2001, and advanced applications have been received to 2007¹⁶. According to their website, "IPS students participate in a wide range of academic, artistic, and recreational pursuits designed to foster responsibility and self-reliance"¹⁷. It costs \$4,700 per year for a student to attend IPS. There is a bursary fund for students, but the number and value of bursaries offered is not public information.

7.7.4 Off-Island Schooling

There are 250 high school age students on Bowen Island. They travel by bus (on Bowen), ferry, and bus again to Rockridge and Sentinel Secondary School in West Vancouver. 150 students go to Rock Ridge High School for grade 8-10, and 85 students to West Vancouver Secondary School for grade 10-12 (Source: Dura, 2000).

7.7.5 Adult Education

Adult education has long been part of community life on Bowen Island. This has come through a number of venues:

- Courses offered through Bowen Island Parks and Recreation and the Bowen Island Community School

¹⁶ *Undercurrent* pg. 16, November 3, 2000

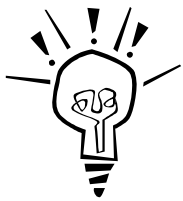
¹⁷ www.islandpacific.org

- Skill-based courses and lessons through the Fibre Arts Cooperative, Penryn Singing Academy, and private teachers and studios
- Discussion groups such as informal 'philosopher cafes'

Box 7-8: The Bowen Life Long Learning Society

The **Bowen Life Long Learning Society** was incorporated in the fall of 2000. Its mandate is to promote adult learning with a focus on learning about sustainability. It takes a learner-focused approach, focusing on the learner's perception of what they need to guide educational opportunities. The Life-Long Learning Society hopes to help in the sharing of knowledge about sustainable activities and practices that are going on in the Bowen Island community. Eventually the Learning Society hopes to create an Island Learning Centre in Snug Cove.

7.7.6 Education Indicators



Indicator: Average school class size and total school enrollment

What does this indicator tell us?

This indicator tells us about accessibility of education in the context of the changing youth population.

Where do the data come from?

Bowen Island Community School and Island Pacific School.

7.8 Seniors Youth and Women

7.8.1 Seniors

7.8.1.1 Organizations

There are a number of organizations that aim to help meet the needs of seniors on Bowen Island:

- Bowen Island Seniors Association (BISA), Branch #133 of the Senior Citizens Association of B.C.
- Seniors Keeping Young organizes fitness and group activities
- Seniors One Stop Info
- The Bowen Island Community Care Society
- Bowen Island Seniors Housing Cooperative
- Bowen Island Memorial Garden Society

7.8.1.2 Housing

Bowen Court, built in the early 1980s, is a housing project targeted specifically for seniors. It has a seniors-oriented co-operative housing project of 18 row houses and one apartment. It is fully occupied and has a waiting list of 8 to 10 parties (combination of singles and couples)¹⁸.

7.8.1.3 Identified needs

A number of facilities to meet the needs of seniors on Bowen Island have been identified.

- Additional seniors housing options on Bowen
- Abbeyfield House- (one or two could be built) a home that can accommodate up to ten people (seniors or persons with special needs) who require some level of medical care and meals
- Seniors activities centre¹⁹
- 20 bed Multi-Level Care Facility: 8 extended care beds; 6 Intermediate Care 2 beds; six Intermediate Care 3 beds; which would service seniors who cannot be maintained at home, long-term care clients of any age with progressive disabilities²⁰

7.8.1.4 Health Care

- 16-20 residents are already clients of North Shore health Services' continuing care program²¹

¹⁸ Cowan Point Social Impact Review

¹⁹ Cowan Point Social Impact Review

²⁰ Proposal for a Multi-Care Facility on Bowen Island

²¹ Ibid

7.8.2 Youth

7.8.2.1 Facilities and Activities

The main services that are available specifically for youth are based at the Teen Centre, where a youth worker is employed part-time. The Teen Centre located in the lower level of the Bowen Island pre-school. It has been at this location since June of 1999. Previous to that time Collin's hall was used. It has an adult advisory board²². Other on-island activities for youth include Scouts, and various programs offered through the Bowen Island Parks and Recreation Association. The Ambleside Youth Centre is also available on the North Shore. There is a 'kids help line' that serves the entire lower mainland.

7.8.2.2 Identified Needs

In 1999 Collene Huskisson, Recreation Programmer with Bowen Island Parks and Recreation, conducted an informal survey of teenagers travelling to and from school on the B.C. Ferry.

The survey found that²³:

- 34 of the top 50 activities could be provided on Bowen (those that could not be provided include sports games, water slides, IMAX theatre)
- 17 of the top 50 activities are outdoor related and the rest require indoor programming space
- 20 of the 50 top activities are team related or involve 2 or more people
- The top two activities were paintball and go-carting

7.8.3 Women

7.8.3.1 Social Services

In Bowen Island's *Gold Pages*, two services are specifically identified for Bowen Island women. There is a crisis line for battered women (based on the North Shore) and Bowen Island Family Place Association which offers an opportunity for mothers and preschool children to socialize. Two health care services for women include breast self-exam and a women's health and menopause line. There is no prenatal nursing care for expectant women.

7.9 Health Care

7.9.1 A brief History of Health Care

In the 1950s, when the population of Bowen Island was smaller, health care was provided through 'weekender doctors' and community support, or people traveled to the mainland to access health services. For 30 years, Ellen Dorman, a registered nurse on Bowen Island, provided weekend nursing service. Karen Levy, Bowen Island community nurse, describes Ellen's care:

²² Cowan Point Social Impact Review

²³ Lees, 1999.

‘ “There was no other form of health care, I was it,” says Ellen. “I looked after everything from baby rashes to fish hooks in hands to garter snake bites. One even wanted me to deliver their baby!” Ellen, a true generalist, took on anything that came her way; strokes, infections, or palliative care. She did what she could or otherwise arranged emergency water taxi service to Horseshoe Bay where the North Shore Ambulance received the patient and took them to Lions Gate Hospital. A past recipient of the Citizen of the Year award, Ellen gave her own time and supplies with no remuneration whatever. “They didn’t have the money to pay, but they sure knew how to show their gratitude,” says Ellen²⁴.

7.9.2 Current On-island Health Care

A number of on-island health care services are offered. These include:

- Family Physicians: Dr. John Hurlburt and Dr. Leah Cline
- Ambulance service to hospitals on the Mainland
- Home care nursing is available to residents of Bowen 3 days a week
- Homemaker service is available to residents of Bowen Island 5-7 days a week
- Medical services include a clinic with limited hours, 7 days per week; seniors complex 3 days a week
- Cates Hill Pharmacy
- A public health nurse is available at BICS Community Use room the third Tuesday of every month, 1-3 pm. This can include consultation on health concern and immunization.
- North Shore health Unit does home visits for mothers with newborns, well baby clinics, school health programs (for example immunizations, hearing and vision screening; health and sex education), wellness program for seniors weekly

Home nursing visits provide care to those individuals requiring wound management, diabetic care, post cardiac/stroke care including monitoring and palliative/hospice care.

Additional visits (i.e. those required when the regular nurse is off) can be coordinated on an 'as needed' basis. Bowen Island residents are included in the North Shore Palliative Care Program and in-home care is available in most cases. The Long Term Care Program resources are also available. The intake desk of Continuing Care at North Shore Health Region can provide additional information regarding care availability on Bowen Island²⁵.

7.9.3 On-island Paid services

A number of other on-island health related services are available. These include:

- 3 homeopathy practitioners
- Dental service offered on-island once a week

²⁴ Levy, Karen. *Island Style Health Care*.

²⁵ Information provided by Karen Levy, Bowen Island community nurse, January 2001.

- 1 Christian Science practitioner
- Bowen Island Wellness Center
- Bowen Island Botanicals
- 2 personal trainers
- 3 counselors
- physiotherapist, chiropractor, podiatrist, counselors, midwife, massage therapist

7.9.4 Off-island

Health care services that can be accessed on the mainland only include:

- Some North Shore community health services
- Poison control centre
- Hospital

7.9.5 Health Care Indicators



Indicator: Number of physical and mental health care services per capita offered on island

What does this indicator tell us?

This indicator tells us about accessibility of health care services on Bowen Island.

Where does the data come from?

Community Nurse.

7.10 Emergency Services

7.10.1 Fire Department

Bowen Island is serviced by a volunteer fire department, which operates out of the fire hall at 788 Grafton Road. It has been operating since 1969. In 1989, the fire chief position went from a volunteer to a (part-time then full-time) paid position. In 1982 there were 19 volunteer fire fighters. In 1992 the number increased to 25, and there are currently 24 volunteers²⁶. The system used to involve calling 947-9555, which would then ring through to seven phones. Whoever answered would begin to call the volunteers. Recently Bowen Island has been integrated into a 911 system. As a result the house numbering system has been reorganized. Hydro poles used to be used as the numbering system in emergencies. All the fire hydrants on the island have recently been mapped.

²⁶ Community Services and Facilities Task Force Report, 1993.

7.10.2 Ambulance Service

Until 1989, the ambulance service was run out of the fire hall. There were 8 core people who were on-call, usually for a week at a time, with the ambulance service. In 1989 the fire hall purchased a large pump truck and the ambulance service needed to find a new home. The ambulance station was built on Miller Road. There are now more than 40 people on-call with the ambulance service. As only 6 are island-based, many of the paramedics come over from Vancouver to work shifts on the island.

7.10.3 Emergency Preparedness

After a major winter storm cut off power to Bowen Island in 1991, emergency preparedness moved up the agenda. A number of Neighbourhood Emergency Resource Persons (NERPS) were appointed to coordinate efforts to plan at the neighbourhood level in the eventuality of an emergency such as a fire, storm, or earthquake. Their role is to:

1. Keep information about skilled people and equipment in their neighbourhood that could be made available in serious emergencies.
2. Help put you in touch with the best person to assist with your particular emergency need.
3. Act as communication facilitators in times of serious island emergencies.
4. Currently the NERPS are not active due to lack of funding²⁷.

7.10.4 Policing and Crime

Policing services on Bowen Island are provided by the Royal Canadian Mounted Police, the full cost of which is supported by the Province. There are two RCMP officers that serve Bowen Island, one of less than half a dozen 2-member forces in the Province. Once Bowen Island has reached the threshold of 5,000 people according to the Census population, the Municipality will be responsible for 70% of the policing costs, and the Province for 30% .

The chart below shows the crime trends on Bowen Island for 1989 to 1998, taken from the *Police and Crime Summary Statistics, 1989-1998*. It is important to note in 1995, Bowen Island became its own detachment. Previous to that time, the statistics listed under 'Bowen Island' also include North Vancouver Rural, which also includes the North Shore mountains of Grouse, Seymour, behind Cypress, and behind Lion's Bay. Since Bowen Island became its own municipality in 1999, separate monthly activity reports have been kept, shown in the second table.

²⁷ Information on emergency planning provided by Chief Allan Still, November 2000.

Table 7-4: Crime Trends on Bowen Island, 1989-1998²⁸

Reported Crime	1989	1990	1991	1992	1993	1994	1995 ²⁹	1996	1997	1998
Number of criminal code offences	101	134	235	377	376	324	178	186	157	150
Crime rate	54	62	106	158	147	121	65	65	53	49
Number of violent crimes	12	11	19	67	68	44	15	15	20	14
Number of sex offences	2	1	4	5	9	5	2	2	0	0
Number of non-sexual assaults	10	10	15	61	59	37	13	13	20	14
Number of property crimes	41	63	150	196	189	184	95	73	55	57
Number of break and enter offences	9	17	46	36	41	51	15	17	25	12
Number of residential break and enter offences	5	12	19	15	20	35	12	10	14	8
Number of motor vehicle thefts	2	6	11	11	13	4	3	6	1	3
Number of thefts	27	38	88	142	124	122	74	50	28	40
Number of thefts from motor vehicles	5	11	14	32	40	18	14	7	3	3
Number of other crimes	48	60	66	114	119	96	68	98	82	79
Number of mischief and property damage offences	31	21	29	68	71	56	25	36	26	27
Population	1,866	2,147	2,218	2,389	2,551	2,675	2,758	2,860	2,944	3,047

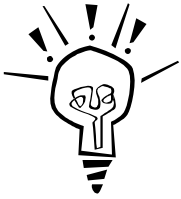
Type of Calls	1999	2000
Calls for Service	837	775
Break & Enter/Thefts	43	45
Property Damage	32	40
Noise Complaints	54	44
Assaults	23	10
General Assistance	463	437
Liquor Files	60	63

²⁸ Police and Crime Summary Statistics 1989-1998.

²⁹ 1995 was the first year of Bowen Island as its own detachment

Impaired Driving/ 24 Hour Suspensions	5	16
Traffic Related	103	82
Drugs	12	11
Other C.C. (frauds, indecent acts etc)	27	18

7.10.5 Crime Indicator



Indicator: Number of crimes reported on Bowen Island per capita

What does this indicator tell us?

This indicator tells us how crime is changing in the community, as the population changes. One particular type of call could be selected from the list of reported calls.

Where do the data come from?

Bowen Island Municipality.

7.11 Community Resources Indicators



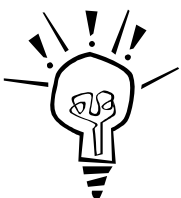
Indicator: Bowen Island Parks and Recreation expenditures per capita

What does this indicator tell us?

This indicator tells us how about educational and recreational opportunities in the community.

Where do the data come from?

Bowen Island Parks and Recreation.



Indicator: Recreational trail length (built vs. unbuilt) per capita

What does this indicator tell us?

This indicators tells us how many trails already exist on the island, how many trails are planned, and how this is changing per capita.

Where do the data come from?

Bowen Islands Parks and Recreation.



Indicator: Number of senior programs per capita and youth programs per capita

What does this indicator tell us?

This indicators tells us how programming for seniors and youth is developing, as the Island demographics change.

Where do the data come from?

Bowen Islands Parks and Recreation, Teen Centre, Seniors Keeping Young.

8.0 Governance

8.1 Jurisdictions

Bowen Island became part of the **Greater Vancouver Regional District** in 1968. The GVRD took over the planning functions from the **Lower Mainland Regional Planning Board** in March 1969, and this delegation of power was made official in the spring of 1971 (Howard, 1973).

8.1.1 Islands Trust

In 1974 the Government of British Columbia enacted special protective legislation called the Islands Trust Act. The Trust Area includes Bowen Island. The Act states that the object of the Islands Trust is to:

"...preserve and protect the trust area and its unique amenities and environment for the benefit of the residents of the trust area and of British Columbia generally, in cooperation with municipalities, regional districts, improvement districts, other persons and organizations and the government of British Columbia."

On April 1, 1990, the Act was amended to establish the Trust as an autonomous local government with land use planning and regulatory authority. The *Islands Trust Act* authorizes establishment of an Islands Trust Fund Board to administer a Trust Fund that can preserve unique features of the Trust Area. The Islands Trust is comprised of 16 distinct corporate entities - Trust Council, 14 Local Trust Committees (one for Bowen Island) and the Trust Fund Board. There is also an Executive Committee that works on the regular business of the Islands Trust.

8.1.2 New Municipality

A referendum to decide whether or not Bowen Island should become a municipality was held among Bowen Island residents in June 1999. The majority of Islanders voted yes, and in December 1999, Bowen Island became the first municipality in the Islands Trust. It has a unique "Island Municipality" designation within the Trust Area. Mayor Lisa Barrett and her six councillors became Bowen Island's first municipal council. They are now facing enormous challenges as they seek to fulfill and manage the aspirations and demands of island residents. All this while devising an entirely new and unique form of government in which the Islands Trust retains an oversight mandate to preserve and protect the unique environmental qualities of the island.

As well, local governments generally control the planning and land use processes, install local development and environmental protection infrastructure, and locally implement broader environmental policies.

8.1.3 Other Jurisdictions

The chart below summarizes the old and new governance system for provision of services.

Table 8-1: Who Provides Local Services on Bowen Island

Responsibility	Before December 1999	After December 1999
Local decision bodies	GVRD; Province; Islands Trust; Improvement Districts	Municipality (mayor + 6 councillors); Islands Trust
Member on GVRD Board	One directly elected for electoral Area C*	One (a member of Council, chosen by Council)
Members on Island Trust	Two trustees directly elected for Bowen	Two council members selected by voters to sit on Trust Council
Responsibility for roads	Province (via private contractor)	Municipality (could be via contractor)
Water system specified areas	GVRD for some; improvement districts and private utilities for others	Municipal specified areas; private utilities remain unchanged
Snug Cove sewer system	GVRD specified area	Municipal specified area
Septic systems	Individual owners	Individual owners
Storm drainage	Province (roadways only)	Municipality
Garbage collection	GVRD (via private contractor)	Municipality (could be via contractor)
Fire protection	Improvement district	Municipality
Policing	RCMP (provincial contract)	RCMP (provincial contract)
911 Service	GVRD	GVRD
Bylaw enforcement	GVRD; Islands Trust	Municipality
Building permits and inspection	GVRD	Municipality
Official Community Plan adoption	Islands Trust Council, after approval from Trust Executive Committee (or Trust Council) and from Province (Minister of Municipal Affairs)	Municipal council, after approval from Trust Executive Committee or Trust Council or Province
Local planning and zoning bylaws	Bowen Local Trust Committee, then approval of either Trust Council or Trust Executive	Municipal council, with referral to Islands Trust
Subdivision approval	Ministry of Transportation and Highways (with referral to GVRD and Islands Trust)	Municipality
Electrical inspection	Ministry of Municipal Affairs	Ministry of Municipal Affairs
Health inspection	North Shore Health Board	North Shore Health Board
Local parks and recreation	GVRD, through the Bowen Island Parks and Recreation Commission	Municipality (through and with advice from Bowen Island Parks and Recreation Commission) The commission still delivers many of the rec services.
Ferry system	Province of BC through Crown Corporation	Province of BC
Library funding	GVRD	Municipality
Tax collection	Province of BC	Municipality
Property assessments	BC Assessment Authority	BC Assessment Authority
School taxes	Province and school district	Province and school district
Welfare	Province and federal government	Province and federal government
Source: 1999 Bowen Island Restructure Study		

Figure 8-1: Where have local services and responsibility shifted? (Sussex Consultants, 1999)

	BEFORE Incorporation	AFTER Incorporation
Municipality	No municipality	Roads Library Subdivision approval Sewer Tax collection Water Building permits Fire Protection
Province	<ul style="list-style-type: none"> • Policing • Roads • Subdivision approval • Tax collection 	<ul style="list-style-type: none"> • Policing
Islands Trust	<ul style="list-style-type: none"> • Trust Policies (Council) • Community plan approval • Local trust committee • Land use and zoning 	<ul style="list-style-type: none"> • Trust Policies (Council) • Community plan (but with appeal to Minister of Municipal Affairs)
Improvement Districts	<ul style="list-style-type: none"> • Bowen Island Fire Dept • Blue Water Park (water) • Bowen Bay (water) • Eagle Cliff (water) • Hood Point (water, misc) • Tunstall Bay (water) • Cove Bay (water) 	
Services Not affected	<ul style="list-style-type: none"> • School • Hospital • Property assessments • Private utilities (including water) • Postal service 	<ul style="list-style-type: none"> • School • Hospital • Property assessments • Private utilities (including water) • Postal service

8.2 Municipal Budget

The municipal budget gives a clear indication of municipal priorities from its first year of operation until 2004. There is a drop in projected costs in planning and subdivision approval between 2002 and 2003. This is when the three-year contract for planning services between the Bowen Island Municipality and the Islands Trust ends.

Table 8-2: The Municipal Budget, 2000-2004

<i>Expenditures</i>	<i>2000</i>	<i>2001</i>	<i>2002</i>	<i>2003</i>	<i>2004</i>
General Government	1,584,281	1,206,700	1,014,700	1,030,700	1,049,950
Snug Cove Wharf (Government Dock)	443,782	167,900	46,500	47,000	47,600
Garbage collection/disposal	209,640	211,000	214,550	225,050	230,150
Parks	100,219	110,000	110,000	110,000	110,000
Recreation	346,728	391,275	394,975	398,725	401,175
Animal control	65,713	54,000	54,500	55,500	56,500
Noise control	7,740	0	0	0	0
Fire department	237,270	249,510	251,290	254,250	286,125
Provincial emergency program	7,500	0	0	0	0
Building inspection	173,975	118,000	119,000	120,000	120,500
Engineering services	56,000	113,400	113,400	119,400	120,400
Public works	10,000	25,000	25,000	25,000	25,000
Roads and drainage	43,500	60,000	50,000	50,000	50,000
Planning and subdivision approval	332,000	345,000	345,000	174,500	180,500
Fiscal debt	63,433	31,045	31,045	31,045	0
Total Expenditures	3,681,433	3,082,830	2,769,960	2,641,170	2,677,900

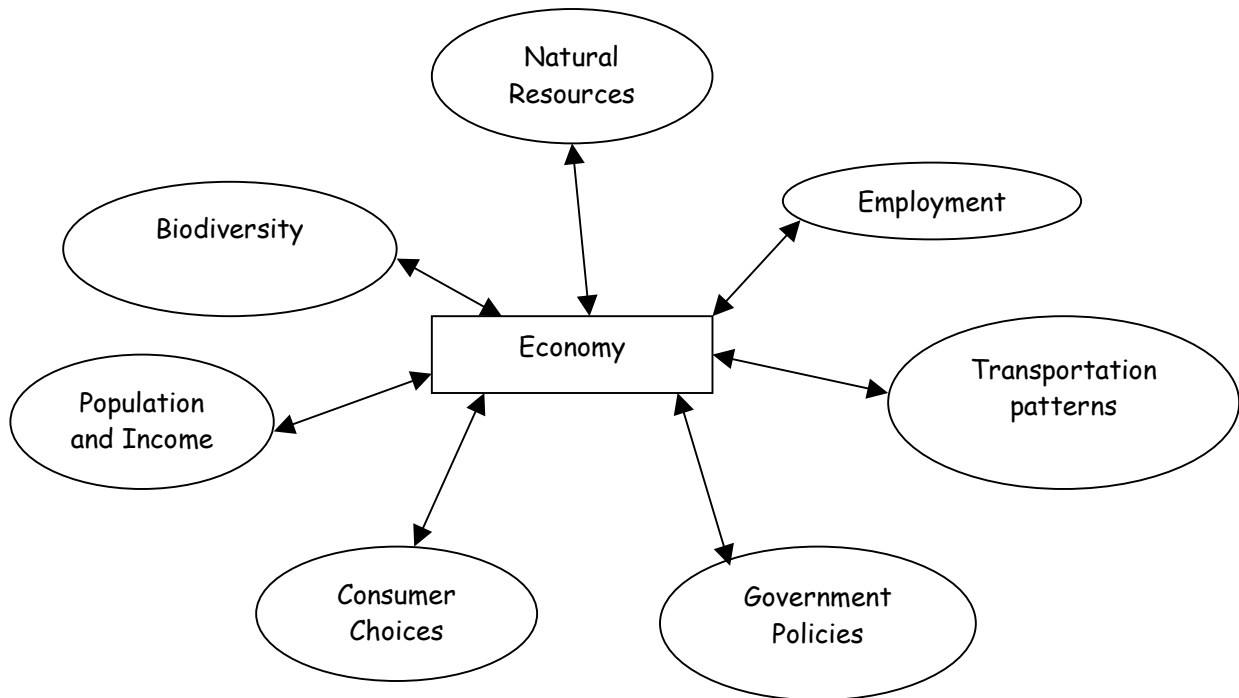
<i>Revenues</i>	<i>2000</i>	<i>2001</i>	<i>2002</i>	<i>2003</i>	<i>2004</i>
Government grants	1,224,741	360,000	160,000	160,000	160,000
Permit fees	52,500	55,000	55,000	56,000	55,000
Miscellaneous income	141,161	73,750	73,750	73,750	63,750
User fees	165,820	201,900	207,500	213,350	217,725
Transfer from reserves (Snug Cover wharf)	51,500	164,600	40,000	37,200	34,600
Parcel taxes (garbage and parks)	254,859	278,000	281,550	291,500	297,150
Property value taxes	1,791,200	1,949,580	1,952,160	1,809,370	1,849,675
Total revenues	3,681,781	3,082,830	2,769,960	2,641,170	2,677,900

<i>Expenditures</i>	<i>2000</i>	<i>2001</i>	<i>2002</i>	<i>2003</i>	<i>2004</i>
Cove Bay water	385,938	365,160	365,067	365,567	369,587
Other water districts	0	0	0	137,400	137,400
Snug Cove sewer	92,129	92,432	92,432	92,432	98,606
<i>Total Expenditures</i>	<i>478,067</i>	<i>457,592</i>	<i>457,499</i>	<i>595,399</i>	<i>605,593</i>
<i>Revenue</i>					
User fees	156,915	156,915	156,968	254,618	255,000
Parcel taxes	321,152	300,677	300,531	340,781	350,593
<i>Total Revenue</i>	<i>478,067</i>	<i>457,592</i>	<i>457,499</i>	<i>595,399</i>	<i>605,593</i>

9.0 Economy

What IS the economy of Bowen Island?

That might seem like a basic question to ask, but it is important to understand what is being considered as the 'economy'. The focus of this section is what is happening on Bowen Island, in terms of the formal and informal economy. While income and employment certainly relate to the economy of Bowen Island, they have been included in the 'people' section because they give us a clearer picture of Bowen Islanders than of the on-island economy itself.



9.1 Formal Economy

What do we know about the on-island economy?

There are a number of on-island active economic sectors. These include commercial and service provision, tourism, agriculture, home-based work, and construction. In the past economic activity has included industry and has been more resource-focused with fishing, forestry, and mining. The *History Section (2.4)* of this report gives a description of these activities.

It is important to understand the on-island economy of Bowen Island and how it is changing. One source of information is the *Gold Pages*, the telephone listings for residences and commercial activities. A number of areas were tracked from 1988-99 to the most recent *Gold Pages* in 2000.

Over the years, listing categories changed, and it is likely that not every business was always listed, but it provides a window onto on-Island activities.

Table 9-1: Gold Pages Listings for Type of Business

Listing	86-87	88-89	89-90	90-91	92-93	93-94	94-95	95-96	97	98	99-00
Arts and Crafts	2	2	1	4	3	-	3	2	5	2	1
Contractors- building	5	7	7	16	18	17	13	9	21	16	14
Contractors- general	7	5	7	7	7	11	11	9	10	9	7
Gifts	1	2	1	2	3	6	3	1	3	10	7
Marinas/marine	2	2	4	3	7	6	6	5	10	9	6
Counselling						4	3	3	5	2	3
Real Estate	3	3	4	4	6	6	-	4	6	6	6
Restaurants	1	-	-	1	1	4	3	3	1	3	3
Clothing	-	1	1	1	1	1	2	1	5	2	3
Financial Services	-	2	5	3	1	2	2		5	3	N/a
House cleaning/maintenance	-	3	2	2	3	2	1	1	3	3	3

Source: Bowen Island Gold Pages 1986-2000

9.1.1 Tourism

Given the historic importance of tourism to Bowen Island, there is limited information about more recent tourism activity on the island.

9.1.1.1 What is known about tourism?

- The Chamber of Commerce uses the Ferry travel statistics to estimate tourist travel to the island (for data, please refer to the transportation section).
- The Bowen Island Heritage Preservation Society keeps records of all visitors to the Information Centre in Cottage Number 20, the requests they make and where they come from. The Heritage Preservation Society now has a handout, pamphlets giving codes of conduct for shoreline and uplands, which are given out to visitors.

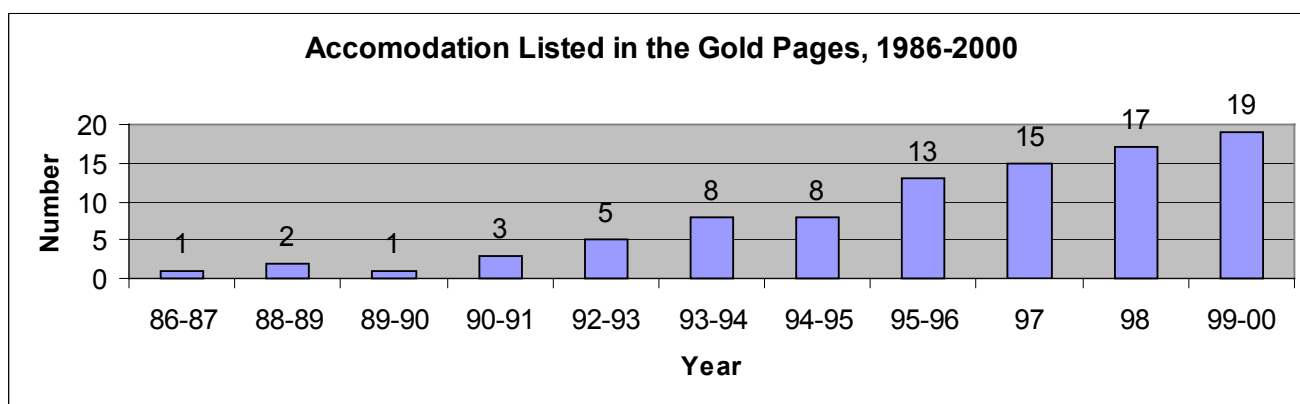


Figure 9-1: Accommodation Listed in the Gold Pages, 1986-2000 Source: Gold Pages, 1986-2000

9.1.1.2 The Tourist Dollar

Tourism can have significant impacts on the island economy. It provides a market for arts and crafts, opportunities for home businesses such as bed and breakfasts to develop, and additional services such as restaurants and recreational activities such as Bowen Island Sea Kayaking, and boat charters.

❖ *Information gap: Information on the economic impacts of tourism on Bowen is not available*

9.1.2 Commercial

While you can get a sense of commercial activity on Bowen Island by walking around Snug Cove and Artisan Square, there is limited 'data' on how commercial activity has changed. The chart at the beginning of this section shows the number of restaurants, arts and crafts, gifts and clothing activities that were listed in the Gold Pages from 1986 to 2000. It may be possible to track commercial activity through provincial sales tax information, but that was not available for this report.

❖ *Information gap: Information on the changing commercial activity on Bowen Island.*

9.1.3 Information Technology

Information technology has changed and will continue to change how Bowen Islanders work, and otherwise participate in the economy. E-mail, home computers and internet connections make telecommuting, working from home, possible.

Information Gap...

How has developing information technology changed the way Bowen Islanders work? We do not know how changing technology and availability of this technology has changed and is changing the face of work on Bowen Island. Anecdotally it seems that more people are able to telecommute one or two days a week from home-based offices on Island, perhaps eventually making the transition to full time work from home. The most recent Census (1996) asked about work location for the first time, but information technology may be only one of a number of factors affecting place of work. A more detailed survey of Bowen Islanders is one way to find out more.

9.1.3.1 Internet Link

Unlike the rest of the Lower Mainland, Bowen Island is not yet set-up for high speed internet access. The island already has a glass fibre cable in place but it is not being used. The changeover from Rogers to Shaw Cable servicing for B.C. has left the provision of high speed cable access in limbo. With cable access, a premium can be paid on top of basic cable for high speed internet service. It is likely that the cable access situation will be resolved by early 2001.

9.1.4 Home-based Work

The 1996 census gives some information about where Bowen Islanders work. For the employed labour force (1,480 people), 44% traveled off Bowen Island to their place of work. 16% work on Bowen Island and 23% work at home. 15% have no fixed workplace and 1% work outside of Canada. 39% of the workforce either work at home or elsewhere on the island.

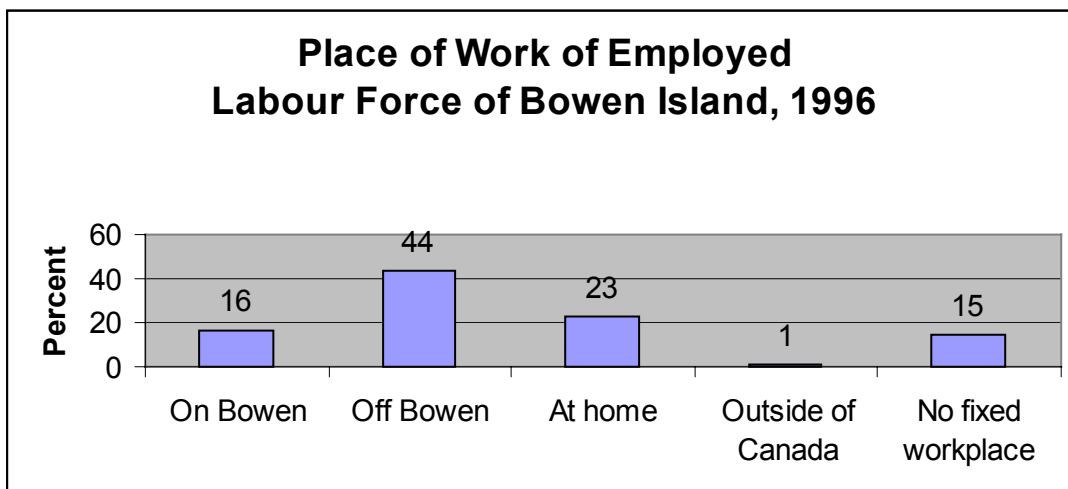


Figure 9-2: Places of Work of Employed Labour Force of Bowen Island, 1996

Source: Statistics Canada, 1996

Why does it matter where people are working?

Workplace location has many implications for health, family life, stress levels and spending patterns. If people work off-island, the implications are lining up for the ferry if commuting by car, taking the 20 minute ferry ride, and a drive or busride of variable length depending on the destination of West or North Vancouver, downtown Vancouver or beyond. Given travel time, commuters can spend 12 hours of the day or more off-island. Although there has not been any survey of commuter attitudes and stress levels, it can be exhausting, and on an anecdotal level 'the commute' is often stated as a reason that people who move to the island choose not to stay. As well, if children are part of a family then it is difficult for two parents to commute without necessitating extensive childcare.

Increasingly more people are able to get some flexibility with their work and telecommute. They can be physically located on Bowen Island, while computers and the internet allow them to be in close contact with their colleagues. Self-employed people may also choose to have a home office and base their work permanently on Bowen.

Bowen 2000, a 1988 survey of almost 200 Bowen Islanders (it was not a random sampling of the population) indicates that 16% of those surveyed worked on Bowen, 25% worked off Bowen and 15% worked both on and off. In a follow-up question, **40%** would work on-island if jobs were available, while 25% would choose to continue commuting.

Where people work affects their spending patterns. If people are heading in and out of town every day, it is likely that they will stock up on food and other goods. This has affected Island business from the introduction of car ferries. Howard writes: "the advent of the car ferry in 1958 brought these little industries to an end- sawmill, travelling store and pie shop folded when people could load up their cars in Vancouver or West Vancouver with everything they needed" (149).

9.1.5 Spending Patterns

Bowen 2000 (completed in 1988) also surveyed people on where they did their shopping. 20% of those surveyed shopped on Bowen and 80% do most of their shopping off-Island. Those who chose to shop on Island stated a number of reasons. They said they wanted to support local business (10 references), for the convenience (12), and had no car (3). Those who shop off-island said that lower prices (68 references), selection (50), variety (31), poor quality of Bowen grocery operation (23), poor quality of Bowen business (16), fresher meats and produce (15), convenience from work (10), hours (4), and to boycott local (2) as reasons to buy on the mainland.

9.1.6 Agriculture

The land designated as Agricultural Land Reserve does not necessarily reflect the on-island agricultural activities, as farming takes place outside of that designation. Recent work by Kathy Dunster and the Bowen Island mapping project has resulted in a large map of working farms on the island. These data have not been digitized, and are difficult to produce in a small format. 22 farms were recorded as active (see box). To view the map, please contact Kathy Dunster at 947-0016.

Box 9-1: Farms on Bowen Island (2000)

Hen Cloud Farm and Howe Sound Seeds and Plants	Alderwood
Frost- free-range eggs, fruit	Bowen Brook
Bumbleberry Farm	Hollyhurst
Lavender Farm	Bowen Island Nursery
Bowen Island Botanicals	Xenia (Permaculture)
Collins Farm	Bally-Brown (Horses)
Peare's Place	Braraths (Mixed)
McDonalds Farm	Crowley/Schuler (Potatoes)
Riley (Fruit)	Seaberly's (Grapes)
Stonehill Farm	Bowen Island Heritage
Preservation (Seeds/Gene bank)	
Ravenhill	Sundog Farm (Sunflowers,
Mint)	

9.1.7 Construction

Construction is an important part of island economic activity. The chart at the beginning of this section shows the number of construction companies that were listed in the *Gold Pages* from 1986 to 2000. The number of annual building permits is shown in the *Land Use* section.

9.1.8 Finance

The present on-island banking is provided by an Automatic Teller that allows for withdrawals only (North Shore Credit Union) and banking services provided one day a week by the Canadian Imperial Bank of Commerce. Recently (2000) a proposal for a VanCity banking facility was submitted by an on-island individual. The proposal has not been approved.

Box 9-2: Why is local credit is important?

- ✓ Local lending institutions may have a different morality than lending institutions located farther away. They will give more credence to an individual or firm's reputation in the community when determining applicability for credit.
- ✓ It helps people get through times when money is short, such as unexpected expenditures or loss of income
- ✓ Local lending institutions keep money circulating within a community

9.2 Informal Economy

The informal economy is an integral part of the economic picture on Bowen Island.

9.2.1 What is the informal economy?

Unpaid personal, voluntary, and household activity make up the informal economy. The informal economy is a source of wealth, well-being and happiness in the community.

Volunteering		Bartering
Household work	INFORMAL ECONOMY	Gift giving
Harvesting of wild food		Child and elder care by family and friends

Why is the informal economy important?

The informal economy can play a big role in building and maintaining important social networks. It can strengthen family and friendship connections, and provide a meaningful role for people who may feel that they are not contributing in other ways (i.e unemployed). Informal economic activities can act as a buffer when economic times are hard. Food harvesting and other subsistence activities can help provide for people whose needs are not met through the 'cash economy'. Informal economic transactions can also have the environmental benefit of reducing the goods distribution (producer to retailer to consumer) chain.

What do we know about Bowen Island's Informal Economy?

Informal economic activities such as barter, gift giving, home gardening and wild food harvesting are thought to occur more in rural communities than in urban communities. It does not take long to discover that there is indeed an active informal economy on Bowen. Estimating the complete 'transactions' of the Bowen informal economy is another matter.

Census information from 1996 gives a picture of unpaid household work, and child and elder care.

9.2.1.1 Unpaid Housework

A conservative estimate of the total amount of unpaid housework that takes place on Bowen Island is about 23,000 hours per week, or 1,196,000 hours per year. The chart below shows a breakdown of the hours. More men do household tasks up to 14 hours per week, while women do more in the 15 hours and higher categories.

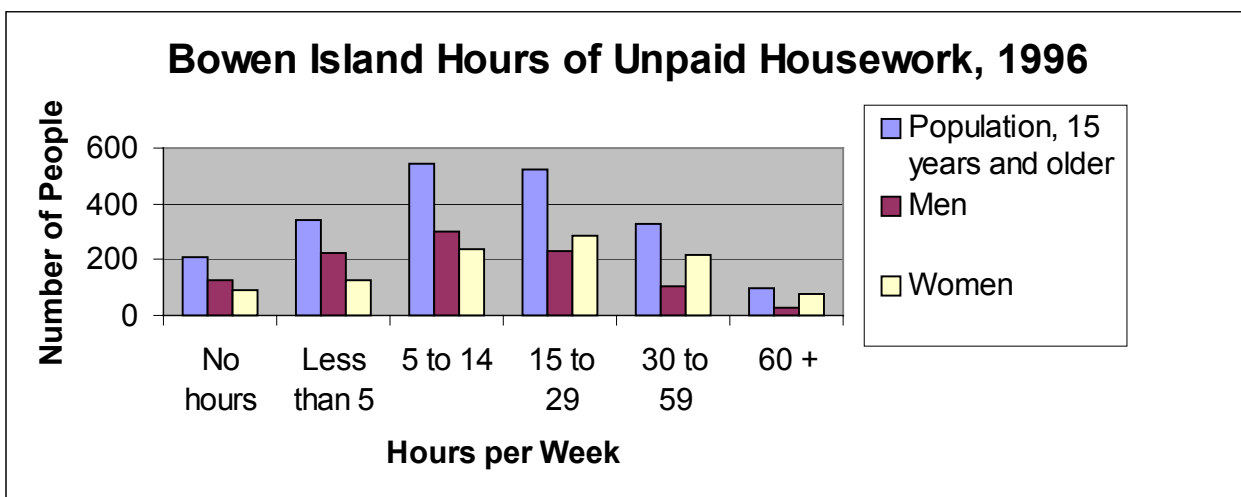


Figure 9-3: Bowen Island Hours of Unpaid Housework, 1996 Source: Statistics Canada, 1996

9.2.1.2 Unpaid Childcare and Eldercare

According to Census Canada, the majority of Bowen Islanders (1235 people, equal number men and women) do not do any unpaid childcare. The number of hours offered by those who do give unpaid childcare is shown in the chart below.

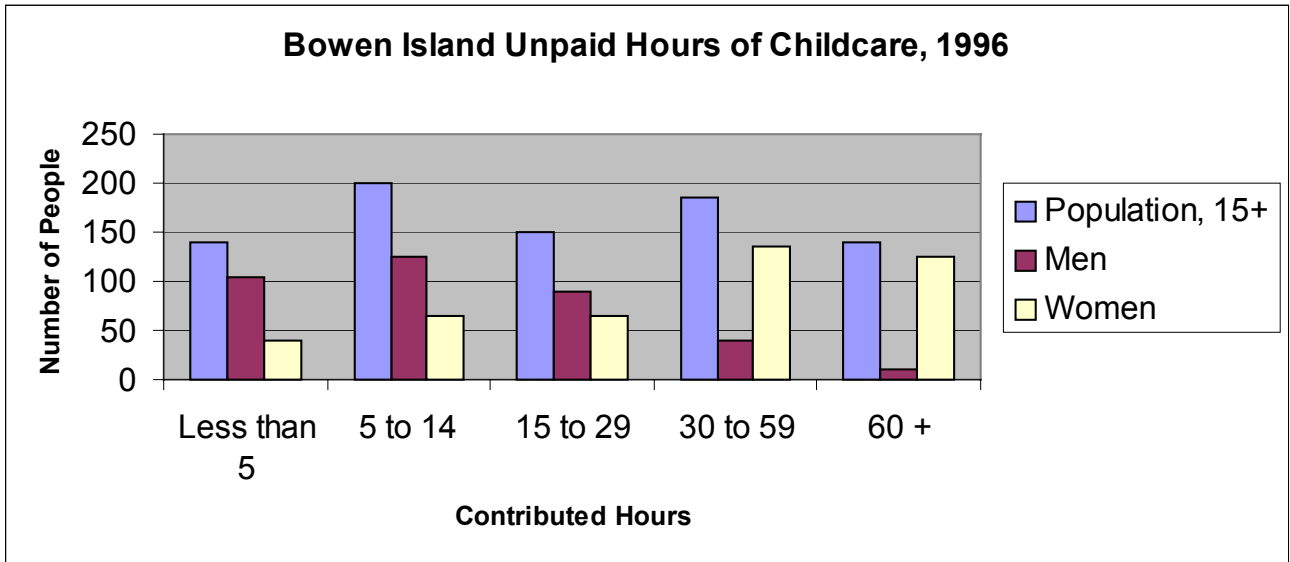


Figure 9-4: Bowen Island Unpaid Hours of Childcare, 1996

Source: Statistics Canada,

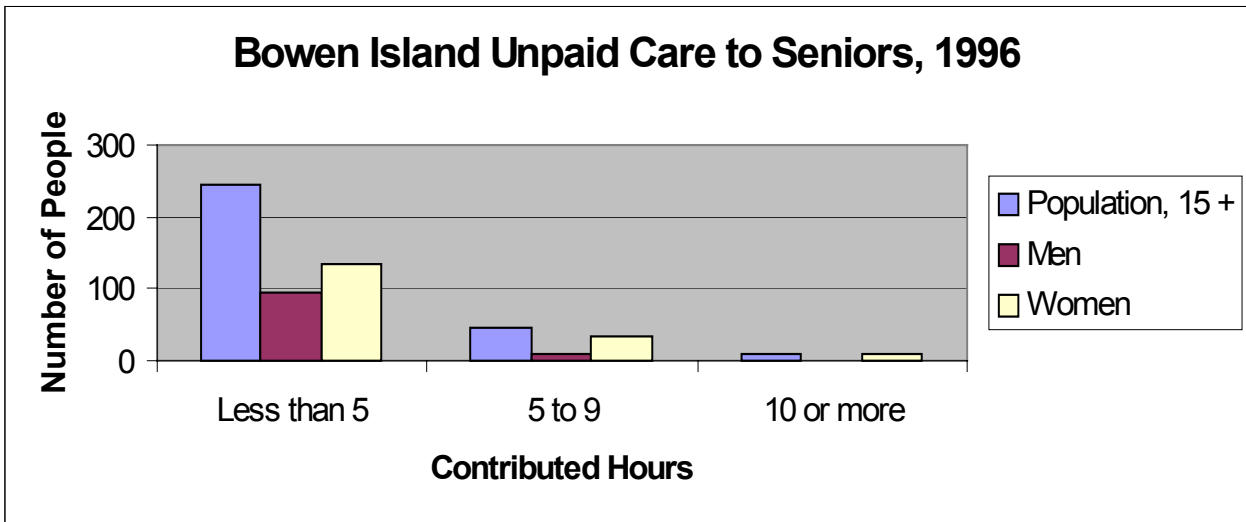


Figure 9-5: Bowen Island Unpaid Care to Seniors, 1996

Source: Statistics Canada, 1996

Similar to unpaid childcare, Census Canada 1996 reports that many more Bowen Islanders do not provide senior care than do. Nearly 1750 people do not provide any hours of unpaid care to seniors. Approximately 300 provide care, the breakdown for this group is shown in Figure 9-5. It is important to note that people might not always report the 'care' that they engage in.

9.3 Economy Indicator s



Indicator: Total inventory rental rooms and cabins

What does this indicator tell us?

This indicator tells us about change in one aspect of the on-island economy, tourism, by tracking the number of bed and breakfast and other accommodation facilities.

Where do the data come from?

Inventory proposed to be conducted by the Chamber of Commerce, 2001

Indicator: Percentage of population working on Island



What does this indicator tell us?

The number of people working on the island, including in businesses and in home offices, gives a picture of the on-island economy, spending on-island, and has other implications for community and family life in terms of commuting time.

Where do the data come from?

Statistics Canada, every 5 years.



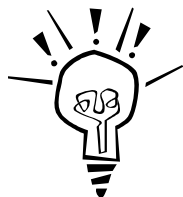
Indicator: Number of hours per capita of unpaid child and elder care

What does this indicator tell us?

This indicator is one measure of volunteering and unpaid but valued work, and is currently being collected by Statistics Canada.

Where do the data come from?

Statistics Canada, every 5 years.



Indicator: Number of members of Local Exchange Trading System (LETS)

What does this indicator tell us?

The development and growth of a LETS system indicates the integration of informal exchange in the local economy and is important in terms of community resources.

Where do the data come from?

Still to be determined.

10.0 Energy

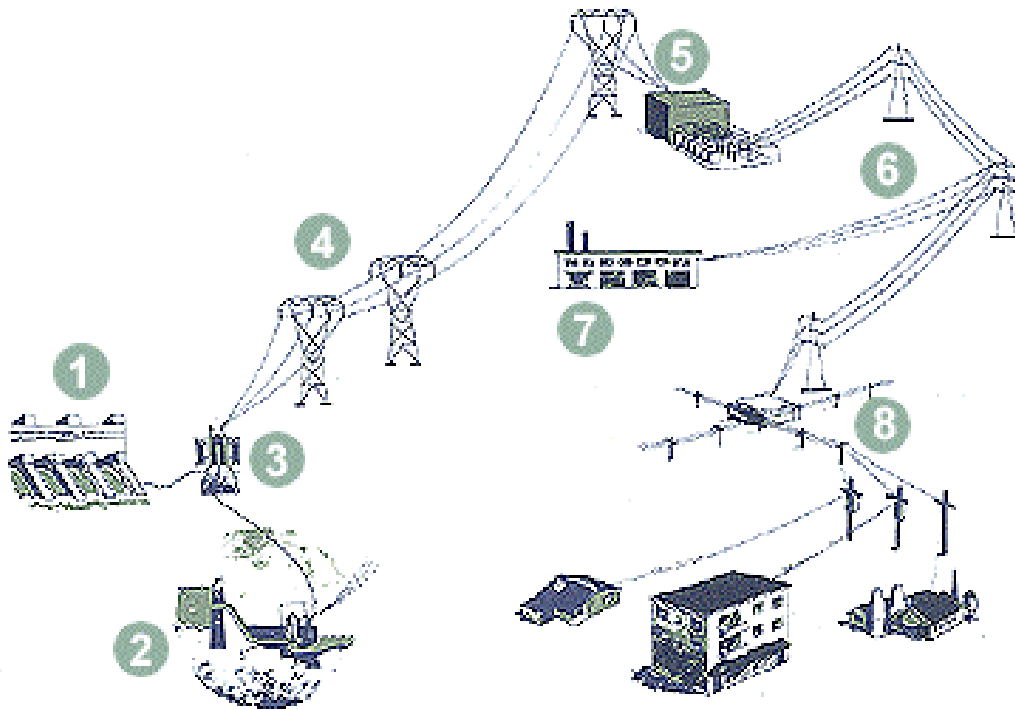
Bowen Island's energy needs are provided by the following sources:

- Hydroelectricity
- Fossil Fuels
- Alternative energy sources

10.1 Hydroelectricity

Currently, hydroelectricity provides energy for most homes, services, and commercial ventures on the Island. Fossil fuels contribute to heating homes and powering transportation. Wood is burned in stoves across the Island, either as a supplemental or sole heat source. Alternative energy sources (such as wind power) are generally in the developmental and experimental stages.

The majority of energy used on Bowen is in the form of **hydroelectricity**. This power is provided by BC Hydro. What is hydroelectricity and where does it come from?



Source: BC Hydro
(http://eww.bchydro.bc.ca/powersupply/power_generation/hydro.html)

How does power get to you?

1. A hydroelectric dam turns potential energy (stored in water) into kinetic energy that is used to turn a turbine.
2. Kinetic energy hits a series of blades in a generator, turning kinetic energy into mechanical energy. The generator turns mechanical energy into electric energy.
3. A step up transformer increases the voltage of the electricity, making it suitable for transmission over long distances.
4. Grid transmission lines, supported by tall metal towers, carry this high voltage electricity over long distances.
5. At a terminal station the grid voltage is reduced to subtransmission voltage.
6. Subtransmission lines take power from the terminal station to large industrial customers or distribution substations (like the Horseshoe Bay substation).
7. Large industrial customers can operate their own substations.
8. At a distribution substation a system of transformers, meters, control, and protective devices reduce electricity voltages for distribution to residential, commercial, and smaller industrial customers.

Source: BC Hydro (http://www.bchydro.bc.ca/powersupply/power_generation/hydro.html)

Where does hydroelectricity on Bowen Island Come From?

Bowen Island is supplied by BC Hydro via the Horseshoe Bay Substation. Electric energy is carried via an submarine cable to the Island where it is distributed via overhead lines to various users. The capacity of the submarine cable is 15 Megavolt Amps (mva) (BC Hydro presentation to Bowen Island Council, 2000).

10.1.1

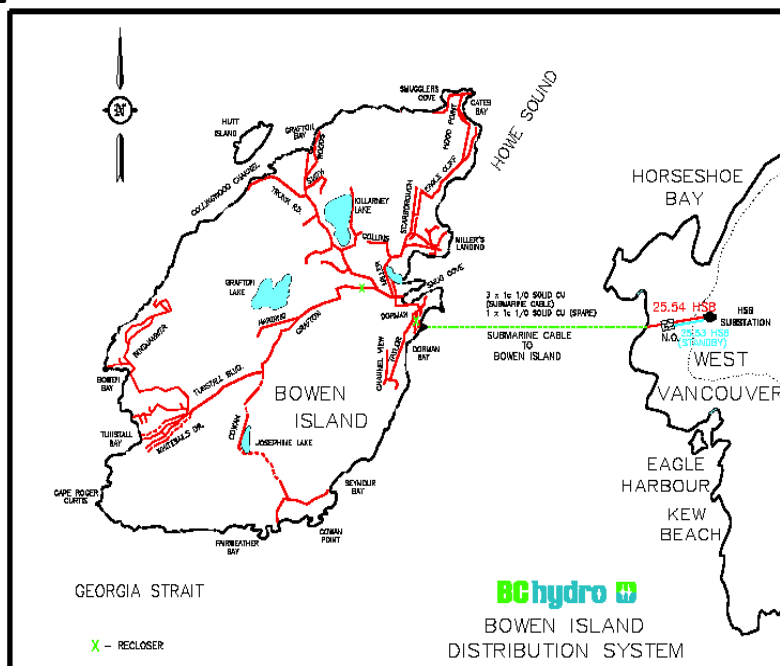


Figure 10-1 BC Hydro Distribution System - Power is sent via underground cable from the Horseshoe Bay substation. The cable runs along the bottom of Georgia Strait and its capacity is 15 mva. Source: BC Hydro, Bowen Island Dist.dwg.

How much hydroelectric energy does Bowen Island use?

The following chart notes growth rates in electricity use on Bowen Island in the past five years. As the number of people increases, the number of accounts rise, average consumption rises and the average demand rises.

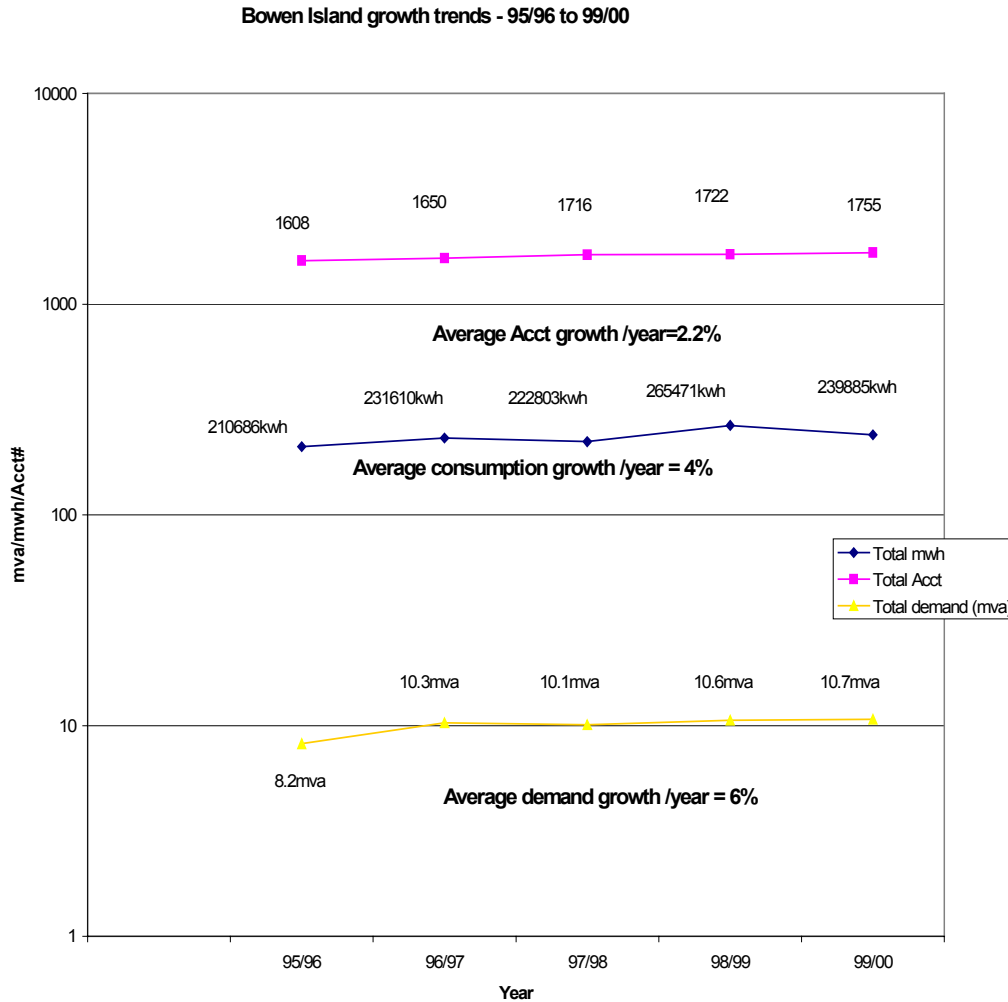


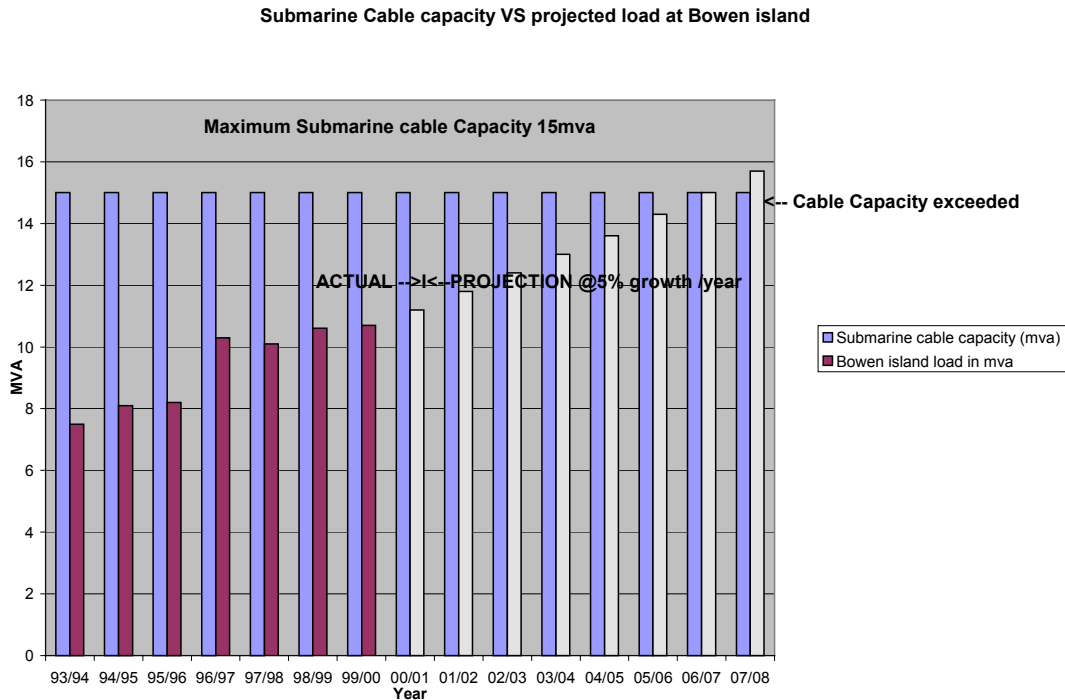
Figure 10-2: Bowen Electricity Demand

Are there limits to hydroelectrical power?

The hydrological cycle is theoretically, infinitely replenishable. However, there are limits to the facilities that supply hydroelectricity. In the case of Bowen Island, the cable that supplies the Island has a capacity of 15 mva. When that capacity is exceeded, the cable will fail. How close are

we to exceeding cable capacity? BC Hydro has developed two scenarios based on increased energy demand growth rates of five and six percent per year.

Figure 10-3: Submarine Capacity vs. Projected Load(5% growth), Bowen Island



With projected energy growth rates of 5% per year, the cable capacity will be exceeded by 2007 - 2008.

The above chart demonstrates some significant issues. Most interesting is that while average account growth was listed at 2.2% per year, average energy demand growth increased 6%, indicating that homes and businesses were using relatively higher levels of energy on a per year basis.

Source: BC Hydro. Presentation to Bowen Island Council, October 10, 2000.

Facts About Bowen Island Power

- Two 25 kv circuits provide Bowen Island with power from the Horseshoe Bay substation. (One is a back-up.)
- The capacity of the submarine cable is 15 mva. (See following diagrams for implications for growth.)
- Growth projections are based on highest demand measurements (for example, the amount of energy used during the coldest day in January at the busiest time of the day). Therefore, demand management techniques could affect power used and affect how power is provided for the Island.

S

Submarine Cable capacity VS projected load at Bowen island

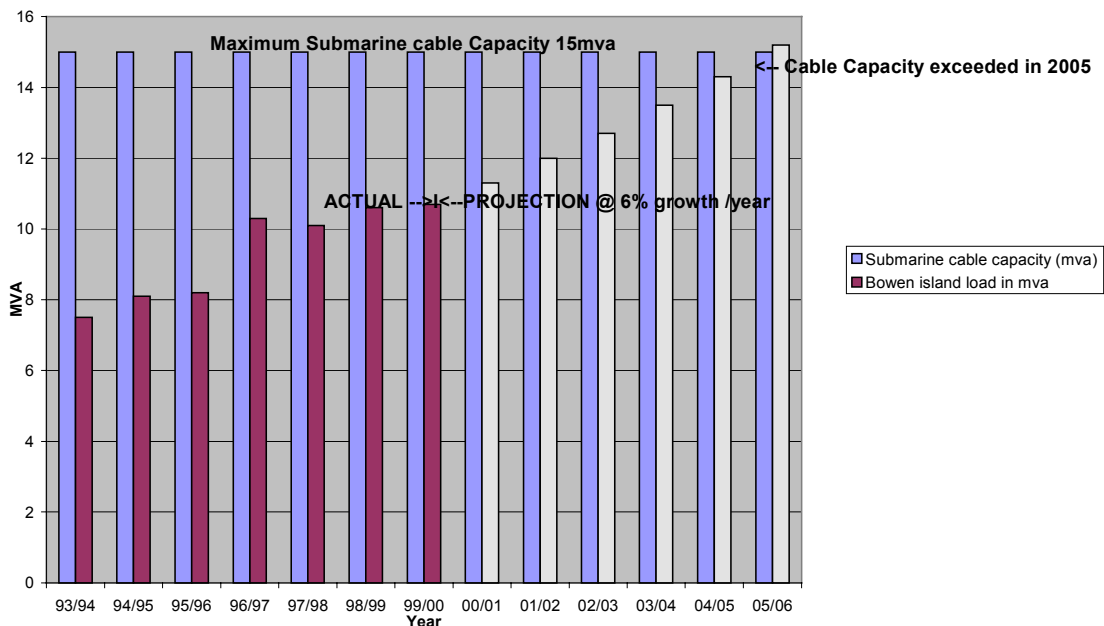


Figure 10-4: Submarine Capacity vs. Project Load (6% Growth), Bowen Island

Are Bowen Islanders energy gluttons?

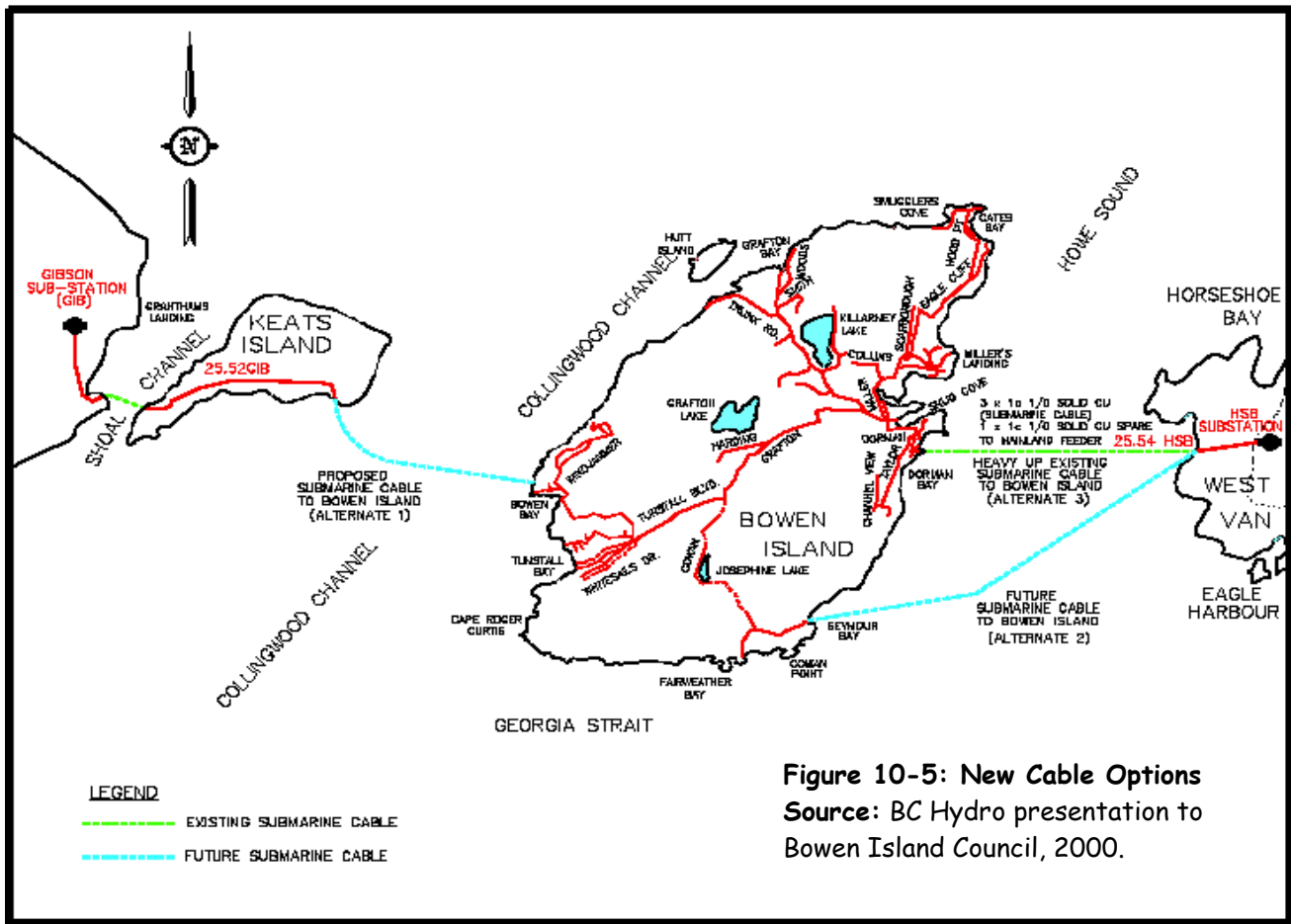
At a public meeting, BC Hydro stated that Bowen Island's electrical consumption demands are very comparable to other locations that do not have natural gas available as a heating and energy option.

BC Hydro has developed a similar scenario for growth rates of 6% per year:

In this case, cable capacity will be exceeded in 2005. It is important to note that in the early 1990s, the Horseshoe Bay substation was modified to increase capacity to Bowen Island. Due to overload conditions in the early nineties, the transformers were changed in the substation, upgraded from 12 kv to 25kv. However, with present energy demands, the major control on the provision of energy to the Island is the capacity of the cable, which, as stated before, is 15 mva. As a result, BC Hydro recognizes that a feasible plan needs to be developed to meet future energy needs.

Conventional Responses to Meeting Increasing Energy Needs on Bowen Island

Several "conventional" strategies have been suggested to increase hydroelectric energy on Bowen Island. These strategies include establishing an overland feeder from Gibsons through the Keates Island to the west side of Bowen, developing a new circuit from Horseshoe Bay to Cowan Point, and increasing the capacity of the present submarine cable. BC Hydro makes it clear that there are trade-offs associated with each one of these strategies. The map below summarizes these potential strategies.



10.2 Alternative Energy Sources

10.2.1 Wind Power

Wind can be used to generate electricity in many locations in British Columbia. However, BC Hydro recognizes that the geography of our province, in particular the prominence of mountains, presents some special challenges to using wind power. BC Hydro notes that wind turbines are best located on land where there is little or no vegetation.

Presently, BC Hydro is conducting its own wind study to determine the suitability of wind power in various locations throughout the province. Anecdotal information from Bowen Islanders suggests that there is suitable power generating wind capabilities on the northwest side of the Island.

10.2.2 Micro-Hydro

Micro-hydro operations operate as small dams or structures that divert water from smaller watercourses through pipes to a generating station. Micro hydro initiatives are generally found on small, steep creeks and streams that are not used by fish. Bridal Falls, near Snug Cove, was once the site of a dam. Bowen Island has not been analyzed in terms of its suitability for micro-hydro initiatives. However, Map 6 outlines the location of creeks on Bowen Island and areas where the slope exceeds 25%.

10.2.3 Wood and Fossil Fuels

Many homes on Bowen Island utilize wood stoves for heating needs. However, the number of homes that use woodstoves is unknown and the intensity in which stoves are used is also unknown. Insurance estimates show wood stove use as high as 90% as a secondary heating source. Anecdotal information from Bowen Island residents suggest that the use of wood burning stoves is significant. Further inquiry into the extent of woodstove use should be examined. For example, if air quality issues became serious and woodstoves were banned as primary heating systems in homes it would be necessary to consider the corresponding implications for hydroelectric energy consumption on the Island.

❖ Information Gap: The extent of woodstove use on Bowen Island

Alan Leigh, who is responsible for selling all diesel, furnace oil, and gas on Bowen Island has the following observations regarding energy use on Bowen Island:

- Gasoline sales in the past ten years were always around 1.3 million litres per year, suggesting that as populations rose, more people bought their gasoline off-Island. With the closure of the gas station, it is estimated that 700 thousand litres of gasoline will be sold in one year.
- Diesel sales fluctuate and are dependent upon the amount of construction on the Island. The more construction, the higher the diesels sales.
- The bigger homes on Bowen Island use furnace oil for heating.

The following chart outlines the amount of diesel and furnace oil used on Bowen Island. The numbers come from Alan Leigh's sales figures.

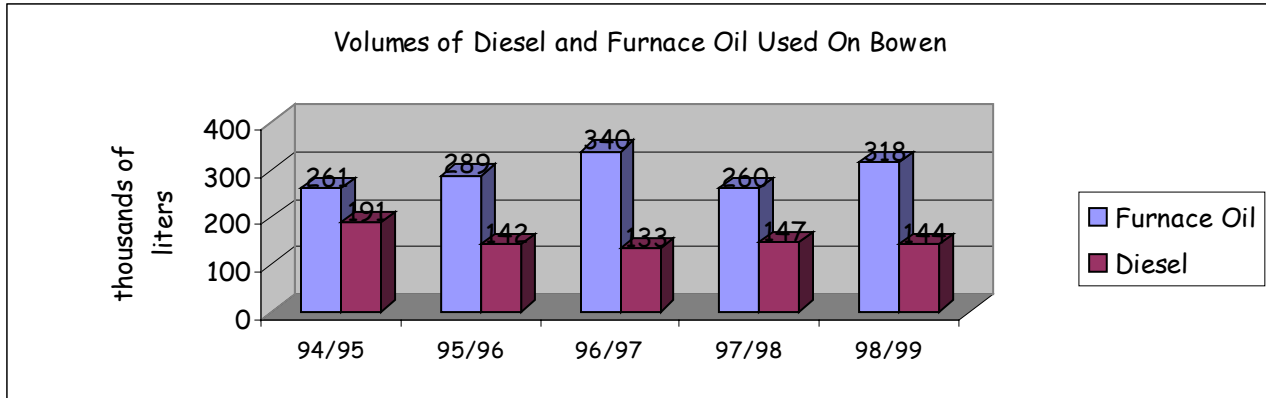


Figure 10-6: Volumes of Diesel and Furnace Oil Used on Bowen

Energy and Transportation: What is the Ecological Footprint of Automobile Use?

Automobile use is growing on Bowen Island. (See Transportation section for increases in automobile use and commuting rates on Bowen Island.) Different types of transportation utilize varying amounts of energy and corresponding inputs from productive land, in terms of getting people from place to place. An interesting proxy measure for determining the energy used via different activities (for example, car use) is ecological footprint analysis.

What is ecological footprint analysis?

Ecological Footprint Analysis is an ecological indicator that provides a holistic assessment of ecological health. Ecological Footprint Analysis is based in the concept of carrying capacity. Carrying capacity, as is used for defining animal populations and range areas, is defined as the "maximum population of a given species that can be supported indefinitely in a specified habitat" (Rees and Wackernagel, 1996, 49). Carrying capacity is considered to be the number of individuals a given habitat can support without being permanently damaged (Odum, 1989, 158). An ecosystem can only support so many of a given species before the needs of that species can no longer be met at a local level.

The concept of Ecological Footprint Analysis (Rees and Wackernagel, 1996) is extremely useful in determining the amount of land that is required to support particular human behaviors, providing a "yardstick" for determining the degree to which we are participating in sustainable behavior. Ecological Footprint Analysis assumes that every category of consumption (energy or material) and the corresponding waste discharge requires the productive or absorptive capacity of a fixed area of land or water. "If we sum the land requirements for all categories of consumption and waste discharge by a defined population, the total area represents the ecological footprint of that population on the earth whether or not this area coincides with the population's home region" (Rees

and Wackernagel, 1996, 51). This calculation measures the land and water area required per person to maintain a certain lifestyle. The measure provides a means to compare the production of the ecosphere with current patterns of human consumption. Planners can use the concept to evaluate the consequence of various policies in terms of how close those policies come to reaching or exceeding the carrying capacity of a given region. The size of a certain population's ecological footprint is typically determined by using consumption figures divided by average yields per hectare for each of the classes of ecosystem. This methodology translates "consumption" into surface area, which in turn relates to the total productive land and marine areas on the planet. The measure, by its very nature, factors in consideration of energy use.

Box 10-1: What is the ecological footprint of different forms of commuting over a one year period?

Biking

What are the energy requirements of someone who commutes by bike in and out of downtown Vancouver? In turn, what is the ecological footprint of this chosen behaviour?

Assuming a daily ten-kilometer trip, a bike rider requires an extra 900 kJ per day of food. This energy comes from breakfast cereals. The total area of land needed for the processing and growing of food is double the growing area. The road space is negligible. Cereals have a nutritional content of 13 thousand kJ per kilogram. The world average production rate is 2600 kilograms of cereals per hectare per year. Based on calculations (see Wackernagel and Rees, 1996 for a full explanation) the ecological footprint of cycling over a one year period is **122 square meters per rider**.

Driving

How do the energy requirements of a car affect this calculation? Average direct gas consumption by North American cars is about 12 litres per 100 kilometers. Additionally, indirect carbon consumption, road maintenance, and manufacturing adds an additional forty five percent. One litre of gasoline contains 35 megajoules of energy. Therefore, the basic Footprint of car use is 1400 square meters per commuter. However, cars need road space. Factoring in the energy requirements of road space results in an ecological footprint of **1530 square meters of land** for one year of commuting 5 km per day. Obviously, the energy requirements of most Bowen Islanders travelling to Vancouver are far greater.

These results show us that the energy requirements of Bowen Islanders who chose to commute come at the expense of land reserves in other parts of the world. If the energy inputs required to drive a car needed to be found on Bowen Island, the amount of commuters would drastically diminish.

Source: Wackernagel and Rees, 1996, 106-107.

10.3 Energy Indicators



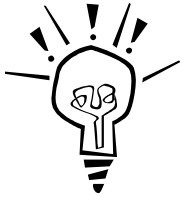
Indicator: Hydro-electric energy consumption per capita

What does this indicator tell us?

This indicator tells us how much hydroelectricity from BC Hydro is being used per capita. By understanding when we use energy, and how much we use, we can start to develop strategies for managing our energy use.

Where do the data come from?

BC Hydro, Statistics Canada, Canada Post



Indicator: Number of individuals on Bowen Island who utilize green energy sources in meeting their energy needs

What does this indicator tell us?

This indicator tells us the proportion of Bowen Islanders who use solar, wind, or other forms of alternative, green energy to meet their energy needs.

Where do the data come from?

These exact figures are not available, but an informal survey of Islanders would reveal how many people use green energy sources in meeting energy needs.

11.0 Land Use

There are about 50 square kilometres of land on Bowen Island. The Municipality's boundaries include Bowen, Finistere, and Hutt Island. This figure has not changed over time, but the way that humans use the land has, particularly since settlement by people of European descent began in the late 1800s. This section outlines relevant land use policy, different land uses and what is known about how they have changed, zoning bylaw changes, and land use planning initiatives. For more information on settlement history, please see Irene Howard's *Bowen Island 1872-1972*.

11.1 Land Use Policy

11.1.1 Legislative Context

Land use within a municipality is governed under the Municipal Act and related legislation. The Local Government Act (Bill 14) is the provincial legislation that designates power to local and regional government. Significant changes have been made to the Municipal Act since 1998. This has included the name change from the Municipal Act to the Local Government Act. According to the Ministry of Municipal Affairs, the Municipal Act is being fundamentally changed to "provide local governments with more authority, autonomy and flexibility, while maintaining balance and accountability to citizens"³⁰. If Bill 14 is passed (it was introduced earlier in 2000), the planning and land use changes are expected to take effect in early 2001.

In terms of planning and land use, the changes are:

- The scope of the Official Community Plan is broadened and the mandatory content for OCPs is eliminated.
- There is an enhanced public consultation process required for the OCP development process
- Development Permit (DP) powers are broadened. They can be used to establish objectives for the form and character of "intensive residential development"
- Potential for exemption of provincial approvals of local government bylaws in certain areas (floodplain approvals, farm practices bylaws approvals, approvals of development near highways, Agricultural Land Commission approvals)³¹

11.1.2 Official Community Plan

The first Official Community Plan of Bowen Island was approved in 1977, and at the same time zoning and subdivision bylaws were adopted³². The first Official Community Plan (OCP) was reviewed in 1982. The OCP currently in effect was approved by the Islands Trust in 1996 and is now the OCP of Bowen

³⁰ Highlights of *Municipal Act Reform Legislative Changes for 2000* <http://www.marh.gov.bc.ca/LGPOLICY/MAR/>

³¹ Union of British Columbia Municipalities. *In the House*. May 11, 2000.

³² Bowen Island Official Community Plan Bylaw No. 139

Island Municipality (see Map 9³³). It is based on the Islands Trust Act, the Islands Trust Policy Statement and over two and a half years of community involvement. The Islands Trust Act states:

The object of the trust is to preserve and protect the trust area and its unique amenities and environment for the benefit of the residents of the trust area and of British Columbia generally, in cooperation with municipalities, regional districts, improvement districts, other persons and organizations and the government of the British Columbia (OCP, 1999).

The Official Community Plan was prepared over a two year period with the direct involvement of hundreds of island residents. The OCP provides a policy framework for land use planning on Bowen Island. More information on this process is detailed later in this chapter.

The Official Community Plan introduced a watershed and stream development permit area to protect the environment and its biological diversity. This development permit area (DPA) was based on the island's watersheds and location of water licences on streams. This DPA means that if a piece of property falls within this area, a development permit must be secured from Council before altering the land or commencing construction³⁴. Planning staff process these applications and since 1994 there have been approximately 100 applications considered. There are also other development permit areas in the OCP, such as steep slope areas.

An analysis of the Official Community Plan (Capilano College, 2000) has identified the following fundamental objectives of the OCP.

- Maximize Bowen Island's Community Diversity and Uniqueness
- Maximize the Rural Character of the Island
- Provide Infrastructure to Meet Community Needs
- Maximize Economic Prosperity within the Community
- Conserve, Protect and Sustainably Manage Natural Systems
- Maximize Health and Safety of Residents

11.1.3 Zoning Bylaw

The current Zoning Bylaw was created in 1984 (see Map 10). It includes a number of zones that regulate the use of land and water on Bowen, Hutt and Finisterre Islands, and their surrounding islets. There are 27 zones: rural (4), community water (2), residential (4), guest house, commercial (8), institutional (3), fuel storage, industrial, public and recreation, water, and parking. The permitted uses, conditions of use, and number of dwellings are outlined in the bylaw. Since 1984 there have been 27 amendments to this bylaw, mostly to accommodate a variety of development proposals (see section below on zoning amendments).

³³ Please refer to **State of Bowen Island Volume 2: Maps and Supporting Information**

³⁴ Prior to December 4, 1999 the permit would have been granted by the Local Trust Committee.

Some historic uses permitted by the zoning bylaw may not be suitably located when reviewed against today's environmental standards. This issue is being considered by the Municipality's Advisory Planning Commission (APC), a citizen's group appointed by Council. Recommendations may be brought forward by the APC in its review of the draft land use bylaw (see Section on the new land use bylaw).

11.1.4 Subdivision Bylaw

The subdivision bylaw regulates the subdivision of land (see Map 11). The current subdivision bylaw was developed by the Greater Vancouver Regional District in 1979. It is intended to "ensure that development on the island is kept to a standard that will protect and maintain a healthy environment". Each subdividable lot has an average lot size, minimum lot size, and minimum service level. This designates what kind of water system (spring or individual well or community water system) and water treatment (individual septic tank or community sewage disposal system) will be required.

Prior to incorporation as a municipality on December 4, 1999, subdivision approval on Bowen Island was under the authority of the Ministry of Transportation and Highways. The Municipality now has subdivision approval and can develop its own subdivision regulations, including road standards.

The Islands Trust, in an effort to facilitate appropriate island road standards, has established a Road Standards Agreement with the Ministry of Transportation and Highways. Community concern has been expressed about Cowan Point Road, a road built to provincial highway standards in 1992, and which, by its appearance, is considered to be "out of character" with the island setting. The Municipality is now able to develop its own unique road standards.

The regulations currently in the Subdivision bylaw are being incorporated into the Land Use Bylaw (see Section below).

11.1.5 New Land Use Bylaw

A new land use bylaw to implement Official Community Plan policy is currently being drafted. The land use bylaw will be a combination of the regulations previously found in the zoning and subdivision bylaws. The development of the land use bylaw commenced under the direction of the former Local Trust Committee. The Advisory Planning Commission (APC) is currently elaborating a draft document. In its review, the APC is considering some innovative ways to implement OCP policy (please see submission by the APC for more details). As a Municipality, Council has some governance tools available to it that were not available to a local Trust Committee.

11.2 Changing Land Use

Current and past land use on Bowen Island has included agriculture, crown land, forested and logged areas, parks, commercial (stores), institutional and civic use, residential (homes), light industrial, and other uses.

Why is land use changing on Bowen? What are the factors that affect changing land use?

Telling the story of changing land use on Bowen Island is complex and challenging. The graphic below gives a picture of just some of the factors that are influencing how land is used.

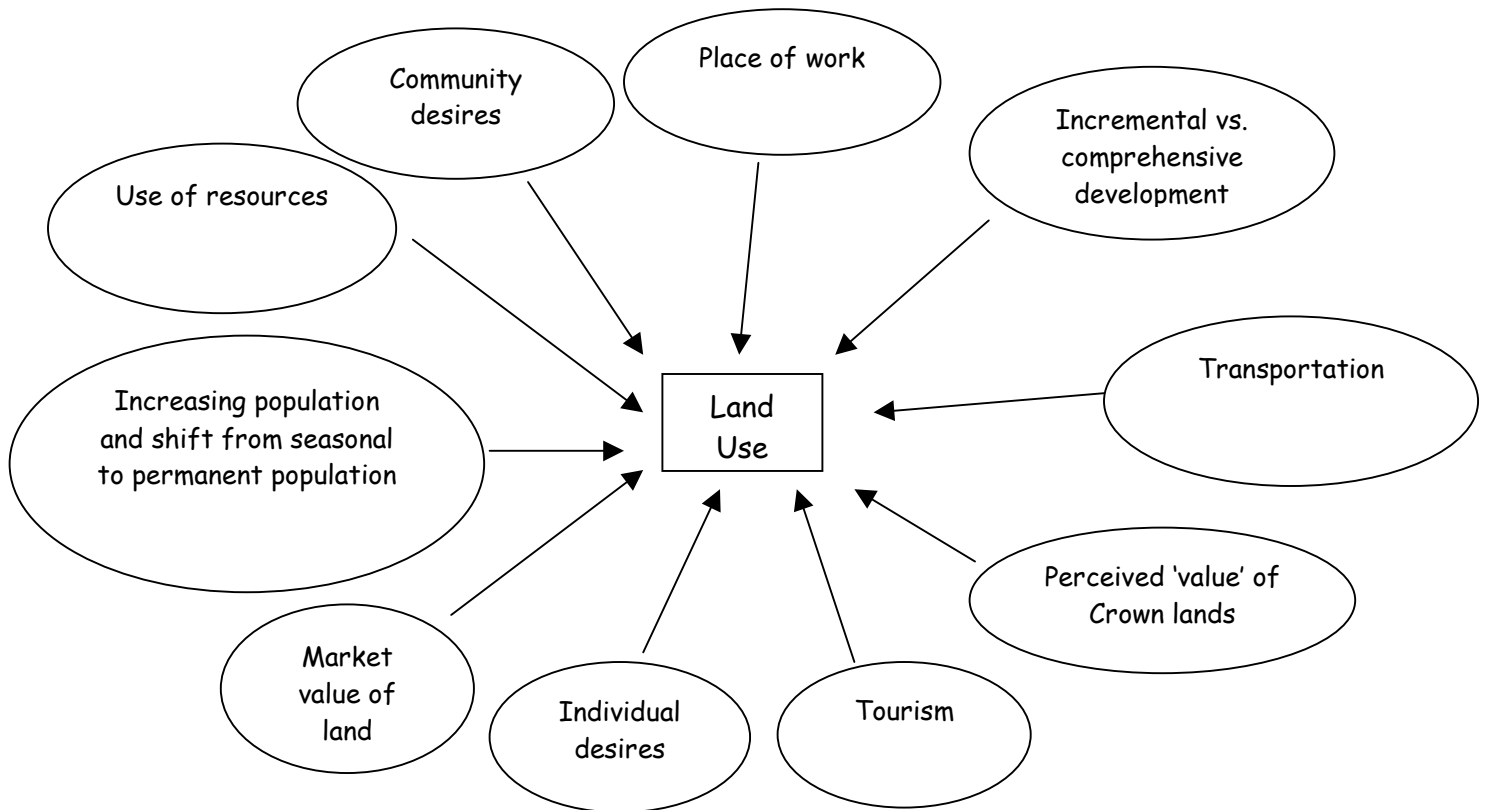


Figure 11-1: Factors Affecting Changing Land Use

11.2.1 Agriculture

Since 1874 there has been farming on Bowen Island: "The pioneer farmers typically planted orchards, established hay pastures, and cleared fields for root crops, grains, and hops. Livestock were also kept. Tree fruit growing was one of the more successful crops..."³⁵. Farming has declined on Bowen since the 1950s.

The Agricultural Land Commission Act established the Agricultural Land Commission to "preserve agricultural land, encourage the establishment and maintenance of farms and the use of land in an

³⁵ Official Community Plan, 1996.

agricultural land reserve compatible with agricultural purposes". On Bowen, there are 181 hectares of land within the Agricultural Land Reserve (ALR) designation. Ninety-nine of these hectares are on private land and 82 are within Crippen Regional Park. A recent community mapping initiative was undertaken to identify what farming activities are currently taking place, and where they are in relation to Bowen's ALR (see Economy chapter for more information).

11.2.2 Crown Land

Crown Lands are land owned by the Province of British Columbia. Almost 40% of Bowen Island is crown land; this includes much of the visible area of the Island such as the mountaintops (Mt. Gardner, Collins Ridges) and adjacent slopes. There are seven parcels of land that are quite large, and many small parcels. The larger areas include Mt. Gardner, Collins Ridge, and the areas along Apodaca and Josephine Ridges. There is further information on the management of the Crown Lands in the Crown Lands Committee section below.

11.2.3 Forestry

About 80 to 100 years ago, much of Bowen Island was logged and some sections were burned. Although there are isolated old growth trees in many places, the current forest cover is second growth for the most part. Cutting can take place on private lands with little regulation. On Crown Lands, administered by the Ministry of Forests, salvage of wind blown trees can take place. Permits for salvage wood can be issued to people from off-island as well as Bowen Islanders.

Development of a community forest was identified as a priority in the Official Community Plan. The recent biophysical appraisal of the Crown Lands³⁶ establishes a much needed baseline to begin to develop a model, but as of yet, there has been very little movement in developing a Bowen Island community forest.

11.2.4 Parks and Open Space

11.2.4.1 Parks

The 240 hectare **Crippen Regional Park**, administered by the Greater Vancouver Regional District (GVRD parks), is a significant piece of land on Bowen Island (see Map 13).

Apodaca Park is an undeveloped 8 hectare Class A Provincial Park. There is no road access and no visitor facilities.

There are also some local **community parks** now administered by the Bowen Island Parks and Recreation Commission (BIPRC).

³⁶ Dunster, J. and Dunster, K. (2000). The Crown Lands of Bowen Island.

Resources for more information:

- ✓ **Bowen Island Parks Master Plan, November 1994**
- ✓ **Directions for a Livable Bowen Island: A Report on Parks and Recreation to the Bowen Island OCP Steering Committee, May 1993**

11.2.4.2 Ecological Reserve

The ecological reserve on Bowen Island was created in 1972 under the Ecological Reserves Act. Known officially as Ecological Reserve #48, the reserve covers 397 hectares on Apodaca Ridge (see Map 13). In the *Guide to Ecological Reserves of British Columbia* its outstanding feature is identified as "relatively extensive and diverse un-logged forest stands in a location convenient for research on tree species and forest ecology". Except for one wetland [fen] and some bedrock outcrops, the reserve is entirely forested. Forest stands have mostly originated since a fire about 1920, although a few older trees are present. Although a great diversity of tree species occurs, Douglas fir is the dominant species.

There are no trails in the reserve and, by law, a permit is required to enter the reserve. The Bowen Nature Club organizes annual hikes into the reserve; for more information contact volunteer warden Alan Whitehead (947-0134).

11.2.5 Conservation Lands

The Islands Trust Fund, created by the Provincial Islands Trust Act, allows for land within the Trust area to be protected. Lands held by the Trust Fund Board are managed by local conservation groups or government agencies³⁷. There are four areas on Bowen that were designated as Islands Trust Fund conservation lands in 1999.

Protected Area	Size (acres)	Features and Values Protected
Cates Hill Nature Reserve	9.0	Coastal Western Hemlock Woodland, buffer for Ecological Reserve #48, mature second growth, headwaters, wetland areas
McIntyre Covenant Lands	1.214	Coastal Western Hemlock Woodland
Terminal Creek Covenant Land North*	0.3	Waterfall, Salmon Bearing stream habitat
Terminal Creek Covenant Land South*	0.85	Aquatic habitat, water intake for salmon hatchery, riparian vegetation

* Co-held with the Ministry of Environment

³⁷ The Islands Trust Fund pamphlet.

11.2.6 Commercial Land Use

Commercial land use on Bowen includes sales and services. Since the Union Steamship era much of this activity has been located in Snug Cove. A few enterprises were established in other locations but most of these no longer exist (notable exceptions include the hardware store and garden center that are located in mid-island). With the first Official Community Plan in 1976, the policy of centralizing commercial space in Snug Cove was adopted.

The OCP makes the distinction between service commercial land use and tourist commercial land use:

- **Service commercial land use:** the sale of products and provision of services that cater primarily to the needs of Island residents
- **Tourist commercial land use:** the sale of products and provision of services that cater primarily to the needs of visitors to the island and include accommodation facilities, developed facilities that are designated to attract visitors to the island and retail sales of local arts, crafts and other products

In the 1996 OCP, it was estimated there was **2200 square metres** of service commercial floor space containing marine services, retail, restaurants, pubs, automotive services, and office uses in the Snug Cove area.

Significant change in commercial space development came with Artisan Square, developed in 1995, with 8 business (set up as live-work spaces) and 7 residential buildings. Two more buildings are proposed for addition in 2001. When they are complete there will be approximately **30,000 square feet** of commercial space (and an additional 10,000 square feet in 13 apartments). It was originally intended as live/work space for artists, as there had been plans for an adjacent arts college. The arts college was never built but 2 or 3 arts and crafts people live and work there. It now contains a number of commercial facilities (bookstore, bakery/restaurant, office store) and offices. The arts facilities (Arts Pacific Gallery, the Gallery and the Fibre Arts Coop) get subsidized rent. The Arts Pacific gallery would like to expand and occupy a larger space³⁸.

11.2.7 Institutional and Civic Land Use

Institutional land uses are "private facilities that are available to serve the needs of specific public groups". They include **Camp Bow-Isle**, a Christian Science camp, several **churches**, and the **Canadian National Institute for the Blind (CNIB)** facility, a recreational facility for visually impaired people. In 1995, the **Island Pacific School** began. Its original location is now being used by the **Bowen Island Municipality** as a civic use.

³⁸ Source: Doug Berry, November 27, 2000

11.2.8 Industrial Land Use

In the 1996 OCP, four separate sites of light industrial land use were identified: highways maintenance facilities, a recycling depot, automotive and machinery repair, a building supplies outlet and a storage/warehouse facility.

What industrial land uses exist in 2000?

- The **Bowen Island Recycling Depot** continues to be an active, volunteer run facility, although it is looking for a larger location.
- The **automotive and machinery repair** was located at the gas station on Government road in Snug Cove, but it closed down and is now being operated as a home business pending construction of a new dedicated facility.
- The **Building Centre** for building supplies is operating mid-Island

11.2.9 Residential Land Use

11.2.9.1 Neighbourhoods

Some areas of Bowen Island have smaller lot sizes and therefore a higher density of people. These are zoned as settlement residential. Traditionally these have included Deep Bay, Millers Landing, Scarborough, Eaglecliff, Hood Point, and Grafton Bay neighbourhoods, with lot sizes from 0.1 to 0.4 hectares. More recent developments have included Bowen Bay (1948), Tunstall Bay, Bluewater, Fairweather, Adams Road and Channelview³⁹. Cates Hill is an area currently under development and promoted as "the new village just up above Snug Cove"⁴⁰. The closer proximity of people means that some areas have developed distinctive neighbourhood character and identity.

The *Directions for a Livable Bowen Island* Report outlined where people were distributed on Bowen in 1993. However it is important to note that there is seasonal variation in population that is not recorded for each neighbourhood. The population of Hood Point is smaller in the winter months. As well, illegal rental suites may not be accounted for in the population numbers.

- The largest concentration of people live in the **Snug Cove area** (Snug Cove Village, Millers Landing, Scarborough, Deep Bay, Queen Charlotte Heights) with 1,600 (2,600 potential or 35% if developed to the allowed density in the Official Community Plan).
- **Bluewater/Tunstall Bay** has 1,035 (1,625 potential or 22% of the population).
- **Eaglecliff-Hood Point** has a population of 475 (862 potential or 12% of the population)
- **Mount Gardner** has 240 people (655 potential or 9% of the population)
- **Mid Island** has 170 people (627 potential or 9%)

³⁹ Official Community Plan, 1996.

⁴⁰ Cates Hill Homes. *Island News*, November 2000.

The following chart shows existing and potential lots for a number of areas and neighbourhoods on Bowen, taken from the Official Community Plan. The source of the chart is the report *Directions for a Livable Bowen Island*.

Table 11-2: 1993 Existing and Potential Lots (from OCP) on Bowen Island			
Description	Total number of existing lots	Total number of potential lots	Estimated land area (ha)
Snug Cove: Snug Cove Village	264	175	350
Miller Landing/Deep Bay	300	111	
Queen Charlotte Heights	83	99	
Sub-total	647	386	
Mount Gardner	96	166	210
Bluewater/Tunstall Bay	414	237	275
Cape Rogers Curtis	5	164	200
Cowan Point	24	211	250
Mid Island	24	183	475
Eaglecliffe-Hood Point	190	155	185
TOTAL	1444	1501	1945

Source: *Directions for a Livable Bowen Island*.

Note: Number of lots based on 1991 OCP. Does not include Cates Hill, Roger Curtis or Cowan Point.

11.2.10 New Construction

The first graph shows the number of total building permits (including renovations) and new home permits issued on Bowen Island from 1989 to 2000. The graph below shows the total value (in dollars) of building permits for the same years.

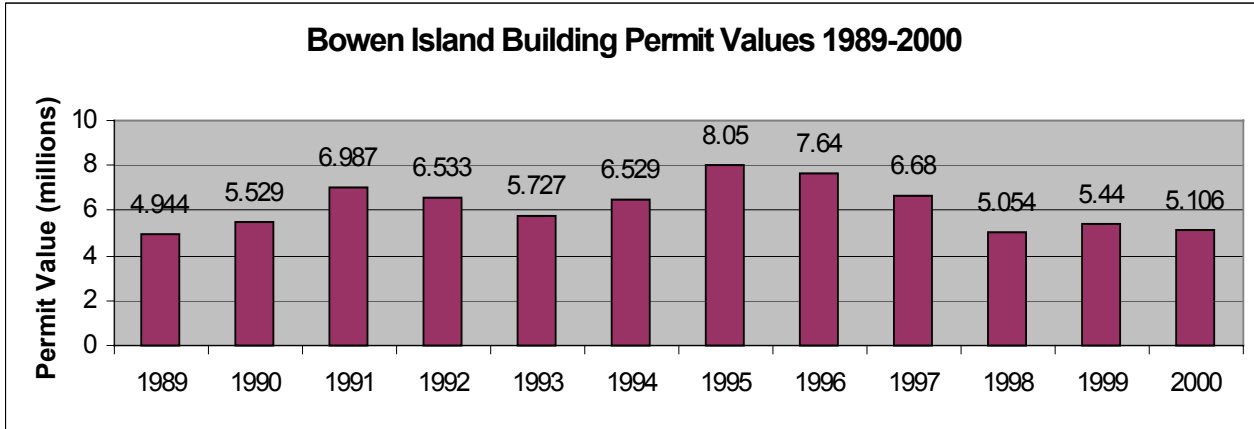


Figure 11-2: Bowen Island Building Permits, 1989-2000 Source: Bowen Island municipality

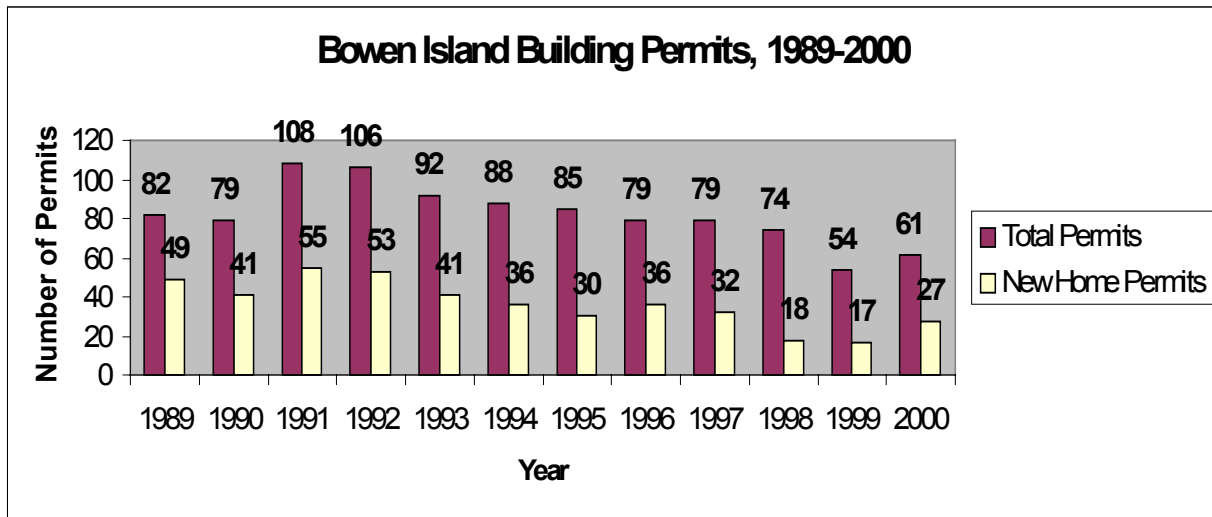


Figure 11-3: Bowen Island Building Permit Values 1989-2000

Source: Bowen Island Municipal Records

11.2.11 House and Property Sales

The first graph shows Bowen Island house sales numbers for 1991 to 2000. From 1995 onward, the number for sale was also recorded. The second graph shows the appreciation and depreciation of the value of a \$200,000 house purchased in 1991, given the changes in the real estate market.

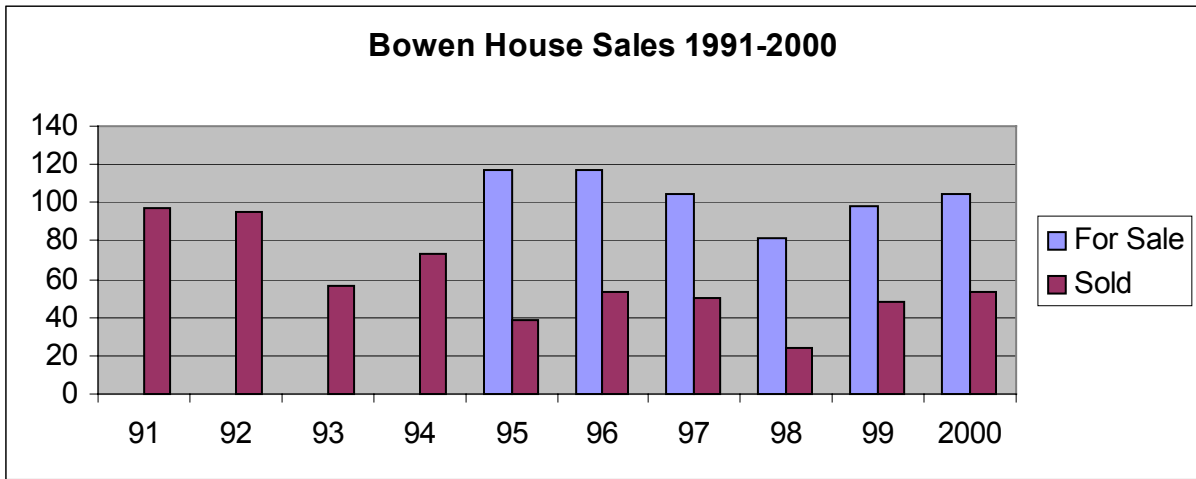


Figure 11-4: Bowen House Sales 1991-2000 Source: Sue Barr, Remax Masters Realty

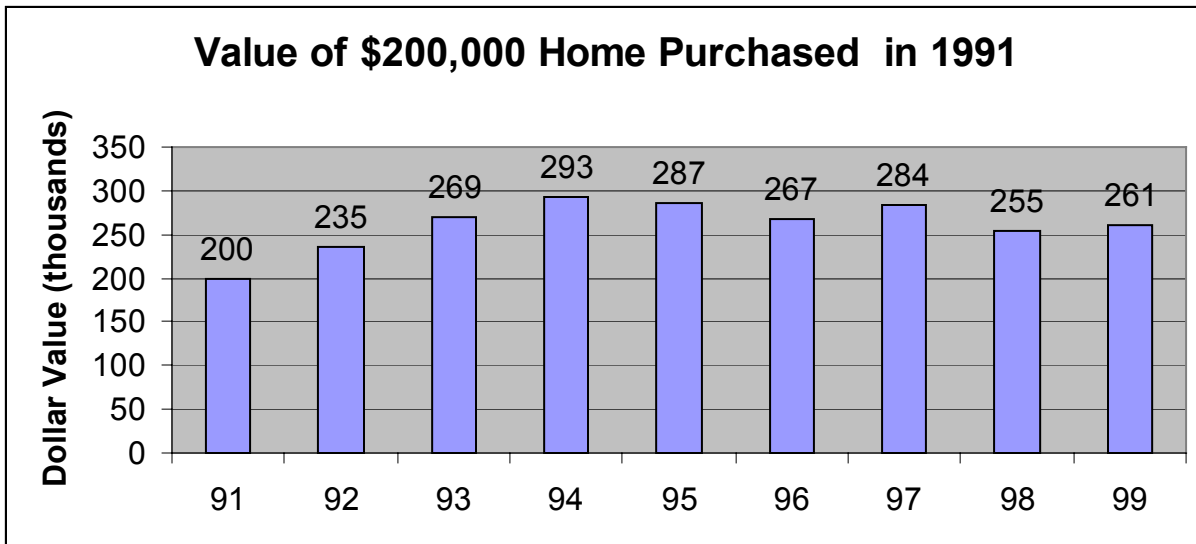


Figure 11-5: Value of \$200,000 Home Purchased in 1991 Source: Sue Barr, Remax Masters Realty

How can we capture the story of changing land use on Bowen in recent years?

One way is to look at the changes made to the Zoning Bylaw 36, since it was adopted on April 27, 1985.

Summary of changes to Zoning Bylaw 36 (to November 2000)⁴¹

The changes fall into six main categories.

1. Community Services
2. Snug Cove area
3. Recognition of historic development
4. Cates Corner/Cates Hill
5. Artisan Square
6. Other

Community Services

Rezoning for the following services:

- Recycling Depot (April 1985)
- Ambulance Hall (June 1989)
- Police Station (April 1989)
- Public Library at Cates Corner (April 1992)
- Pre-School and Teen Centre on Carter Road (March 1996)
- Pre-School at Artisan Square (July 1997)
- Bowen Island Community School (school grounds expansion) (May 1998)
- Parks on north and south of Terminal Creek (June 1999)
- Municipal Hall (April 2000)

Snug Cove Area

- Zoning for Bowen Island Pub (June 1986)
- Change in zoning for various properties on Government Road (June 1990 and February 1994)
- Zoning for Union Steamship Marina (March and April 1989)

Recognition of Historic Development

This includes rezonings to recognize existing uses on the property, i.e. more than one dwelling unit on a lot. Comprehensive zones prior to "comprehensive development zones".

- Davies property and Galbraith Bay property and creation of two new zones CWSC-1 and RC-1 (November 1985)
- Cumming property (Arbutus Bay) to RC-1 (September 1987)
- Bowen Bay Holdings to RC-2 (September 1997)

⁴¹ Summarized by Felicity Adams, Senior Planner for Bowen Island, Islands Trust. November, 2000.

Cates Corner/Cates Hill

- Addition of a new C-1A zone including office use, bank, professional services and added definition of professional services at Cates Corner. (May 1991)
- Addition of single family dwelling use on upper floor of two storey building in the C-1A zone. (April 1992) - example of "housing above shops". This form of housing has been continued within the Cates Corner development with some units subject to a Housing Agreement to ensure that the units remain as rental units and are offered first to Bowen Island residents.
- Rezoning for Island Pacific School (former site) (May 1995)
- Addition of new CP-1 zone (commercial parking) and rezoning of parking lot at Cates Corner (June 1996)
- Zoning for expansion of Cates Corner area (March 1996)
- Rezoning for Cates Hill area and creation of new VR, VR-1, RC-3, I-3 and C-1A zones (June 1999)
- Rezoning for Vineyard guesthouse (May 1999)
- Rezoning for Municipal Hall (April 2000)

Artisan Square

- Addition of new C-6 zone and definition of "artisan workshop occupation". (November 1993)
- Replacement of C-6 zone and change from "artisan workshop occupation" to "cottage industry" and expansion of the area zoned C-6 (August 1996)
- Addition of assembly use at Artisan Square (July 1997)

Other

- Addition to prohibit siting of buildings, including boatsheds, on any water or any zone except as permitted by development permit in the C-4 zone (i.e., Union Steamship Marina) (April 1985)
- Addition of a general regulation to regulate the minimum dimension of single family dwellings and to require that they be permanently fixed to a site (to address mobile homes). (September 1987)
Note: The Advisory Planning Commission is recommending that this regulation not be included in the LUB as it could limit smaller homes that could provide for affordable housing and interesting design. This change would require an OCP amendment.
- Removal of development permits from the bylaw as a result of a change to provincial legislation. (May 1989)
- Addition to list of prohibited uses to include rental of all-terrain vehicles, motorcycles, or limited speed motorcycles. (October 1991)

Possible Future Land Use Changes based on major rezoning applications received to November 2000

- Restrictive covenant on privately-owned lands to limit land use to protect the water supply and riparian area around Josephine Lake (water supply reservoir for Cowan Point and South Bowen) and its tributaries and wetlands in exchange for the potential to re-subdivide 9 lots within an existing subdivision known as Highland Estates. Restrictive covenant area is based on a biophysical review undertaken by a professional biologist. This application is currently under consideration by Council (November 2000).
- Amendment to the C-6 zone to permit additional uses at Artisan Square. Council has directed that this application be deferred until consideration of the concept plan being prepared by the Snug Cove Task Force (2000).
- Residential and commercial development on land formerly within Crippen Regional Park (declared surplus), including the potential for a site for Abbeyfield Housing for seniors. Council has directed that this application be deferred until consideration of the concept plan being prepared by the Snug Cove Task Force (2000).
- Youth mentoring centre on a property known as Xenia. This application could require new OCP policy for this type of land use.
- Comprehensive development area established for the lands known as the Cowan Point lands located within South Bowen through the consideration of an OCP amendment.

11.3 Planning Initiatives

11.3.1 The Official Community Plan Review

Bowen Island's Official Community Plan was reviewed and updated from late 1992 until its adoption in February of 1996. It was agreed from the onset that "the process" would be emphasized to gain support from the community. Public participation became integral to this review process. A Steering Committee of Bowen Islanders was formed as well as 10 task groups that involved more than 170 Islanders in reviewing policy. The Islands Trust planner took the reports of the Task Forces and with some difficulty synthesized them into a draft plan.

OCP Review Task Groups	
Recreation/Parks	Residential Land Use
Transportation	Commercial/ Industrial Land Use
Forestry	Agricultural Land Use
Water/Waste Disposal	Special Environmental Concerns
Heritage sites	Community Facilities & Services

From July 1994 to October 1994 a series of 11 public meetings were held in the community to raise questions and voice concerns about topics and issues in the draft Official Community Plan⁴².

From the Notice of Completion, OCP Review Steering Committee:

"The Steering Committee and Task Forces worked in an atmosphere where differences of opinion were common, discussions were lengthy, and time was limited. Yet, nearly everyone who participated agreed that much was accomplished—compromises were reached and common goals were set. The Steering Committee viewed planning for Bowen's future as an ongoing process. Preparation of this OCP is a picture of what the Bowen community of today, working with the best available information, wants for Bowen tomorrow. The Official Community Plan should be specific enough in its policies to prevent piecemeal planning in the future while being responsive to unforeseen community needs."

Crown Lands Committee and Bowen Island Forest and Water Management Society⁴³

11.3.2 The Crown Lands Committee

was in existence in 1989 as a local trust subcommittee with 10 members. In 1990 the committee received a report entitled: Bowen Island - Options for Use and Associated Impacts on the Provincial Forest (Crown) Land⁴⁴. In 1991 and 1992, the Crown Lands Committee considered proposals for a water study and the development of a Community Forest. In 1992 the Bowen Island Forest and Water Management Society (BIFWMS) was formed as a non-profit society to raise funds to conduct research about Crown Lands and other lands on the island. During 1992 and early 1993, the Crown Lands Committee and the Bowen Island Forest and Watershed Management Society worked together. Over time the Crown Lands Committee was phased out and work continued through BIFWMS.

The Bowen Island Forest and Water Management Society played a major role in documenting and updating creek locations for the last Official Community Plan in 1993. BIFWMS took a hiatus after this significant effort but was reformed in 1999. Since then a number of grants have supported continued work to update creek location information and to produce maps using a Global Positioning

⁴² APC Report on the Draft OCP, January 1995

⁴³ Witty, Dave. *Crown Lands Committee: History and Role*. Island News, November 2000, and information from Julian Dunster

⁴⁴ Copland, M., T.McKay and J.Fennel. 1990. *Bowen Island - Options for Use and Associated Impacts on the Provincial Forest (Crown) Land*. Report submitted to the Bowen Island Crown Lands Subcommittee and the Advisory Planning Committee, by students of the Natural Resource Management Program, British Columbia Institute of Technology. Burnaby. May 1, 1990.

System. The current focus of their work is on developing the digitized mapping capabilities of Bowen Island to ultimately support a current and community accessible digital map library.

In September 1997, a group of Bowen Islanders met to consider re-creating the Crown Lands committee. The impetus for the meeting was the push by the Parks and Recreation Commission, at the request of interested citizens, to secure some Crown Land for a community golf course. A field meeting with Ministry of Forests representative Len Leroux was held to walk around the potential site. It became clear that the Ministry of Forests would not consider an isolated donation but needed an island-wide plan to assess how the golf course proposal sat within that plan. The findings of the BCIT report were, for some reason, never widely circulated nor considered. In view of the Ministry of Forest's position, the Crown Lands Committee was reformed and its first meeting was held on January 7, 1998.

Terms of reference were established as:

1. Assess the Crown Lands on Bowen Island to identify possible use(s) overall and parcel specific where appropriate.
2. Initiate project(s) that move towards the most appropriate use of Bowen Island's Crown Lands.
3. Communicate to the residents of Bowen Island the progress of the Committee's work and the results.
4. Coordinate efforts with the Islands Trust with regard to the Forest Strategy and Crown Lands transfer programs.
5. Initial report to be made April 1 1998 to coincide with the Forest Strategy report from the Islands Trust.

GOALS:

1. Seek funding for appropriate inventory of Crown Lands and relevant studies
2. Organize the completion of inventory with other Island groups
3. Develop an Island Community Forest Model.

11.3.3 Dunster Report on Crown Lands

In May of 1999, the Islands Trust contracted Dunster and Associates Environmental Consultants Ltd. to complete a biophysical inventory of Crown Lands on Bowen. The report was released in November 2000, delayed by the critical step of boundary identification for all Crown land parcels on the Island. Key findings of the report include:

From the Islands News, November 2000

- "Bowen Island Crown Lands contain many provincially rare plant communities, as well as two wetland systems rated as the best examples of their type in Southern BC by a wetland specialist...

- The Crown Lands form the main water recharge area for all of Bowen's watersheds, as well as offering slope stabilization and protection...
- The Crown Lands provide habitat for a very diverse array of fauna and flora...
- There are no extensive tracts of Old Growth forest, but many scattered old growth trees, and many parts of the forest cover are now provincially classified as older forest with significant ecosystem values...
- Opportunities for development of the land are limited by steep terrain, very shallow soils overlying bedrock, lack of water supply, and non-existent septic capability in many areas...
- Opportunities for timber harvesting exist on the less steep slopes, but widespread logging would seriously compromise the integrity of the island watersheds.."

11.3.4 Public Lands Strategy

The Public Lands Strategy (PLS) has been initiated to consider future use of Provincial Crown Lands and is being developed by a Victoria-based provincial working group. The Islands Trust, Islands Trust Fund and several provincial agencies, coordinated by the Land Use Coordination Office, are assessing "potential future uses of the Crown Lands within the Islands Trust Area"⁴⁵. Under the PLS, a land use strategy has been identified for Bowen Island Crown Lands. The Crown Lands are rated using criteria to identify potential uses (for example mining, forestry, tourism), to assess the resource, economic and environmental values of each parcel of land. The Crown Lands Committee has expressed concern that the PLS has been developed without consideration of the results from the Dunster Report on Crown Lands, limited community input or input from the Crown Lands Committee itself. The preliminary analysis sent to the Bowen Island Municipal Council has assessed Bowen Island Crown Lands with "no known conservation values" and a rating of 6 out of 13 for energy and mining potential for the Crown Land parcels.⁴⁶ The findings of the PLS for Bowen Island Crown Lands are in conflict with the findings based on up-to-date and locally generated information contained in the Dunster report.

⁴⁵ Public Lands Strategy Process in the Islands Trust, Briefing. October 16, 2000

⁴⁶ *The Island News*, November 2000

11.4 Land Use Indicators



Indicator: Number and value of building permits

What does this indicator tell us?

This indicator tells us about new house and renovation construction, and gives an indication of population growth.

Where do the data come from?

Municipality collects this data monthly. It can be collated annually.



Indicator: Ratio of commercial square footage to residential square footage

What does this indicator tell us?

This indicator gives a sense of how fast residential and commercial land is being developed over time, and if each use is growing at the same rate.

Where do the data come from?

The Chamber of Commerce is proposing to survey commercial square footage. Total residential square footage is not currently tabulated, but it may be possible.



Indicator: Active farms

What does this indicator tell us?

The number of active farms tells us about land use, the economy, local employment and on-island food production.

Where do the data come from?

Bowen Island Mapping Project began to collect this data in 2000.



Indicator: Housing Sales

What does this indicator tell us?

Tracking housing sales is useful as an indication of changing land use, demographics and the economy.

Where do the data come from?

There needs to be a survey of housing stock. Change over time could then be monitored.



Indicator: Number of designated heritage sites

What does this indicator tell us?

This indicator tells us how efforts towards heritage preservation are progressing on-island.

Where do the data come from?

Bowen Island Heritage Preservation.

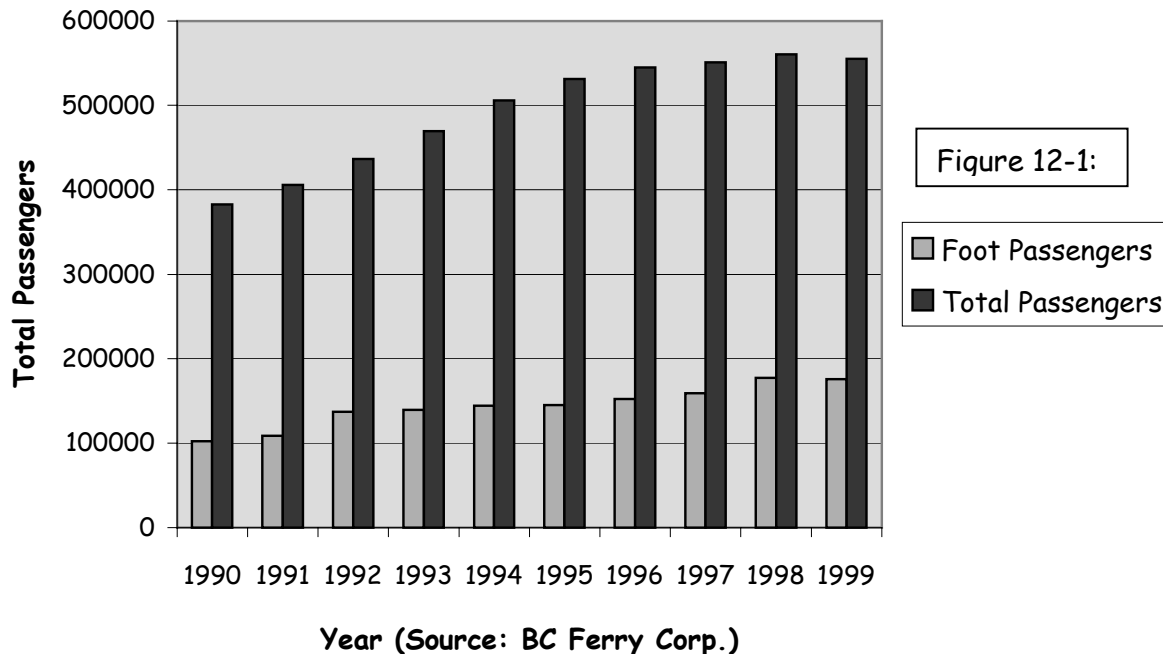
12.0 Transportation

What is the state of transportation on Bowen Island?

As the Bowen Island's population grows, the demand for increased transportation services and facilities will also grow. The single determining factor in the provision of transportation off the Island is ferry service. As more people commute to Greater Vancouver, an increase in ferry capacities and services would be required to accommodate the growth in passenger and vehicle volume. The accommodation of the growth in volume may be achieved by providing faster or larger ferries or more frequent service, all of which are decisions made by BC Ferry Corporation. In addition to increased ferry capacity the terminal facilities, in terms of parking and marshalling area at both Snug Cove and Horseshoe Bay, would be impacted.

How Many People Use the Ferry?

Total Passengers on Route 8



Passenger Vehicles on Route 8

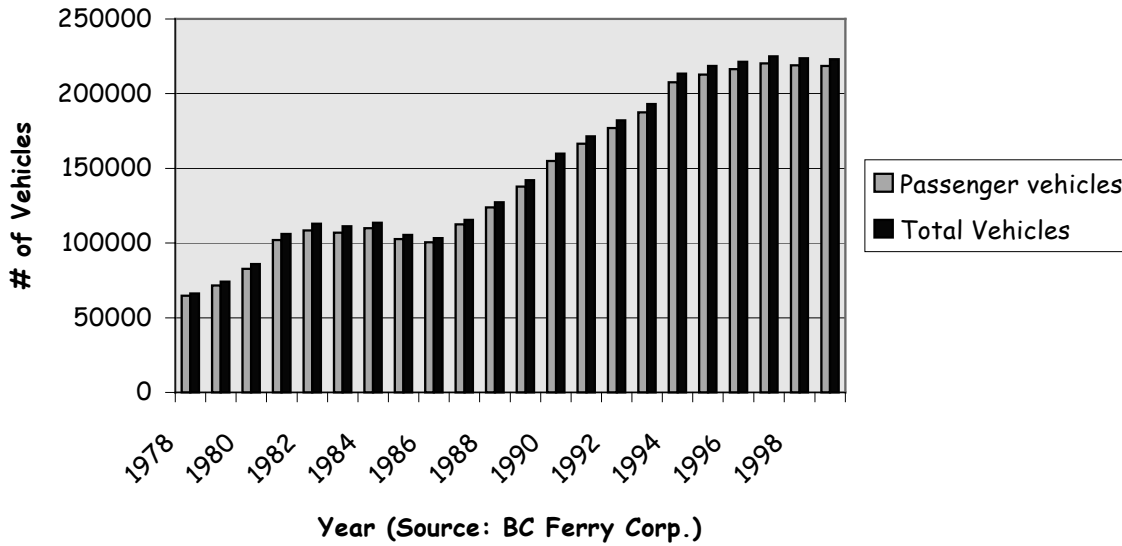
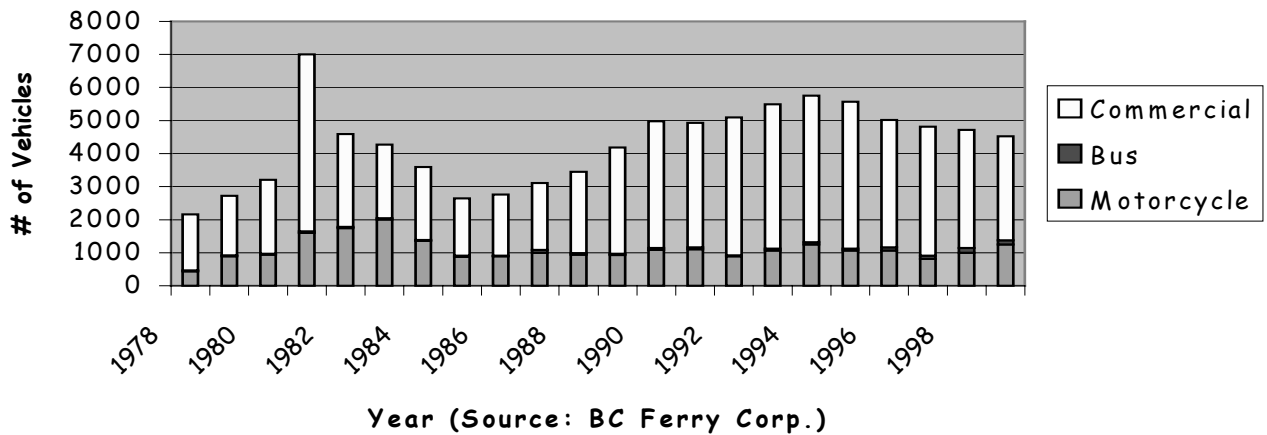


Figure 12-2: Passenger Vehicles on Route 8

BC Ferries Route 8 links Bowen Island to Horseshoe Bay, with scheduled daily sailings between 5:45 a.m. and 9:45 p.m. The ferry is the primary means of getting on and off the island.

The rate of growth for the number of total passengers is exceeding the rate of growth for number of passenger vehicles. This shift corresponds with the introduction of the Snug Cove minibus service. It also may relate to overloads on morning sailings and more people parking in Horseshoe Bay and walking on the ferry.

Motorcycles, Buses, and Commercial Vehicles on Route 8



This figure demonstrates the number of vehicle types used other than cars.

Figure 12-3: Motorcycles, Buses, and Commercial Vehicles on Route 8

Who Drives What?

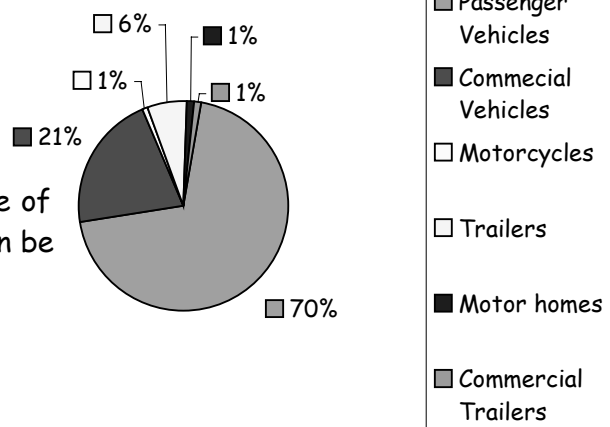
The traveling population on Bowen Island consists of three major groups: resident commuters, resident non-commuters, and tourist/seasonal travelers. The types of vehicles driven on Bowen are represented by the following chart (Source: Reid Crowther, 1999).

Figure 12-4: Breakdown of Vehicle Types on Bowen Island

Breakdown of Vehicle Types on Bowen Island

Considering Passenger Vehicles

The vehicles per capita ratio on Bowen Island has increased slightly according to the most recent Census and ICBC data. However because of the truncated data few concrete conclusions can be drawn until more statistics are collected.



Passenger Vehicles per capita on Bowen Island

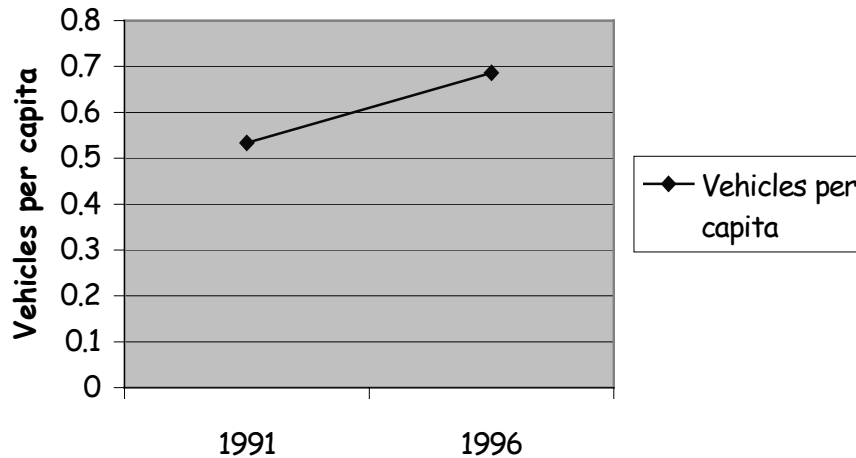


Figure 12-5: Passenger Vehicles per capita on Bowen Island

Considering Passenger Vehicles and Population Trends

The population composition indicates that 28% of the population is less than 19 years of age. And the combined age group of residents up to 64 years dominates the demographics on Bowen Island. It is within this large block of residents that travel demand will be

Passenger Vehicles on Bowen Island, 1991-Aug. 2000

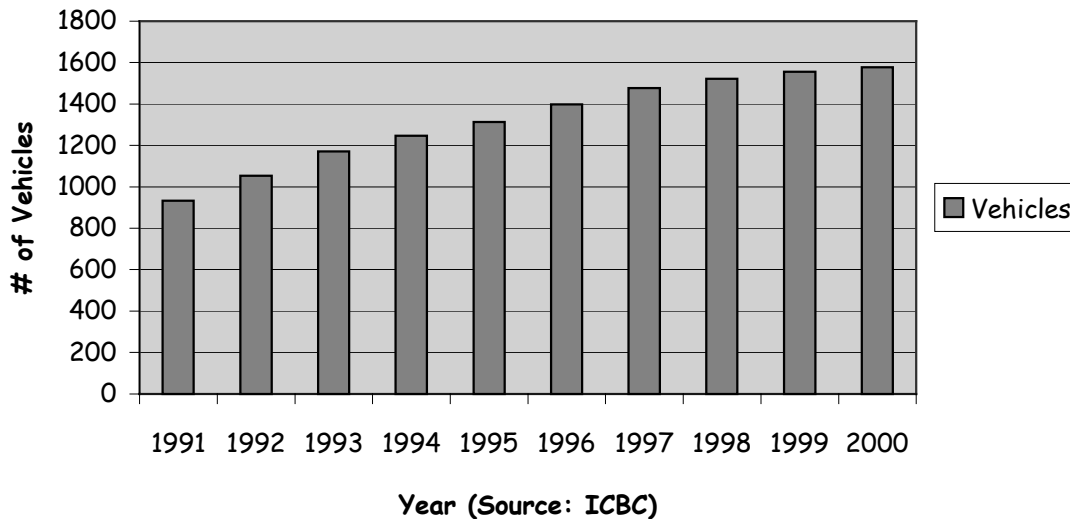


Figure 12-6: Passenger Vehicles on Bowen Island, 1991- August 2000

sustained for both on and off-island commute. The number of passenger vehicles is influenced by this population trend. Development pressure on Bowen Island will depend on the local and regional housing markets and the overall economic outlook in the future. The transportation system will have to grow to accommodate commuter and on-island demand for mobility (Reid Crowther, 1999).

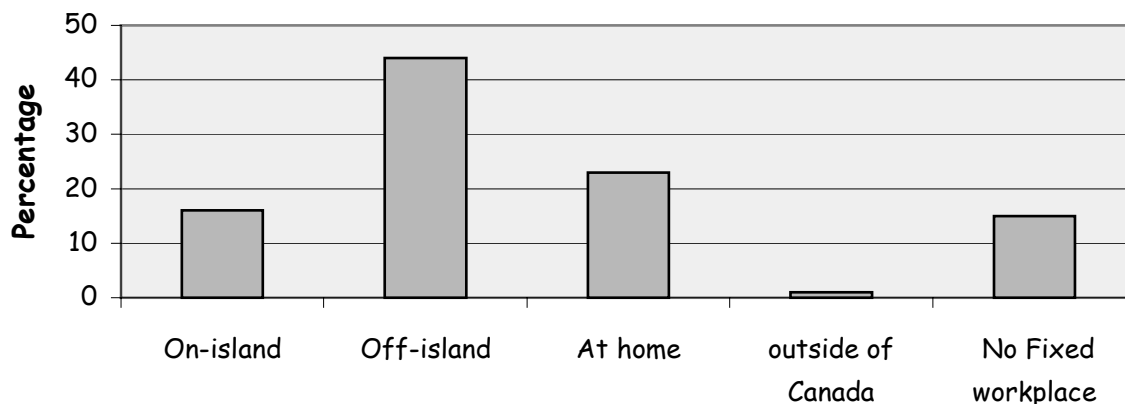
12.1 Commuting

The 44 percent of the labor force that commutes off-island is very important for future transportation development for Bowen Island. A significant increase in commuting trips would imply the increased demand for additional ferry service.

12.1.1 Students and Commuters

Off-island travel consists of two main groups of travelers: commuters and students. Though these travelers use the same ferry services, the times at which the services are used are considerably different for the two groups. For students, the peak travelling hours during the morning rush at 7:30 a.m. and at 3:30 p.m. after school. Most if not all of the students are foot passengers as indicated by West Vancouver School district. As for the working commuter the morning rush runs from 6:30 until 9:30 a.m. The after-work rush is generally from 4:30 to 6:30 p.m.

Place of Work of Employed Labour Force, Bowen Island, 1996



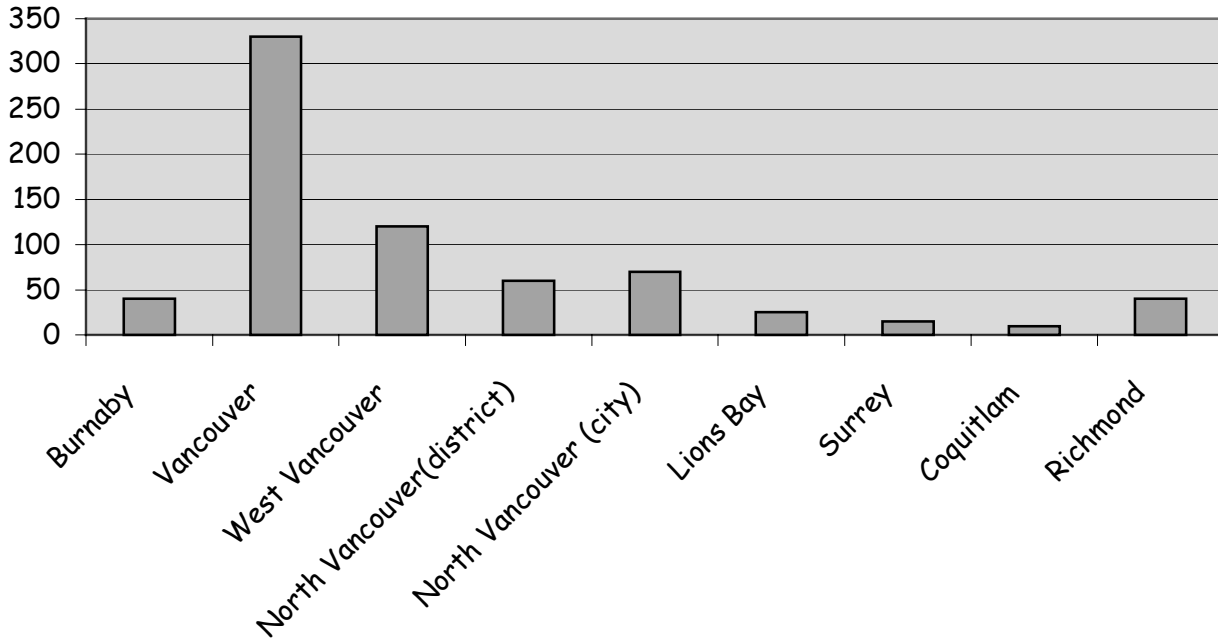
Place (Source: 1996 Census, BC Statistics.)

Figure 12-7: Place of Work of Employed Labour Force, Bowen Island, 1996

Where do the Students go?

To Rock Ridge High School grade 8-10 is 150 students, and to West Vancouver Secondary School grade 10-12 is 85 students (Source: Dura, 2000).

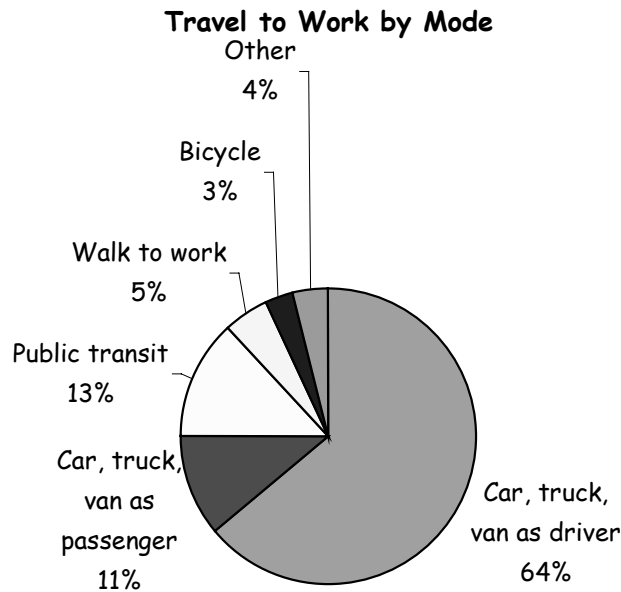
Place of Work in the GVRD for Residents of Bowen Island



Source: Census 1996

Figure 12-8: Place of Work in the GVRD for Residents of Bowen Island

12.1.2 How do People Get to Work?



In 1996 Census, residents of Bowen Island were asked how they traveled to work. For the Island's employed labour force, 64 percent travel to work by car/truck or van as drivers and 11 percent as passengers, 13 percent use public transit and 8 percent either walk or bicycle.

12.1.3 On Island Bus Service

Currently on-island public services include 2 routes one from Bluewater to Snug Cove (22.6 km round trip) and one from Eaglecliff to Snug Cove (12 km round trip). Each of these vehicles has a seating capacity of 20. The buses run to take people to the 5:45 to 9:25 a.m. ferries and meet the 3:30 to 6:30 p.m. in the afternoon. In the year 2000, the ridership was 205 people per day.

12.1.4 Water Taxi Service

Outside of the scheduled BC Ferry services, a water taxi operated by Cormorant Marine Water Taxi is available for Bowen Island and surrounding areas. It runs from Horseshoe Bay at 11:30 p.m. Sunday to Thursday, and 12:30 a.m. on Friday and Saturday. The service operates a 40 "passenger only" vessel. Cormorant also provides emergency service to the Mainland in association with the Island Ambulance and Fire Services.

12.2 Key Issues In Snug Cove

Snug Cove is a focal point for Bowen Island's community and commercial activities. It is also the transportation hub of the Island. Immediate and longer-term transportation issues identified in the Reid-Crowther (1999) include:

- Ferry foot passenger marshalling;
- Traffic operation;
- Parking;
- Land use and development.

The inefficient sequential movement of disembarking foot passengers/disembarking vehicles/boarding foot passengers/boarding vehicles creates delay in the ferry operation which can lead to disruptions in the sailing schedule between Snug Cove and Horseshoe Bay.

Traffic congestion and operational difficulties and their attributes are described in Reid-Crowther (1999).

Issues in parking demand and supply in Snug Cove include the problem of on-street parking supply being used by commuter parking, and off-street parking supply being very limited. For further discussion on this and its implications for land-use, see Reid-Crowther (1999).

12.2.1 Road Network Issues (Source: Reid-Crowther, 1999)

Bowen Island is served by a network of paved and unpaved roads (see Map 14⁴⁷). Visual inspection indicates that there is no consistency in pavement conditions, with some older roads suffering from structural collapse. Many roads are narrow with little to no shoulders, and ditch control is poor. Serpentine alignments, poor sight distances, and heavy vegetation restrict visibility.

Network Configuration

The current network configuration has its focus at Snug Cove with all major routes heading to the north, south, and west directions. The development of the current network is the combined result of the following factors:

- Historical human settlement patterns;
- Terrain and biophysical barriers;
- Historical accesses to commercial developments;
- Regional and provincial parks and other jurisdictional constraints and boundaries;
- Location of the ferry terminal

⁴⁷ Please refer to **State of Bowen Island Volume 2: Maps and Supporting Information**

Because of the positioning of Snug Cove and its commercial prominence, those communities furthest from Snug cove are considered poorly served in terms of accessibility to community and emergency services. Communities such as Bluewater, Tunstall Bay, Lower Cowan Point, Hood Point, and Grafton Bay are accessed by only one route to and from Snug Cove.

12.2.2 Pedestrian, Cycling, and Equestrian Facilities

According to Reid-Crowther (1999):

“With the exception of Government Road in Snug Cove, the movement of pedestrians and bicycles within public roadways are seldom separated from passenger vehicle movements. Since the majority of the roads on the Island lack any form of shoulders, pedestrians and bicycles are forced to share the paved roads on the island with motorized vehicular traffic. Equestrian movements, the few occasions when they occurred in public roadways, must also share the road space with vehicular traffic.”

Since that report a second separate path has been added on Miller Road.

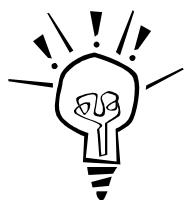
Currently, Bowen Island does not have a bicycle route incorporated into the Official Community Plan (OCP).

The relevant *Pedestrian Objectives* as established in the OCP are:

- To encourage the creation of a public pathway system and supporting infrastructure that provides a shared-use trail network for pedestrians, bicycles and equestrians;
- Enhances the natural outdoor experience of Bowen island by serving as an alternate transportation mode on the island and a general recreational resource;
- Provide pedestrian access to local neighbourhoods; and,
- Ensures that road right of way design incorporates a capability for safe pedestrian movement especially linked to trailheads.

12.2.3 Indicators

Indicator: Ferry use, including number of cars and number of foot passengers



What does this indicator tell us?

This indicator tells us how many vehicles are using the ferry and the number of foot passengers on the ferry. By comparing the ratio of cars to passengers, we can determine, a rough measure of our community transportation efficiency (number of people moved/ number of cars used)

Where do the data come from? BC Ferries

Indicator: Proportion of municipal transportation budget (i.e. Roads Budget) allocated to cycling and pedestrian trails, lanes and facilities



What does this indicator tell us?

This indicator tells us how much money local and regional governments are committing to developing alternative transportation infrastructure

Where do the data come from? Bowen Island Municipality

13.0 Resource Use

"We are in an orgy of consumption"

- David Suzuki speaking on Bowen Island, November 25, 2000

13.1 Resource Consumption

There is very little information about resource and good consumption by Bowen residents. This is a significant information gap.

It would be useful to know more about:

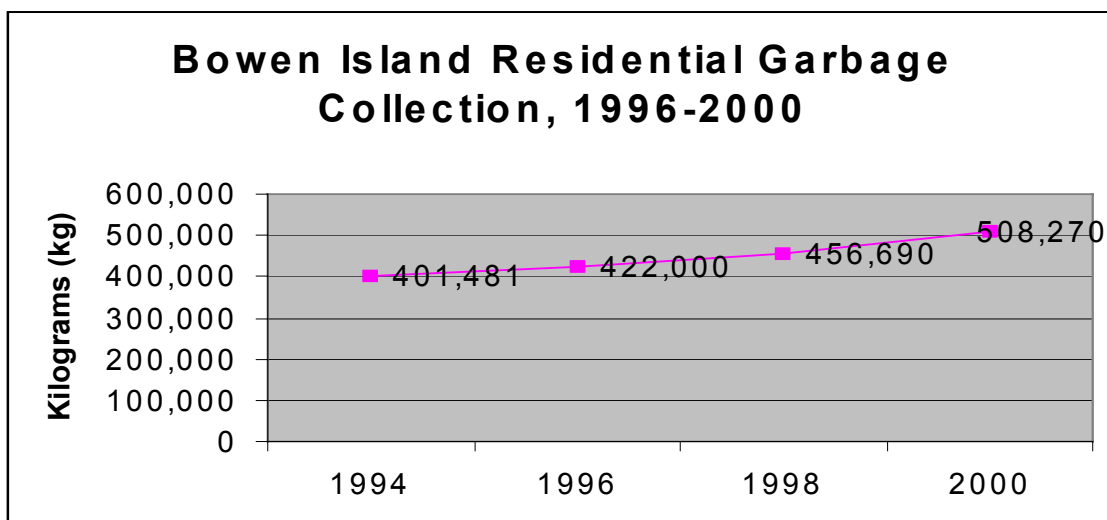
- On-island and off-island purchasing
- Volume of goods brought onto island: food, consumer goods, construction materials
- Amount of wood harvested on the island for island use and the amount taken off the island
- How many households have home vegetable gardens or chickens

13.2 Waste

There was a time when there were a number of 'unofficial' dumping areas on Bowen Island on larger pieces of private property. It is unclear how widespread this practice is today. Several of these spots have been cleaned up in recent years.

The following graph shows the amount of residential waste collected annually on Bowen Island. It does not include material collected in the Spring and Fall Clean-up. During these two days (mid-April and mid-October), oversized material such as mattresses, appliances, and furniture is collected.

Figure 13-1: Bowen Island Residential Garbage Collection, 1996-2000 Source: Dave McIntosh, 2001



How does this compare to population growth?

In 1996, the per capita waste production was **156 kilograms per person**, based on the census population count. In 2000, given an estimated population of 3,100, the per capita waste production is **164 kilograms per person**. Therefore not only is the population growing and increasing the amount of garbage produced, but as individuals more garbage is being produced.

13.2.1 Hazardous Waste

Every year there are 2 paint pick-up days and 2 hazardous waste days. Since 1994, **18,000 litres of paint** have been collected. The amount of hazardous waste collected bi-annually is roughly estimated to be 50-100 containers each collection day⁴⁸.

13.2.2 Construction Waste and Septic Field Waste

❖ Information Gap: More information is needed about two significant waste contributors: **septic field waste** that is pumped and trucked off-island and **construction waste**.

13.3 Recycling

Recycled materials are collected at a centralized depot, a system that is considered efficient in terms of cost, because residents are doing the 'pickup and delivery'. In 1986 when the Bowen Island Recycling Depot got started, the system was much smaller, and once a month a number of people would gather on a Wednesday morning to haul the material into Vancouver. It is estimated that the entire load of recycling in the first couple of years would have been 20-30 tonnes⁴⁹. In 2000, the total is closer to 210 tonnes per year. The chart below shows the amount of recycling in 1998 and 2000 in a much expanded system that is now hauled into Vancouver in large containers.

Table 13-1: Amount of Recycled Materials on Bowen Island

Material	1992 (kg)	1996 (kg)	1998 (kg)	2000 (kg)
Glass	*	51,430	43,390	13,510
Newspaper	30,016	30,280	45,670	68,730
Mixed paper	*	20,890	34,940	45,010
Cardboard	34,750	57,740	61,940	72,840
Tin	*	*	8,173	10,700
Plastic	0	0	1,970	2,300
	Source: BIRD records		Source: Dave McIntosh	

* Data not available

⁴⁸ Dave McIntosh, January 2001.

⁴⁹ Dave McIntosh, January 2001.

The amount of glass recycled has dropped significantly since 1996. This is probably due to the amount of glass that is captured in the beverage deposit return system, that has been running since 1998. This recycling data understates the total recycling including beverage containers. Other programs that likely impacted recycling numbers include the Greater Vancouver Regional District mixed paper, newspaper and cardboard ban from landfill.

Seasonal variation

Recycling is taken off the island in containers. There are two sizes on containers, 30 yard and 40 yard. The weight varies according to the material. A 30 yard container of mixed paper can weigh 5 to 5.5 tonnes, while a 40 yard container of plastic would weigh about 1.5 tonnes. The number of containers removed in 2000 is as follows:

January	3
February	3
March	4
April	5
May	4
June	6
July	3
August	7
September	4
October	3
November	3
December	4

Source: Dave McIntosh, January 2001

How much is garbage and how much is recycling?

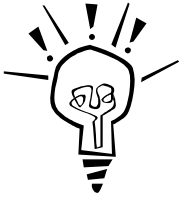
The ratio of material recycled to the total amount recycled and thrown out was **27.5% in 1996** and rose slightly to **29% in 2000**.

Where does the waste and recycling go?

When garbage and recycling leaves Bowen Island by truck, it travels to different parts of the Greater Vancouver Regional District.

- Residential waste goes to the North Vancouver Transfer Station
- Glass goes to ETL in Delta
- Newspaper and mixed paper goes to Crown in Vancouver
- Plastics go to ETL in Surrey
- Tin cans go to Richmond Steel in Richmond

13.4 Waste Indicator



Indicator: Ratio of garbage to total material recycled

What does this indicator tell us? This not only tells us total waste production, but also the ratio of waste recovery through the recycling program.

Where do the data come from?

Waste data is available from Dave and Louise McIntosh who have the garbage and recycling contract, and through the Bowen Island Recycling Depot.

14.0 Conclusion

14.1 Information Gaps

In writing about the "State of Bowen Island," we tried to access and document as much information about the Island as possible. Nevertheless, there is important information missing. In many cases, important data did not exist. In other cases, information about the Island was not included due to the limits of our study. We recognize that information is missing and hope that the report is continually updated with local and expert information from the citizens of Bowen. Please see Appendix C, Volume 2 for a list of information gaps that were identified during this project.

In many cases, what we do not know is just as important as what we do know. For example, we do not know how much water is available in certain deep bedrock wells. This information has key implications for potential development and growth on the Island. In order to address the importance of "missing information," key information gaps have been highlighted throughout the report. These information gaps highlight the significance of future research and public participation in moving towards a more sustainable Bowen Island.

14.2 Indicators – What's Next?

This report has provided a list of indicators that are useful in tracking progress towards a more sustainable Island. These indicators were established in consultation with our steering committee and the Bowen Island Municipality. However, the indicators provided are not the only definitive measures of what constitutes a healthy Bowen Island. In essence, these indicators are a useful first step in establishing priorities for developing a more sustainable community. As the community continues to communicate and learn about the state of Bowen Island and the implications of moving towards a more sustainable future, the indicators may change.

While the indicators developed for this project are useful, a more involved indicator process might seek to integrate higher levels of community knowledge through greater public participation. The indicators developed during this project are compiled in Appendix B in Volume 2 and address important environmental, social, and economic issues that define Bowen Island.

14.3 Moving Towards Sustainability

The State of Bowen Island Report is structured in a way that separates different systems on Bowen Island. For example, water, energy, and people are all separate chapters. Nonetheless, throughout the report, we develop linkages between different systems in an attempt to demonstrate the interconnectedness between different facets of life on Bowen. In reality, strategies for planning on Bowen need to reflect the interconnected nature of different systems. It is essential to understand that addressing each component of sustainability on Bowen requires an integrated, trans-disciplinary approach

Wilson (1998) suggests that this involve the bringing together of “knowledge by the linking of facts and fact-based theory across disciplines to create a common groundwork of explanation” in order to more accurately describe humanity's existence and our relationship with the each other and the planet.

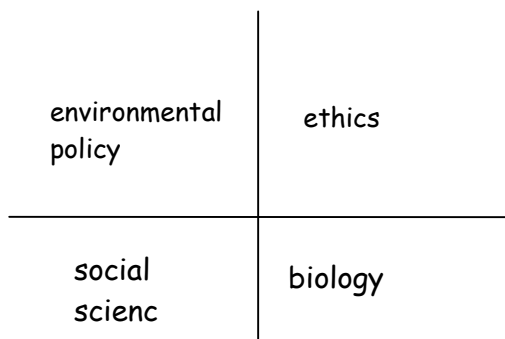


Figure 14-1: Towards a Consilience of Disciplines (Source: Wilson, 1998)

This diagram shows the various components of intellectual inquiry that play a role in developing strategies for traditional planning. Wilson (1998) argues that the concepts in the diagram are, in reality, linked and interdependent. However, he recognizes that:

"[o]nly in imagination can we travel clockwise from the recognition of environmental problems and the need for soundly based policy; to the selection of solutions based on moral reasoning; to the biological foundations of that reasoning; to a grasp of social institutions as the products of biology, environment, and history. And thence back to environmental policy" (Wilson, 1998, 10).

Traditionally, each component is perceived of as separate in understanding human and natural systems. As real-life problems and conflicts arise in developing management strategies, few maps or concepts exist to guide us through the different disciplines. Human action, expressed through policies, will best be approached by a fusion of natural and social sciences (components of the diagram) that facilitates the bringing together of abstract principles through the development of a common models of understanding.

An intellectual synthesis of the natural world that creates a shared vision of a desirable environmental and economic state is a necessary precondition for developing sustainable strategies for Bowen Island. It is hoped that the information found in this report will contribute to developing an informed citizenry that understands the implications of their actions at a variety of scales.

It's getting a bit academic again! What are we saying??

Everything is connected and you have to shift your thinking to reflect that. You can't just think about water, it relates to everything else (see cover!). We have to do things a little differently to get the sustainability wheels turning.



Recommendations

1. This is a Edition Number One of the State of Bowen Island Report. There are many areas that were addressed superficially due to time constraints. This report needs to be revised regularly to include new information.
2. This is not a report that is intended to gather dust on a shelf. It is fuel for active DEBATES: it needs to be discussed, questioned, pulled apart and put back together again! How do all these issues fit together? What is sustainability in the Bowen Island context?
3. This report is as much about the information contained between these covers as it is about what we don't know! There are key INFORMATION GAPS that need to be addressed; water, air quality, and the on-island economy are key areas where more research is needed (see Appendix C)!
4. The MAPS in the companion volume of this report are a critical part of the State of Bowen Island Report, and give an indication of the current state of digitized information for mapping Bowen Island. There are critical data gaps. Additional work needs to be undertaken to continue to develop accurate and useful maps for Bowen Island. Critical areas include: the current road network, current trails, and vegetation cover.
5. The new DIGITAL LIBRARY and community mapping opportunities now being created by the Bowen Island Forest & Water Management Society provides an excellent forum for assembling, tracking, and disseminating all of the data and supporting documentation required to maintain and enhance the community's knowledge about the State of Bowen Island. These opportunities should be nurtured and used to expand collective community knowledge.
6. This report introduces some potential COMMUNITY SUSTAINABILITY INDICATORS for Bowen Island. These are a first cut at developing a set of meaningful, useful indicators that track change and become a catalyst for action. These need to be discussed, debated, adapted and used!

7. A **COMMUNITY REPORT CARD** should be developed and be widely available in the community.
8. The next step in developing Sustainability Indicators is to establish **TARGETS** for each indicator. These targets need to be tied to overall community goals.
9. The challenges of sustainability provide an incredible learning opportunity for Bowen Islanders. **LINKAGES** need to be nurtured and developed with existing projects and organizations both on and off island. Bowen Island Community School and Island Pacific School (through the Sustainable Communities Initiative) are both involved in developing learning initiatives from this report and maps.



Next Steps

To call this section a conclusion is very misleading. In reality, it is more of an introduction, outlining key factors that are important to Bowen Island as the community continues down the path towards a more sustainable future. Framing the issues on Bowen Island was the job of this report. Addressing the issues is the job of Bowen Islanders.

Use this report! Think about issues that are important to you on Bowen Island. Make the report better by contributing your own ideas and thoughts. The trip towards a more sustainable future will be made with people working together using various forms of knowledge, ideas, and ingenuity. Talk to you soon.

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Sue Barr, Remax Masters Reality, October 2000

Alan Leigh, December 2000

BC Hydro Presentation to Council, November 2000

Dave McIntosh, January 2001

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Doug Berry, November 27, 2000

Felicity Adams, November 2000

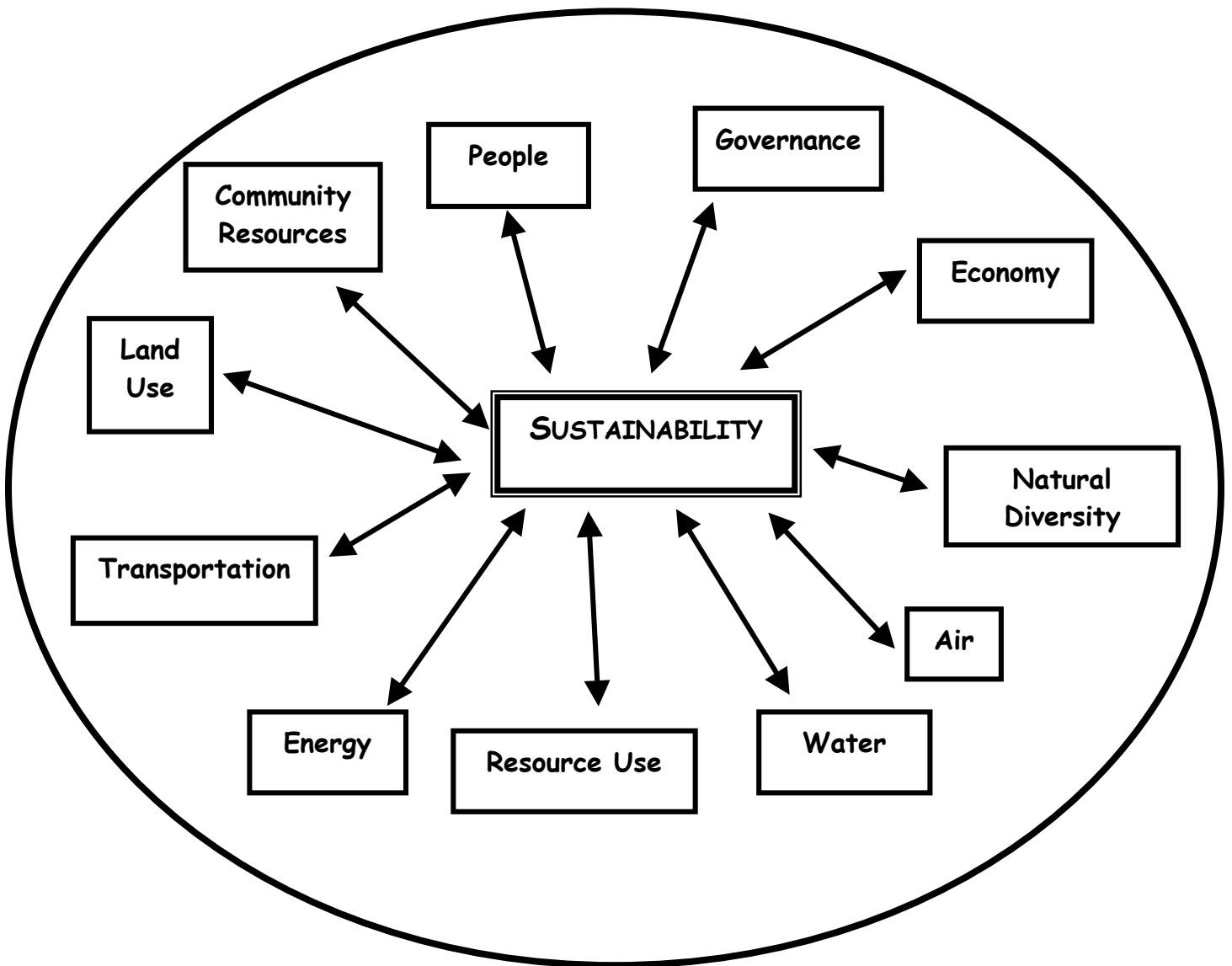
Julian Dunster, November 2000

Karen Levy, Community Nurse, January 2001

Alan Still, Fire Chief, December 2000

Alan Kahut, Groundwater Manager, BC Government, November 2000.

The State of Bowen Island



Volume 2: Maps and Supporting Information

Bowen Island Sustainability Project
February 2001

The State of Bowen Island
Volume 2: Maps and Supporting Information

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Bowen Island Library
Bowen Island Community School
Bowen Island Museum and Archives

Cite as:

Shoji, M., Lemmon, S., Julian, M., and R. Bailey. 2001. The State of Bowen Island Volume 2: Maps and Supporting Information. Bowen Island Sustainability Project, Bowen Island Municipality, Bowen Island. Multiple pages.

Mapping Team

Miki Shoji, Geological Survey of Canada, worked on the mapping component of the project. She has a B.Sc. in Environmental Science from Simon Fraser University. She completed this project as the practicum for her Post-Baccalaureate diploma in Environmental Science from Capilano College, in North Vancouver. She is also involved with the Sustainable Communities Initiative.

Stephanie Lemmon, Omni-tech Environmental Services, worked on the mapping component of the project. She has a B.Sc. in Environmental Science from the University of Guelph and has a the Post-Baccalaureate diploma in Environmental Science at Capilano College. She has also completed a Sensitive Habitat Inventory and Mapping (SHIM) project on Bowen Brook and some of its tributaries, and worked on a biophysical assessment of Bowen's Crown Lands.

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1.4 Introduction

This is **The State of Bowen Island Volume 2: Maps and Supporting Information**. It is a compilation of maps intended to be used with **The State of Bowen Island Volume 1: Report**. This Volume (2) contains 15 maps, and an Appendix (A) that outlines the source data for each map. Appendix B contains the complete list of sustainability indicators introduced in Volume 1. Appendix C lists the information gaps identified throughout Volume 1.

These maps reflect the current state of mapping for Bowen Island. To put them together, the most up-to-date digitized information was used. The digitized information may not always reflect community knowledge, and in some cases the maps contain inaccuracies. Developing mapping capabilities in the community is an on-going process, and this set of maps is one iteration of this process. Mapping on Bowen Island will continue to improve with on-going work of the the Bowen Island Municipality, the Bowen Island Water & Forest Management Society, the Geological Survey of Canada, and other interested individuals and groups.

These maps were compiled from June to November of 2000 by Miki Shoji and Stephanie Lemmon. For more information about mapping activities on Bowen Island, please contact the Bowen Island Forest & Water Management Society at 947-0016.

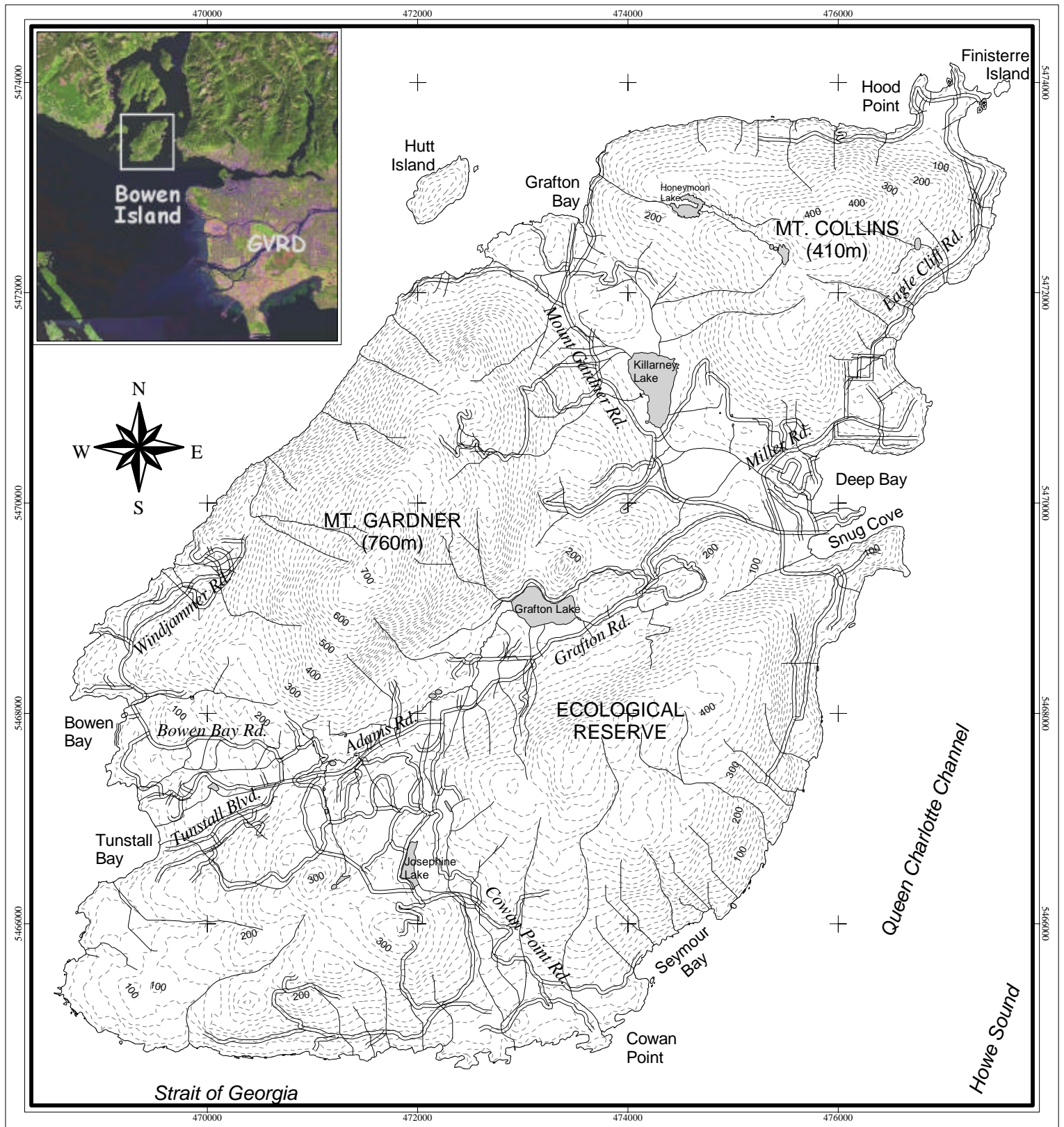
BOWEN ISLAND GIS MAP ATLAS

Draft Maps of Bowen Island, Created for the State of Bowen Island Report





Sixteen draft maps are included in this appendix. Those maps are created for the use in the State of Bowen Island (SoBI) Report, which will be released in December 2000. Further revisions are planned for these maps by Bowen Island Sustainability Project prior to the release of SoBI report. Those maps may contain errors, and should not be used for planning or recreational purposes.

16 pages (13 maps - 8x11" & 3 maps - 11x17")

Map 1) General Map of Bowen Island



LEGEND

-  Roads
-  Streams
-  Lakes
-  Contours [m]

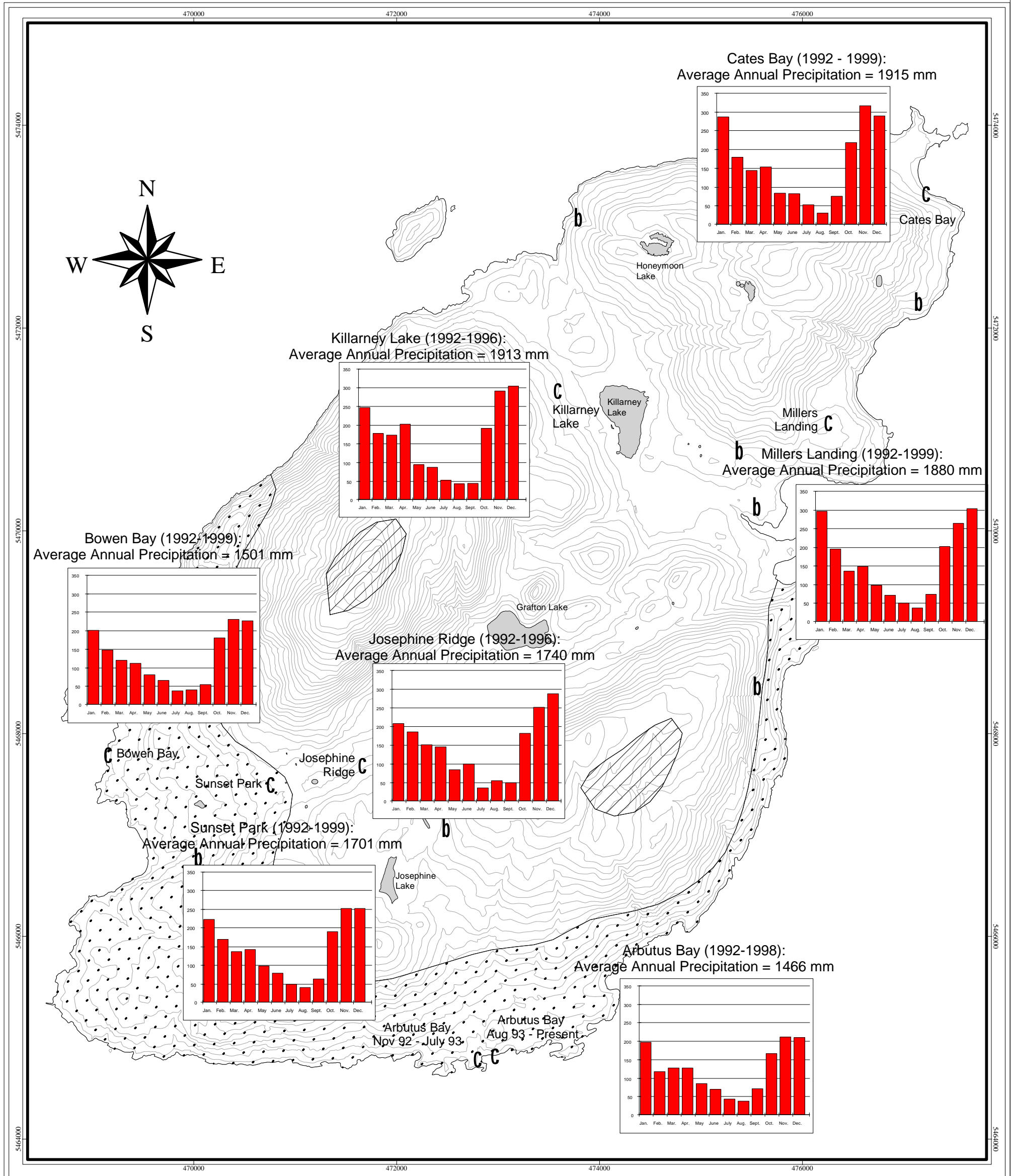
This map shows Bowen Island, British Columbia. The indexed satellite image (top left) shows the relative location of Bowen Island in the Greater Vancouver Regional District (GVRD). Heights of land are defined in meters.

1 0 1 2 3 Kilometers

Scale = 1:50,000; Contour Intervals = 20m;
Projection UTM; Zone 10; Datum NAD83; Spheroid Clarke 1866;

For detailed sources of information upon which the map is based, please refer to Appendix of State of Bowen Island Report (2000)

Map 2) BOWEN ISLAND: Biogeoclimatic Zones and Total Precipitation



LEGEND

Lakes

c Weather Stations - Precipitation Data Shown

b Weather Stations - No Data Shown (Data may be reported back to Bowen Island Forest and Water Management Society, or Closed prior to 1992)

Contours

Biogeoclimatic Zones

CWH dm - Coastal Western Hemlock Zone, Dry Maritime Subzone

CWH vm 2 - Coastal Western Hemlock Zone, Very Wet Maritime Subzone: Montane Variation

CWH xm 1 - Coastal Western Hemlock Zone, Very Dry Maritime Subzone: Eastern Variation

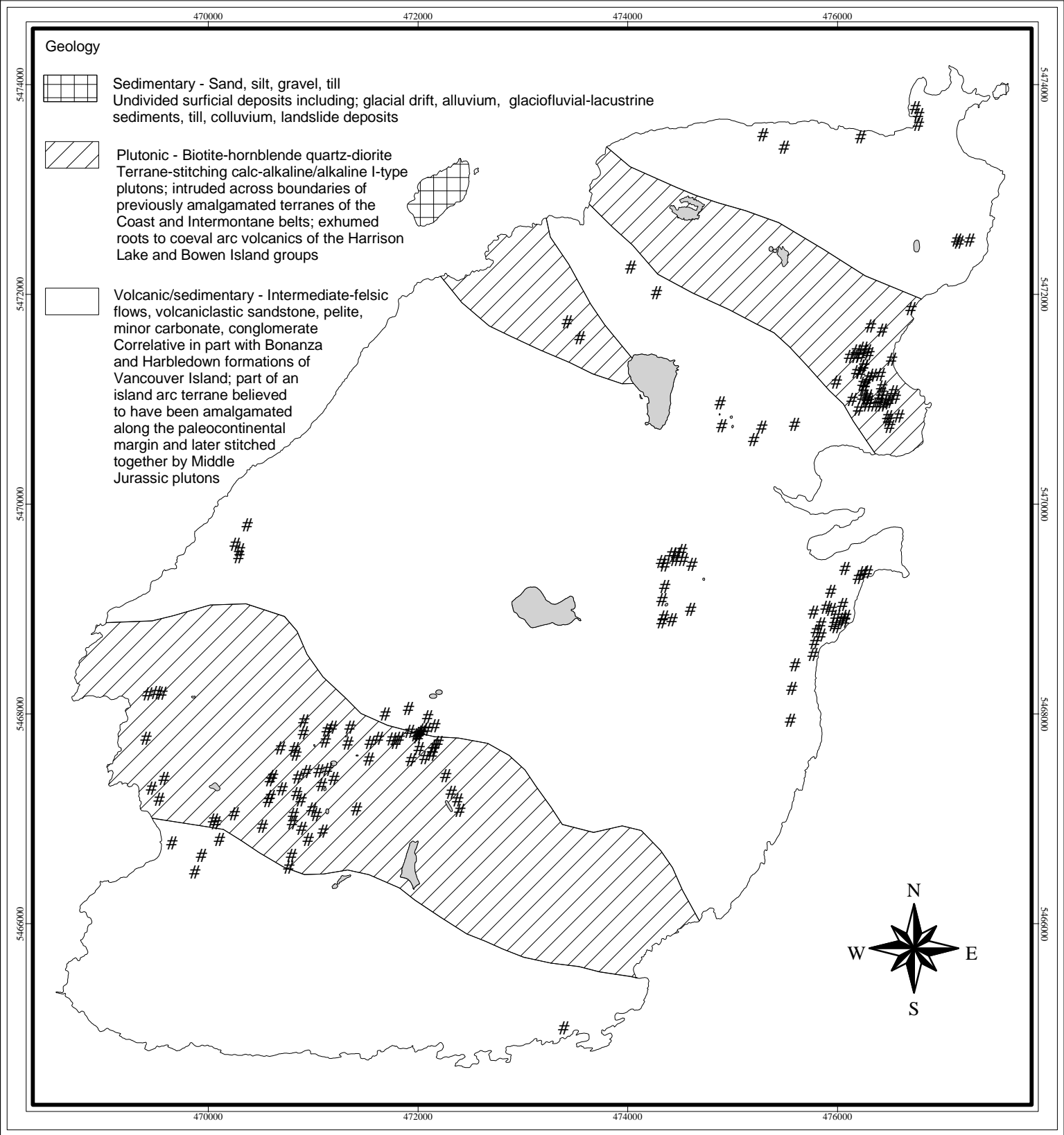
This map shows the Biogeoclimatic Zones of Bowen Island defined by BC Ministry of Forest. Inserted graphs show monthly average of total precipitation (rain and snow) recorded at various weather stations over the period of 1991 - 1999 (Some station has stopped collecting data prior to 1999). The precipitation data was obtained from Environment Canada.

1 0 1 2 3 Kilometers

Scale = 1:37,500; Contour Intervals = 20m;
Projection UTM; Zone 10; Datum NAD83; Spheroid Clarke 1866;

For detailed sources of information upon which the map is based, please refer to Appendix of State of Bowen Island Report (2000)

Map 3) BOWEN ISLAND : Bedrock Geology



LEGEND

- # Deep Wells
-  Lakes

This map shows the bedrock geology of Bowen Island. Location of deep wells (drilled wells) are also shown on the map.

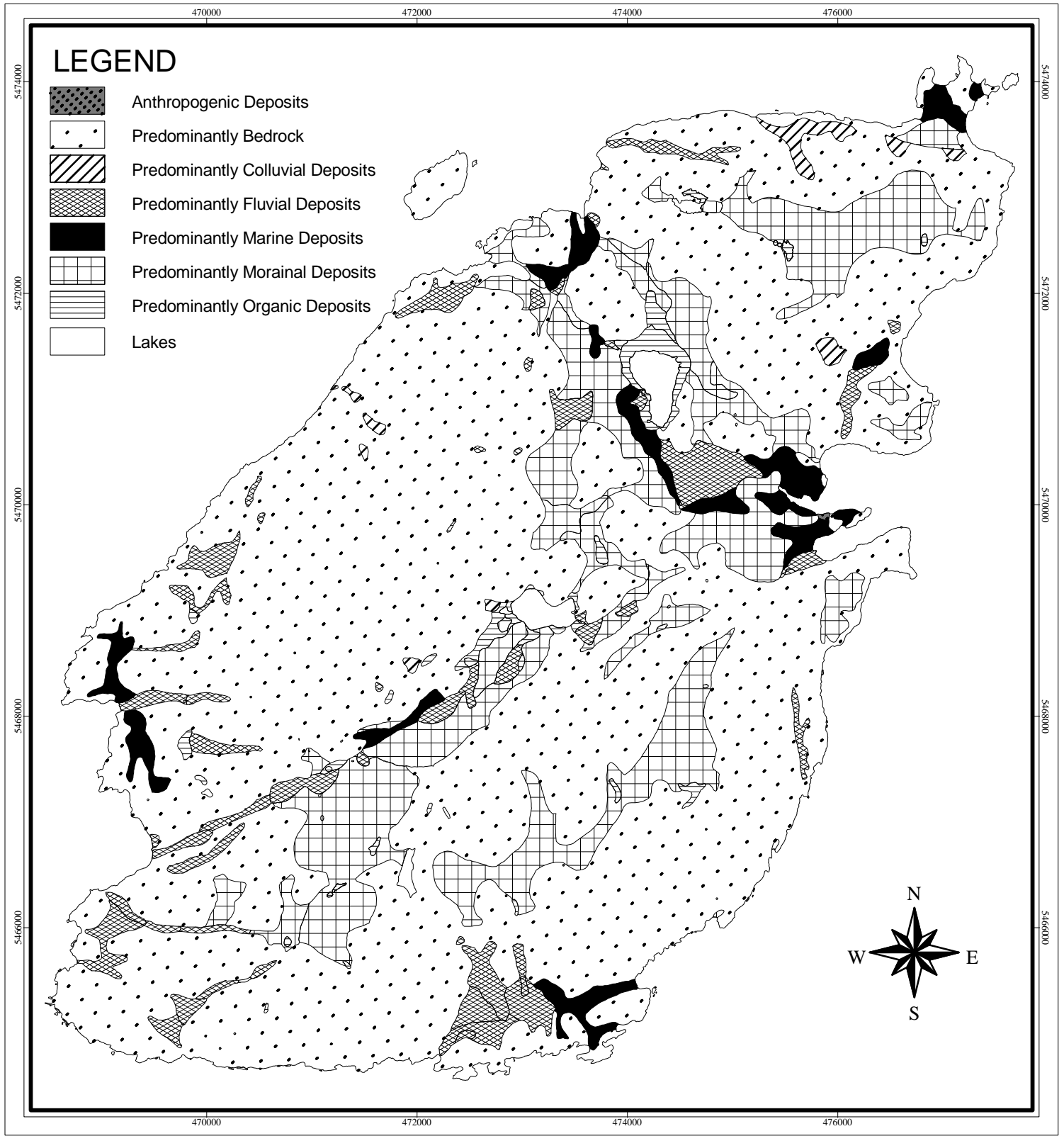


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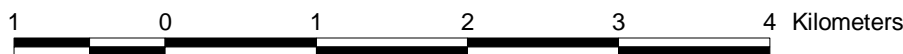
Projection UTM; Zone 10; Datum NAD83; Spheroid Clarke 1866;

For detailed sources of information upon which the map is based, please refer to Appendix of State of Bowen Island Report (2000)

Map 4) BOWEN ISLAND: Surface Geology



This map shows the surface geology of Bowen Island. The surface materials were classified by an analysis of predominant substances in each area by J. Block (1978).

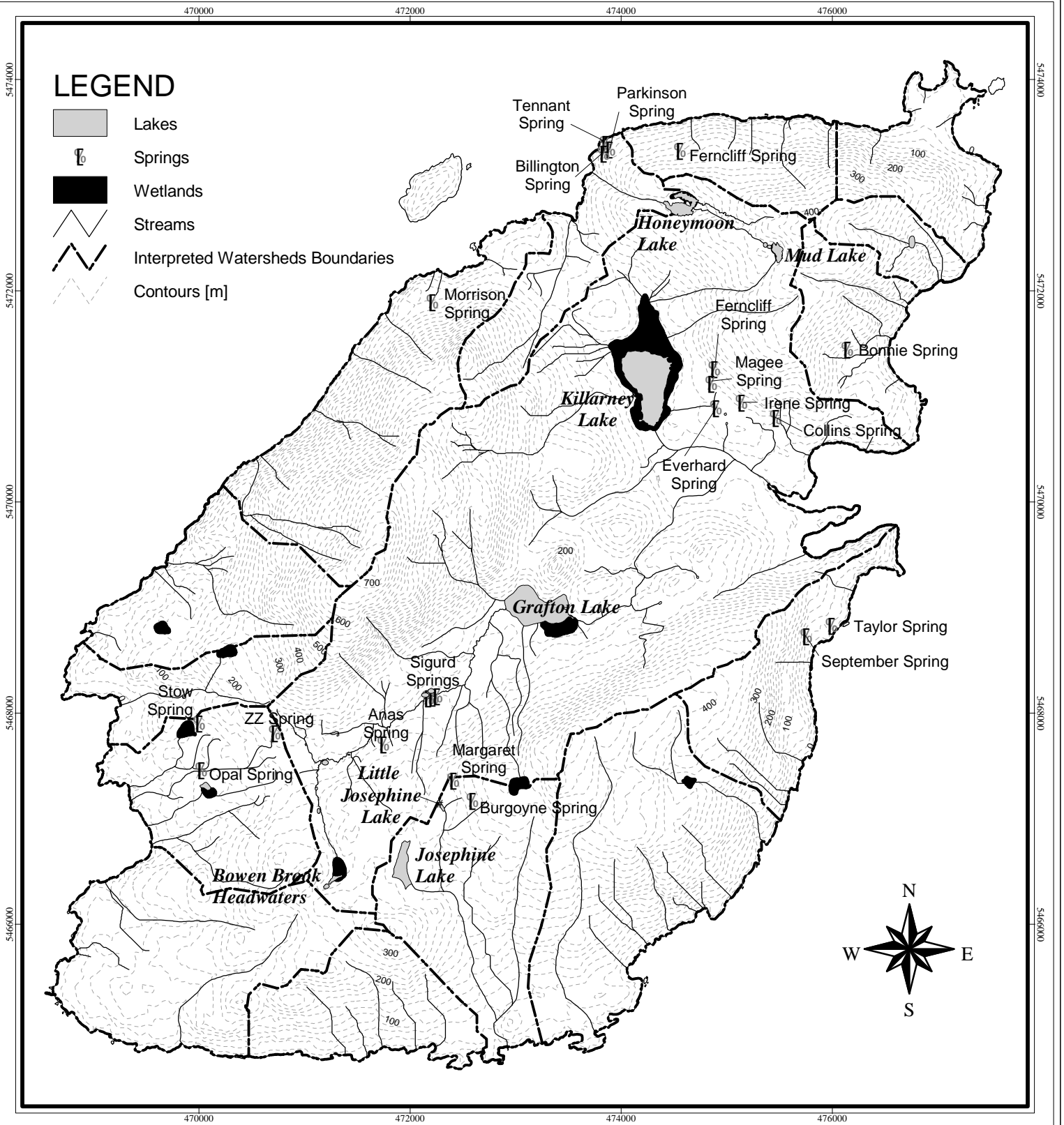


Scale = 1:50,000

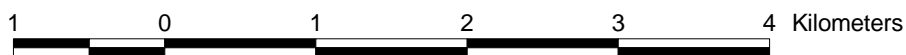
Projection UTM; Zone 10; Datum NAD83; Spheroid Clarke 1866;

For detailed sources of information upon which the map is based, please refer to Appendix of State of Bowen Island Report (2000)

Map 5) BOWEN ISLAND: Surface Water



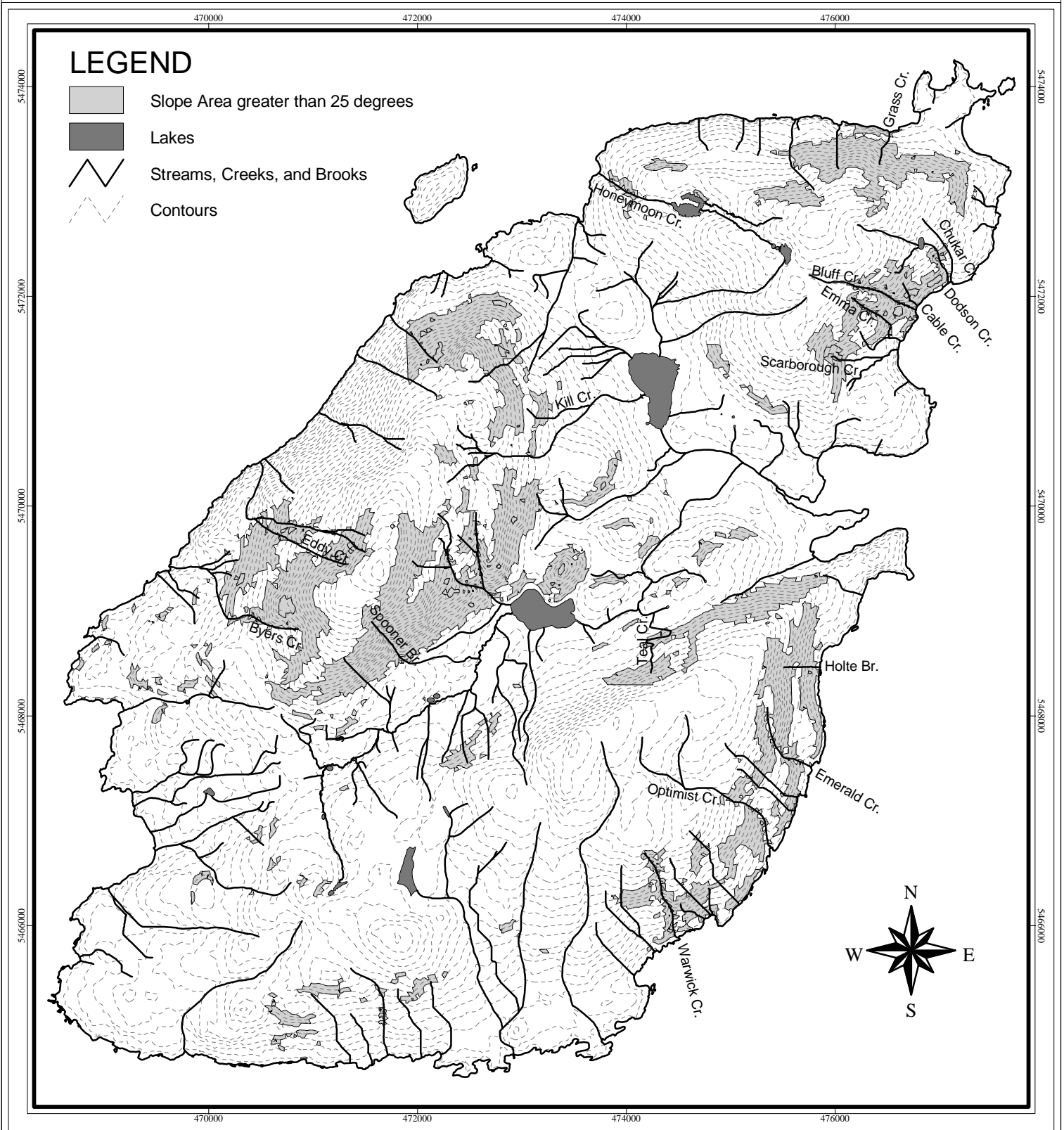
Distribution of surface water on Bowen Island is shown on this map. The surface water include lakes, springs, wetlands, and streams. The watershed boundaries were Interpreted from height of lands.



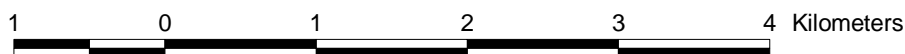
Scale = 1:50,000; Contour Intervals = 20m;
 Projection UTM; Zone 10; Datum NAD83; Spheroid Clarke 1866;

For detailed sources of information upon which the map is based, please refer to Appendix of State of Bowen Island Report (2000)

Map 6) BOWEN ISLAND: Streams and Slope Area > 25 Degrees



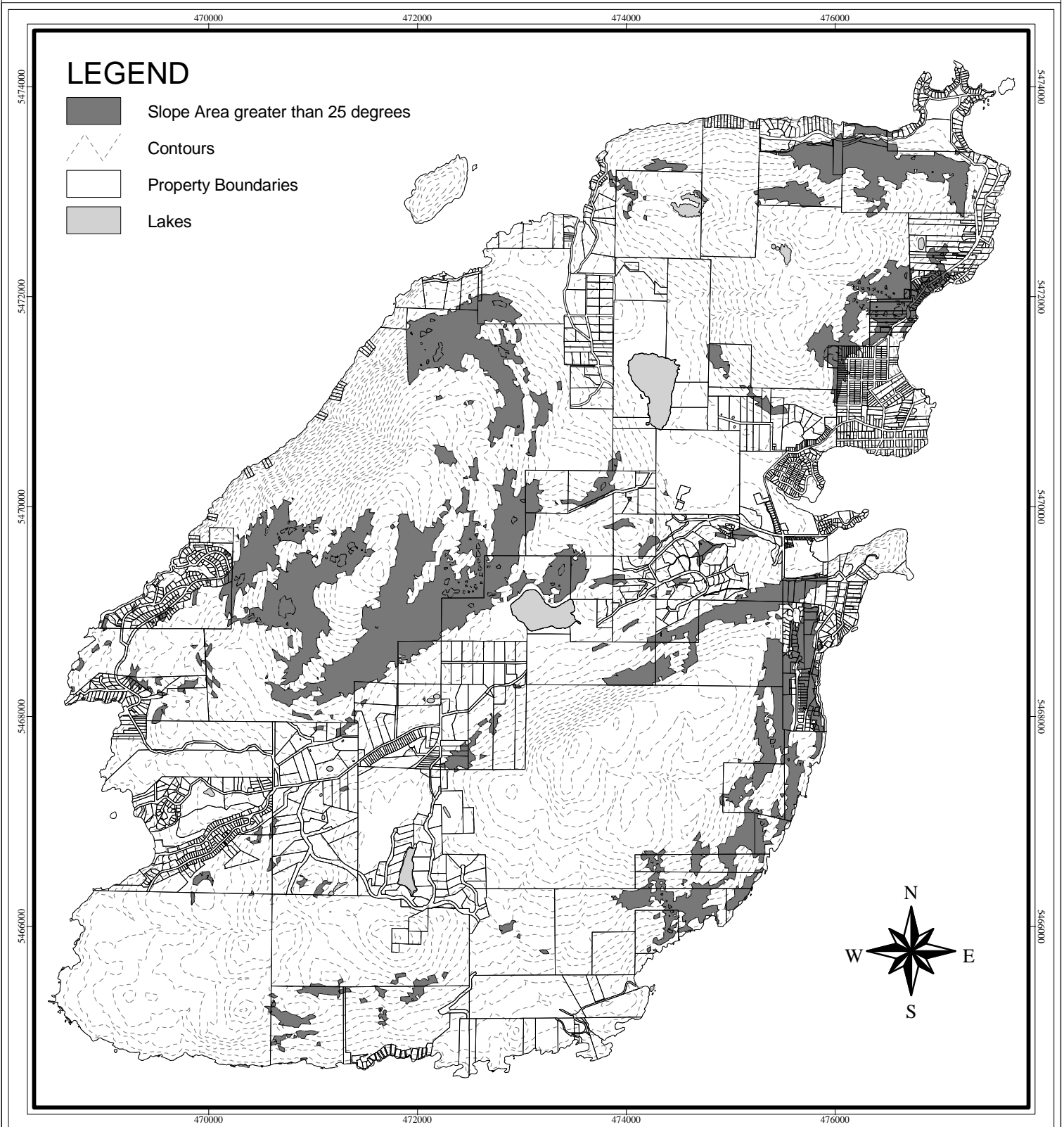
Areas that have slope greater than 25 degrees are shown on this map. Some streams flow through those steep areas on Bowen Island. Those areas are defined by Bowen Island Official Community Plan Bylaw No. 139 (1995) as Development Permit Area for protection of development from hazardous conditions (Schedule E (Map 2)).



Scale = 1:50,000; Contour Intervals = 20m;
 Projection UTM; Zone 10; Datum NAD83; Spheroid Clarke 1866;

For detailed sources of information upon which the map is based, please refer to Appendix of State of Bowen Island Report (2000)

Map 7) BOWEN ISLAND: Development Permit Area for Slope > 25 Degrees



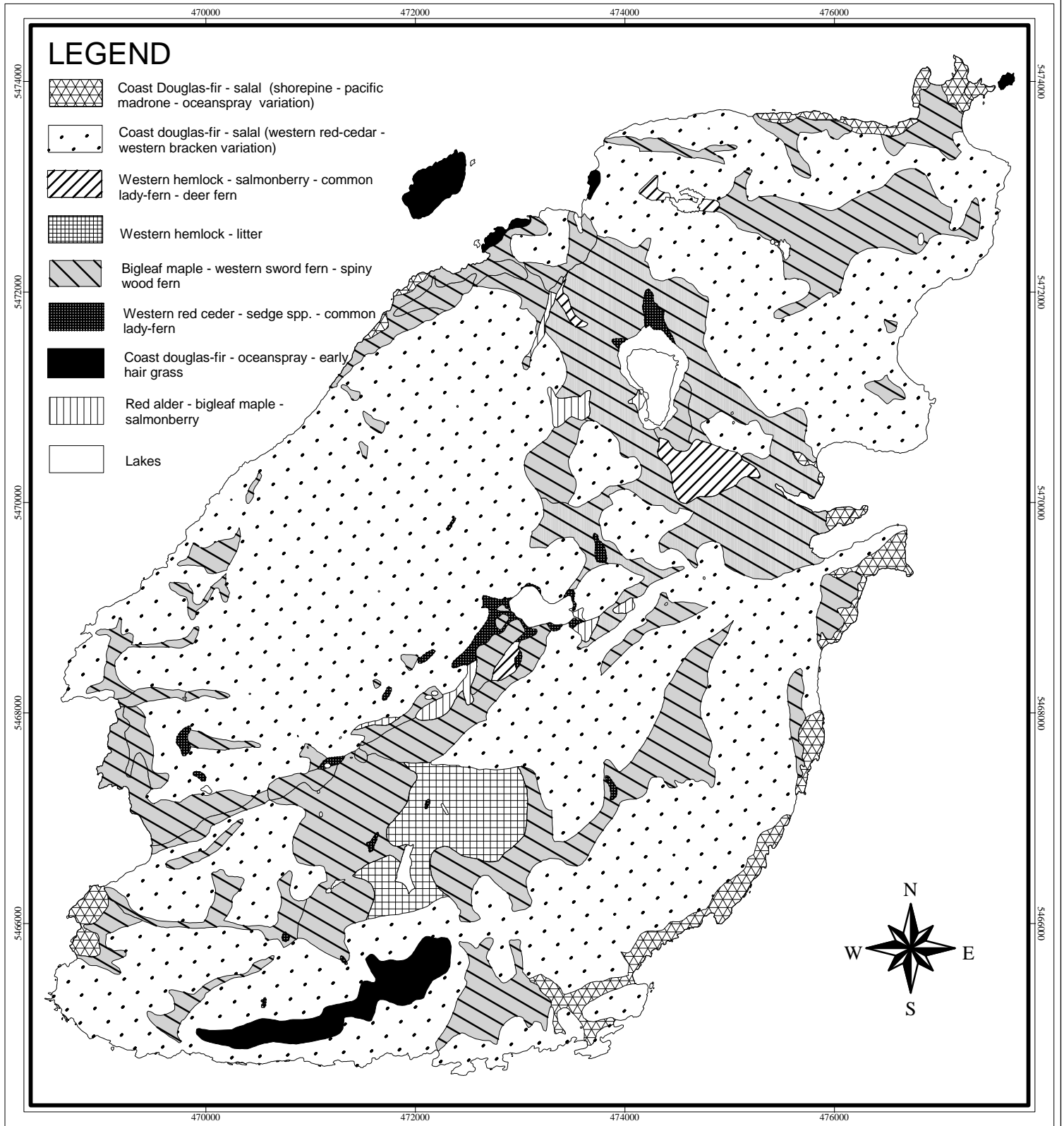
Areas that have slope greater than 25 degrees are shown on this map. Those areas require a development permit. Those areas are defined by Bowen Island Official Community Plan Bylaw No. 139 (1995) as Development Permit Area for protection of development from hazardous conditions (Schedule E (Map 2)).

1 0 1 2 3 4 Kilometers

Scale = 1:50,000; Contour Intervals = 20m;
Projection UTM; Zone 10; Datum NAD83; Spheroid Clarke 1866;

For detailed sources of information upon which the map is based, please refer to Appendix of State of Bowen Island Report (2000)

Map 8) BOWEN ISLAND: Vegetation Associations



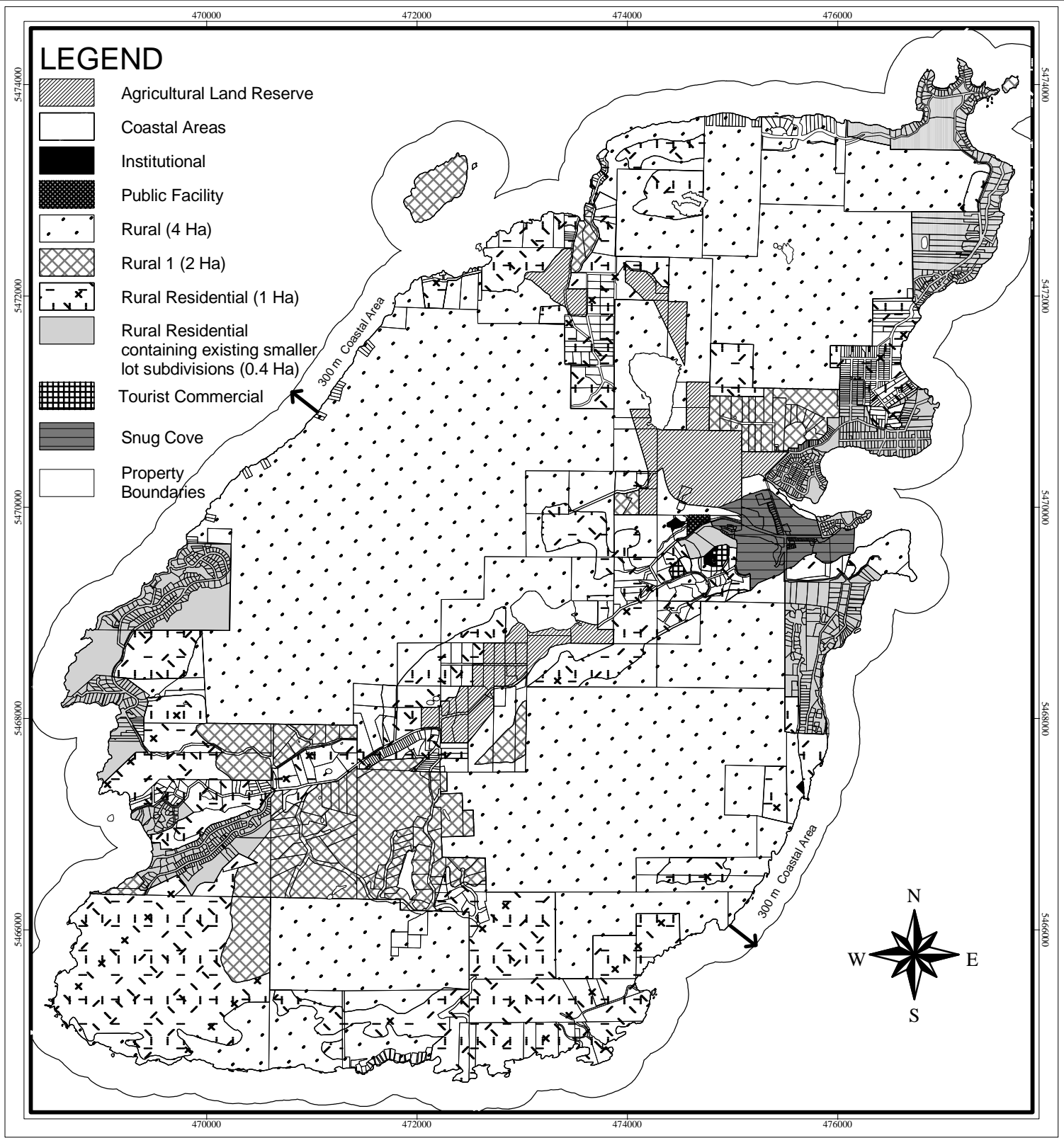
This map shows the distribution of vegetation associations on Bowen Island. The vegetation groups shown were determined to be the major associations in each area by J. Block (1978).

1 0 1 2 3 4 Kilometers

Scale = 1:50,000
 Projection UTM; Zone 10; Datum NAD83; Spheroid Clarke 1866;

For detailed sources of information upon which the map is based, please refer to Appendix of State of Bowen Island Report (2000)

Map 9) BOWEN ISLAND: OCP Land Use Designations



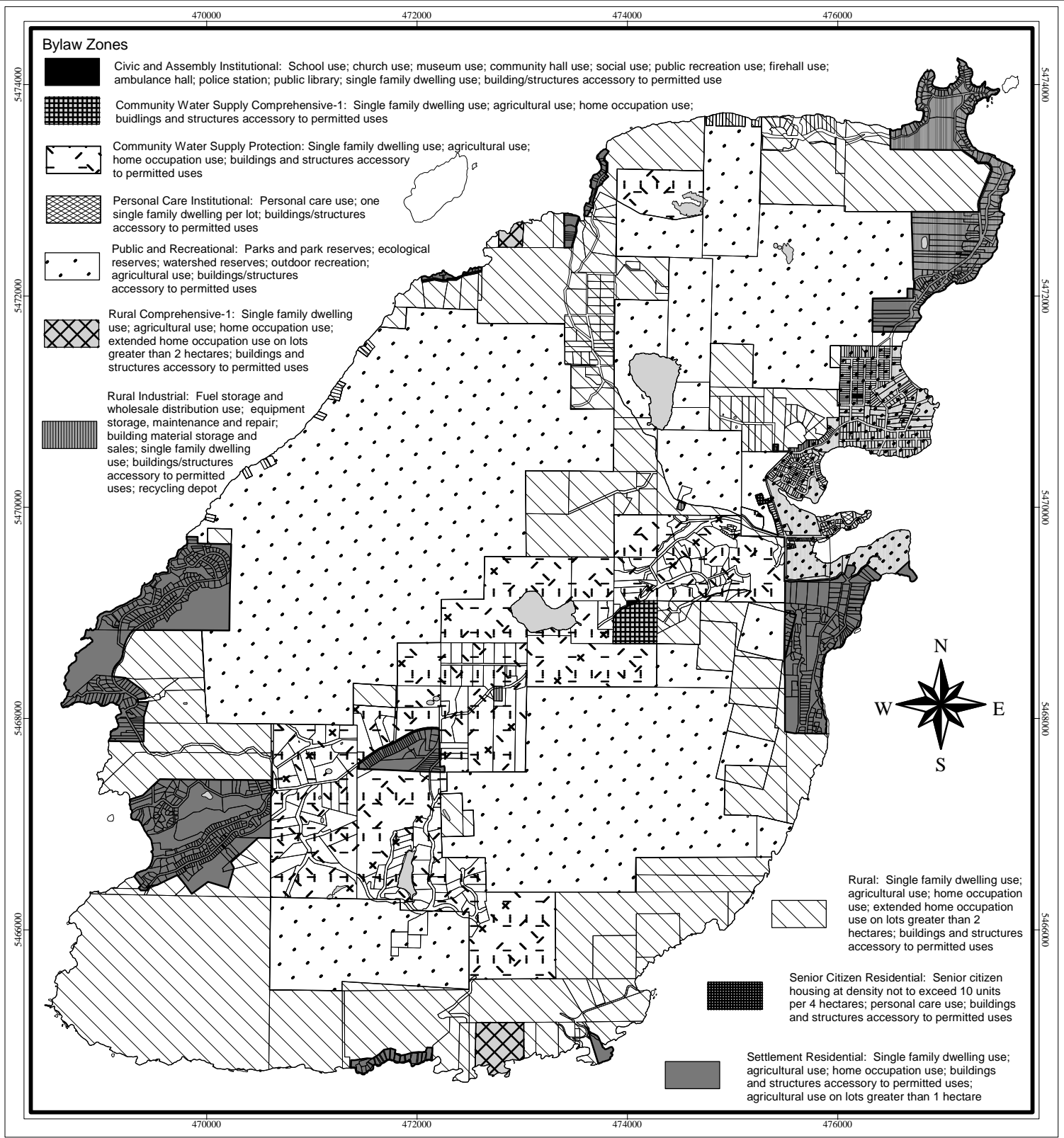
This map describes the land use designations defined by Bowen Island Official Community Plan Bylaw No. 139 (1995). The average lot size allowed for the area is given within brackets () in the legend.

1 0 1 2 3 4 Kilometers

Scale = 1:50,000
 Projection UTM; Zone 10; Datum NAD83; Spheroid Clarke 1866;

For detailed sources of information upon which the map is based, please refer to Appendix of State of Bowen Island Report (2000)

Map 10) BOWEN ISLAND: Zoning Bylaw

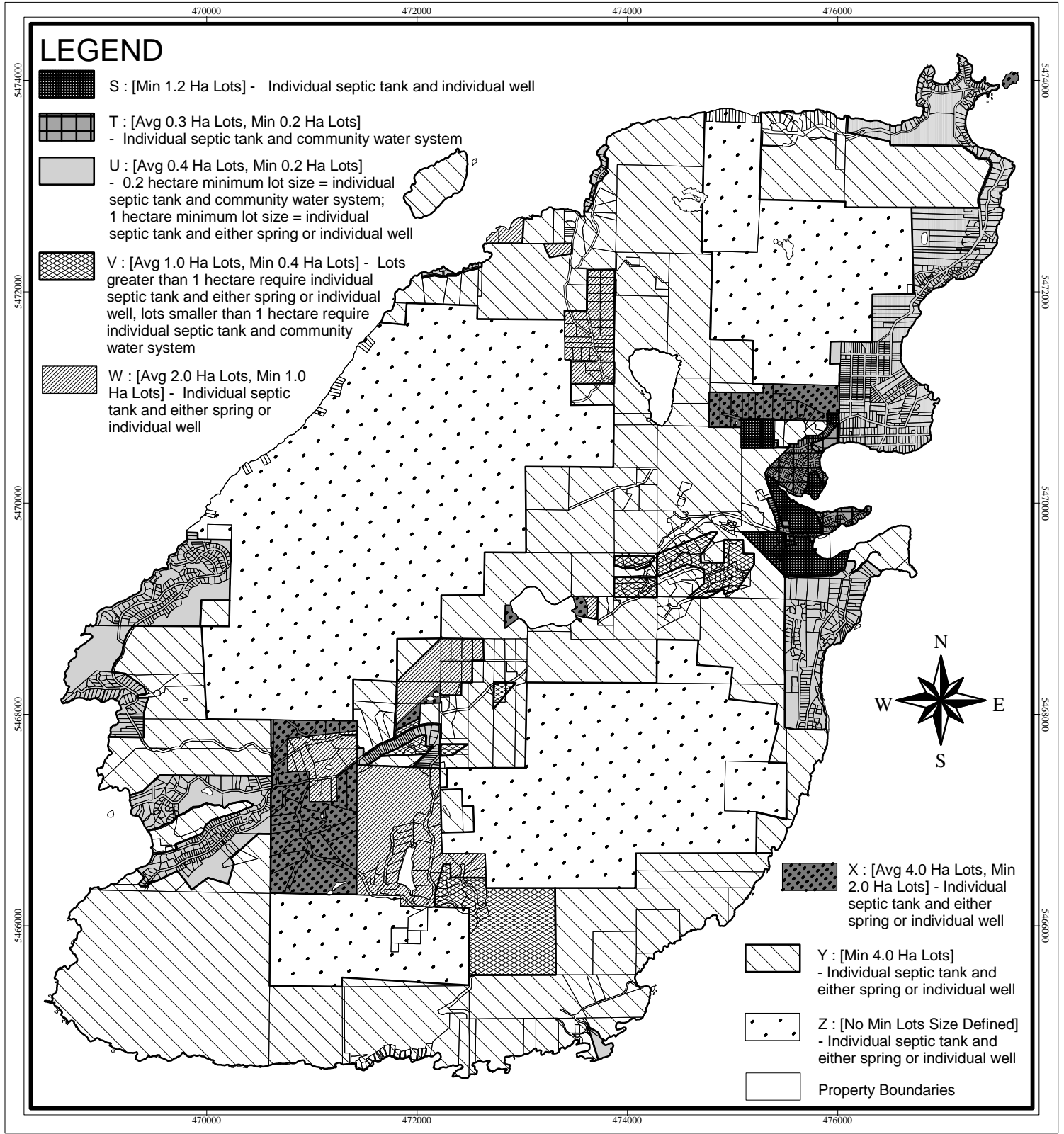


This map shows the zoning bylaw in effect, defined by Bowen Island Zoning Bylaw No. 36. Accurately digitized zoning bylaw information is not available for Snug Cove and surrounding area (including Bowen Bay and Cates Hill).



For detailed sources of information upon which the map is based, please refer to Appendix of State of Bowen Island Report (2000)

Map 11) BOWEN ISLAND: Subdivisions



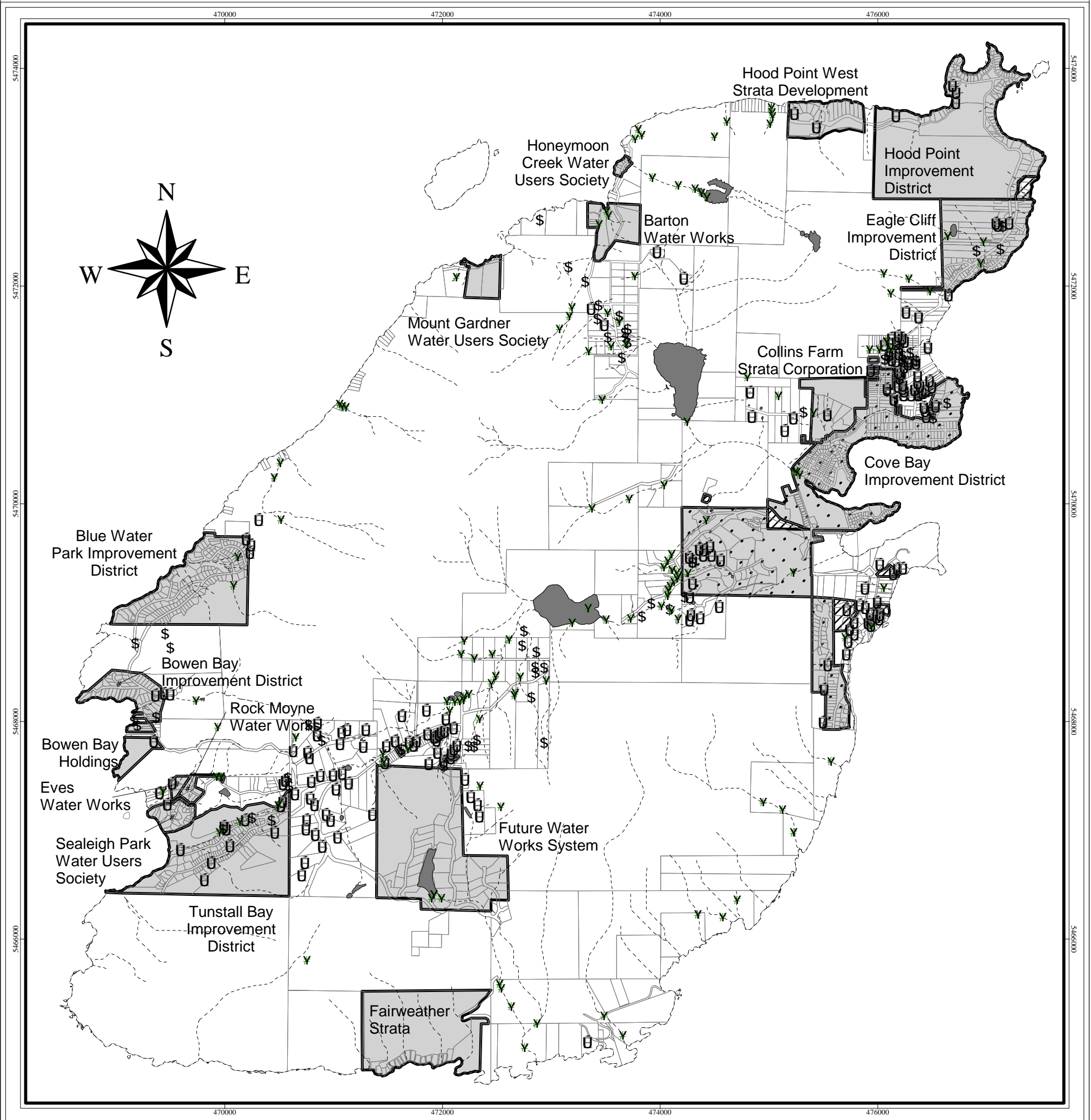
This map describes the subdivision bylaw in effect, defined by Bowen Island Subdivision Bylaw No. 270. The minimum and average lot sizes allowed for the zone is given within brackets [] in the legend.



Scale = 1:50,000;
Projection UTM; Zone 10; Datum NAD83; Spheroid Clarke 1866;

For detailed sources of information upon which the map is based, please refer to Appendix of State of Bowen Island Report (2000)

Map 12) BOWEN ISLAND: Water Districts and Location of Water Intake



This map shows the water districts of Bowen Island. Locations for various methods of water intake (registered surface water intake, shallow wells, and deep wells) are also shown. Note that the District boundaries are approximate, and current extension of Cove Bay Improvement District is not shown on this map.

LEGEND

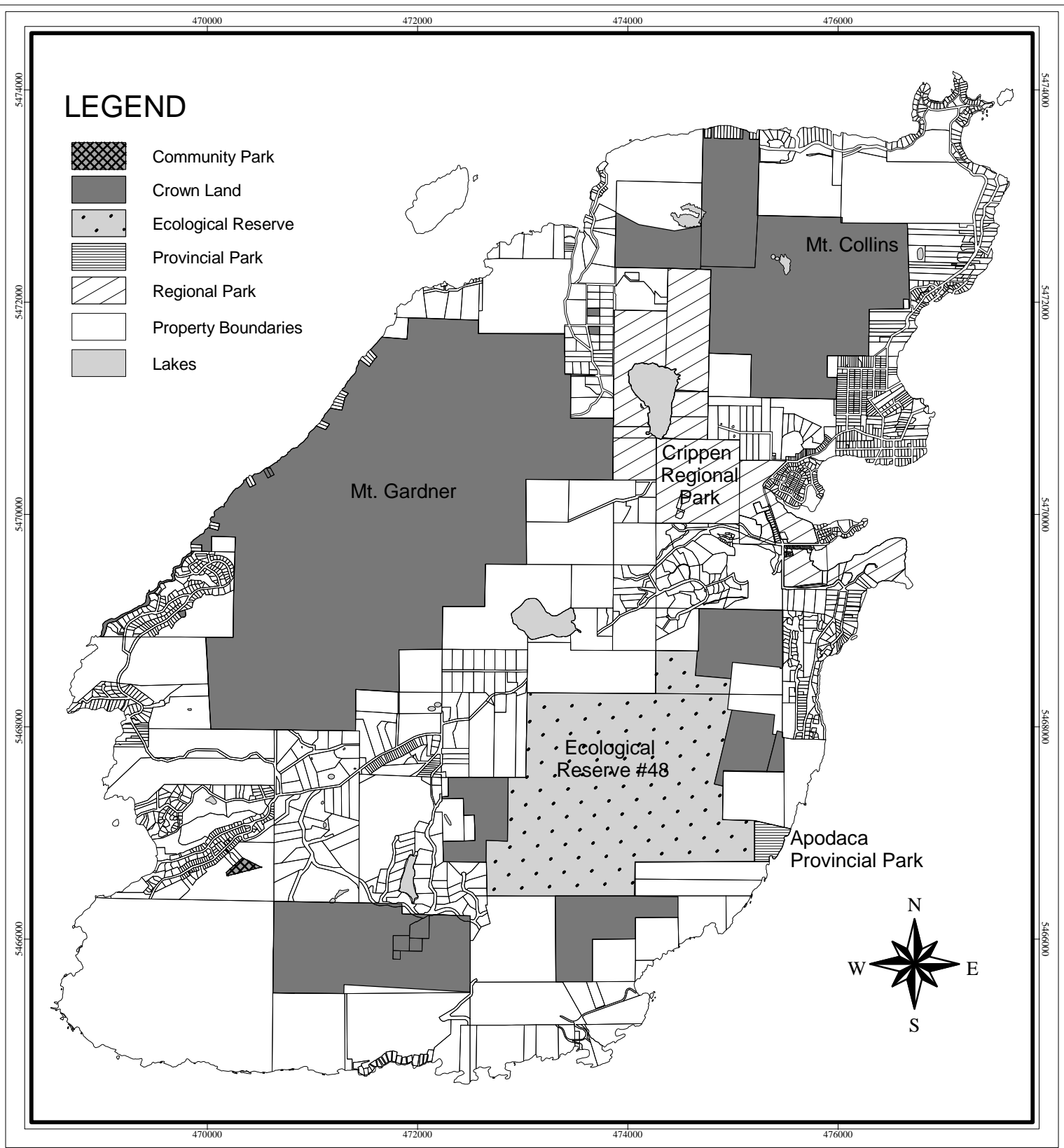
- Y Registered Surface Water Intake Point (Point of Diversion) - Licenses are associated with each intake point.
- \$ Shallow Wells - Wells and intake points that were dug shallow into surface materials
- U Deep Wells - Wells that were drilled deep into bedrock
- Lakes
- Streams
- Property Boundaries
- Water Improvement Districts and Private Water Distribution
- Cove Bay Improvement District
- ▨ Other Private Water Distribution

1 0 1 2 3 Kilometers

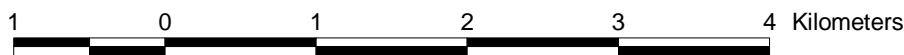
Scale = 1:37,500
Projection UTM; Zone 10; Datum NAD83; Spheroid Clarke 1866;

For detailed sources of information upon which the map is based, please refer to Appendix of State of Bowen Island Report (2000)

Map 13) BOWEN ISLAND: Parks, Ecological Reserve and Crown Land



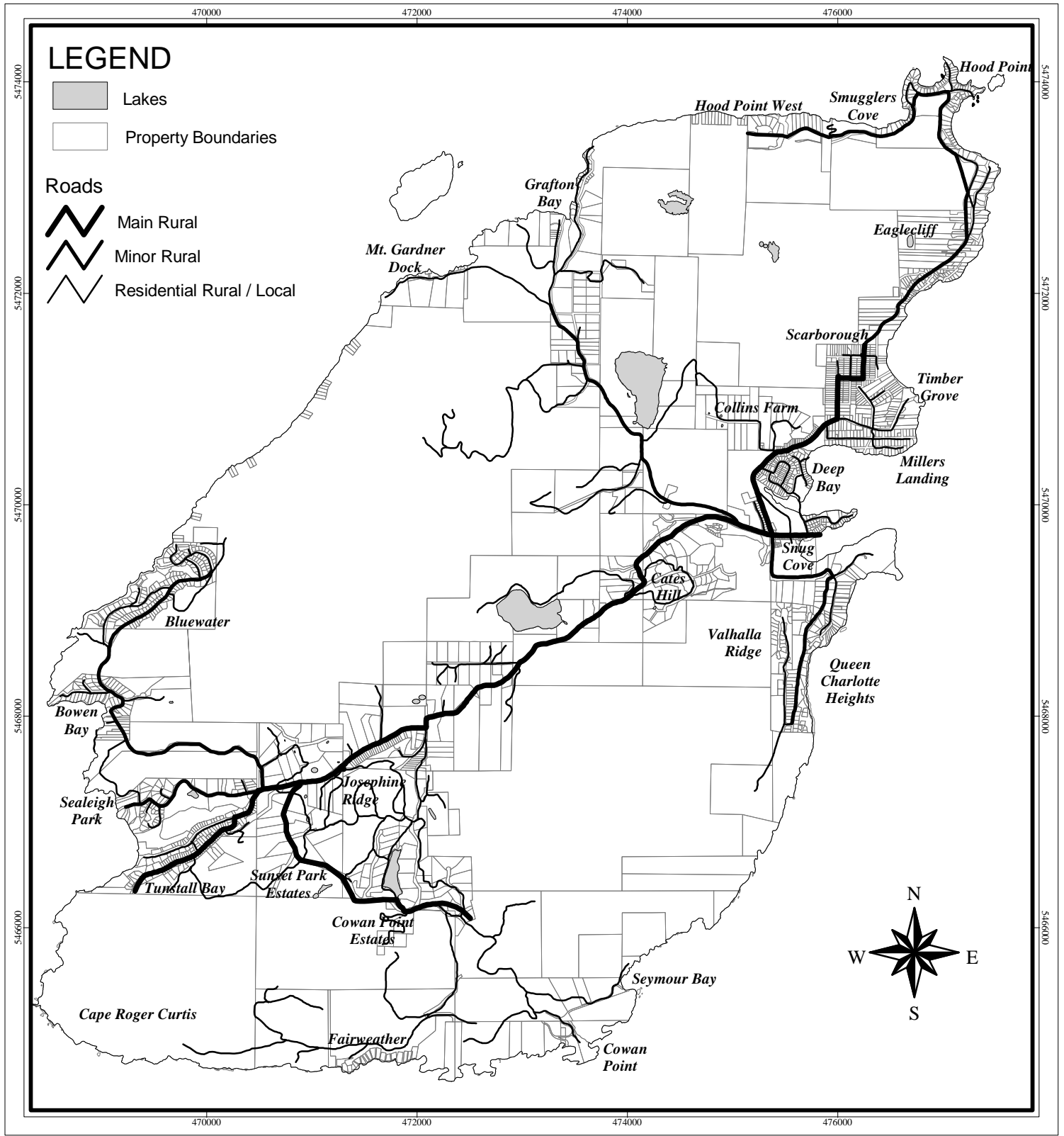
Parks, Ecological Reserve and Crown Land on Bowen Island is shown on this map. Those areas are defined by Bowen Island Official Community Plan Bylaw No. 139 (1995). Not all the existing parks are shown on this map.



Scale = 1:50,000
 Projection UTM; Zone 10; Datum NAD83; Spheroid Clarke 1866;

For detailed sources of information upon which the map is based, please refer to Appendix of State of Bowen Island Report (2000)

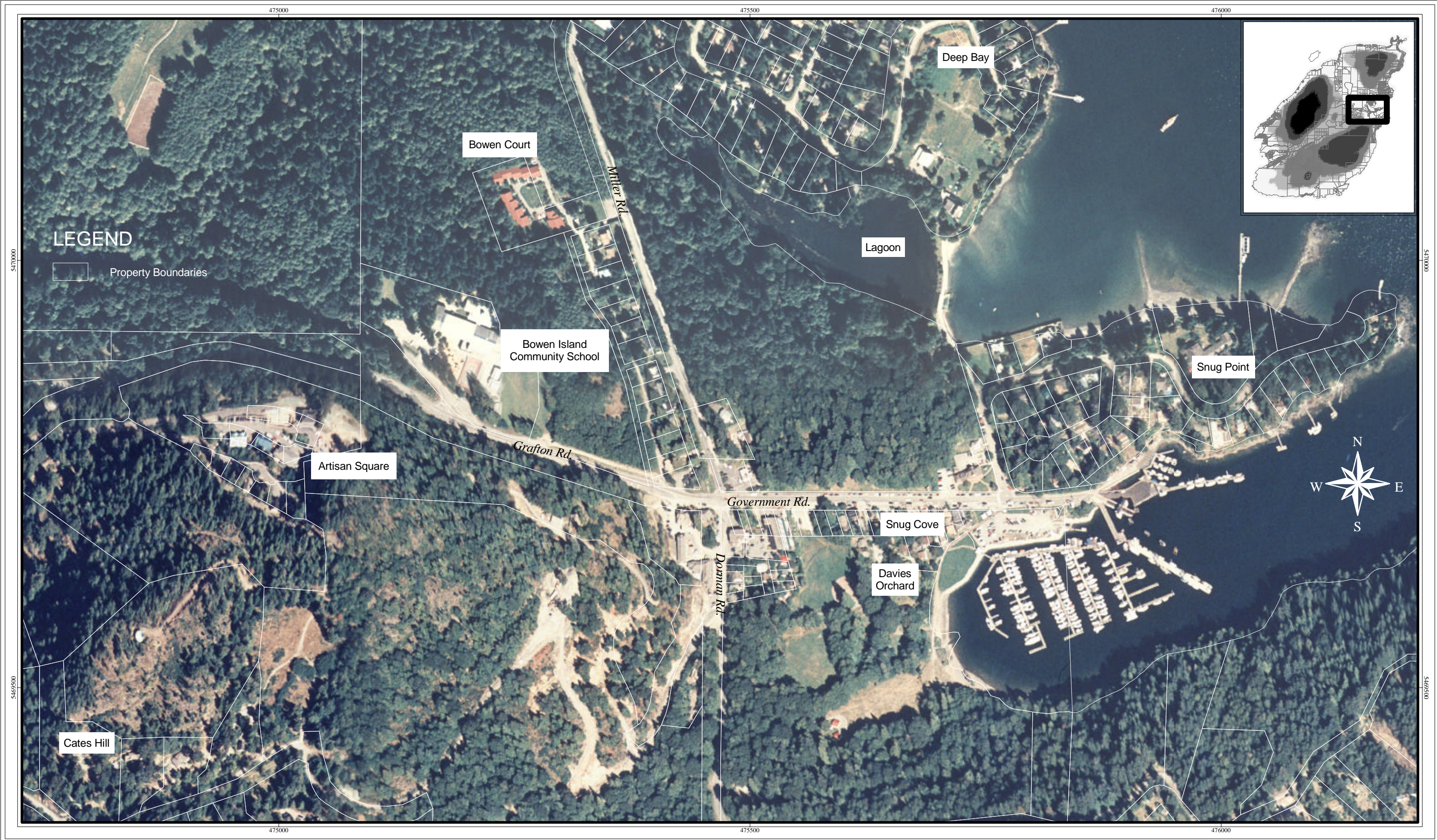
Map 15) BOWEN ISLAND: Roads



The map shows roads on Bowen Island. Some digitized road data shown here is inaccurate. Also not all the roads are shown on this map.

For detailed sources of information upon which the map is based, please refer to Appendix of State of Bowen Island Report (2000)

Map 16) BOWEN ISLAND: Orthophoto of Snug Cove Area



This orthophoto was taken by Ministry of Environment, Land and Parks in 1999. The insert map represents Bowen Island and the location of Snug Cove (Photo Area) is defined by the rectangle.



Scale = 1:8,000; 0.5m Colour Ortho Photo (1999)
 Projection UTM; Zone 10; Datum NAD83; Spheroid Clarke 1866;
 Source: Ministry of Environment, Land and Parks;

For detailed sources of information upon which the map is based, please refer to Appendix of State of Bowen Island Report (2000)

15.0 Appendix A:

Detailed Metadata for Maps Cited in the State of Bowen Island Volume 2: Maps and Supporting Information

Appendix A contains detailed metadata about each map (i.e. authors, sources, projections, accuracy etc.)

15.1 Map 1) General Map of Bowen Island

Layers Used:

Road Network - Bowen Island

Created by: Islands Trust (1993)

File Name: Bowenroads.shp (Currently in ArcView shape file)

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: BC TRIM - Roads Network; Digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from TRIM at 1:20K scale; Modified by BIFWMS;

Custodian: Islands Trust

Abstract: Coverage showing Road network for Bowen Island; showing major road network;

Accuracy: Not all the roads are digitized - require review

Stream Network - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "streams" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the streams GPS'd and Digitized (2000) for SHIM project, Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Stream Network on Bowen Island; Some of the streams were GPS'd by BIFWMS through SHIM project; attributes include name of the streams, sources, and GPS'd date;

Lakes - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "Lakes" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the lakes are GPS'd and Digitized (2000) for SHIM project; Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Lakes on Bowen Island; Some of the lakes were GPS'd by BIFWMS through SHIM project; attribute include Name of the lakes and GPS'd date;

Contours - Bowen Island

Created by: Islands Trust (1994)

File Name: "Contours" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: BC TRIM - modified by BIFWMS to fit the latest (at 2000) shoreline;

Abstract: 1: 10000 TRIM Contours for Bowen Island at 20m interval

Shoreline and the Island Polygons - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1993)

File Name: "Bowsh" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: Shoreline digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale;

Custodian: BIFWMS

Abstract: Coverage of coastline and island polygon on Bowen Island; Appears as solid Island polygon; For Cartographic purposes

Other Information Used:

Index - Satellite Image of Greater Vancouver Regional District including Bowen Island.

Height of Mount Gardner and Mount Collins - Obtained from H.E. Hirvonen (1976) and converted into Meters.
Hirvonen, H.E. (1976). *Bowen Island: A Landscape Analysis*. Ed. Canadian Forestry Service. Department of the Environment: Victoria British Columbia. p. 29.

Map Compositions:

Printed on: 8x11 inches - Black and White (Gray Scale)

Created by: Bowen Island Sustainability Project - Miki Shoji, Stephanie Lemmon and Murray Journey

Created for: State of Bowen Island Report (2000)

Map Scale: 1:50,000

Contour Interval: 20m (Height of Land defined in Meters)

Projection: UTM, NAD83, Zone10, Clarke 1866

15.2 Map 2) BOWEN ISLAND: Biogeoclimatic Zone and Total Precipitation

Layers Used:

Biogeoclimatic Zones- Bowen Island

Created by: BC Ministry of Forests (1995)

File Name: "Climate" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: NAD83 BISP (2000) - Converted from .e00 file to Arc/Info file; Reprojected from ALBERS, GRS1980, Parameters (50,0,0; 58,30,0; -126,0,0; 45,0,0; 1000000; 0) to UTM, NAD83, Zone 10, Clarke 1866; Projection Error was fixed using NAD83 to NAD27 Transformation; Clipped to show only Bowen Island; Shoreline changed to the latest shoreline at year 2

Source: Qbec.e00; Ministry of Forests - Biogeoclimatic Ecosystem Classification with Coastlines - More Info at http://www.res.for.gov.bc.ca/projects/bec_doc.html

Custodian: Ministry of Forests

Abstract: Coverage showing biogeoclimatic zones. Not ground truthed and known to have errors, as it was created at a scale of 1:250,000, whereas differences are noted at a scale of 1:10,000. Zone for Bowen is Coastal Western Hemlock (CWH) and there are three subzones (dm, vm2, xm1).

Weather Stations - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1994)

File Name: "Wstat" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: BIFWMS Water Survey - Conducted by Anne Chollat

Custodian: BIFWMS

Abstract: Coverage showing 18 Weather Stations on Bowen Island; include name of the station and date that have been in use

Lakes - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "Lakes" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the lakes are GPS'd and Digitized (2000) for SHIM project; Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Lakes on Bowen Island; Some of the lakes were GPS'd by BIFWMS through SHIM project; attribute include Name of the lakes and GPS'd date;

Contours - Bowen Island

Created by: Islands Trust (1994)

File Name: "Contours" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection
Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;
Source: BC TRIM - modified by BIFWMS to fit the latest (at 2000) shoreline;
Abstract: 1: 10000 TRIM Contours for Bowen Island at 20m interval

Shoreline and the Island Polygons - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1993)
File Name: "Bowsh" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection
Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;
Source: Shoreline digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale;
Custodian: BIFWMS
Abstract: Coverage of coastline and island polygon on Bowen Island; Appears as solid Island polygon; For Cartographic purposes

Other Information Used:

Precipitation Graphs - Data obtained from Environment Canada (Monthly CD for quality -controlled data 1992 to early to mid 1999. Filename: MARG2.xls. (provided by Stan Stobbe, Climate Services) The data was analyzed by Bowen Island Sustainability Project (BISP) 2000 for monthly sverage of total precipitation (snow and rain) over the period when the data is available. The Annual Average of Total Precipitation was calculated as a Sum of Monthly Average of Total Precipitation.

Description of Biogeoclimatic Zones - Information obtained from British Columbia Ministry of Forests.
BC Ministry of Forests. (1991). *Ecosystem of British Columbia*. Meidinger, D. and Pojar, J. Eds. Special Report Series 6. Province of British Columbia, Research Branch: Victoria. ISSN 0843-6452, February 1991. <http://www.for.gov.bc.ca/hfd/pubs/docs/Srs/SRseries.htm>

Map Compositions:

Printed on: 11 x 17 inches - Black and White (Gray Scale)
Created by: Bowen Island Sustainability Project - Miki Shoji, Stephanie Lemmon and Murray Journeay
Created for: State of Bowen Island Report (2000)
Map Scale: 1:37,500
Contour Interval: 20m (Height of Land defined in Meters)
Projection: UTM, NAD83, Zone10, Clarke 1866

15.3 Map 3) BOWEN ISLAND : Bedrock Geology

Layers Used:

Geology - Bowen Island

Created by: Geological Survey of Canada (1996)

File Name: "Geology" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Shoreline changed to the latest shoreline at year 2000 (Same as Bowsh (polygon) shoreline); Existing Lake outlines have been renewed to latest (2000) version of Lakes (Josephine, Grafton, and Killarney);

Source: Monger, J.W.H. (1985-1993) - Geological Survey of Canada paper 93-1A

Custodian: Geological Survey of Canada

Abstract: This coverage shows the geology for Bowen Island (Bowen Island Group). Attribute table is complete with rock class, description, type, era/epoch, age

Deep Wells - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1994)

File Name: "Dwell" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: BIFWMS Water Survey - Conducted by Anne Chollat (SCI_Bowen CD)

Custodian: BIFWMS

Abstract: Coverage showing registered and non-registered deep wells (179) on Bowen Island; Deep wells are drilled wells;

Lakes - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "Lakes" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the lakes are GPS'd and Digitized (2000) for SHIM project; Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Lakes on Bowen Island; Some of the lakes were GPS'd by BIFWMS through SHIM project; attribute include Name of the lakes and GPS'd date;

Contours - Bowen Island

Created by: Islands Trust (1994)

File Name: "Contours" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: BC TRIM - modified by BIFWMS to fit the latest (at 2000) shoreline;

Abstract: 1: 10000 TRIM Contours for Bowen Island at 20m interval

Shoreline and the Island Polygons - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1993)

File Name: "Bowsh" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: Shoreline digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale;

Custodian: BIFWMS

Abstract: Coverage of coastline and island polygon on Bowen Island; Appears as solid Island polygon; For Cartographic purposes

Map Compositions:

Printed on: 8x11 inches - Black and White (Gray Scale)

Created by: Bowen Island Sustainability Project - Miki Shoji, Stephanie Lemmon and Murray Journey

Created for: State of Bowen Island Report (2000)

Map Scale: 1:50,000

Contour Interval: 20m (Height of Land defined in Meters)

Projection: UTM, NAD83, Zone10, Clarke 1866

Other Information Used:

Geology Legend Descriptions - Descriptions of different types of rocks were obtained from *GeoMap Vancouver*,

available as a poster from the Geological Survey of Canada.

Geological Survey of Canada. (1997). *GeoMap Vancouver*. Geological Map of the Vancouver Metropolitan Area. Geological Survey of Canada Open File 3511. Also available online:

<http://sts.gsc.nrcan.gc.ca/page1/urban/geomap/index.html>

15.4 Map 4) BOWEN ISLAND : Surface Geology

Layers Used:

Terrain Analysis: Base Data- Bowen Island

Created by: Block (1978)

File Name: "Terrex" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83; Shoreline changed to the latest shoreline at year 2000 (Same as Bowsh (polygon) shoreline); Existing Lake outlines have been renewed to latest (2000) version of Lakes (Honeymoon, Mud Lake, Small pond in NE of Island, Bowen Brook Headwaters, Josephine, Grafton, and Killarney, also, Lagoon polygon was deleted); Attribute data

Source: Digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale; Block (1978)

Custodian: BIFWMS

Abstract: Coverage used to make a map "Terrain Analysis: Base Data", Block (1978) - Block Report; describes Soil and Surface Materials, Texture, Genetic Materials, Surface Expression, Modifying processes;

Lakes - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "Lakes" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the lakes are GPS'd and Digitized (2000) for SHIM project; Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Lakes on Bowen Island; Some of the lakes were GPS'd by BIFWMS through SHIM project; attribute include Name of the lakes and GPS'd date;

Shoreline and the Island Polygons - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1993)

File Name: "Bowsh" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: Shoreline digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale;

Custodian: BIFWMS

Abstract: Coverage of coastline and island polygon on Bowen Island; Appears as solid Island polygon; For Cartographic purposes

Map Compositions:

Printed on: 8x11 inches - Black and White (Gray Scale)

Created by: Bowen Island Sustainability Project - Miki Shoji, Stephanie Lemmon and Murray Journey

Created for: State of Bowen Island Report (2000)

Map Scale: 1:50,000

Projection: UTM, NAD83, Zone10, Clarke 1866

Other Information Used:

Legend Descriptions - Descriptions of different types of deposits were obtained from *Glossary of Geologic*

Terms in the book, *Physical Geology*.

Strahler, A. N. (1981). *Physical Geology*. Harper & Row publishers: New York. p.612.

15.5 Map 5) BOWEN ISLAND : Surface Water

Layers Used:

Springs - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1999)

File Name: "springs" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file;

Source: Digitized by BIFWMS from water licence map (MELP)

Custodian: BIFWMS

Abstract: Coverage of springs on Bowen Island;

Stream Network - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "streams" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the streams GPS'd and Digitized (2000) for SHIM project, Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Stream Network on Bowen Island; Some of the streams were GPS'd by BIFWMS through SHIM project; attributes include name of the streams, sources, and GPS'd date;

Wetlands - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1994)

File Name: "Wetlands2" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Reprojected from NAD27 to NAD83;

Source: BIFWMS Field Surveys

Custodian: BIFWMS

Abstract: Coverage of Wetlands on Bowen Island; Shows wetland areas and buffers;

Accuracy: Not all wetlands are digitized;

Lakes - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "Lakes" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the lakes are GPS'd and Digitized (2000) for SHIM project; Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Lakes on Bowen Island; Some of the lakes were GPS'd by BIFWMS through SHIM project; attribute include Name of the lakes and GPS'd date;

Watershed Interpreted - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: wshed_interp.shp (Currently in shape file - ArcView 3.1) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Sub_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83; New watershed boundaries were interpreted from topology by integrating Islands Trust's "Wshed_it," which was missing some critical boundaries and coastal watershed, and BIFWMS' "Wshedall," which had non-existing small watershed that was defined from topology (Interpretation performed by M. Journeay (Research Scientist at Geological Survey o

Source: Journeay, M send Watershed areas defined by topology (filename: Wshedall.shp) to Islands Trust, and Islands Trust choose the given layer by deleting small, non-existing watersheds (filename: Wshed_it)

Custodian: BIFWMS

Abstract: Coverage of Interpreted Watershed areas on Bowen Island;

Contours - Bowen Island

Created by: Islands Trust (1994)

File Name: "Contours" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: BC TRIM - modified by BIFWMS to fit the latest (at 2000) shoreline;

Abstract: 1: 10000 TRIM Contours for Bowen Island at 20m interval

Shoreline and the Island Polygons - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1993)

File Name: "Bowsh" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: Shoreline digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale;

Custodian: BIFWMS

Abstract: Coverage of coastline and island polygon on Bowen Island; Appears as solid Island polygon; For Cartographic purposes

Map Compositions:

Printed on: 8x11 inches - Black and White (Gray Scale)

Created by: Bowen Island Sustainability Project - Miki Shoji, Stephanie Lemmon and Murray Journeay

Created for: State of Bowen Island Report (2000)

Map Scale: 1:50,000

Contour Interval: 20m (Height of Land defined in Meters)
Projection: UTM, NAD83, Zone10, Clarke 1866

15.6 Map 6) BOWEN ISLAND : Streams and Slope Area >25 Degrees

Layers Used:

Slopes grater than 25 % - Bowen Island

Created by: Islands Trust (1995)

File Name: "slope_25" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Reprojected from NAD27 to NAD83;

Source: Derived from 1:10000 DEM for land use planing purpose;

Custodian: Islands Trust

Abstract: Coverage showing regions (polygons) where slope exceed 25% grade; derived from 1:10K DEM. Schedule E (map 2) in OCP, "Development Permit Area, Slope Area >25 degrees"

Stream Network - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "streams" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the streams GPS'd and Digitized (2000) for SHIM project, Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Stream Network on Bowen Island; Some of the streams were GPS'd by BIFWMS through SHIM project; attributes include name of the streams, sources, and GPS'd date;

Lakes - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "Lakes" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the lakes are GPS'd and Digitized (2000) for SHIM project; Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Lakes on Bowen Island; Some of the lakes were GPS'd by BIFWMS through SHIM project; attribute include Name of the lakes and GPS'd date;

Contours - Bowen Island

Created by: Islands Trust (1994)

File Name: "Contours" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: BC TRIM - modified by BIFWMS to fit the latest (at 2000) shoreline;

Abstract: 1: 10000 TRIM Contours for Bowen Island at 20m interval

Shoreline and the Island Polygons - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1993)

File Name: "Bowsh" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: Shoreline digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale;

Custodian: BIFWMS

Abstract: Coverage of coastline and island polygon on Bowen Island; Appears as solid Island polygon; For Cartographic purposes

Map Compositions:

Printed on: 8x11 inches - Black and White (Gray Scale)

Created by: Bowen Island Sustainability Project - Miki Shoji, Stephanie Lemmon and Murray Journeay

Created for: State of Bowen Island Report (2000)

Map Scale: 1:50,000

Contour Interval: 20m (Height of Land defined in Meters)

Projection: UTM, NAD83, Zone10, Clarke 1866

15.7 Map 7) BOWEN ISLAND : Development Permit Area for Slope >25 Degrees

Layers Used:

Slopes grater than 25 % - Bowen Island

Created by: Islands Trust (1995)

File Name: "slope_25" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Reprojected from NAD27 to NAD83;

Source: Derived from 1:10000 DEM for land use planing purpose;

Custodian: Islands Trust

Abstract: Coverage showing regions (polygons) where slope exceed 25% grade; derived from 1:10K DEM. Schedule E (map 2) in OCP, "Development Permit Area, Slope Area >25 degrees"

Cadastral - Bowen Island

Created by: Islands Trust (2000)

File Name: "Cadastre" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: NAD83; BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from Decimal Degrees to UTM

Source: LUCO (Land Use Commission Office)

Custodian: Islands Trust

Abstract: Coverage showing most recent version (at year 2000) of Cadastral for Bowen Island; Attribute includes district lots, plan, lots, block and legal notes

Lakes - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "Lakes" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the lakes are GPS'd and Digitized (2000) for SHIM project; Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Lakes on Bowen Island; Some of the lakes were GPS'd by BIFWMS through SHIM project; attribute include Name of the lakes and GPS'd date;

Contours - Bowen Island

Created by: Islands Trust (1994)

File Name: "Contours" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: BC TRIM - modified by BIFWMS to fit the latest (at 2000) shoreline;

Abstract: 1: 10000 TRIM Contours for Bowen Island at 20m interval

Shoreline and the Island Polygons - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1993)

File Name: "Bowsh" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: Shoreline digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale;

Custodian: BIFWMS

Abstract: Coverage of coastline and island polygon on Bowen Island; Appears as solid Island polygon; For Cartographic purposes

Map Compositions:

Printed on: 8x11 inches - Black and White (Gray Scale)

Created by: Bowen Island Sustainability Project - Miki Shoji, Stephanie Lemmon and Murray Journey

Created for: State of Bowen Island Report (2000)

Map Scale: 1:50,000

Contour Interval: 20m (Height of Land defined in Meters)

Projection: UTM, NAD83, Zone10, Clarke 1866

THIS MAP IS NOT AN OFFICIAL DOCUMENT, IT IS PROVIDED FOR GENERAL INFORMATION PURPOSES ONLY; FOR CURRENT BYLAW INFORMATION PLEASE REFER TO BYLAW MAP SCHEDULES AT MUNICIPAL HALL.

15.8 Map 8) BOWEN ISLAND : Dominant Forest Species

Layers Used:

Forest - Bowen Island

Created by: BC Ministry of Forests (1999)

File Name: "bowenforest" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Sub_Collection

Modified by: NAD83 BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from ALBERS, GRS1980, Parameters (50,0,0; 58,30,0; -126,0,0; 45,0,0; 1000000; 0) to UTM, NAD83, Zone 10, Clarke 1866; Clipped to show only Bowen Island; 3 adjacent maps were combined into one layer; Shoreline changed to the latest shoreline at year 2000 (Same as Bowsh);

Source: Ministry of Forest - 3 files (forest33, forest34, and forest 44) - f_fc33, f_fc34, f_fc44

Custodian: Ministry of Forests

Abstract: Coverage showing forest types on Bowen Island; Attribute table is complete and decoded.

Accuracy: Accuracy 1m

Lakes - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "Lakes" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the lakes are GPS'd and Digitized (2000) for SHIM project; Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Lakes on Bowen Island; Some of the lakes were GPS'd by BIFWMS through SHIM project; attribute include Name of the lakes and GPS'd date;

Shoreline and the Island Polygons - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1993)

File Name: "Bowsh" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: Shoreline digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale;

Custodian: BIFWMS

Abstract: Coverage of coastline and island polygon on Bowen Island; Appears as solid Island polygon; For Cartographic purposes

Map Compositions:

Printed on: 8x11 inches - Black and White (Gray Scale)

Created by: Bowen Island Sustainability Project - Miki Shoji, Stephanie Lemmon and Murray Journey

Created for: State of Bowen Island Report (2000)

Map Scale: 1:50,000

Projection: UTM, NAD83, Zone10, Clarke 1866

15.9 Map 9) BOWEN ISLAND : OCP Land Use Designations

Layers Used:

OCP Land Use Designations - Bowen Island

Created by: Islands Trust (1995)

File Name: "ocplanduse" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: Grafton BISP (2000) - Converted from shape file to Arc/Info file; Existing Lake outlines have been renewed to latest (2000) version of Lakes (Honeymoon, and Killarney); Attribute data Decoded;

Source: Bowen Island Official Community Plan (1995)

Custodian: Islands Trust

Abstract: Coverage showing Land use designations and 300m coast buffer polygon for Bowen Island; Attribute includes 'Res_Land_u' , which classifies the polygons as ALR - Agriculture Land Reserve, R - Rural (4 hectare); R1 - Rural 1 (2 hectare), RS- Rural residential (1 hectare), RS(e)- Rural residential (0.4 hectare), SC - Snug Cove; CS - Cpastal Area; Also field called Image existed and filename "/eor1/island_trust/floor_plan.tif" is filled in the column for the island polygons

Cadastral - Bowen Island

Created by: Islands Trust (2000)

File Name: "Cadastre" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: NAD83; BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from Decimal Degrees to UTM

Source: LUCO (Land Use Commission Office)

Custodian: Islands Trust

Abstract: Coverage showing most recent version (at year 2000) of Cadastral for Bowen Island; Attribute includes district lots, plan, lots, block and legal notes

Lakes - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "Lakes" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the lakes are GPS'd and Digitized (2000) for SHIM project; Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Lakes on Bowen Island; Some of the lakes were GPS'd by BIFWMS through SHIM project; attribute include Name of the lakes and GPS'd date;

Shoreline and the Island Polygons - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1993)

File Name: "Bowsh" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection
Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;
Source: Shoreline digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale;
Custodian: BIFWMS
Abstract: Coverage of coastline and island polygon on Bowen Island; Appears as solid Island polygon; For Cartographic purposes

Other Information Used:

Bowen Island Official Community Plan (OCP) Bylaw No. 139, 1995. - Used for decoding of legends and Quality Assurance & Control for Spatial Data. (Schedule B - Map Designations)

Map Compositions:

Printed on: 8x11 inches - Black and White (Gray Scale)
Created by: Bowen Island Sustainability Project - Miki Shoji, Stephanie Lemmon and Murray Journeay
Created for: State of Bowen Island Report (2000)
Map Scale: 1:50,000
Projection: UTM, NAD83, Zone10, Clarke 1866

THIS MAP IS NOT AN OFFICIAL DOCUMENT, IT IS PROVIDED FOR GENERAL INFORMATION PURPOSES ONLY; FOR CURRENT BYLAW INFORMATION PLEASE REFER TO BYLAW MAP SCHEDULES AT MUNICIPAL HALL.

15.10 Map 10) BOWEN ISLAND : Existing Zoning Bylaw

Layers Used:

Land Use Zones - Bowen Island

Created by: Islands Trust (1993)

File Name: "Zones" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83; Shoreline changed to the latest shoreline at year 2000 (Same as Bowsh (polygon) shoreline); Attribute data Decoded;

Source: Digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale; Bowen Island Zoning Bylaw No. 36;

Custodian: Islands Trust

Abstract: Coverage of Land Use Zones of Bowen Island; Shows Land Use Zoning defined by Bowen Island Zoning Bylaw No. 36;

Accuracy: Snug Cove and the surrounding area (including Bowen Bay, Cates Hill) is missing detailed data. - have not been digitized - refer to paper copy of Bylaw Map (Available at Bowen Island Municipality). Data relied on by Islands Trust planners to within 50m;

Cadastral - Bowen Island

Created by: Islands Trust (2000)

File Name: "Cadastre" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: NAD83; BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from Decimal Degrees to UTM

Source: LUCO (Land Use Commission Office)

Custodian: Islands Trust

Abstract: Coverage showing most recent version (at year 2000) of Cadastral for Bowen Island; Attribute includes district lots, plan, lots, block and legal notes

Lakes - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "Lakes" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the lakes are GPS'd and Digitized (2000) for SHIM project; Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Lakes on Bowen Island; Some of the lakes were GPS'd by BIFWMS through SHIM project; attribute include Name of the lakes and GPS'd date;

Shoreline and the Island Polygons - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1993)

File Name: "Bowsh" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: Shoreline digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale;

Custodian: BIFWMS

Abstract: Coverage of coastline and island polygon on Bowen Island; Appears as solid Island polygon; For Cartographic purposes

Other Information Used:

Bowen Island Zoning Bylaw No. 36. (1984) - Used for decoding of legends and Quality Assurance & Control for Spatial Data.

Map Compositions:

Printed on: 8x11 inches - Black and White (Gray Scale)

Created by: Bowen Island Sustainability Project - Miki Shoji, Stephanie Lemmon and Murray Journey

Created for: State of Bowen Island Report (2000)

Map Scale: 1:50,000

Projection: UTM, NAD83, Zone10, Clarke 1866

THIS MAP IS NOT AN OFFICIAL DOCUMENT, IT IS PROVIDED FOR GENERAL INFORMATION PURPOSES ONLY; FOR CURRENT BYLAW INFORMATION PLEASE REFER TO BYLAW MAP SCHEDULES AT MUNICIPAL HALL.

Please note that Municipal Council is developing a new land use bylaw for Bowen Island which when adopted would replace Zoning Bylaw No. 36, 1984 and Subdivision Bylaw No. 270, 1977.

15.11 Map 11) BOWEN ISLAND : Existing Subdivisions

Layers Used:

Subdivisions- Bowen Island

Created by: Islands Trust (1993)

File Name: "Subdiv" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83; Shoreline changed to the latest shoreline at year 2000 (Same as Bowsh (polygon) shoreline); Existing Lake outlines have been renewed to latest (2000) version of Lakes (Grafton and Killarney); Attribute data Decoded;

Source: Digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale; Bowen Island Subdivision Bylaw No. 270;

Custodian: Islands Trust

Abstract: Coverage showing subdivisions of Bowen Island according to Bowen Island Subdivision Bylaw No. 270;

Accuracy: Relied on by Islands Trust planners to within 50m;

Cadastral - Bowen Island

Created by: Islands Trust (2000)

File Name: "Cadastre" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: NAD83; BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from Decimal Degrees to UTM

Source: LUCO (Land Use Commission Office)

Custodian: Islands Trust

Abstract: Coverage showing most recent version (at year 2000) of Cadastral for Bowen Island; Attribute includes district lots, plan, lots, block and legal notes

Lakes - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "Lakes" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the lakes are GPS'd and Digitized (2000) for SHIM project; Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Lakes on Bowen Island; Some of the lakes were GPS'd by BIFWMS through SHIM project; attribute include Name of the lakes and GPS'd date;

Shoreline and the Island Polygons - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1993)

File Name: "Bowsh" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;
Source: Shoreline digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale;
Custodian: BIFWMS
Abstract: Coverage of coastline and island polygon on Bowen Island; Appears as solid Island polygon; For Cartographic purposes

Other Information Used:

Bowen Island Subdivision Bylaw No. 270. - Used for decoding of legends and Quality Assurance & Control for Spatial Data.

Map Compositions:

Printed on: 8x11 inches - Black and White (Gray Scale)
Created by: Bowen Island Sustainability Project - Miki Shoji, Stephanie Lemmon and Murray Journey
Created for: State of Bowen Island Report (2000)
Map Scale: 1:50,000
Projection: UTM, NAD83, Zone10, Clarke 1866

THIS MAP IS NOT AN OFFICIAL DOCUMENT, IT IS PROVIDED FOR GENERAL INFORMATION PURPOSES ONLY; FOR CURRENT BYLAW INFORMATION PLEASE REFER TO BYLAW MAP SCHEDULES AT MUNICIPAL HALL.

Please note that Municipal Council is developing a new land use bylaw for Bowen Island which when adopted would replace Zoning Bylaw No. 36, 1984 and Subdivision Bylaw No. 270, 1977.

15.12 Map 12) BOWEN ISLAND : Water Districts and Location of Water Intake

Layers Used:

Deep Wells - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1994)

File Name: "Dwell" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: BIFWMS Water Survey - Conducted by Anne Chollat (SCI_Bowen CD)

Custodian: BIFWMS

Abstract: Coverage showing registered and non-registered deep wells (179) on Bowen Island; Deep wells are drilled wells;

Shallow (Surface Wells) - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1994)

File Name: "shwell" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: BIFWMS Water Survey - Conducted by Anne Chollat (SCI_Bowen CD)

Custodian: BIFWMS

Abstract: Coverage showing registered and non-registered (58) wells on Bowen Island; Shallow wells include water intake from streams and dug-out wells;

Registered Surface Water Intake Point - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1994)

File Name: "Wat_lic" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Source: MELP - Water License Information Database; BIFWMS (1999) has modified locations to overlay with locations of streams and lakes;

Custodian: BIFWMS

Abstract: Coverage showing registered surface water intake points (Point of Diversion) on Bowen Island - Licenses are associated with each Point of Diversions and Registration numbers

Water Districts- Bowen Island

Created by: Islands Trust (1994)

File Name: "Watersys" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Shoreline changed to the latest shoreline at year 2000 (Same as Bowsh (polygon) shoreline); Name of the district has been added as attribute; Valhalla Ridge has been incorporated into Bowey Bay Improvement District; Bowen Bay Holdings has been added;

Source: BIFWMS

Custodian: Islands Trust

Abstract: Coverage showing water districts on Bowen Island; Attribute fields are 'district' - 7 Improvement districts, 'private' - 11 private water distribution, and 'sewers' - 2 sewer improvement districts

Accuracy: Valhala Ridge has been incorporated into Bowen Bay Improvement District, and Current Bowen Bay Improvement District may have extended further; Snug Cove Sewer Improvement District has been extended - no current data available; All water districts boundary require revisions

Note: Snug Cove Sewer Improvement District (name has also changed) is not shown on the map as the boundary of current area is not digitally defined. Fire Station is not shown on the map.

Stream Network - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "streams" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the streams GPS'd and Digitized (2000) for SHIM project, Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Stream Network on Bowen Island; Some of the streams were GPS'd by BIFWMS through SHIM project; attributes include name of the streams, sources, and GPS'd date;

Cadastral - Bowen Island

Created by: Islands Trust (2000)

File Name: "Cadastre" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: NAD83; BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from Decimal Degrees to UTM

Source: LUCO (Land Use Commission Office)

Custodian: Islands Trust

Abstract: Coverage showing most recent version (at year 2000) of Cadastral for Bowen Island; Attribute includes district lots, plan, lots, block and legal notes

Lakes - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "Lakes" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the lakes are GPS'd and Digitized (2000) for SHIM project; Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Lakes on Bowen Island; Some of the lakes were GPS'd by BIFWMS through SHIM project; attribute include Name of the lakes and GPS'd date;

Shoreline and the Island Polygons - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1993)

File Name: "Bowsh" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: Shoreline digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale;

Custodian: BIFWMS

Abstract: Coverage of coastline and island polygon on Bowen Island; Appears as solid Island polygon; For Cartographic purposes

Other Information Used:

BIFWMS Water Survey Project - Report used to understand different types of wells and survey methods.

Bowen Island Forest and Water Management Society. (1994). *Bowen Island Water Survey Report on Phase One: Data Acquisition and Database Development (Preliminary Draft)*. BIFWMS: Bowen Island.

Bowen Island Official Community Plan (OCP) Bylaw No. 139, 1995. - Used for decoding of legends for water districts and Quality Assurance & Control for Spatial Data. (Schedule F - Community Water Systems and Utility Areas)

Map Compositions:

Printed on: 11x17 inches - Black and White (Gray Scale)

Created by: Bowen Island Sustainability Project - Miki Shoji, Stephanie Lemmon and Murray Journey

Created for: State of Bowen Island Report (2000)

Map Scale: 1:37,500

Projection: UTM, NAD83, Zone10, Clarke 1866

15.13 Map 13) BOWEN ISLAND : Parks, Ecological Reserve and Crown Land

Layers Used:

Crown land and Parks- Bowen Island

Created by: Islands Trust (1995)

File Name: "Park_res" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Names of Parks has been added

Source: Digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale;

Custodian: BIFWMS

Abstract: Coverage showing parks and crown land on Bowen Island; 107 polygons, 5 designations - community park, crown lands, ecological reserve, provincial park, regional park

Accuracy: Not all Community Parks are digitized

Cadastral - Bowen Island

Created by: Islands Trust (2000)

File Name: "Cadastre" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: NAD83; BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from Decimal Degrees to UTM

Source: LUCO (Land Use Commission Office)

Custodian: Islands Trust

Abstract: Coverage showing most recent version (at year 2000) of Cadastral for Bowen Island; Attribute includes district lots, plan, lots, block and legal notes

Lakes - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "Lakes" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the lakes are GPS'd and Digitized (2000) for SHIM project; Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Lakes on Bowen Island; Some of the lakes were GPS'd by BIFWMS through SHIM project; attribute include Name of the lakes and GPS'd date;

Shoreline and the Island Polygons - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1993)

File Name: "Bowsh" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;
Source: Shoreline digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale;

Custodian: BIFWMS

Abstract: Coverage of coastline and island polygon on Bowen Island; Appears as solid Island polygon; For Cartographic purposes

Other Information Used:

Bowen Island Official Community Plan (OCP) Bylaw No. 139, 1995. - Used for decoding of legends and Quality Assurance & Control for Spatial Data. (Schedule C - Parks and Trails)

Map Compositions:

Printed on: 8x11 inches - Black and White (Gray Scale)

Created by: Bowen Island Sustainability Project - Miki Shoji, Stephanie Lemmon and Murray Journey

Created for: State of Bowen Island Report (2000)

Map Scale: 1:50,000

Projection: UTM, NAD83, Zone10, Clarke 1866

15.14 Map 14) BOWEN ISLAND : Major Transportation Routes

Layers Used:

Road Network - Bowen Island

Created by: Islands Trust (1993)

File Name: Bowenroads.shp (Currently in ArcView shape file)

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: BC TRIM - Roads Network; Digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from TRIM at 1:20K scale; Modified by BIFWMS;

Custodian: Islands Trust

Abstract: Coverage showing Road network for Bowen Island; showing major road network;

Accuracy: Not all the roads are digitized - require review

Cadastral - Bowen Island

Created by: Islands Trust (2000)

File Name: "Cadastre" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: NAD83; BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from Decimal Degrees to UTM

Source: LUCO (Land Use Commission Office)

Custodian: Islands Trust

Abstract: Coverage showing most recent version (at year 2000) of Cadastral for Bowen Island; Attribute includes district lots, plan, lots, block and legal notes

Lakes - Bowen Island

Created by: Bowen Island Forest & Water Management Society (2000)

File Name: "Lakes" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Several Layers were combined to create this complete layer;

Source: BIFWMS - Some of the lakes are GPS'd and Digitized (2000) for SHIM project; Combined to create complete layer by BISP (2000)

Custodian: BIFWMS

Abstract: Coverage showing Lakes on Bowen Island; Some of the lakes were GPS'd by BIFWMS through SHIM project; attribute include Name of the lakes and GPS'd date;

Shoreline and the Island Polygons - Bowen Island

Created by: Bowen Island Forest & Water Management Society (1993)

File Name: "Bowsh" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from NAD27 to NAD83;

Source: Shoreline digitized by Dixon, C. and Kemble, C. (BCIT Student - 1993) from BC Mapping and Surveys (via Islands Trust) thematic maps at 1:10K scale;

Custodian: BIFWMS

Abstract: Coverage of coastline and island polygon on Bowen Island; Appears as solid Island polygon; For Cartographic purposes

Other Information Used:

Names of Community / Neighborhood - Cited from Map in Gold Pages almanac 2000: Bowen Island.
Bowen Island Chamber of Commerce. (2000). *Gold Pages Almanac 2000: Bowen Island*. Wiltshire House Publishing: Bowen Island.

Map Compositions:

Printed on: 8x11 inches - Black and White (Gray Scale)

Created by: Bowen Island Sustainability Project - Miki Shoji, Stephanie Lemmon and Murray Journeay

Created for: State of Bowen Island Report (2000)

Map Scale: 1:50,000

Projection: UTM, NAD83, Zone10, Clarke 1866

15.15 Map 15) BOWEN ISLAND : Orthophoto of Snug Cove Area

Layers Used:

Cadastral - Bowen Island

Created by: Islands Trust (2000)

File Name: "Cadastre" folder (Currently in Arc/Info 8 Format) in Compact Disc - Bowen Island Information System, Version2: November 17, 2000 \ GIS Atlas \ GIS Coverages \ Working_Collection

Modified by: NAD83; BISP (2000) - Converted from shape file to Arc/Info file; Reprojected from Decimal Degrees to UTM

Source: LUCO (Land Use Commission Office)

Custodian: Islands Trust

Abstract: Coverage showing most recent version (at year 2000) of Cadastral for Bowen Island; Attribute includes district lots, plan, lots, block and legal notes

Other Information Used:

Orthophoto - The orthophoto used was loaned from Ministry of Environment, Land and Parks (MELP) for the Bowen Island Sustainability Project to BIFWMS.

Ministry of Environment, Land and Parks. (1999). 1999 Ortho Data. 0.5m Colour. Selected TIFF and World Files for Bowen Island. E4680 - E4760, N54635-N54735.

Map Compositions:

Printed on: 11x 17 inches (Landscape) - Black and White (Gray Scale)

Created by: Bowen Island Sustainability Project - Miki Shoji, Stephanie Lemmon and Murray Journey

Created for: State of Bowen Island Report (2000)

Map Scale: 1:8,000

Projection: UTM, NAD83, Zone10, Clarke 1866

Appendix B:

16.0 Bowen Island Indicators

Appendix B contains the complete list of indicators from the State of Bowen Island Volume 1: Report.

Energy

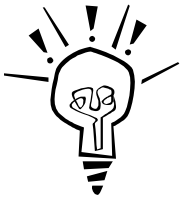


Indicator: Hydro-electric energy consumption per capita

What does this indicator tell us?

This indicator tells us how much hydroelectricity from BC Hydro is being used per capita. By understanding when we use energy, and how much we use, we can start to develop strategies for managing our energy use.

Where do the data come from? BC Hydro, Statistics Canada, Canada Post



Indicator: Number of individuals on Bowen Island who utilize green energy sources in meeting their energy needs

What does this indicator tell us?

This indicator tells us the proportion of Bowen Islanders who use solar, wind, or other forms of alternative, green energy to meet their energy needs.

Where do the data come from?

These exact figures are not available, but an informal survey of Islanders would reveal how many people use green energy sources in meeting energy needs.

Air



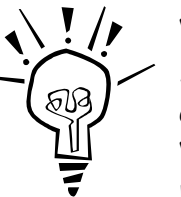
Indicator: Air quality

What does this indicator tell us?

This indicator tells us how many potentially harmful substances are in the air on Bowen Island.

Where do the data come from?

Presently, there is no air quality testing done on Bowen. This is a serious and important information gap. The GVRD provides air quality testing for other communities within the regional district.



Indicator: Number of cases of asthma on Bowen Island

What does this indicator tell us?

Air quality directly affects health. The number of cases of asthma will increase as air quality decreases.

Where do the data come from?

Not currently available for Bowen Island.

Water



Indicator: Number of boil orders

What does this indicator tell us?

This indicator tells us the number of times that the water on Bowen Island, in different areas, is unfit for human consumption.

Where do the data come from?

Northshore Health

Indicator: Per Capita water use within water districts

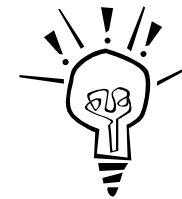
What does this indicator tell us?

How much water is used by the people of Bowen Island. You can modify this indicator to consider specific water districts. Additionally, by dividing by the number of people in the district (or households) one can ascertain per capita water use.

Where do the data come from?

Various water districts on Bowen Island keep track of their water use. The ability to monitor water use could be considered a priority for the various water suppliers who do not monitor water use as development increases.

Natural Diversity



Indicator: Keystone species as determined by the community; could be the Great Blue Heron, Pileated Woodpecker, or Salmon.

What does this indicator tell us?

This indicator tells us the health of species that are important to the overall natural diversity of Bowen Island.

Where do the data come from?

Annual bird counts, Department of Fisheries and Oceans

Indicator: Percentage of protected land on Bowen Island

What does this indicator tell us?

This indicator tells us the amount of land that is available to support species and ecosystems that contribute to the overall health and natural diversity of Bowen Island.

Where do the data come from?

Crown Lands Report (Dunster and Associates, 2000)

Community Resources



Indicator: Mix of housing by type, tenure, and cost

What does this indicator tell us?

This indicator tells us about housing availability and affordability, and is a window onto the changing demographics the Island.

Where do the data come from?

There needs to be a survey of housing stock. Change over time could then be monitored.



Indicator: Bowen Island Parks and Recreation expenditures per capita

What does this indicator tell us?

This indicator tells us how about educational and recreational opportunities in the community.

Where do the data come from?

Bowen Island Parks and Recreation.



Indicator: Recreational trail length (built vs. unbuilt) per capita

What does this indicator tell us?

This indicators tells us how many trails already exist on the island, how many trails are planned, and how this is changing per capita.

Where do the data come from? Bowen Islands Parks and Recreation.



Indicator: Number of senior programs per capita and youth programs per capita

What does this indicator tell us?

This indicators tells us how programming for seniors and youth is developing, as the Island demographics change.

Where do the data come from?

Bowen Islands Parks and Recreation, Teen Centre, Seniors Keeping Young.

Education Resources



Indicator: Average school class size and total school enrollment

What does this indicator tell us?

This indicator tells us about accessibility of education in the context of the changing youth population.

Where do the data come from? Bowen Island Community School and Island Pacific School.

Health



Indicator: Hours of exercise per week per capita

What does this indicator tell us?

Exercise can positively affect the health of individuals in a number of areas. The exercise level of Bowen Islanders is a useful window onto the health of the population.

Where do the data come from?

Survey

Health Care



Indicator: Number of physical and mental health care services offered on island

What does this indicator tell us?

This indicator tells us about accessibility of health care services on Bowen Island.

Where do the data come from?

Community Nurse.

Crime



Indicator: Number of crimes reported on Bowen Island per capita.

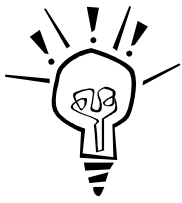
What does this indicator tell us?

This indicator tells us how crime is changing in the community, as the population changes. One particular type of call could be selected from the list of reported calls.

Where do the data come from?

Bowen Island Municipality.

Population



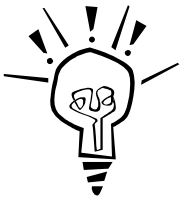
Indicator: Population growth rate and change in population under 15.

What does this indicator tell us?

This indicator tells us about how fast the population is growing, and how the youth population is changing.

Where do the data come from?

Statistics Canada, every 5 years (1991,1996, 2001)



Indicator: Visible minorities as percentage of total population

What does this indicator tell us?

This indicator tells us about the ethnic diversity of Bowen Island, and can be compared to other municipalities in the Greater Vancouver Regional District.

Where do the data come from?

Statistics Canada, every 5 years (1991,1996, 2001)

Education Level



Indicator: Percentage of population who have completed high school, percentage of population with university education.

What does this indicator tell us?

This indicator tells us the education level of Bowen Islanders.

Where do the data come from?

Statistics Canada, every 5 years (1991,1996, 2001)

Income



Indicator: Average income for total population, men and women

What does this indicator tell us?

This indicator tells us about the income of Bowen Islanders, and can be compared to change over time, as well as the income level of nearby municipalities.

Where do the data come from?

Statistics Canada, every 5 years (1991,1996, 2001)

Employment



Indicator: Unemployment rate for the total population, 25 and over

What does this indicator tell us?

This indicator tells us about the employment level of the Bowen Island adult population.

Where do the data come from?

Statistics Canada, every 5 years (1991, 1996, 2001)

Economy



Indicator: Total inventory rental rooms and cabins

What does this indicator tell us?

This indicator tells us about change in one aspect of the on-island economy, tourism, by tracking the number of bed and breakfast and other accommodation facilities.

Where do the data come from?

Inventory proposed to be conducted by the Chamber of Commerce, 2001



Indicator: Percentage of population working on Island.

What does this indicator tell us?

The number of people working on the island, including in businesses and in home offices, gives a picture of the on-island economy, spending on-island, and has other implications for community and family life in terms of commuting time.

Where do the data come from?

Statistics Canada, every 5 years.



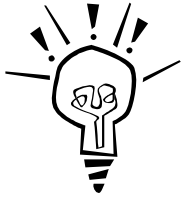
Indicator: Number of hours per capita of unpaid child and elder care

What does this indicator tell us?

This indicator is one measure of volunteering and unpaid but valued work, and is currently being collected by Statistics Canada.

Where do the data come from?

Statistics Canada, every 5 years.



Indicator: Number of members of Local Exchange Trading System (LETS)

What does this indicator tell us?

The development and growth of a LETS system indicates the integration of informal exchange in the local economy.

Where does the data come from?

Still to be determined.

Transportation



Indicator: Ferry use, including number of cars and number of foot passengers

What does this indicator tell us?

This indicator tells us how many vehicles are using the ferry and the number of foot passengers on the ferry. By comparing the ratio of cars to passengers, we can determine, a rough measure of our community transportation efficiency (number of people moved/ number of cars used)

Where do the data come from?

BC Ferries



Indicator: Proportion of municipal transportation budget (i.e. Roads Budget) allocated to cycling and pedestrian trails, lanes and facilities

What does this indicator tell us?

This indicator tells us how much money local and regional governments are committing to developing alternative transportation infrastructure

Where do the data come from?

Bowen Island Municipality

Land Use



Indicator: Number and value of building permits **What does this indicator tell us?**

This indicator tells us about new house and renovation construction, and gives an indication of population growth.

Where do the data come from?

Municipality collects this data monthly. It can be collated annually.



Indicator: Ratio of commercial square footage to residential square footage **What does this indicator tell us?**

This indicator gives a sense of how fast residential and commercial land is being developed over time, and if each use is growing at the same rate.

Where do the data come from?

The Chamber of Commerce is proposing to survey commercial square footage. Total residential square footage is not currently tabulated, but it may be possible.



Indicator: Active farms **What does this indicator tell us?**

The number of active farms tells us about land use, the economy, local employment and on-island food production.

Where do the data come from?

Bowen Island Mapping Project began to collect this data in 2000.



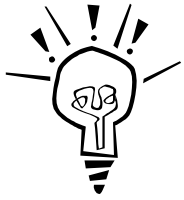
Indicator: Housing Sales

What does this indicator tell us?

Tracking housing sales is useful as an indication of changing land use, demographics and the economy.

Where do the data come from?

There needs to be a survey of housing stock. Some data available from Realtors on Bowen Island.



Indicator: Number of designated heritage sites

What does this indicator tell us?

This indicator tells us how efforts towards heritage preservation are progressing on-island.

Where do the data come from?

Bowen Island Heritage Preservation.

Appendix C:

17.0 Identified Information Gaps

Appendix C contains the list of information gaps identified in the State of Bowen Island Volume 1: Report.

17.1 Key Information Gaps

The following information gaps were identified during the research and writing of the State of Bowen Island Volume 1: Report.

4.0 Air

- ❖ Air Quality testing data- no testing has been undertaken

5.0 Natural Diversity

- ❖ Estimates of the Island deer population
- ❖ Information about nesting bird population

9.0 Economy

- ❖ Data on on-island tourism needs to be compiled from different sources (Bowen Island Preservation Society, Chamber of Commerce, BC Ferries, GVRD Parks)
- ❖ More information about the economic impacts of tourism on Bowen is needed
- ❖ Information on the changing commercial activity on Bowen Island
- ❖ Information about the number of home offices and businesses is needed
- ❖ More information on the impact of changing information technology on people who work and live on Bowen Island.

10.0 Energy

- ❖ The extent of woodstove use on Bowen Island
- ❖ Propane use on Bowen Island

13.0 Resource Use

- ❖ On-island and off-island purchasing
- ❖ Volume of goods brought onto island: food, consumer goods, construction materials
- ❖ Amount of wood harvested on the island for island use and the amount taken off island
- ❖ How many households have home vegetable gardens or chickens
- ❖ More data is needed about septic field waste that is pumped and trucked off-island
- ❖ More data is needed on the amount of construction waste taken off-island