

**ASSESSING WATER RESOURCE MANAGEMENT IN A
SMALL ISLAND LIFESTYLE COMMUNITY**

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ABSTRACT

The Gulf Islands of British Columbia are attracting growing numbers of migrants to their communities because of the rich coastal amenities these areas possess. Such migration occurs primarily in the drier, summer months when water resources are limited and more susceptible to water quality and quantity deterioration. This research examines the extent to which differences exist between permanent and non-permanent residents in matters related to water use behaviour, attitudes and values, and how this might inform water resource management policy and planning. The methods used for the research include key informant interviews and a resident survey. The findings reveal that although differences between the two resident groups exist, they are not substantial. However, the seasonal nature of second-home tourism on the Island does stress water supplies and requires increased water conservation efforts. Water resource management challenges are evident and a number of recommendations are presented for its improvement.

Keywords: second-home tourism, lifestyle and amenity migration, small islands, water resource management, water conservation

QUOTATION

“In an age when man has forgotten his origins and is blind even to his most essential needs for survival, water along with other resources has become the victim of his indifference” (Carson et al., 2002, p. 39).

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GLOSSARY

- Behaviour** The way in which one acts or conducts oneself.
(McKean, 2006)
- Attitude** A settled way of thinking or feeling about someone or something, typically one that is reflected in a person's behaviour.
(McKean, 2006)
- Values** A person's principles or standards of behaviour; one's judgment of what is important in life.
(McKean, 2006)
- Value** To consider someone or something to be important or beneficial; have a high opinion of.
(McKean, 2006)
- Perception** A way of regarding, understanding, or interpreting something; a mental impression.
(McKean, 2006)

CHAPTER 1: INTRODUCTION

1.1 Research Rationale

Small islands have unique characteristics and amenities that attract people to their communities. Many of these communities are increasingly dependent on tourism to drive their economic growth. Many people are drawn to live in these places because of the tourism services created and the rich coastal amenities the islands possess. Such markets are part of a phenomenon known as amenity migration (Hall & Williams, 2002; Moss 2006) and when these migrations are induced by tourism services it can be described as 'tourism-led lifestyle¹ migration' (Gill, 2008). In particular, second-home tourism involves lifestyle migrants who use second homes for recreational and leisure purposes (Tress, 2002). This type of migration is a growing concern for small island communities (Pringle & Owen, 2006). Emerging research suggests that the various environmental, social, political and economic impacts generated by lifestyle migrants affect host regions and their communities (Hunter et al., 2005; Lichtman, 2001; Price et al., 2000; Shumway & Otterstrom, 2001; Stewart, 2001; Williams & Gill, 2006).

¹ Within the literature the term 'amenity' is used rather than 'lifestyle'. However, for the purpose of this research 'lifestyle migrants' will be the term used because it is better understood by the respondents. This research focuses on second-home tourism, a form of tourism-led lifestyle migration, in which owners who are lifestyle migrants use a second home for recreational and leisure purposes. In this paper, they are termed 'non-permanent migrants', 'non-permanent residents' or 'second-home migrants'.

Small islands are typically limited in their resources. In these unique places, adverse impacts are easily felt and exacerbated by migration shifting pressures (Ghina, 2003). Water resources in particular are in high demand during the warmer and drier months when small islands typically experience increases in second home use. Usually during times of peak non-permanent visitation, precipitation is limited in island environments and they are more susceptible to drought conditions. Often water quality and quantity are threatened. Island communities and their businesses depend on these vulnerable water resources for their water supplies. It is imperative that appropriate water resource management policies be implemented to protect the quality and quantity of water available on such islands.

The Gulf Islands in coastal British Columbia are experiencing increases in population comprised of non-permanent and longer term lifestyle migrants. The Gulf Islands' fresh water supply is reliant upon rainfall that is stored primarily as groundwater. Unmanaged tourism and population growth can have adverse effects on the sustainability of this supply. Small islands in B.C. depend on these water resources for various uses and are vulnerable to over consumption and exploitation by various sectors including lifestyle migrants. In British Columbia, groundwater is an open access common property resource and apart from well construction standards, is not subject to licensing, monitoring or regulation (Nowlan, 2007) However, regulation is forthcoming on groundwater data collection and well siting (Denny et al., 2006; Denny et al., 2007). This study's

research examines the relationship between small island water supplies and lifestyle migrants in a case study of Mayne Island's water situation.

The conceptual framework for this research is based on several inter-related bodies of theory, including the transformation of place. Gill and Williams (2008) developed a conceptual framework entitled 'Tourism-led Migration and the Transformation of Place' that is the foundation for this research. It examines the dynamics between the transformations of place as a result of the flow of second-home migrants, the politics of place concerning water resource management issues, and the stakeholders affected within a small island community.

In addition, research concerning second-home tourism, small island tourism and water resource management supplements this frame of reference. It helps identify how small island communities might address concerns associated with second-home tourism and water resource issues. Understanding how second home migrations drive water quality and quantity issues and shape conservation management responses is critical for determining appropriate policy, planning and management strategies for the communities affected.

1.2 Research Objectives and Questions

The overarching purpose of this research is to determine whether differences exist between permanent and non-permanent residents in their water use behaviour, attitudes and values, and to suggest how this can inform water resource management policy and planning. Based on the preceding context and rationale, the proposed research is guided by the following objectives and

questions. These questions are examined in a case study of Mayne Island, British Columbia.

1. What is the current governance and management system for managing fresh water resources on Mayne Island?

- a. What are the water resource management strategies on Mayne Island?
- b. Who are the key stakeholders responsible for this management?

2. What perceived impacts do second-home migrants have on the quantity and quality of water resources on Mayne Island?

- a. How do their perceived water use patterns compare to those of permanent residents?
- b. What are the perceived current and potential water quality and quantity issues confronting Mayne Island, and how are these issues affected by non-permanent migrants?

3. Do differences exist in the values, attitudes and perceptions of non-permanent and permanent residents with respect to water resources and conservation?

- a. Do differences exist in the awareness and participation levels of permanent residents and second-home migrants with respect to water conservation?
- b. Do divergent viewpoints exist amongst the community members concerning water resource management issues?

4. What management options are preferred by permanent and non-permanent residents for managing water resources?

- a. What is the perceived effectiveness of current water management strategies by permanent and non-permanent residents?

b. What changes to the current policies and planning strategies would accommodate the perspectives and perceptions of permanent and non-permanent residents?

1.3 Research Approach

1.3.1 Literature Review

A literature review provided the foundation on which the research objectives and questions were established, and helped contextualize the findings that developed. It also offered insights into how small island's water resources are affected by second-home migrants, especially with respect to water resource management.

1.3.2 Case Study

A case study approach was used to understand the impacts of second-home tourism migrations and the underlying causal factors associated with this phenomenon. Mayne Island was selected as the case study area because the area is experiencing population growth associated with second-home tourism, and is encountering emerging water resource issues. Data informing this research's case study was collected from active interviews with key informants, and an online survey of permanent and non-permanent residents.

1.4 Research Significance

The research findings provide local decision makers with insights into how small island communities can adapt, cope with and utilize the growing population of second-home migrants to achieve community economic, social and

environmental water resource goals. The findings are intended to help Mayne Island enable communities to become more proactive in planning and managing the effects of lifestyle-led migrations on water resources. It is hoped that these findings will also be examined and tested in the context of other marine based island destinations confronted with lifestyle migration pressures.

1.5 Report Organization

This report is divided into five chapters. Chapter Two reviews and discusses literature relevant to the study and provides a contextual framework for this research. Chapter Three describes the methods used in this study's research, including the interview and survey processes. Chapter Four presents the research findings emanating directly from the key informant interviews and resident survey. Chapter Five discusses the research findings from a policy and management perspective and provides recommendations informed by the research findings. Chapter Six provides conclusions drawn from this study and offers future research possibilities.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

In this section literature relevant to this study is reviewed and described. First, the conceptual framework that guides this research is presented. Second, second-home tourism and the associated impacts it has on water resources and management are presented. Third, the vulnerabilities of small island tourism and the potential impacts it has on water resource management are reviewed. Fourth, literature regarding water conservation behaviour is presented. Fifth, policy and planning strategies for small islands are reviewed and various existing water resource management regimes are presented. Lastly, groundwater legislation in Canada and British Columbia is reviewed and discussed.

2.1.1 Conceptual Framework

The conceptual framework for this research (Figure 1) is derived from the research developed by Gill and Williams (2008). It draws on several inter-related bodies of theory. In its broadest form, their research is framed within the new paradigm of mobility that considers the movement of people, capital and knowledge (Cresswell & Verstraete, 2003; Sheller & Urry, 2006). It further incorporates the transformation of place and the power relations that are associated with such occurrences. This research is framed within these bodies of theory and relates to the movement of second-home migrants to island destinations. It examines the perceived effects of this flow of people with respect to the management of water resources.

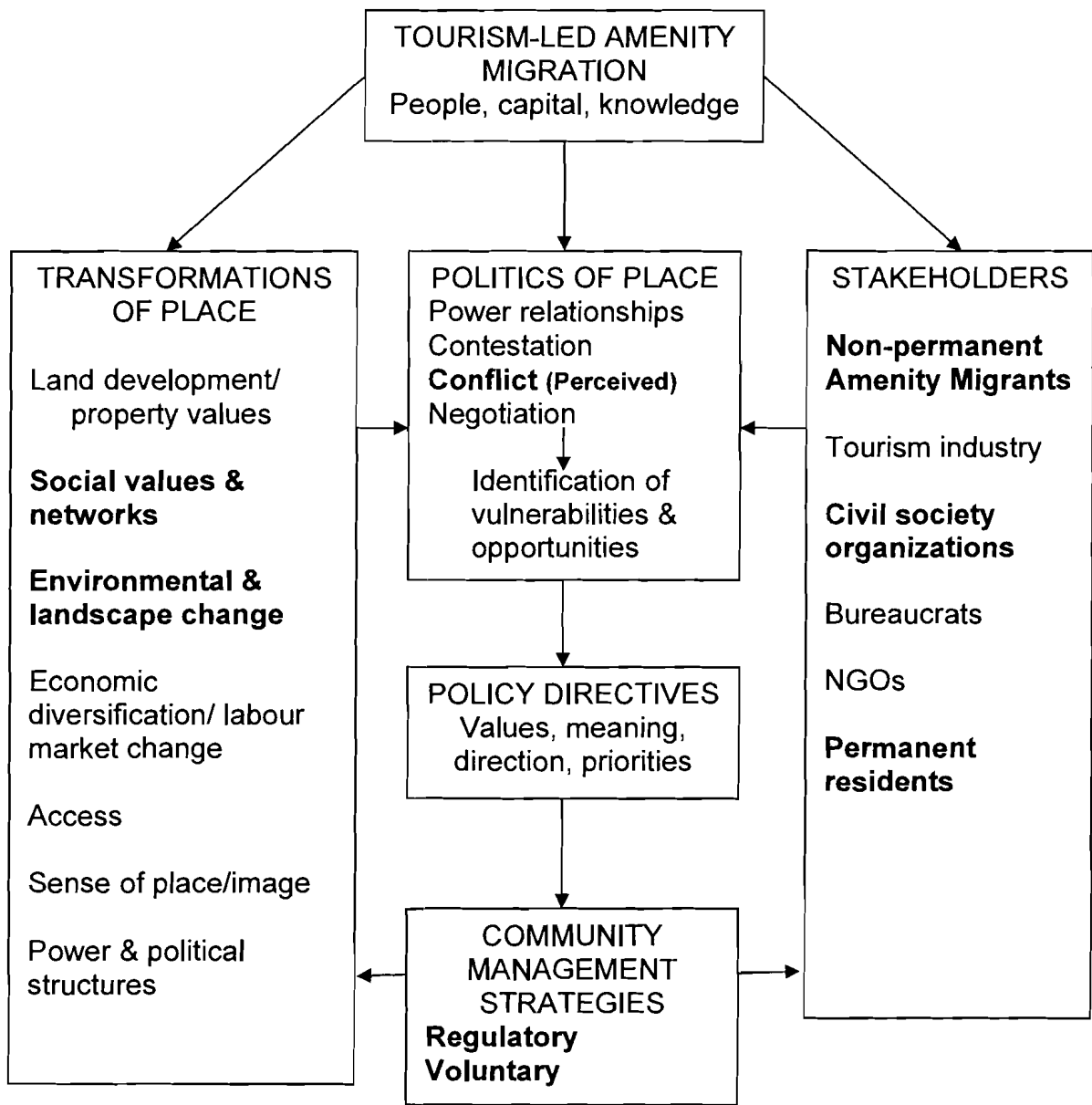


Figure 1. Tourism-led Migration and the Transformation of Place.

(modified from Gill & Williams, 2008). Note: The bold highlights within the outer boxes indicate the specific areas of the research of this report.

2.1.2 'Tourism-led Migration and the Transformation of Place' Framework

In Figure 1, tourism-induced residential migrations are representative of the flow of people, capital and knowledge to a rural destination. It illustrates the dynamics held between stakeholders within affected communities and the various transformations that can occur as a result of the mobility of people, capital and knowledge. These relationships are established within the political arena of place. Often this is reflected in the introduction of new power relations (Few, 2002; Reed, 1997; Ryan, 2002; Stokowski, 2002) and political structures (Macnaghten & Urry, 1998; Mair et al., 2005) to the politics of such places (Allen, 2003; Hall, 2003; Kemmis, 1990). Mechanisms within the political arena may include contestation, conflict and negotiation (Woods, 2007). Through the interaction of varying community members, a number of transformations can take place that are dependent on the political arena of the destination. These dynamics affect policy directives within a destination and drive community management strategies.

The focus of this research within the conceptual framework is the assessment of the transformation of place with respect to the management of water resources within a small island community. This research examines the perceptions, attitudes and behaviours of both permanent and second-home migrants concerning existing and emerging water resource management issues to provide insight into the politics of the destination. This includes exploring their water use behaviour and their perceptions of water resource management in

their community. The politics of place further directs how water resource management policies are shaped for the small island and the community management strategies that result from such dynamics. The goal is to determine what water resource management issues are considered critical to address, and what are the preferred ways of dealing with them.

2.2 Lifestyle Migration and Tourism

Communities that rely on tourism to drive their economies tend to attract not only visitors, but also flows of people interested in the lifestyle amenities of a destination and the opportunities to purchase a vacation home. 'Tourism-led lifestyle migration' involves the flow of people to areas rich in amenities (recreational, leisure activities, climate, culture, scenery) and the flow of such migrations are further induced by tourism services (Gill, 2008; Hall & Williams, 2002; Moss, 2006). Two basic forms of tourism-led lifestyle migration are identified as: consumption-led and production-led (Williams & Hall, 2000;2002). The former includes second-home owners (Hall & Muller, 2004; Halseth, 1998), and retirees (Foster & Murphy, 1991; Gustafon, 2002; Hass & Serow, 1997). In contrast, in both the developed (Cooper, 2002) and developing world (Gössling & Schulz, 2005) production-led tourism migration includes large labour pools and entrepreneurial personnel. The number of case studies of destinations experiencing lifestyle migration flows is growing (Hall & Müller, 2004; Hall & Williams, 2002; Moss, 2006), and suggests that further research is necessary to increase the tools available to more effectively manage the impacts of tourism-led migration.

Lifestyle migrants can bring both positive and negative economic, social, environmental and political changes to a destination (Hunter et al., 2005; Lichtman, 2001; Price et al., 2000; Shumway & Otterstrom, 2001; Stewart, 2001; Williams & Gill, 2006). Understanding the underlying causes for such changes on a destination is critical to the development of suitable policy, planning and management strategies for the communities affected. The effects of lifestyle migration have not been comprehensively addressed by planners and resource managers and such planning requires fiscal and political resources to effectively deal with related concerns (Chipeniuk, 2004). Planning and management options that have been examined by various researchers include growth management, planning permissions review, taxation, and recreational zoning (Gallent et al., 2004; Gill, 2000; Nepal & Chipeniuk, 2005).

2.3 Second-home Tourism

2.3.1 Defining Second-home Tourism

Many lifestyle migrants seek out a destination where they can purchase a vacation home in order to take advantage of the leisure and recreational activities available. This research includes second-home tourism as a form of lifestyle migration. Hall and Williams (2002) discuss the relationship between migration and lifestyle through the use of second homes. They suggest that this trend is influenced by the lifestyle choices of an individual or household. Often this is reflected in their choosing a second-home destination based on the quality of life amenities offered, such as recreational and leisure opportunities (Hall & Williams, 2002). Jaakson (1986) describes second-home owners as “permanent tourists”.

Tress (2002, p.110) defines second-home tourism “as the recreational use of second homes by their owners, friends or relatives of the owners, or vacationers who rent them”. Environmental, social and economic impacts of second-home tourism are not unlike the impacts of other forms of tourism (Müller et al., 2004).

It is suggested that in some cases a continuum exists where second-home migrants are in transition from being tourists to becoming permanent migrants within a community (Stewart, 2001). Studies have indicated that second homes are often bought with the intentions and expectations that the second-home owner will eventually retire to this destination (as cited in Dwyer & Childs, 2004; Foster & Murphy, 1991; Gartner, 1987; Gustafson, 2002).

2.3.2 Impacts of Second-home Tourism on the Water Resources of Island Communities

Population growth due to tourism infrastructure can exacerbate the pressures placed on limited water resources, especially in coastal zones (Gössling, 2001; Pigram, 1999b; Sasidharan & Thapa, 2002). Second-home development can place additional stress on the water supplies of small islands. Popular second-home destinations are often located in coastal areas with low precipitation in the summer months, which coincides with the peak tourism season (Essex, 2004; Hughes-Adams & Burgess, 2006; Ioannides, 2002). Water demand is therefore at its greatest during times when the destination is more susceptible to drought conditions and the capacity for adequate water supply for both permanent and non-permanent residents is limited (Essex, 2004).

Second-home development in island communities can influence the urbanization of the coastline (Bramwell, 2004). In the Mediterranean region, second-home development is largely attributed to the pressures of capital-seeking real estate developments (Bramwell, 2004). This type of development can be an attractive way for communities to bring in additional local tax revenues, which can rejuvenate the local economy (as cited in Bramwell, 2004). However, such development can increase the demands placed on the water supply of coastal regions. Barke and Towner (2004), note that this increases the necessity to adequately manage water resources.

As Stewart (2001) observes in a study of amenity migration in the United States, in destinations where there are limited local facilities and infrastructure, second homes add to the stress on these water resource services and overwhelm the capabilities of both the physical and public resources within a community. As permanent and high-season population grows, areas with limited fresh water resources are challenged to maintain adequate fresh water supply (Stewart, 2001). Consequently, degradation of the environment may result without appropriate infrastructure upgrades to increase potable water distribution, sewage treatment and solid waste capacities. Second homes may also have individual wells and septic tanks that can easily go unmonitored due to the difficulties local authorities face in the enforcement of regulations (Stewart, 2001). This can potentially increase the risk of adverse environmental impacts (Stewart, 2001) including issues involving groundwater contamination.

Gartner (1987) examined the development and environmental impacts of second homes in the northern lower peninsula of Michigan, USA. Results from this study indicate that second-home tourism typically has a high degree of impact on a destination (both environmentally and socioeconomically). These effects are due to the extended lengths of stay of the occupants and the location of the second-home within the community, especially where waterfront development is concerned. Furthermore, Gartner (1987) concluded that although second-home owners may be sensitive to the environmental conditions and potential impacts of their activities, their behaviours suggest that they do not recognize their contributions to these conditions and impacts. These behaviours include excessive use of water for gardening and irrigation of their properties, as indicated by Hughes-Adams & Burgess (2006) in their study of household water consumption of permanent and non-permanent residents on Mayne Island, BC and other Gulf Island communities.

2.3.3 Gardens

For many individuals gardens provide various recreation and psychological benefits, as well as an enhanced sense of place (Syme et al., 2004). Moreover, a garden can be seen as a part of current 'fashion' and trend in the social presentation of a home (Syme et al., 2004). Therefore, gardens are seen as an important 'quality of life' aspect (Syme et al., 2004) that second-home migrants may seek. Correlations between the significance of a garden to home owners and the amount of external water consumed were identified by Syme et al. (2004) in their study of garden water use in an area of Perth, Australia.

Results indicate that irrigation systems were a large factor contributing to water consumption, particularly when these systems were used more frequently for longer periods of time (Syme et al., 2004). This study emphasized the need for resource managers and planners to consider both the social and ecological implications of sustainable water management strategies.

2.3.4 Resident Perceptions of Water Resource Issues

While water issues are important to address within management schemes, it is also critical to consider the perceptions held by community members concerning water resource issues. Girard and Gartner (1993) examined host community perceptions of a second-home destination in Wisconsin, USA. Results from their study indicate that the host population perceived that “homes by the shore increase water pollution”, “increased water activity increases water pollution” and “growth around the lake should be controlled” (Girard & Gartner, 1993, p. 696).

This provides a useful example of the type of perceptions permanent residents may have regarding the impacts that second-home development has on water resources. Planning and policy for water management can be informed by the perceptions and attitudes of permanent and non-permanent residents concerning matters related to water use (Puczko & Ratz, 2000).

2.3.5 Behavioural Characteristics of Tourists

In addition to the impacts on the scarce water resources of small island destinations due to the timing of second-home owner visits, the water use

behaviour, perceptions and water resource values of the second-home migrants themselves often further the exploitation of water supplies (Christensen & Beckmann, 1998). How individuals value water resources, their attitude toward the use of the resource, and the perceptions they have concerning the vulnerability of water supplies may dictate their water use behaviour (Schultz et al., 2005). Studies have shown that people on vacation may change their consumptive behaviour and exploit water resources within a destination (as cited in Gössling, 2003; United Nations, 1999). More specifically, results from a study by Gössling (2001) in Zanzibar, Tanzania highlighted that extraction of groundwater for use by the tourism industry is excessive and potentially unsustainable. Garcia and Servera (2003) in their study of tourism water demand on the island of Mallorca (Spain) also discovered that tourist consumption of water is nearly twice the volume compared to the local population.

Excessive water demand by tourists include both direct (showers, toilet flushing, hot tubs, pools, laundry services) and indirect uses (restaurant services, recreational services and irrigation) (Essex, 2004; Gössling, 2001). By using alternative water sources (such as rainfall harvesting) for non-consumptive services that do not require the same quality or treatment of water (such as irrigation, site cleaning, and fire fighting) communities would be able to better address the demands placed on their potable water supply (United Nations, 1999).

2.3.7 Waterfront Properties

Coastal zones and small islands in particular attract second-home development due to the availability of waterfront locations (Gartner, 1987; Marjavaara, 2007; Jaakson, 1986). These locations are more vulnerable to the impacts of second-home development due to the sensitivity and fragility of coastal zones (Bennett, 1996). In addition, for small islands, their geographical size and limited capacity of the island to assimilate environmental pollution can combine to magnify adverse impacts (Kokkranikal et al., 2003). Second-home development along the coastline can have negative impacts on the biodiversity at the shoreline, and degrade the quality of water resources through inadequate management and treatment of human waste and wastewaters (Hiltunen, 2007). Additionally, saltwater intrusion into fresh water aquifers can be induced by the exploitation of groundwater through over-pumping of wells along the coastline, particularly during drought conditions (Calvache & Pulido-Bosch, 1997).

2.4 Small Island Tourism

2.4.1 Small Island Vulnerability

Small islands have many unique characteristics and natural amenities that attract tourists and second-home migrants (Kokkranikal et al., 2003). However, some characteristics also contribute to economic and environmental vulnerabilities (Table 1), that can be exacerbated by tourism infrastructure.

Table 1. Characteristics Contributing to Small Island Vulnerability

- Small physical size
- Ecological uniqueness and fragility
- Rapid human population growth and high densities
- Limited natural resources
- Susceptibility to climate change and sea-level rise
- Fragile and small economies with limited diversification possibilities
- High dependence on marine resources
- Isolated
- Limited human and financial infrastructure
- Dependency on the mainland
- Limited carrying capacity
- Cultural and traditional barriers

Source: Andriotis, 2004; Ghina, 2003; Kim & Uysal, 2002; Marjavaara, 2007; Pigram, 1999a

Small islands typically have a limited and often skewed supply of natural resources (Ghina, 2003; Kim & Uysal, 2002), including fresh water. This emphasizes the importance of appropriate and adequate management of such valuable resources for island communities. For their fresh water supplies, many small island populations rely primarily on groundwater resources (Assimacopoulos, n.d.), and these supplies are sustained by rainfall, catchment and aquifer recharge, and the storage capacity of the island (United Nations, 1999). In addition, interaction between groundwater, streams, rivers, lakes and reservoirs are important to the health and stability of ecological systems, and these interactions are more susceptible to adverse impacts on small islands (Berardinucci & Ronneseth, 2002; Gössling, 2001).

Water resource issues can result from the lack of initial sustainable management of both tourism development and water resources. Tourist and second-home migrants demands can lead to the over consumption of water resources, particularly in coastal zones (Gössling, 2001). In addition, water

resource infrastructure within a destination may not be adequate for the increased demand generated by visitors during peak seasons (Pigram, 1999b).

2.4.2 Potential Water Resource Consequences and Impacts from Tourism

Potential consequences and impacts can be severe where a lack of management of the tourism industry, and in particular specific residential policies with respect to land use and groundwater extraction, coincides with insufficient water resources and sustainable water management policy (Table 2).

Table 2. Potential Consequences and Impacts of Unmanaged Tourism Development and Water Resources

- Saltwater intrusion
- Lowered groundwater table
- Land subsidence; erosion; sedimentation
- Eutrophication (depletion of oxygen in water)
- Health risks – water-related diseases
- Deterioration of ground water quality
- Ecosystem degradation (marine and terrestrial) and pollution
- Tourism degradation

Source: Assimacopoulos, n.d.; Belle & Bramwell, 2005; Garcia & Servera, 2003; Gössling, 2001

In addition, water resources on small islands are more difficult to manage due to the implications outlined by Pigram (1999b) (Table 3).

Table 3. Implications for Water Resource Management in Small Islands

<ul style="list-style-type: none">▪ Limited (often seasonal) precipitation▪ Restricted catchment areas, especially those affected by deforestation▪ High runoff/evaporation▪ Limited availability of water storage sites▪ Infrastructure deficiencies (e.g. leaks)▪ Limited database on surface water and groundwater resources▪ Shortage of qualified personnel▪ Isolation and lags in delivery of materials▪ Limited scope for education in water conservation▪ Lack of, or inadequate environmental impact assessment <p>Source: modified from Pigram, 1999b by permission</p>
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These implications can become obstacles to local resource managers and planners within a community. They may inhibit their capacity to effectively address their water resource issues where tourism and the addition of second-home migrants are involved.

Small islands are often more susceptible to the impacts of climate change, such as sea-level rise, because of their physical geography. The low lying land base of small islands, and long coastlines compared to their land base makes them particularly vulnerable to changes in sea level (Belle & Bramwell, 2005). A rise in sea level may contribute to saltwater intrusion threatening the viability of fresh water aquifers on the islands (Ghina, 2003).

2.5 Water Conservation Behaviour

Water conservation can be defined as “procedures, techniques and technologies that improve the efficiency and effectiveness of water use” (Charalambous, 2001, p. 5). Therefore, water conservation behaviour could be described as the effort by an individual to behave in such a manner that water conservation is promoted. There is a tendency for people to be mentally

removed from their water source which may contribute to behaviour that promotes excessive water use and waste. In other words, freshwater is often taken for granted by the general population, and water conservation does not enter their minds until it is too late, and either drought or contamination conditions are present (as cited in Geller et al., 1983).

Water conservation plays an important role in the management of water resources. Technological and socio-behavioural strategies are a necessary component to effectively promote the conservation of water resources within communities (Corral-Verdugo et al., 2003). Various dispositional, demographic and situational factors have been attributed to water conservation behaviour (Corral-Verdugo et al., 2003). Motives for saving water have been associated with the following reasons: to save the resource for its intrinsic value; to cooperate with a water conservation campaign; to pay less in order to consume the resource; and fear of punishment due to over consumption (as cited in Corral-Verdugo et al., 2003). Skills that provide individuals with the specific ability and knowledge to conserve water resources are an essential step to promote conservation behaviour (Corral-Verdugo et al., 2003).

Studies have indicated that water consumption depends largely on household size, the actual size of a house, household values toward water resources (Aitken et al., 1994), the value and perception individuals place on gardens, and household income (Syme et al., 1983). In contrast, reduction in water consumption has been attributed to the use of water-saving devices (Geller et al., 1983), obligatory water conservation campaigns (De Oliver, 1999), and

water scarcity within a community (Corral-Verdugo, 2002). In their study of residents in Blacksburg, Virginia, Geller et al. (1983) determined that there was a significant impact in the reduction of water use through the installation of water conservation devices in a residential setting. In addition, they concluded that if a water conservation program was implemented at a community-wide level it could substantially increase water savings without a financial burden (Geller et al., 1983). However, such a program would require the “systematic assessment of attitude change, behaviour change, and consumption change” (Geller et al., 1983, p.110).

2.5.1 The Tragedy of the Commons

Groundwater can be perceived as a common property resource, a resource which is shared by the commons, and therefore is subjected to massive degradation (Feeny et al., 1990). A tragedy of the commons occurs when an individual “takes more than his pro rata part of a resource, to the detriment of the common good he shares with other individuals” (Corral-Verdugo et al., 2002, p. 527). A cycle continues where as more and more individuals take advantage of the shared resource, the commons become destroyed as they are consumed faster than they can be replenished (as cited in Corral-Verdugo et al., 2002). It is suggested that the tragedy of the commons may be influenced by how individuals perceive each other’s conservation ethics, and may direct the actions of an individual toward environmental resources (Corral-Verdugo et al., 2002). In other words, the tragedy of the commons is a result of the behaviour that an individual observes in another, causing them to act in the same manner (Corral-

Verduga et al., 2002). Therefore, water conservation may be dictated by the attitudes, behaviour and perceptions of each individual within a community, sharing the resource.

2.5.2 The New Environmental Paradigm-Human Exception Paradigm Scale

The New Environmental Paradigm-Human Exception Paradigm (NEP-HEP) is widely recognized as an instrument to measure the environmental beliefs of a given population using quantitative research (as cited in Corral-Verdugo et al., 2003). The NEP scale on its own was originally created by Dunlap and Van Liere (1978). It sought the ability “to capture comprehensive systems of ecological beliefs” (Lundmark, 2007, p.330) rather than research solely based on a singular environmental issue (Lundmark, 2007). Theoretically, an individual’s pro-environmental belief should dictate their actions toward the environment and promote conservation efforts (Corral-Verdugo et al., 2003). In contrast, the Human Exception Paradigm theoretically assumes that humans believe themselves to be superior to nature and thus disregard its intrinsic value and exploit its resources (Corral-Verdugo et al., 2003). Therefore, in theory, this anthropocentric view encourages behaviour that prevents conservation efforts (Corral-Verdugo et al., 2003).

Corral-Verdugo et al. (2003) completed a study in northern Mexico that utilizes the NEP-HEP scale to research general environmental beliefs specific to water resources and their conservation. In this research, a utilitarian belief is described as a specific belief that pertains to the human consideration of water as an infinite resource and to have random human uses. In contrast, ecological

beliefs were a specific belief pertaining to the human consideration of water as a finite resource to be conserved (Corral-Verdugo et al., 2003). They concluded that water consumption can depend on the following: demographic characteristics, such as gender, age, and socio-economic class; and that actual water consumption exceed expected and desired consumption. Therefore, to encourage water conservation there is a need to promote a change in worldviews in combination with developing water conservation skills and motives. Further, due to the direct effect that specific water beliefs have on water consumption, it is important for individuals to change their views of water from being highly anthropocentric to more ecologically inclined. This can be accomplished through environmental education programmes (Corral-Verdugo et al., 2003).

A modified NEP-HEP scale based on the study conducted by Corral-Verdugo et al. (2003) is employed in the research in this report. It builds upon their study's scale focusing on water resource use and conservation. This modified scale is included in the resident survey, later described in the methods chapter of this report.

2.6 Policy and Planning Strategies for Small Island Tourism and Water Resources

For small island communities to achieve sustainable development in both tourism and water management practices, appropriate and effective policy and planning strategies must be implemented. Strategically, planners must recognize that environmental management of both residential and commercial tourism development should consider not only areas where development can be

permitted, but also those areas that should be protected from it (Price, 1996). Effective planning strategies must exist or be developed when and where needed to address issues of coastal development. Additionally, due to the high rate of inertia of such projects, these strategies should be implemented prior to such developments (as cited in Dobson, 2003). Therefore, planning strategies to protect specific areas from environmental degradation need to be current to prevent development from proceeding in an uncontrolled and unmanaged manner (as cited in Dobson, 2003).

Steps to improve policy-making were outlined as a result of the Simon Fraser University workshop, "Policy Directions for Coastal Tourism" (Table 4). These steps have been modified to fit the small-island focus of this research.

Table 4. Steps to Improve Policy Making for Coastal Zones and Small Islands

1. Define the institutional and legislative jurisdictional uncertainties that exist for all stakeholders, ensuring that all stakeholders are included in decision-making processes as they relate to tourism development and watershed impacts
2. Include science-based information into policy decision-making
3. Focus on appropriate education and understanding of the cultural values for watershed areas within the community
4. Improve how tourism and watersheds are monitored and enforced
5. Integrate environmental stewardship strategies to protect both human and ecological environments
6. Integrate human resources, education and business development
7. Identify best practices for tourism development and watershed management that can be used as benchmarks for sustainable strategies
8. Enhance the link between education and policy-making for sustainable tourism and watersheds
9. Support and encourage academic [and other forms of] research within this field of study
Source: modified from Dobson, 2003 by permission

Other recommendations and potential opportunities for small island communities to address a more sustainable approach to tourism and water management are outlined by Pigram (1999a), and should be considered by local governments of small islands (Table 5).

Table 5. Recommendations and Opportunities for Small Island Communities to Implement Sustainable Tourism and Water Management

1. Improving the knowledge and understanding of local communal demands and the needs for water in a range of uses (survey prior to tourism development).
2. Planning of water supply infrastructure adequate to cope with base demands and peak tourism demands, and integrated to also service/upgrade community water needs.
3. Provisioning of water treatment facilities adequate to service both tourism and island community water needs at a high standard.
4. Provisioning of facilities for treatment, recycling and reuse/disposal of wastes and waters containing wastes, according to agreed guidelines to avoid water resource and marine contamination.
5. Monitoring of performance of water supply infrastructure and treatment facilities to detect and correct deficiencies
6. Controlling deforestation and reforestation and integrated catchment management to correct adverse effects on watersheds and water supplies.
7. Organizational and institutional strengthening and capacity building to enhance water resources management, operations, maintenance and service delivery, and optimum deployment of human resources
Source: Pigram, 1999a by permission

2.6.1 Supply-side Management

Globally, supply-side management has typically been the basic paradigm for many communities. This approach seeks to secure water availability for future demand based on the projected population and economic growth within a community (Brandes & Maas, 2004). This is accomplished through the expansion of infrastructure capacity and/or by the addition of new water sources

(Table 6) (Brandes, 2004) which typically proves to be extremely expensive and often opportunities are limited (Schachtschneider, 2002). However, there is little consideration of economic and ecological costs because sustainability imperatives are often ignored and water conservation is lacking (Brandes & Reynolds, 2004).

Table 6. Supply-side Management Strategies

- Annual aquifer recharge
- Designation of aquifer protection areas
- Contingency plans in the event of aquifer contamination
- Desalination plants
- Water diversion
- Flood water capture and storage
- Drilling of additional bore holes / wells
- Increased reservoir capacity
- Long-distance water carriers

Source: Essex et al., 2004; Garcia & Servera, 2003; Gossling, 2001; Lange, 1998; Radif, 1999

Overall, the stresses placed on fresh water supplies through supply-side management strategies encourage the degradation of water resources and quality (Radif, 1999). Therefore, this form of water resource management is unreliable as the sole management strategy for small island destinations, where natural supply is limited and vulnerable.

2.6.2 Demand-side Management

Demand-side management is another approach to address water scarcity and quality issues that is often seen as either an alternative or a complement to supply-side management strategies (Brandes & Maas, 2004). Brandes (2004, p.

40) describes demand-side management as “a comprehensive, integrated and long-term approach, [that] improves overall productivity of water use and delivers water services matched to the needs of end users” . This paradigm illustrates that water demand can be influenced and that water conservation methods provide a more cost-effective and efficient means to address water supply issues (Brandes & Maas, 2004; Guy & Marvin, 1996). Demand-side management techniques play a critical role for land use planners in their management strategies, “thereby allowing planners scope for introducing more environmentally sustainable local economic development” (Guy & Marvin, 1996, p. 123). Appendix F illustrates various demand management measures that can be implemented within a community. Examples include water restrictions, regulations and by-laws, water efficient rebate programmes, pricing structures, and use of efficient technologies.

Many benefits exist for the use of demand-side management including environmental impact reduction, increased utility capacity, supply limitations aversion, and relief from unnecessary costs for infrastructure expansion (Brandes, 2004). However, despite the benefits of demand management there are barriers that must be recognized and overcome. For example, water must be priced in terms of its “real” or “full” costs to encourage water conservation strategies (Lange, 1998). Low pricing of water promotes its overuse and wasteful use contributing to its unsustainable supply (Lange, 1998). Due to the nature of most water sources as a common property resource², a pricing policy

² ³ A common property resource has two dominant characteristics; non-excludability amongst users and rivalry between users (Feeny et al., 1990).

should include social costs from water degradation or depletion and reflect the opportunity cost “that measures the lost revenues from alternative uses” (Lange, 1998, p. 307). Additional barriers include inadequacy of data collection, overcapitalization, engineering bias for supply-side management, lack of funding, and the implementation of inflexible policies (Brandes, 2004).

2.6.3 Soft Path Approach

The soft path approach to water resource management is recognized as a method of water planning that “offers various routes to guide our current water management onto a sustainable path for long-term ecological and social prosperity” (Brandes & Brooks, 2005, p. 1). It incorporates demand management strategies that will change water-use habits, technologies, and practices, while ensuring ecological limits are not breached. Additionally, local public participation plays an important role in the management of water resources within the soft path approach (Brandes & Brooks, 2005). Gleick et al., (2002) outlined the important attributes of the soft path approach. It aims to meet consumer demands through water use efficiency but with less focus on profitability. It utilizes newer cost-effective distribution technologies and seeks to supply water based on the type of use for the water rather than only supplying potable water. For instance, grey water can be used for numerous nonpotable purposes such as golf course irrigation or toilet flushing. It focuses on collaborative efforts in the management of water resources, while promoting economies of scope. For instance, the knowledge held by various stakeholders is integrated into the

decision-making processes. More importantly, it recognizes the intrinsic value of water for ecological health and function.

2.6.4 Integrated Water Resource Management

Integrated Water Resource Management (IWRM) is becoming recognized as the only sustainable solution for small islands and should be considered by local and regional governments to address existing and future water issues and concerns (Durham et al., 2003). IWRM focuses on holistic long-term management practices and includes various stakeholders, such as users, planners and policy makers, within decision-making processes (Durham et al., 2003). IWRM has been defined by the Global Water Partnership (2000, p. 22) as:

a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

Although this definition appears to provide a clear understanding of what IWRM is, it raises fundamental questions regarding how it can be implemented, and its interpretation is dependent on the context and location it is to be applied (Biswas, 2004). For example, terms found within the definition require further interpretation, such as 'land and related resources', 'equitable', and 'sustainability' (Biswas, 2004). In addition, IWRM requires support from legislation, agreed upon quality standards, and adequate financing for projects to take place (Durham et al., 2003).

Therefore, small island governments need to implement appropriate and effective groundwater legislation, if such legislation does not already exist. Extraction licensing can control who can extract water and how much they can extract to maintain a sustainable supply. A source protection legislation should also be implemented to protect the quality of the groundwater within an aquifer. Such a structure would ultimately promote the sustainability of the island water resources for both human needs and ecological functions (Nowlan, 2007).

2.7 Groundwater Legislation in Canada and British Columbia

Groundwater resources in Canada are often seen as being taken for granted, and this has influenced their limited regulation and management by all levels of government (Nowlan, 2007). A large proportion of Canadian residents – approximately 1/3 of the total population – are reliant upon groundwater resources for drinking water and other services (Nowlan, 2007). In addition, Canadians are generally unaware of its vulnerability to exploitation and the consequences that can occur as a result. This is largely due to groundwater being a 'hidden resource' and therefore available quantities have not been heavily researched or made known (Nowlan, 2007). Until recently, there has been little priority for monitoring groundwater resources throughout the country. However, recent groundwater contamination outbreaks – such as Walkerton, Ontario in May 2000 – have increased its perceived importance and have raised awareness of issues regarding groundwater quality and quantity in Canada (Nowlan, 2007). Although there is no direct legislation in place in B.C. regarding groundwater management, there are regulations for well construction standards

(*Ground water protection regulation*, B.C. Reg. 299/2004). In addition, Part 4 of the *Water Act* allows for the development of a water management plan for an area (*Water Act*, RSBC 1996, Chapter 483). Such a plan would enable specific groundwater issues to be addressed through legislation. For instance, the Township of Langley faces a number of groundwater quality issues and is currently going through the processes of developing a water management plan (Christensen, 2007; Douglas, 2008).

Despite the proposal within the 1987 Federal Water Policy to put greater effort into acquiring knowledge of groundwater resources throughout Canada, little efforts have been made by the federal government to define or implement groundwater policy (as cited in Nowlan, 2007). However, the Earth Sciences Sector of Natural Resources Canada is beginning to address the need for better information on the groundwater resources within the country. Implementation of a 'Groundwater Mapping Program' is currently in place, and is intended to identify 20 percent of the key regional aquifers, map their natural water quality, implement a national database on groundwater quantity and quality, and provide for website links and information (Natural Resources Canada, 2008). The Program is designed to assist all levels of government in assessing the sustainability and quality of existing aquifers and provide information for appropriate management of groundwater issues (Natural Resources Canada, 2008).

In Canada, each provincial and territorial government implements its own groundwater permitting process. Within British Columbia, groundwater permitting

is under the jurisdiction of and regulated by the BC Ministry of Environment (Nowlan, 2007). Table 10 provides the details regarding this permitting system.

Table 7. Overview of Groundwater Permitting Processes in British Columbia

Jurisdiction and primary regulator	BC: Ministry of Environment
Number of wells	Approximately 100, 000+; submission of well records is not mandatory
Total number of groundwater permits	N/A; Licensing does not currently apply to groundwater
Number of permits issued annually	N/A
Groundwater licensing law	The Water Act could be extended to include groundwater licensing, however the necessary regulations do not currently exist
Date licensing applied	No requirement permit
Regulation	Groundwater Protection Regulation, 2004, focuses on well construction standards and groundwater quality protection
Source: modified from Nowlan, 2007, p. 61 by permission	

In summary, British Columbia lacks licensing requirements for groundwater beyond well construction standards and water quality protection. Moreover, British Columbia is the only jurisdiction within Canada that does not have general licensing requirements for the extraction of groundwater (Nowlan, 2007).

CHAPTER 3: METHODS

3.1 Introduction

This chapter describes the methods selected for this research. It outlines the research objectives and questions, including both primary and secondary questions. It introduces the case study approach to the research, and the reasons the specific case study was selected. It provides a breakdown of both the qualitative and quantitative approaches used for the research methods of inquiry. Lastly, it identifies limitations associated with the research methods.

Figure 2 illustrates how tourism influences lifestyle migrations and the various forms of such migrations. This research focuses on second-home tourism which includes the non-permanent migrants in the form of seasonal and part-time second-home migrants.

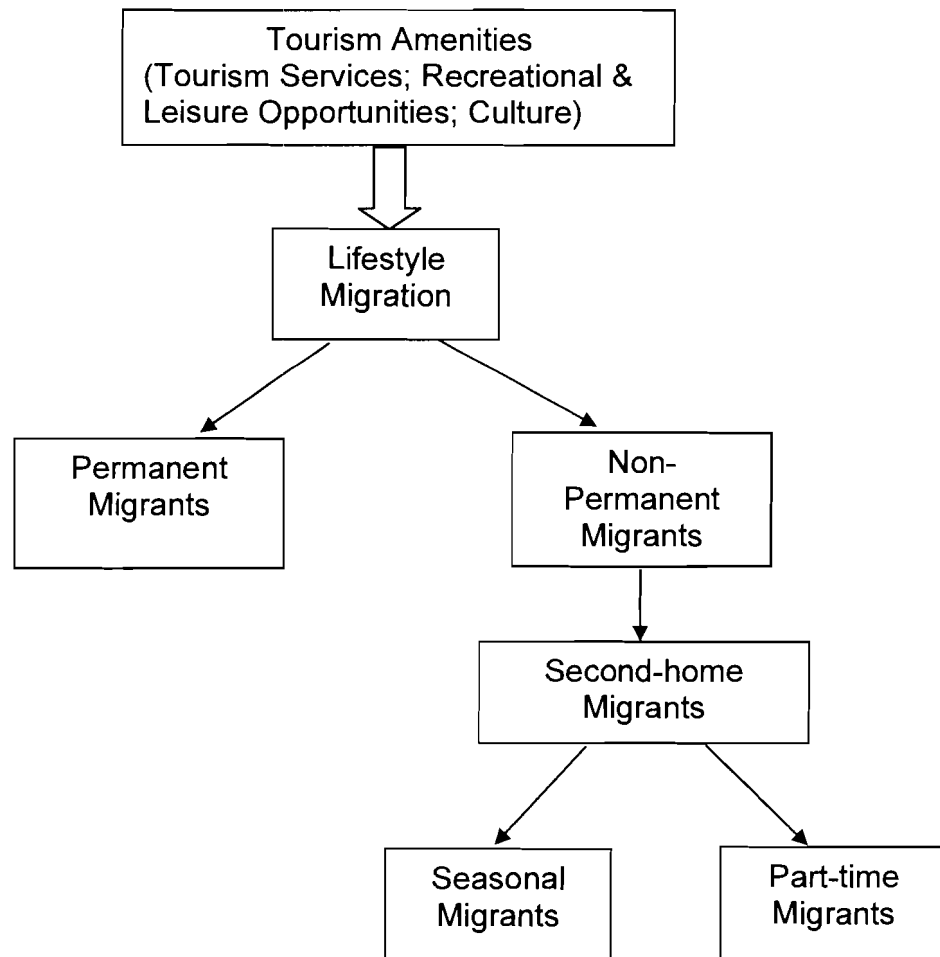


Figure 2. Tourism-Induced Lifestyle Migration Flow Model

3.2 Research Objectives and Questions

The overarching purpose of this research was to determine whether differences exist between permanent and non-permanent residents in their water use behaviour, attitudes and values, and to suggest how this can inform water resource management policy and planning. A series of primary thematic and secondary sub-questions guided this study's focus. They were as follows:

1. What is the current governance and management system for managing fresh water resources on Mayne Island?
 - a. What are the water resource management strategies on Mayne Island?
 - b. Who are the key stakeholders responsible for this management?

2. What perceived impacts do second-home migrants have on the quantity and quality of water resources on Mayne Island?
 - a. How do their perceived water use patterns compare to those of permanent residents?
 - b. What are the perceived current and potential water quality and quantity issues confronting Mayne Island, and how are these issues affected by non-permanent migrants?

3. Do differences exist in the values and attitudes of non-permanent and permanent residents with respect to water resources and conservation?
 - a. Do differences exist in the awareness and participation levels of permanent residents and second-home migrants with respect to water conservation?
 - b. Do divergent viewpoints exist amongst the community members concerning water resource management issues?

4. What management options are preferred by permanent and non-permanent residents for managing water resources?
 - a. What is the perceived effectiveness of current water management strategies by permanent and non-permanent residents?
 - b. What changes to the current policies and planning strategies would accommodate the perspectives and perceptions of permanent and non-permanent residents?

3.3 Case Study

A case study approach (Yin, 2003a) was used to explore lifestyle migrations in the form of second-home tourism to small islands, and the impacts this migration has on the water resource management of affected communities. It was used in an effort to compare water use behaviour, attitudes, values and perceptions of permanent residents and second-home migrants within a specific place-context (Palys, 1997). Case studies are most appropriate for broad research topics (Yin, 2003b) and enable a researcher to maintain the “holistic and meaningful characteristics of real-life events” (Yin, 2003a, p. 2). However, case study research has been stereotyped as a weaker social science research method due to its perceived deficiencies in “precision, objectivity, or rigor”; therefore the findings may be underappreciated or challenged by others (Yin, 2003a).

3.3.1 Case Study Selection

Many communities in the Gulf Islands have felt growing pressures on their local cultural and natural resources. This is increasingly the case with respect to fresh water supplies emanating from groundwater resources (Rutherford, 2004). Communities are experiencing groundwater quantity and quality issues due in part to population growth, urban development, and various forms of tourism (Allen & Pelude, 2001; Allen & Suchy, 2001a; Allen & Suchy, 2001b; Hughes-Adams & Burgess, 2006; Islands Trust Fund, n.d.; Mayne Island Integrated Water Systems Society, 2008; Nowlan, 2007; Rutherford, 2004).

A growing number of lifestyle migrants are moving to the Gulf Islands either permanently or temporarily. They are attracted to the area's high quality coastal zones and many of them are building second and/or permanent new homes (Allen et al., 2001). Second homes are primarily used during the summer months when water supply is limited and the region faces peak tourist demand (Allen et al., 2001; Hughes-Adams & Burgess, 2006). This situation places significant stress on local water resources needed for consumptive and non-consumptive purposes. During the summer season Island populations may double or triple as a result of the second-home migrations and tourist activity. The activities of these seasonal migrants and their permanent counterparts contribute to the lowering of water tables, as well as salt water intrusions and water quality degradation associated with unnecessary abstraction (Allen et al., 2001; Berardinucci & Ronneseth, 2002; Ministry of Environment, 2001; Rutherford, 2004). Water wells for residential use along the coastline can lead to saltwater intrusion (Allen et al., 2001). These water resource issues are emerging on Mayne Island (Figure 3), a member of the southern Gulf Islands, B.C.

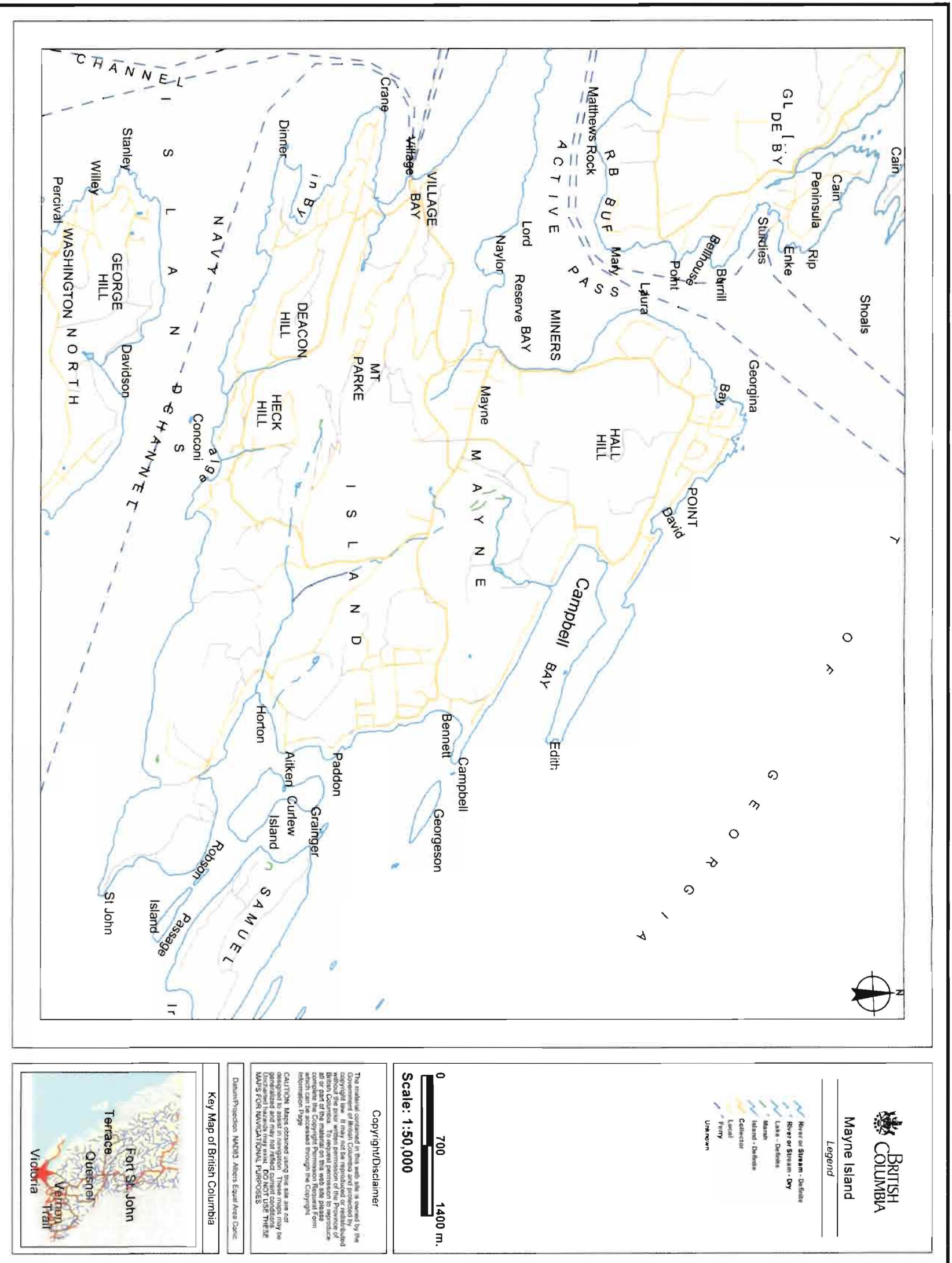


Figure 3. Map of Mayne Island, British Columbia

Source: Modified from Province of BC, 2008 by permission

Mayne Island was chosen as the case study for this research because: it experiences seasonal lifestyle migration in the form of second-home migrations, particularly during the summer months; it is primarily reliant on groundwater for its water resources; and the management of its resources is critical to both human and ecological functions of the Island.

Groundwater research in the Gulf Islands concludes that:

...[I]ncreased numbers of people in the part-time residences will increase average household water use in the future. This will result from an increased number of larger seasonal homes that are used by more people for longer periods of time, as well as an increased number of vacation rental properties (Hughes-Adams & Burgess, 2006, p. 20).

Their findings predict that part-time resident water consumption will increase annually by 20 percent, and will increase average overall household water use by 13 percent (Hughes-Adams & Burgess, 2006). They indicated that part-time home owners contribute substantially to these water pressures on Mayne Island, and are likely to contribute to greater pressures in the future (Hughes-Adams & Burgess, 2006).

Mayne Island's water use management system is particularly challenging because it involves the use of both private wells and community water systems for the supply of potable groundwater. While various management strategies exist to address these issues, they are more problematic to implement because of the transient character of most second-home residents (Hughes-Adams & Burgess, 2006).

3.4 Data Collection

Both qualitative and quantitative research methods were used to inform this case study. Qualitative methods collected knowledge through personal interviews with key informants. More quantitatively focused information concerning resident attitudes, perceptions and behaviour were accumulated via survey method. The convergence of qualitative and quantitative approaches is described as triangulation. In this case it helped to validate the interpretations of data collected (Jick, 2008).

Initially, a literature review provided the foundation for the development of the context, rationale and focus of the research. It also guided the development of the key informant and resident surveys that were implemented.

3.4.1 Key Informant Interview Approach

3.4.1.1 Interview Strategy: The 'Active Interview'

Active interviewing is a form of interpretive practice involving respondent and interviewer as they articulate ongoing interpretive structures, resources, and orientations with..."practical reasoning" (Holstein & Gubrium, 1995, p. 16).

An active interview approach was used to gather critical information on perceived relationships between water resource management issues and lifestyle migrants on Mayne Island. Interviewing respondents, no matter the configuration of the interview, is an interactional event (Holstein & Gubrium, 1995). Active interviews seek to address the most fundamental epistemological question: "Where does this knowledge come from, and how is it derived?" (Holstein & Gubrium, 1995, p. 2). The art of obtaining the desired information from a respondent is dependent

upon how the questions are asked, otherwise the resulting outcome may be biased, misunderstood, or misguided (Holstein & Gubrium, 1995). In this case study, questions were formulated so that communication between the respondent and the interviewer was open and authentic, and that it happened within an environment that promoted such transparency. Both the respondents and the interviewer were active participants in the process.

Contributions provided by both parties were eventually integrated into the production and analysis of the interview data as recommended by Holstein & Gubrium (1995). This approach led to the spontaneous uncovering of sometimes unsuspected and insightful perspectives.

3.4.1.2 Interview Instruments

The interview questions were designed based on thematic issues found in the literature review that were relevant to the research objectives. For each interview respondent, a specific set of questions related to the expert knowledge of the participant guided the interview. Appendix A contains the key informant participation request letter, and Appendix B provides the key informant consent letter used for this research. Appendix C details the key informant interview questionnaire.

The entire set of questions and their sequencing were pre-tested for clarity and relevance by colleagues of Simon Fraser University's Centre for Tourism Policy and Research. Areas where issues of potential misinterpretation and completeness occurred were modified based on the feedback received.

3.4.1.3 The Interview Process

Interviews took place between March and June of 2008 at locations requested by the participants. Overall, eight interviews were conducted. Three interviews were 'face-to-face' and the others were conducted by telephone. Each interview began with a verbal summary of the research objectives. Each participant was asked to sign a research consent form, approved by the ethics board at Simon Fraser University. This form was given to them directly by the researcher or via email. All of them were returned through email by the participants, printed, and secured for confidentiality. Interviews were recorded using a digital computer recorder and were eventually transcribed. Participants were provided with the opportunity to request a review of the full transcription, as well as the ability to provide further comments on the subject matter.

3.4.1.4 Participant Selection and Recruitment

The selection of the participants for the key informant interviews was based on either their role within the community of Mayne Island, and/or their expert knowledge concerning water resource management. They were identified through publicly available websites and recommendations from other key informants. It was difficult to contact some of the potential key informant participants. However, amongst those who did participate a balanced representation of key stakeholders for the community still exists. The number of key informant interviews was limited to eight due to the fact that potential respondents either did not return interview request emails or phone messages, or

they declined participation, or they were unavailable for other reasons. Table 8 summarizes their positions in the Mayne Island community.

Table 8. Key Informant Interviews

Type of Respondent	# of Respondents Interviewed
Local Government Official Trustee	2
Islands Trust Regional Representative	1
Local Community Planner	1
Mayne Island Water District Representative	1
Mayne Island Integrated Water Systems Society NGO Representative	1
Retired Mayne Island Water District Manager/Local Long-Standing Active Community Member	1
Groundwater Specialist	1

3.4.2 Resident Water Management Survey

To complement the key informant interviews, a resident survey was distributed to a sample of the Mayne Island population, including both permanent and second-home migrants. This was in an effort to ensure a greater reliability in the findings derived from the key informant interviews due to the relatively low number of people interviewed. The resident survey was used to focus on the perspectives of the permanent and second-home migrants of Mayne Island concerning their water use behaviour, values and attitudes, and the perceived emerging and existing water resource management issues.

3.4.2.1 Survey Instruments

Initially, resident survey questions were derived from both the academic literature review and other applied research studies with somewhat similar objectives (Corral-Verdugo et al., 2003; Henderson, 1997; Hughes-Adams &

Burgess, 2006; Statistics Canada, 2006a). The survey questions were eventually refined and complemented with information obtained through the key informant interview process. Appendix D contains the survey participation request letter, and Appendix E contains the detailed resident survey.

3.4.2.2 The Survey Process

An online survey format was used to collect the survey responses and occurred between June and July, 2008. Participants were provided with a digital link to an automated online survey site. The results were saved in a secure database and later formatted as an excel file for data analysis in SPSS. This survey instrument was also tested and refined by colleagues affiliated with the Centre for Tourism Policy and Research at Simon Fraser University.

3.4.2.3 Participant Selection and Recruitment

The sampling frame was derived from three different sources. Initially, the Islands Trust distributed a survey participation request letter to 150 Canadian off-island property owners of Mayne Island (the non-Canadian off-island property owners were not included to simplify the distribution process). This was complemented by a mass email participant request letter sent to Mayne Island residents via the Mayne Island Telephone Directory that included some of the residents email addresses. It contained the email addresses of 269 residents. Finally, a survey request letter was distributed through the Mayne Island Integrated Water Systems Society member email list. It contained 149 members. Some overlap in potential respondents was perceived to exist amongst the three

distribution methods, but the respondents were only able to provide their perspectives once due to the restrictions that were set in the online survey software for the collection of the responses. About 18% of the survey requests distributed generated completed questionnaires³.

3.5 Data Analysis

Themes emerging from the evaluation of the key informant interviews were used to organize the results within the research questions. These themes included: a socio-demographic profile of the residents of Mayne Island; the current state of how water resources are managed; the impacts to water resources associated with non-permanent lifestyle migration; the differences in attitudes, behaviour and values of permanent and non-permanent residents concerning water resource conservation; and lastly, current water resource policy and planning efforts of the community.

For the purpose of this research six resident categories were initially developed based on the survey participant's residency on Mayne Island. (Table 9).

³ The response rate was calculated as follows: 150 off-island property owner request letters mailed + 269 Mayne Island Telephone Directory emailed requests + 149 MIIWSS member email requests divided by 100 completed surveys = 18%

Table 9. Mayne Island Resident Categories

Category	Description
Long term permanent resident	Resided on Mayne Island year-round for 5 years or more
Recent permanent resident	Resided on Mayne Island year-round for less than 5 years
Long term part-time resident	Resided on Mayne Island on most weekends and vacations year-round for 5 years or more
Short term part-time resident	Resided on Mayne Island on most weekends and vacations for less than 5 years
Long term seasonal resident	Resided on Mayne Island primarily between June and September for 5 years or more
Short term seasonal resident	Resided on Mayne Island primarily between June and September for less than 5 years

To compare responses from permanent and non-permanent residents, the six resident categories found in Table 9 were collapsed into two main groups. The first group included the long term permanent (resided on Mayne Island year-round for 5 years or more) and recent permanent residents (resided on Mayne Island year-round for less than 5 years) to form the permanent resident category. The second group included the remaining four resident groups found in Table 9 to form the non-permanent resident category. The majority of the questions were analyzed by comparing these two resident groups. However, for a few specific survey questions, the six resident categories found in Table 9 were collapsed into four resident categories to more closely analyze the differences amongst the permanent and non-permanent residents. This included the two permanent resident categories remaining separate, but based on limited sample sizes and analytical reasons, long and short term part-time residents were combined, and long and short term seasonal residents were combined. This analysis was used to better inform the outcomes of the research concerning policy directives and management options by analyzing the data with more detail and specificity of the

resident types (i.e. type of permanent or non-permanent resident related to time spent on the Island).

Several nonparametric techniques were used to analyze the survey data collected. First, frequency statistics revealed the distribution of the survey responses for all of the variables examined. Mean response scores were determined where appropriate. Second, Independent Samples T-test calculations were used to determine if significant relationships existed between the responses provided by the two targeted resident groups: permanent residents and non-permanent residents. Third, One-way ANOVA calculations were used to assess whether relationships exist between the four collapsed resident groups: long term permanent residents, recent permanent residents, part-time residents, and seasonal residents. Finally, Crosstabulation calculations in combination with Chi-Square tests were used to identify whether significant relationships existed between the resident groups. Only overall responses where significant differences at the 0.05 level existed were reported in the findings, unless otherwise stated. Additionally, open-ended responses provided by respondents were categorized into thematic groups and reported. They helped clarify interpretations of the more quantitative research findings.

3.6 Study Limitations

A number of limitations in this study have the potential to affect the validity of the results. These are provided to increase the transparency and caution the reader's use of the findings.

- While generalizations cannot be made based solely on this case study, it can be used for comparisons with other small island communities facing non-permanent lifestyle migrations and water resource issues.
- Key Informant Interview Limitations
 - Despite efforts to ensure that the participants had a clear understanding of the interview questions, there is still possibility of misinterpretation. Additionally, the researcher may have misinterpreted their responses. To counteract this possibility clarification from the key informants was sought as necessary.
 - It was occasionally difficult to clearly transcribe digitally recorded information. This was compensated by referring to the written notes that corresponded with the recorded information, or by seeking clarification from the participant. This was only necessary on approximately ten separate occasions.
- Resident Survey Limitations
 - Participants encountered technical issues with the use of the online format for the survey. This was compensated for by providing contact information of the researcher should problems arise. There were only two known instances of this occurrence.
 - The participants may have varied interpretations of the survey questions. This could also vary from the researcher's own interpretations.

- Using a web-based survey for this research requires that the sampled residents have access to the Internet. According to Dever et al. (2008), this bias can be compensated for through selecting participants from a well-defined group of individuals that have Internet access. The target group for this research were both off-island property owners and permanent residents of Mayne Island with existing internet services.
- The survey response rate was approximately 18%, and this is considered low. Therefore, it does not necessarily provide a full representation of the population.

CHAPTER 4: FINDINGS AND ANALYSIS

4.1 Introduction

This chapter presents the main findings emanating from the study's key informant interviews and the Mayne Island residential survey. The themes and findings identified in both investigations are presented collectively. The purpose of this study was to determine whether differences exist between permanent and non-permanent residents in their water use behaviour, attitudes and values, and to suggest how this can inform water resource management policy and planning. The chapter consists of three sections. First, a socio-demographic profile of the respondents is presented in addition to the 2006 Census data for Mayne Island. Second, lifestyle migrants to Mayne Island are described with respect to the perspectives of the key informants and the survey responses. Third, responses to the key informant interview findings and the resident survey results are presented in the context of the research questions.

4.2 Survey Respondents and Mayne Island Resident's Profiles

The permanent and non-permanent respondents of the resident survey provided information pertaining to their socio-demographic characteristics. These findings are compared to the 2006 Census data for Mayne Island (and/or British Columbia), which demonstrates the degree to which the survey is representative of the actual population of Mayne Island.

The majority of the respondents were 45 years of age or older (95%) (Table 10).

Table 10. Age Distribution of Resident Survey Respondents

Age Distribution	%
20 – 44	5
45 – 64	63
65 – 74	28
75+	4
N = 100	

This sample distribution has a similar correspondence to the age distribution of Mayne Island that was determined by the 2006 Census data (Statistics Canada, 2006) (Figure 4). According to the 2006 Census, the largest proportion (46%) of Mayne Island residents were between 45 and 65 years of age in 2006 (Figure 3). However, the sample distribution from the survey over represented this age category (63%) (Table 10).

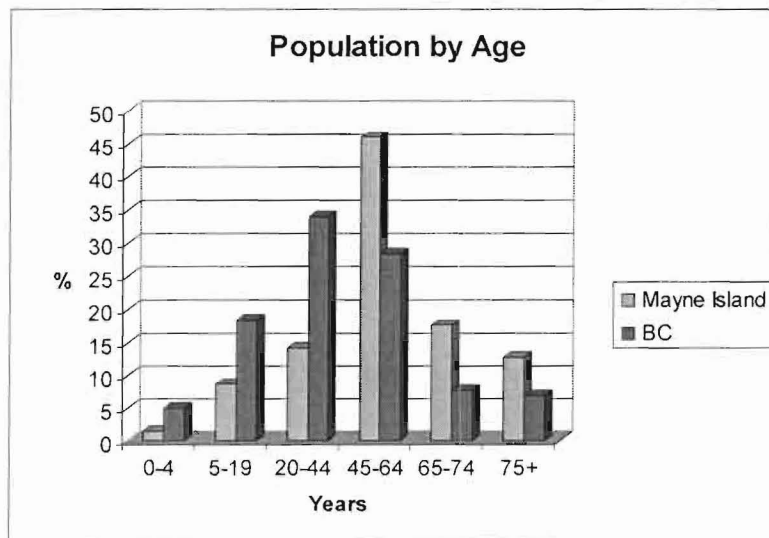


Figure 4. Comparing Age Distribution of Mayne Island and British Columbian Residents (Statistics Canada, 2006b; Statistics Canada, 2007)

Additionally, survey respondents were nearly equally distributed according to gender. About 51% of the survey respondents were male. The largest percentage of the respondents were academically well educated. For instance, about 45% held Graduate Degrees (Table 11). When compared to the 2006 Census, 6% of Mayne Island residents hold a Degree at the graduate level, while 16% of British Columbians have a University degree (Statistics Canada, 2006).

Table 11. Highest Level of Education of Respondents

Level of Education	%
Less than high school	3
Graduated high school	6
Post-secondary certificate or diploma	19
Degree undergraduate	27
Degree graduate	45
N = 100	

To demonstrate the recent changes in the population of Mayne Island and the degree to which migrations are related to second-home ownership, the 2006 Census data for Canada is presented. Between 2001 and 2006, Mayne Island experienced a relatively large increase in its population (27%), especially when compared with growth rates for British Columbia in general (5%) (Table 12) (Statistics Canada, 2006). Overall, 97% of the survey respondents owned homes on the Island. While the majority of the Island's residents are homeowners (86%), only about half of the total private dwellings are occupied by permanent residents (53%). The remainder are owned by seasonal or part-time residents (47%) (Table 12).

Table 12. Statistical Comparison of Mayne Island and British Columbia

Statistic Category	Mayne Island, BC	BC
2006 population	1,112	4,113,487
2001 population	880	3,907,738
2001-2006 population change	27%	5%
2006 private dwellings occupied by residents	589 owned 86% rented 14%	1,642,715 owned 70% rented 30%
2006 total private dwellings (includes seasonal, etc.)	1107	1,788,474
2001 total private dwellings	1095	-
2006 % private dwellings occupied by residents	53	-

Source: (Statistics Canada, 2006b; Statistics Canada, 2007)

4.3 Mayne Island's Lifestyle Migrants

Many definitions of 'lifestyle' or 'amenity' migrants exist. The findings of this research revealed that while these terms are interpreted in varying ways by different respondents, some common themes and perspectives emerge.

The key informant interviews suggested that lifestyle migrants are attracted to the Gulf Islands. An Islands Trust informant categorized them as being in one of two groups. The first group consists of those "...people who own a second hom[e] on the island, [and] live for most of the year elsewhere" (Key Informant 6). The length of stay for second-home owners ranges between weekend visits to up to six months (Key Informant 6). Often, friends and family members of the owners also use the second home throughout the year (Key Informant 6).

The second group of lifestyle migrants are those described by the same informant as people:

[w]ho have decided to move to the island permanently, but they've moved there because of the lifestyle and the amenities of the island,

as opposed to moving there because there is some other reason. They are not necessarily there because there is a job based on Mayne Island that they have come to (Key Informant 6).

Other key informants suggested that the area's "lifestyle migrants" could be categorized according to their socio-demographic features. Early retirees, or those individuals who are approaching the retirement stage comprise one group (Key Informants 2 & 5). These migrants are typically in their late 50s or early 60s, and move to Mayne Island because of their desire to escape the city, and use property that is more affordable (Key Informant 5). These lifestyle migrants are "...very active retirees, community-minded...more so than ever" (Key Informant 5). A second group of lifestyle migrants are younger families who use their second home primarily for recreational purposes. Some key informants suggested that this group has declined in prominence in recent years.

Overall, many key informants consider lifestyle migrants to be second-home owners, rather than permanent residents. The degree to which the second-home owners utilize their Mayne Island residence varies considerably. On Mayne Island, these people are considered 'tourists' or 'vacationers' due to the transient nature of their residency. In contrast, permanent residents are considered 'Islanders' (Key Informant 4). However, these second-home 'tourists' are viewed as having "...a connection to the Island" (Key Informant 4). While many second-home owners share similar 'true tourist' characteristics, they are often considered community members during their Island stays. 'True tourists' were categorized by the interviewees as being those who do not own property, but utilize commercial accommodations, and have shorter stays (Key Informant 8).

For the purpose of this research six resident categories were initially developed based on their residency on Mayne Island. Table 13 describes the reported residency status of the survey's respondents. The majority of the participants (57%) reported they were permanent residents. Another 28% indicated they were long term part-time residents, while a smaller group (15%) classified themselves as short term part-time and seasonal residents (Table 13).

Table 13. Respondent Resident Categories

Category	%
Long term permanent resident: (Resided on Mayne Island year-round for ≥ 5)	37
Recent permanent resident: (Resided on Mayne Island year-round for ≤ 5 years)	20
Long term part-time resident: (Resided on Mayne Island on most weekends and vacations year-round for ≥ 5 years)	28
Short term part-time resident: (Resided on Mayne Island on most weekends and vacations for ≤ 5 years)	8
Long term seasonal resident: (Resided on Mayne Island primarily between June and September for ≥ 5 years)	4
Short term seasonal resident: (Resided on Mayne Island primarily between June and September for ≤ 5 years)	3
N = 100	

The two primary groups used for analytical purposes were permanent and non-permanent residents. Permanent residents consisted of those respondents who classified themselves as either long or short term permanent residents. Non-permanent residents consisted of those respondents who classified themselves within the remaining four categories found in Table 13.

4.4 Water Resource Management on Mayne Island

This section highlights key findings from the research related to the following questions.

What is the current governance and management system for managing fresh water resources on Mayne Island?

- a. What are the water resource management strategies on Mayne Island?
- b. Who are the key stakeholders responsible for this management?

4.4.1 Water Sources for Mayne Island Residents

A variety of fresh water sources are used by Mayne Island residents. Overall, 12 community organized water systems (Water Districts) exist. Each has its own organizational and management system (Key Informant 7). Two of these systems are managed by the Capital Regional District; four are managed privately through societies, co-ops or strata holdings; and six are regulated under British Columbia Law as Improvement Districts (Mayne Island Integrated Water Systems Society, 2008). The majority of the Island's waterfront and shoreline properties are subject to Water District regulations and management. The Water District's can play a role in monitoring water consumption and promoting conservation amongst water users in their jurisdiction (Key Informant 3, 7 & 8). Property owners not within the boundaries of a Water District are typically located inland and access groundwater through private wells (Key Informant 3 & 5). They have full responsibility for managing their own water supply. Additionally, residents often have rainwater cisterns to supplement their fresh water supplies for exterior purposes.

Overall, about 26% of the respondents use a single well for non-drinking purposes, compared to 74% who use it for drinking water purposes (Table 14). However, permanent residents are significantly more likely (90%) to drink their well water than are non-permanent residents (56%) (Table 14).

Table 14. Single Well Fresh Water Use on Mayne Island

Single Well	Overall		Permanent residents		Non-permanent residents		Significance Value
	n	%	n	%	n	%	
Drinking Use	29	74	19	90	10	56	0.013
Source Use	10	26	2	10	8	44	
N =96 (based on Tables 14, 15, 16 combined)							

Additionally, a large number of the respondents (93%) use rainwater cisterns to supplement their water supply for non-drinking purposes (Table 15).

Table 15. Rainwater Cistern Fresh Water Use on Mayne Island

Rainwater Cistern	Overall		Permanent residents		Non-permanent residents		Significance Value
	n	%	n	%	n	%	
Drinking Use	28	0	16	0	12	0	0.090
Source Use	28	93	16	100	12	83	
N =96 (based on Tables 14, 15, 16 combined)							

About a third (29%) of the permanent residents who were using tap water distributed by a Water District do not drink their water from this source compared to 85% of the non-permanent residents (Table 16). Instead, these residents (10%) tended to purchase bottled water for drinking purposes.

Table 16. Water District Fresh Water Use on Mayne Island

Water District Supply	Overall		Permanent residents		Non-permanent residents		Significance Value
	n	%	n	%	n	%	
Drinking Use	61	77	35	71	26	12	0.156
Source Use	61	21	35	29	26	85	
N =96 (based on Tables 14, 15, 16 combined)							

4.4.2 Islands Trust

The local government for the Gulf Islands is the Islands Trust. As a community land planning and zoning authority, it deals primarily with land use issues (Key Informant 2). However, it does have an indirect influence over groundwater resources. Existing and potential second homes (and the homes of permanent residents) are subjected to land use bylaws established and enforced by the Islands Trust. The Official Community Plan (OCP) for Mayne Island outlines guidelines and intentions about future land use. It is established by the Mayne Island Local Trust Committee and Islands Trust planners with input from the community, other government agencies and the local First Nations (Key Informant 2). It specifies a number of policies concerning groundwater resources such as the following: subdivision approvals are subject to the proof of the availability of sufficient potable water to support the proposed development; areas identified as being limited in groundwater should not be developed; and subdivision approval or building construction is subject to the assessment of adequate sources of potable water, including impacts to the wells in the surrounding area (Key Informant 2; Islands Trust, 2007). In addition, the OCP includes issues that the community would like addressed by other agencies, such

as the Ministry of Environment. According to Key Informant 2, the Islands Trust lacks sufficient resources to directly address water management issues beyond their land use planning responsibilities. Currently, the legislated responsibilities over the resources needed to manage groundwater are not in place. This would require expanded legal and fiscal support (Key Informant 2).

4.4.3 Water Resource Management Stakeholders on Mayne Island

There are a number of authorities that play a role in the management of fresh water resources on Mayne Island. The degree of responsibility varies and Table 17 provides a brief description of each.

Table 17. Water Resource Management Stakeholders on Mayne Island

Water Management	Responsibilities
Water Districts	<ul style="list-style-type: none"> ▪ Distributes fresh water to community members through organized, legal water systems (Key Informant 7) ▪ Reports directly to Vancouver Island Health Authority (VIHA) concerning bacterial contamination outbreaks in water supply (Key Informant 3)
Capital Regional District (CRD)	<ul style="list-style-type: none"> ▪ Manages the Water Districts through establishing building regulations and codes for residential developments (Key Informant 2) ▪ Inspects buildings with respect to water supply and distribution (Key Informant 2) ▪ Manages two of the Water Districts on Mayne Island (Key Informant 8)
Volunteer Community Members	<ul style="list-style-type: none"> ▪ Volunteers to manage water systems and participates on the Water District Board of Trustees (Key Informant 8) ▪ Supports the CRD regulations of the Water District by participating on the organized Commission (Key Informant 8)
Vancouver Island Health Authority (VIHA)	<ul style="list-style-type: none"> ▪ Ensures water quality meets provincial legislation (Key Informant 3) ▪ Monitors Water Districts on a monthly basis (Key Informant 3)
Ministry of Community Services	<ul style="list-style-type: none"> ▪ Regulates Water Districts that provide water supply services to communities (Key Informant 3) ▪ Manages the governance and administration of Water Districts (Key Informant 3)
Islands Trust	<ul style="list-style-type: none"> ▪ Controls community land planning and zoning (Key Informant 2) ▪ Assesses groundwater capacity related to subdivision approvals and development (Key Informant 2) ▪ Develops the Official Community Plan (OCP) that includes guidelines concerning future land use and policies affecting fresh water and groundwater resources (Key Informant 2)

In summary, this section answered the research question regarding how the local governments of Mayne Island are managing water resources. First, the fresh water distribution mechanisms for the community were illustrated. This includes fresh water supply from either Water Districts or private wells, both able to be supplemented by rainwater cisterns. Second, current water management strategies of the Water Districts and Islands Trust were presented. This illustrated the lack of direct authority the Islands Trust has over the management of groundwater resources on the Island. Lastly, it described the key stakeholders responsible for this management: Water Districts; the Capital Regional District; community members; Vancouver Island Health Authority; the Ministry of Community Services; and the Islands Trust.

4.5 Perceived Water Resource Impacts Associated with Lifestyle Migration

This section highlights key findings from the research related to the following questions.

What perceived impacts do second-home migrants have on the quantity and quality of water resources on Mayne Island?

- a. How do their perceived water use patterns compare to those of permanent residents?
- b. What are the perceived current and potential water quality and quantity issues confronting Mayne Island, and how are these issues affected by non-permanent migrants?

4.5.1 Population Growth and Second-Home Lifestyle Migration

Existing literature suggests that there is a strong link between population growth and water resource quality and quantity issues in many Island

destinations. Specific aspects of this relationship were contextualized by Mayne Island informants.

While the Gulf Islands have experienced limited population growth over the past decade, there is an expectation that as the 'baby boomers' move into their retirement years, there will be increased growth due to their interest in purchasing second homes. Both water quality and quantity conditions are expected to worsen this anticipated growth (Key Informant 1).

A lifestyle related migration cycle is perceived to exist on Mayne Island. It is perceived that many lifestyle migrants purchase property with the intention of eventually retiring there. However, approximately "every ten to twenty years...a cycle of older retirees mov[e] back to the urban areas" (Key Informant 5). One respondent described this phenomenon as follows:

As people do retire onto the Island into their second homes, the circle of life also happens on the other end, where the people who were the previous retirees are moving off or passing away.... (Key Informant 4).

Another respondent suggests that despite the intentions of some second-home owners to retire to Mayne Island, the reality is that many do not:

...when you come to live here full-time and you realize the lack of facilities..., some people get fed up and after two or three years they move back to the city (Key Informant 3).

According to the resident survey findings, the majority of part-time and seasonal residents will not become permanent residents (40%) (Table 18). However, about a quarter of them (24%) anticipated becoming full-time permanent residents in the future (Table 18). Another third (36%) were uncertain about such a move (Table 18).

Table 18. Future Residency of Non-permanent Residents on Mayne Island

Future Residency	n	%
Will not become a full-time resident in the future	18	40
Will become a full-time permanent resident in the future	11	24
Uncertain of becoming a full-time permanent resident in the future	16	36
N = 45		

An aging population puts pressures on local services. Residents in the Water Districts volunteer to manage and run the systems. However, increasing real estate prices have escalated the displacement of younger people (Key Informant 6, 8 & 7). As a consequence, the ability of the community to find willing and able-bodied volunteers to run the systems is threatened. The transient nature of the population limits the number of year-round individuals available to volunteer their time. Most of the Water District Board of Trustees is made up of five volunteers, but the number depends largely on the size of the Water District (Key Informant 7). The degree to which the volunteers participate varies between each Water District; some may contribute 10 hours a month, while others may contribute up to 120 hours a month, depending on their level of commitment and the issues needing to be addressed (Key Informant 7). The Water Boards have a few paid staff that work on a part-time basis; operators and maintenance personnel, and sometimes administrators and bookkeepers (Key Informant 7). The average number of Water District Board meetings is about 8 to 10 times in a year, but this largely depends on the state of the Water District (Key Informant 7). It would be an asset if the volunteers had a basic knowledge of

how a Water District operates, but this is not required. It is more important that they have a willingness to learn (Key Informant 7).

4.5.2 The Seasonality of Second-Home Tourism

It is apparent the addition of second-home owners to Mayne Island results in a number of water resource management challenges for the community. Seasonal visitor traffic to the area is expected to remain fairly constant (Key Informant 4). Mayne Island has a permanent population of approximately 1,000 residents. During the summer months, the population escalates to between 2,500 and 3,000 residents, particularly on long weekends (Key Informant 3). This peaking of traffic is a long standing pattern that is expected to persist. According to the resident survey findings, part-time and seasonal residents are most likely to spend the majority of their time on Mayne Island between June and August (33% of Total Days) (Table 19). They spent an average number of 78 days on the Island in 2007.

Table 19. Mayne Island Non-permanent Residency Patterns In 2007

Months	% Total Days Spent on Mayne Island
June to August	33
September to October	21
April to May	20
November to December	18
January to March	13
Average number of days spent on the Island for the year 2007 = 78	
N =44	

The addition of non-permanent residents to Mayne Island during the summer months increases demands placed on available groundwater during that time. No information regarding the actual capacity of the aquifers is available. This is largely because no licensing of groundwater extraction exists in British Columbia (Key Informant 1). This makes it incredibly difficult to “project how sustainable [the] resource is, but population will continue to increase...as [Mayne Island] is a very attractive bedroom community to Vancouver” (Key Informant 1).

However, there is some perception amongst permanent residents that their seasonal counterparts may be decreasing availability and sustainability of water resources:

I do see that the tourism and the summer residents have been known to be a threat to the Islands’ water resources, but the magnitude of it I don’t think the verdict is out yet. People are certainly worried, a lot of local residents are really worried....(Key Informant 1).

[A]necdotally you hear concerns from people who live on the Island year-round that people who come to the Island and who aren’t familiar with the finite nature of the water resources don’t tend to take that into account when they are using water (Key Informant 6).

Other respondents described the effect of the seasonal flow of the lifestyle migrants during the summer months on the water resources of the Island:

...[T]he bulk of our population are weekend or summer residents. ...[I]n some areas, ...[out of] approximately 300 lots, approximately 60 of those lots are occupied on a year-round basis. ...[In] July and August...[there is] almost a 100 % occupancy of that area.... So, of course you have a phenomenal impact on the water resources July 1 and that carries on into Labour Day (Key Informant 5).

A lot of those cottages...may be rented out, but a lot of them will be used by family and friends as well. So, whether an owner of a cottage is there all summer is not as much the point, it is the fact that it’ll be used all summer (Key Informant 5).

The impact of these migrants on water supplies is aggravated due to the limited storage capacity in the Water Districts. One respondent described this situation:

Within our Water District...we do not have sufficient storage..., if we had more people living here in the summer, for longer periods in the summer, [we would have to increase our storage]....(Key Informant 3).

In addition, many of the Water District systems require material and infrastructure upgrades. As a consequence, they are currently operating at less than full capacity (Key Informant 4). This failing infrastructure is not capable of meeting current demands, let alone handling growing flows of migrants (Key Informant 8).

4.5.3 Water Resource Use Behaviour on Mayne Island

Many studies elsewhere (Gössling, 2001; Garcia & Servera, 2003; as cited in Gössling, 2003; United Nations, 1999) suggest that 'tourists' typically use a greater amount of water than permanent residents. This type of behaviour is probably context specific. In this study, non-permanent residents may have longer-term attachments to their second-home destinations and as a result might behave more responsibly with respect to water use. Opinions vary on the extent of consumption by various resident groups. For instance, a resident's need for exterior water use is considered by some Islander's to be a determining factor in the amount of water consumed. Some informants suggest that permanent residents tend to have a greater need for exterior water use than more transient lifestyle migrants. They are perceived to be more likely to have water use

intensive amenities such as pools, hot tubs, or gardens (Key Informant 5 & 4). Landscaping and gardening practices typically require significant amounts of water for their sustenance. According to many of the key informants, non-permanent residents are less likely to have gardens than permanent residents because of the amount of time required for upkeep (Key Informant 4).

Conversely, other respondents suggest that transient lifestyle migrants are more apt to pursue heavier water consumptive activities related to cleaning outdoor recreational equipment such as boats and kayaks (Key Informant 7). In addition, one informant believed they were “not as conscious of the number of times [they] do laundry [and take] longer showers” (Key Informant 7). According to Key Informant 5, these residents are less likely to install water efficient services due to the limited amount of time they spend on the Island:

I can't see a seasonal home owner rushing out to buy a low flush toilet....[I]f you are only here for two to four weeks...you are paying on a year-round basis for [your] water you really feel a sense of entitlement.

This behaviour was especially believed to exist if non-permanent residents were connected to a water system rather than using a private well (Key Informant 7). In contrast, some informants felt that residents on a private well faced the challenges of managing their own water supply which in turn created greater awareness of water supply issues that might have existed otherwise (Key Informant 3). Properly maintaining a private well requires a great deal of stewardship. As a consequence, residents not connected to a more centralized Water District system were perceived by some informants to be more attuned to water conservation issues (Key Informant 5).

This study's survey results indicated that the most frequently used types of water consuming practices were linked to maintaining non-native flower and vegetable gardens. Overall, about half of the respondents indicated they maintained a non-native flower garden (51%) and/or a vegetable garden (42%) (Table 20). Permanent residents were significantly more likely to have such water consuming gardens (66% and 60% respectively) than non-permanent residents (30% and 18% respectively) (Table 20). However, a large proportion of both permanent (84% and 81% respectively) and non-permanent (74% and 67% respectively) residents indicated they had native and drought-resistant plantings in their gardens. In addition, the survey responses identified that hot tub and pool amenities were not common facilities in either permanent (13% and 4% respectively) or non-permanent (7% and 0% respectively) homes.

This study's survey results suggest that overall the most frequently used types of water conserving facilities were linked to low-flow showerheads (81%) and toilets (≤ 6 L = 60%; Dual flush = 26%) (Table 20). However, significant differences existed between permanent and non-permanent residents with respect to using many other water facilities. Permanent residents were significantly more likely to have an eco-efficient dishwasher (62%) and washing machine (67%) than non-permanent residents (24% and 33% respectively) (Table 20). They were also significantly more likely to have installed an irrigation system connected to a rain barrel (31%) or an underground sprinkler system (12%) and/or to use manual watering mechanisms for garden or lawn care (95%) than non-permanent residents (Table 20).

Table 20. Inventory of the Fresh Water Use Facilities in Mayne Island Homes

Fresh Water Use Facility or Practice		Overall		Permanent residents		Non-permanent residents		Significance Value
		n	%	n	%	n	%	
Hot tub		96	10	53	13	43	7	0.320
Pool		94	2	53	4	41	0	0.209
Low flow shower-heads		98	81	55	84	43	77	0.250
Low-flow toilets	≤ 6L	96	60	54	63	42	57	0.843
	Dual flush	87	26	49	31	38	21	0.316
Eco-efficient dishwasher		88	46	50	62	38	24	0.002
Eco-efficient washing machine		94	52	54	67	40	33	0.002
Non-native flower garden		96	51	56	66	40	30	0.001
Vegetable garden		95	42	55	60	40	18	0.000
Native flower garden		94	80	55	84	39	74	0.152
Drought-resistant plantings		96	75	54	81	42	67	0.163
Drip or trickle irrigation system		93	26	52	33	41	17	0.087
Drip irrigation connected to a rain barrel		92	23	51	31	41	12	0.029
Sprinkler – underground system		92	7	51	12	41	0	0.023
Manual watering – buckets, hose or watering cans		98	89	57	95	41	80	0.028
N =100								

The survey results suggest that overall, both permanent and non-permanent residents are willing to implement various water conservation practices, or have already done so (Table 21). However, a significant difference existed for the implementation of xeriscaping at permanent and non-permanent homes. It was apparent that permanent residents were marginally significantly

more likely to have already implemented xeriscaping practices (mean score = 5.24) than non-permanent residents (mean score = 4.76) (Table 21).

Table 21. Respondent Willingness to Implement Water Conservation Practices

	Overall		Permanent residents		Non-permanent residents		Significance Value
	n	Mean	n	Mean	n	Mean	
Xeriscaping (Native and drought-tolerant gardens)	96	5.03	54	5.24	42	4.76	0.052
Low-flow toilets	99	5.21	57	5.26	42	5.14	0.617
Eco-efficient washing machine	96	4.96	57	5.14	39	4.69	0.096
Eco-efficient dishwasher	90	4.82	54	5.04	36	4.50	0.088
Low-flow shower head	98	5.48	56	5.50	42	5.45	0.825
Fixing leaks	97	5.44	56	5.46	41	5.41	0.745
Water metering	93	4.33	52	4.31	41	4.37	0.869
Rainwater harvesting system	97	5.29	55	5.44	42	5.10	0.075
Grey Water Recycling	97	4.47	57	4.60	40	4.30	0.156
The rating scale is from 1-6, from 1 = Not at all willing to 6 = Have already done so							
N = 100							

Several respondents identified constraints that prevented them from installing water conservation practices. These constraints were largely: monetary; legal and health-related; time commitment related; awareness related; or the respondent had a lack of desire for the service.

However, according to Key Informant 8, some lifestyle migrants were upgrading their original summer cottages and investing more substantially in water related amenities that were not appropriate to Island circumstances:

... they will put in two dishwashers and a Jacuzzi and a bathtub in every room. ...Or, they will tear out the native vegetation and plant rhododendrons which are the ones [that] need a lot of water...and if that means they have to get more water from the local Water Works District,... the fee is not big enough that it is any constraint to them....(Key Informant 6).

...Saltspring [Island] has had an awful time with some of their really...wealthy people that go there and they are using three or four thousand gallons of water a day in a small water system....(Key Informant 7).

Notwithstanding these perspectives, key informants felt that opportunities did exist for the residents to install water-saving appliances and felt that this trend was emerging as upgrades to homes progressed. The survey findings discovered that overall, the respondents felt it was important (92%) to personally increase their fresh water conservation actions on Mayne Island over the next five years (Table 22).

Table 22. Respondent Importance Rating to Increase Personal Water Conservation Actions

	Overall			Permanent residents			Non-permanent residents			Significance Value
	n	Mean	%	n	Mean	%	n	Mean	%	
Importance of personally increasing fresh water conservation actions	100	4.35	92	57	4.30	90	43	4.42	95	0.481
The rating scale is from 1-5, from 1 = Not at all important to 5 = Very important										
N = 100										

4.5.4 Water Quality and Quantity Issues on Mayne Island

Two main water resource challenges exist in the Gulf Islands. The first involves ensuring water quantity. While information concerning the adequacy of existing supplies of water is limited, there is a growing concern about increasing rates of consumption and the lack of storage facilities to meet the increasing demand (Key Informant 1). The majority of the fresh water needed for domestic consumption is derived from groundwater (Key Informant 1). The BC Ministry of Environment has a number of Gulf Island observation wells that are used to monitor groundwater levels on an annual basis. None of these suggest that overall water table levels are declining. Only one of them has declined on Mayne Island (Key Informant 1). This single case may be due to either climatic effects or unsustainable levels of groundwater extraction for human use (Key Informant 1). Key Informant 8 suggested that future population increases might create greater water scarcity:

...[O]ver time as consumption rates...rise [and] the infill of previously developed properties or lots [occurs],...we will be experiencing an increased demand on a continual basis. And...from [past] experience...there is no substantial elasticity in the supply and overtime...there has been a drop in the water table....(Key Informant 8)

The second major challenge concerns water quality. This is perceived to be a larger issue for residents. Interestingly, a link exists between the quality and quantity of groundwater:

...[I]t is all connected together but quantity is not as front and centre as quality, even though it is causing the quality degradation and as soon as you start to get a saline well, you can't use it for anything (Key Informant 1).

The primary cause for groundwater contamination is saltwater intrusion. A majority of the Island's residential properties are situated within the coastal zone where saltwater-freshwater interfaces are typically at very shallow depths (Key Informant 1). The freshwater aquifers sit on fresh water lenses that float on top of the saltwater. In such cases, the fresh water-saltwater interface is maintained by a constant flow of fresh water into the sea (Key Informant 1 & 3). This is a delicate balance that requires the attention of residents who live in such environments. Saltwater intrusion is both a current and a potentially greater threat for Mayne Island (Key Informant 1, 3 & 7). Over-pumping of private and Water District wells can increase the risk of saltwater contamination of fresh water supplies, which cannot be reversed (Key Informant 1 & 3). Mayne Island has had numerous incidents of saltwater intrusion and the potential for further incidents exists (Key Informant 4).

Other water quality issues include increases in coliform counts, and the emergence of naturally occurring contaminants such as arsenic, manganese and iron in the wells. Coliform contamination is mostly attributed to septic systems leaking their by-products into existing wells. This form of contamination typically occurs in older septic fields that have not been maintained or upgraded (Key Informant 2). New septic fields are installed according to more demanding regulations, including specifications concerning set backs from water resources (Key Informant 2). The incidences of such contamination are more a result of previous developments and associated with older regulations.

There are incidents of arsenic contamination in a number of the Mayne Island wells (Key Informant 7). The lowering of water tables due to water consumption increases the arsenic content during the end of the drought season and some wells have to be shut down (Key Informant 7). In such cases, residents are compelled to find alternative methods for accessing fresh water until the well can be re-opened.

According to the resident survey, permanent and non-permanent residents of Mayne Island have similar opinions about the quality of Mayne Island's water supply. Overall, the majority of the respondents feel Mayne Island's water is satisfactory (78%) (Table 23). However, about 68 percent of them believe the sustainability of Mayne Island's supply of high quality groundwater is in jeopardy (Table 23). Additionally, the majority of the respondents were unsure whether saltwater intrusion (35%), septic contamination (38%), and arsenic, iron and manganese contamination (42%) were growing challenges to Mayne Island's groundwater supply (Table 23).

Table 23. Respondent Perceptions of Water Quality on Mayne Island

Perception of Water Quality	Overall			Permanent residents		Non-permanent residents		Significance Value
	n	% Agree	% Unsure	n	% Agree	n	% Agree	
The quality of Mayne Island's water is satisfactory	100	78	3	57	79	43	77	0.444
The sustainability of Mayne Island's supply of high quality groundwater is in jeopardy	100	66	15	57	63	43	74	0.094
Saltwater intrusion is a growing challenge to Mayne Island's fresh water supply	100	53	35	57	61	43	42	0.224
Septic contamination is a growing challenge to Mayne Island's fresh water supply	99	43	38	56	46	43	40	0.230
Arsenic, iron and manganese contamination are growing challenges to Mayne Island's fresh water supply	99	42	42	56	45	43	37	0.084
N = 100								

Overall, the majority of the respondents (70%) felt that there had been no change in Mayne Island’s water quality over the past five years (Table 24). A large percentage of permanent (75%) and non-permanent residents (63%) reported that their water quality supply has remained constant within this time period (Table 24). However, non-permanent residents were significantly more likely (26%) than permanent residents (5%) to be uncertain of the state of their fresh water supply (Table 24).

Table 24. Perceived Changes in Water Quality on Mayne Island

State of Water Quality	Overall		Permanent residents		Non-permanent residents		Significance Value
	n	%	n	%	n	%	
Increased	7	7	5	9	2	5	0.033
Decreased	9	9	6	11	3	7	
Remained Constant	70	70	43	75	27	63	
Uncertain	14	14	3	5	11	26	
N = 100							

Research in the Gulf Islands suggests that the quantity and quality of groundwater is affected by climate change. Impacts from this phenomenon could potentially decrease the available summer fresh water supply. This is especially the case with respect to reductions in recharge capacity and its consequences on the amount of water that infiltrates the ground annually (Key Informant 1). Early climate change projections suggest that there will be an increase in average precipitation during the winter months (Key Informant 1). However, this precipitation could occur as:

...very intense rain events. Even though the average precipitation for a month may increase, the fact that it is going to increase over

very short intervals, like a two hour severe rain storm, that actually results in less groundwater infiltration (Key Informant 1).

In addition, climate change may induce sea level to rise. It is projected to increase approximately a meter. This could submerge portions of Mayne Island and escalate saltwater intrusion impacts on fresh water wells (Key Informant 1). These effects could exacerbate seasonal migration pressures on water quality and quantity.

In summary, this section answered the research question regarding the perceived impacts of non-permanent lifestyle migrants have on the quality and quantity of water resources on Mayne Island. First, the population trends for the Island were presented. The findings suggest that the Island's population is comprised of a large percentage of aging non-permanent residents as younger people move from the Island. This is problematic for the management of the Water Districts that require able-bodied volunteers on a year-round basis. Second, the effects of the seasonality of second-home migrants were outlined. This demonstrated that increased population during drier, summer months places specific pressures on the Island's water resources and its management. Third, the water resource use behaviour of permanent and non-permanent residents was identified. A comparison was drawn between these resident groups and demonstrated that few significant differences do exist. Fourth, the existing water quality and quantity issues Mayne Island residents face were highlighted. The two more pressing issues identified were incidents of saltwater intrusion and the lack of water storage facilities. The water consumption habits of residents, particularly those not using water conservation facilities or services, may

increase such issues. Overall, residents were satisfied with water quality but believe that its sustainability is in jeopardy.

4.6 Resident Water Resource Values and Attitudes

This section highlights key findings from the research related to the following questions.

Do differences exist in the values and attitudes of non-permanent and permanent residents with respect to water resources and conservation?

- a. Do differences exist in the awareness and participation levels of permanent residents and second-home migrants with respect to water conservation?
- b. Do divergent viewpoints exist amongst the community members concerning water resource management issues?

4.6.1 Water Resource Conservation Awareness and Behaviour

Existing literature suggests that tourist behaviour and attitudes toward water resources are typically not conservation-minded in island destinations (Christensen & Beckmann, 1998; Garcia & Servera, 2003; as cited in Gössling, 2003; United Nations, 1999). This perspective appears to prevail on Mayne Island. However, there is a perception that second-home migrants are increasing their awareness of water conservation issues. One key informant commented:

I think your [second-home tourists]...are becoming more aware of water use and impacts on the environment, especially being that a lot of them are coming over here for...the environment, the nature, and those aspects of it (Key Informant 4).

This informant also emphasized that second-home tourism was better for the community from a water conservation perspective compared to more transient visitors (Key Informant 4).

The four resident groups that the respondents assigned themselves to in the survey were used to compare the motivation behind the respondents' migration to Mayne Island. Overall, natural factors were rated as the most important driver (mean score = 4.42) of the respondents decision to come to Mayne Island (Table 25). This score was significantly higher for recent permanent residents (mean score = 4.70) and part-time residents (mean score = 4.77) than long term permanent residents (mean score = 3.82) (Table 25).

Overall, recreation was rated as the second most important driver (mean score = 3.23) of their decision to come to the Island (Table 25). Part-time residents were significantly more likely to move to Mayne Island due to recreation motivators (mean score = 3.66) than long term permanent residents (mean score = 2.50) (Table 25).

Overall, tourism motivators had a mean importance rating of 1.89 (Table 25). Part-time residents were significantly more inclined to move to Mayne Island because of tourism factors (mean score = 2.41) than long term permanent residents (mean score = 1.44) (Table 25). However, both of these drivers were rated quite low in importance.

Other decision motivators for residents to reside on the Island were social, economic and cultural reasons (Table 25). However, for the majority of the respondents these motivators were rated as being of little importance to migration decisions.

Table 25. Reported Respondent Motivations for Residing on Mayne Island

Reasons to Reside on Mayne Island	Overall		Long term permanent residents		Recent permanent residents		Part-time residents		Significance Value	
	n	Mean	n	Mean	n	Mean	n	Mean	Mean Diff-erence Sig. Score	Overall Level of Signifi-cance
Recreation reasons	90	3.23	28	2.50	20	--	35	3.66	0.004	0.005
Tourism reasons	87	1.89	27	1.44	19	1.47	34	2.41	0.020	0.011
Natural factors	95	4.42	33	3.82	20	4.70	35	4.77	0.031 0.015	0.001
Economic factors	87	1.89	28	2.00	19	2.47	33	1.39	--	*0.039
Social factors	91	2.19	31	2.42	19	2.00	34	1.91	--	0.241
Cultural factors	95	2.58	27	2.33	18	2.89	34	2.56	--	0.482
The rating scale is from 1-5, from 1 = Not at all important to 5 = Very important *The Post Hoc tests did not reveal significance amongst the resident groups, but revealed an overall significance value N = 100										

Some key informants suggested that residents migrating from urban areas may lack awareness of the water resource vulnerability associated with a small island. The perception is that they are quite removed from their water source and are less likely to have experienced water shortages or major water quality issues at their permanent residences (Key Informant 7). According to one informant:

...[P]eople who are used to the virtual unlimited water supplies of say Greater Vancouver or Greater Victoria, I don't think their concern is as high as some people who may have experienced this rural kind of lifestyle....(Key Informant 8).

As a result, they believed their behaviour toward water use may be less conservation-oriented. Similarly, they felt that residents connected to Water

Districts might be less aware of the state of their water supply. One respondent commented on this possibility:

Those that bought within a [Water] District I would say [are] less [aware]...because much like a city they think they are remote from the source...therefore you don't have to be aware of the source and....It is a way of living in the city that when you bring it with you it doesn't fit the Island because we are really self reliant in all our resources (Key Informant 7).

Key informants indicated that local Water Districts were challenged in their ability to promote water conservation. The temporary duration of many non-permanent migrants were considered problematic to increasing conservation practices:

...their feeling is that "we are only here for four or five days and we will use as much water as we feel like because it is such a temporary thing"....(Key Informant 8).

In contrast, permanent residents were perceived by a number of the key informants to have a greater awareness of the vulnerabilities of their water resources than other residents (Key Informant 1, 3, 4 & 5). They were seen to have found ways of conserving their water supply. As one key informant suggested:

...[they] know very well that their groundwater is a limited resource and it does not come from Mt. Baker,...so they are very savvy in regard to...conservation efforts....(Key Informant 1).

Additionally, permanent residents were also perceived by a number of key informants to have a greater tendency to participate in community water conservation events and provide information to others on how to improve their

contributions to water resource sustainability⁴ (Key Informant 1, 4, 5, 6 &7).

However, some key informants suggested that not all permanent residents had a strong awareness of water resource conservation issues, or a full understanding of the most appropriate practices:

There are always some people that don't want to hear anything about it,...[and believe that] it is not their problem....(Key Informant 1).

Survey findings suggested that permanent and non-permanent residents have similar opinions concerning the factors that put undue pressures on the quality and quantity of Mayne Island's fresh water supply. Overall, the majority of the respondents believe that limited citizen understanding of methods for conserving water supplies puts the greatest pressure on water quality and quantity (mean score = 4.24) (Table 26).

⁴ Water resource sustainability can be defined as "the maintenance of a desired flow of benefits to a particular group or place, undiminished over time,...[in which] benefits to all current users be maintained, without reducing benefits to other users, including natural ecosystems,... [and doneso] without affecting the ability to provide comparable benefits into the future" (Gleick, 1998, p. 573)

Table 26. Survey Respondent Perceptions of Water Quality and Quantity Pressures

Water Quality and Quantity Pressure Factors	Overall		Permanent residents		Non-permanent residents		Significance Value
	n	mean	n	mean	n	mean	
Limited citizen understanding of methods for conserving water supplies	100	4.24	57	4.30	43	4.16	0.400
Excessive use of water for hot tubs and pools	100	3.59	57	3.58	43	3.60	0.913
Excessive use of water for lawn and garden irrigation	100	3.84	57	3.89	43	3.77	0.542
Excessive use for washing vehicles (boats, cars, other recreational vehicles/ equipment)	100	3.61	57	3.72	43	3.47	0.299
The rating scale is from 1-5, from 1 = Not at all significant to 5 = Very significant							
N = 100							

Overall, the respondents believe the following water user groups put the greatest pressures on water resources: summer visitors (mean score = 4.18); B&B owners and their visitors (mean score = 4.04); short term seasonal residents (mean score = 3.95); and short term part-time residents (mean score = 3.85). However, the perspectives on the relative pressures each group exerted varied significantly between resident types.

Part-time residents were significantly more likely to perceive that long term (mean score = 3.28) and recent permanent residents (mean score = 3.75) caused the greatest stress (Table 27).

Long term permanent residents were significantly more likely to perceive that short term part-time residents (mean score = 4.17) inflicted the most pressure on fresh water resources (Table 27).

Additionally, long term permanent residents were significantly more likely to perceive short term seasonal residents (mean score = 4.32) inflicted the most pressure (Table 27).

Table 27. Respondent Perceptions of Resident Groups Exerting Most Pressure on Water Resources

Water User Group	Overall		Long term permanent residents		Recent permanent residents		Part-time residents		Significance Value	
	n	Mean	n	Mean	n	Mean	n	Mean	Mean Difference Test Score	Overall Level of Significance
Long term permanent residents	99	2.80	36	2.47	20	--	36	3.28	0.014	0.009
Recent permanent residents	100	3.44	37	--	20	2.80	36	3.75	0.022	0.011
Short term part-time residents	98	3.85	35	4.17	20	3.80	36	3.67	--	0.037
Short term seasonal residents	99	3.95	37	4.32	19	--	36	3.69	0.015	0.006
The rating scale is from 1-5, from 1 = Not at all significant to 5 = Very significant										
N = 100										

Overall, the majority of the respondents believe that over the past five years there has been an increase in the need for water conservation practices on Mayne Island (mean score = 4.27) (Table 28).

Table 28. Respondent Perceptions of Changing Need for Increased Water Conservation Practices over Past 5 Years

	Overall		Permanent residents		Non-permanent residents		Significance Value
	n	mean	n	mean	n	mean	
The need for water conservation practices over the past five years has increased	98	4.27	57	4.19	41	4.37	0.262
The rating scale is from 1-5, from 1 = Not at all important to 5 = Very important							
N = 98							

If free information were available concerning water conservation techniques, the majority of the respondents were interested in obtaining such information (Table 29). However, non-permanent residents were significantly more likely to want information concerning low flow toilets (80%) than permanent residents (60%) (Table 29).

Table 29. Respondents Interest in Receiving Free Water Conservation Information

Water Conservation Topic	Overall		Permanent residents		Non-permanent residents		Significance Value
	n	%	n	%	n	%	
Low-flow toilets	95	68	55	60	40	80	0.038
Eco-efficient washing machine	95	64	55	56	40	75	0.061
Eco-efficient dishwasher	94	56	54	52	40	63	0.303
Low-flow appliances (i.e. showerheads)	93	63	54	56	39	74	0.063
Fixing leaks	93	68	55	69	38	66	0.738
Water metering and pricing schemes	94	64	53	57	41	73	0.097
Rainwater harvesting systems	98	84	57	81	41	88	0.348
Grey water systems	97	87	56	89	41	83	0.364
Xeriscaping (Native and drought-tolerant gardens)	94	80	54	76	40	85	0.279
N = 100							

Several key informants suggested that differences exist between second-home migrants and permanent residents concerning their values, attitudes and behaviours toward water use and conservation. Essentially they suggested that the more time residents spent on the Island, the more conscious and aware they became of water conservation issues (Key Informant 2, 3, 6, 7 & 8):

I think people who have had any sort of period of time on the Islands, whether it is seasonal or permanent, are very conscious of water and their dependency on either groundwater or these water systems and the water systems themselves are dependant on wells, and groundwater. Any newcomer, whether permanent or seasonal, may not have the same awareness (Key Informant 2).

The survey results identified that the majority of the respondents are more likely to have an ecocentric⁵ view of the water resources on Mayne Island. However, significant differences in their responses were apparent between permanent and non-permanent residents (Table 30).

Overall, the respondents disagree with the statement: “water scarcity will not be an issue in the future” (mean score = 1.47) (Table 30). However, permanent residents are significantly more likely to agree with this statement (mean score = 1.66) compared to non-permanent residents (mean score = 1.21) (Table 30).

Overall, the respondents tend to agree with the statement: “the most effective way of preventing water exhaustion is to use it only when absolutely necessary” (mean score = 3.70) (Table 30). However, non-permanent residents are significantly more likely to agree with this statement (mean score = 4.12) than permanent residents (mean score = 3.39) (Table 30).

Overall, respondents agree with the statement: “water conservation is necessary to ensure both human and ecosystem needs are met for present and future generations” (mean score = 4.19) (Table 30). However, non-permanent residents are significantly more likely to agree with this statement (mean score = 4.58) than permanent residents (mean score = 3.89) (Table 30).

⁵ Ecocentric can be described as an ethic where “nature has moral consideration because it has intrinsic value, value aside from its usefulness to humans” (Kortenkamp & Moore, 2001, p.262).

Table 30. The NEP-HEP Scale Modified to Measure Water Resource Attitudes

Environmental Attitudes	Overall		Permanent residents		Non-permanent residents		Significance Value
	n	Mean	n	Mean	n	Mean	
1. There is much water available on Mayne Island. We just have to supply it to our homes.	100	1.89	57	1.98	43	1.77	0.375
2. Water is a very cheap resource, that should be available free of charge.	100	1.99	57	2.04	43	1.93	0.677
3. Science and technology will solve any existing or potential water scarcity issues on Mayne Island.	100	2.07	57	2.00	43	2.16	0.477
4. Science and technology will solve any existing or potential water quality issues on Mayne Island.	100	2.60	57	2.49	43	2.74	0.334
5. Drinkable water is an unlimited resource on Mayne Island.	100	1.42	57	1.49	43	1.33	0.314
6. Water scarcity is not a current issue on Mayne Island.	99	1.64	57	1.77	42	1.45	0.082
7. Water scarcity will not be an issue on Mayne Island in the future.	98	1.47	56	1.66	42	1.21	0.014
8. Drinkable water on Mayne Island will exhaust if we do not take efforts to conserve it.	99	4.08	56	3.89	43	4.33	0.082
9. The most effective way of preventing water exhaustion on Mayne Island is to use it only when absolutely necessary.	100	3.70	57	3.39	43	4.12	0.002
10. Water conservation is necessary to ensure both human and ecosystem needs are met for present and future generations.	100	4.19	57	3.89	43	4.58	0.008
The rating scale is from 1-5, from 1 = Strongly Disagree to 5 = Strongly Agree							
N = 100							

4.6.2 Community Cohesion

Community social cohesion⁶ is an important asset in promoting water conservation and long term water resource sustainability. A lack of social cohesion between permanent residents and non-permanent migrants can weaken efforts to sustain water resources. One respondent commented that on Mayne Island stronger social cohesion existed within permanent resident groups than between them and non-permanent lifestyle migrants:

...[U]nless the lifestyle or amenity migrants immerse themselves into [community] activities, and that is more difficult for them to do.....I don't feel there is going to be the same kind of cohesion [that exists]...amongst the full-time Islanders (Key Informant 6).

However, key informants suggested that bonds can still be formed between these resident groups. They felt that due to the small size of the Island, peer pressure to actively conserve water resources is sometimes easier to generate. Respondents commented that significant peer pressure exists to promote water conservation amongst transient and permanent neighbours:

You still form community....[T]hat is part of the Island...and your neighbour is your neighbour whether they are there for only two weeks or not...(Key Informant 4).

Water use associated with outdoor activities such as lawn watering and vehicle washing is particularly subject to restrictions during the summer months. Each Water District has its own exterior water use regulations and neighbourhood peer pressure assists in enforcing such restrictions. For example, with respect to washing cars on the Island:

⁶ Community social cohesion can be defined as "cohesive community relationships with high levels of participation in communal activities and public affairs, and high levels of membership of community groups" (Marmot & Wilkinson, 2006, p. 162)

Car washes I think are subject to death on the Island, and it is not hard to see who washes a car, so most cars tend to be brown by the end of the summer, unless you go off-island....You are ostracized pretty good unless you go to town and someone knows you have been to town and you have that excuse that you went to a car wash over there (Key Informant 4).

4.6.3 Divergent Community Viewpoints

The infusion of lifestyle migrants into Island communities can create tensions and conflicts between different groups. Despite Mayne Island's relatively cohesive social environment, divergent viewpoints concerning water resource use and sustainability exist. These differing perspectives relate to specific issues of water use and pricing.

Several key informants believe that a stigma exists concerning development and its impacts on water resources on the Islands:

You have got people on the Island that are defending water and saying that we need to slow down development....Some people say, 'no more development...water use is scarce' to all the way over to 'there is lots of water what's your problem?' (Key Informant 4).

However, it is perceived that most residents feel their water supply is "protected from unreasonable demands and usage" (Key Informant 8) and that current capacity was adequate. People promoting development were perceived to be aware of the Island's limited water resources, and the importance of sustaining supplies. Proponents of development claim that growth can be accommodated while maintaining appropriate water supply, provided alternative approaches are implemented (Key Informant 5). In contrast, other key informants suggest that some residents believe development should be halted due to the current failing

water systems, as well as impending water quality and quantity supply issues.

The overriding and divergent perspectives are: 1) water issues on Mayne Island can be mitigated and this accommodates development interest, and 2) no development is the only means of addressing the future water resource vulnerability.

Water pricing on Mayne Island is set at an annual flat rate fee regardless of consumption levels that are monitored by water meters within each Water District residence. As suggested by several key informants, this creates tension between seasonal and permanent residents:

If you are just coming as a seasonal migrant person...[and] you are on a Water District, you are paying all year for that water..... In other words, you are going to want to get your money's worth. I know that there is a very strong attitude....So, there isn't the incentive there to really curtail your use when you are here (Key Informant 5).

Additionally, tension exists concerning perceived awareness levels and respect for water resources:

...there is...a lot of resentment on the part of the permanent homeowners. Not so much with the tourism, but...with the part-time residents...and a lack of awareness, a lack of education, a lack of taking pride and protecting the resource that they all have to rely on...and it is just going to get worse over the years (Key Informant 1).

However, there is a feeling that no single strong community group exists and that all stakeholders have equal levels of influence and power within the community (Key Informant 4). This situation appears to be a valuable for enabling constructive approaches to water conservation and use.

4.6.4 Volunteerism

Many of Mayne Island's community services are run by volunteers. This includes volunteering for the management of existing Water Districts. The majority of volunteers that contribute in these efforts are permanent residents. It is difficult to get seasonal and part-time residents involved due to the transient nature of their relationship to the Island. Transient visitors are perceived to be more inclined to participate in community related volunteer initiatives in their permanent communities (Key Informant 7). One respondent described the need and responsibility of non-permanent residents to assist in water resource issues:

...it only takes an hour here and an hour there, and there are opportunities for not doing long-term commitment volunteerism....[and they] need to realize that they have a community responsibility even as a part-time resident....You can't just come, eat, drink, and leave (Key Informant 5).

Other informants suggested that it is difficult to find appropriate and qualified volunteers to take on Water District responsibilities, especially in cases where the pool of residents is largely seasonal or part-time residents. A number of respondents commented on this particular issue and its potential implications for Water District management:

The Water Boards are also volunteer, and if 70% of your District ...is off-island then it is difficult to get people to sit on the Water Board. You don't have the choice of quality people that you would necessarily have, or people understanding of the water situation, that you would have if they were living here 12 months of the year (Key Informant 7).

I think...that the larger Water Districts will be phased out ten years...because...the really hardy volunteers...[won't] have the same willingness of the [current] residents to...[keep] the systems going. Our new comers...are going to be more apt to want a government run system (Key Informant 5).

Professional management would eliminate the current pressures on the volunteer Water District Trustees (Key Informant 8). Limited non-permanent resident volunteer engagement is expected to have long-term repercussions that extend beyond water conservation uses for the community, and “will change the whole nature of the Island” (Key Informant 7).

4.6.5 Short Term Vacation Home Rentals

Short term vacation home rentals are driving up demand for fresh water. Typically, renters use the homes of non-permanent residents in their absence. Despite Island bylaws restricting such use, the practice continues. A key informant's comments illustrate this situation:

...[t]he person who owned the property...was renting the place out as a short term vacation rental when they weren't there....[T]he water demand was huge and the [penalty]...didn't mean anything in light of the revenue that they were able to obtain....(Key Informant 6).

It is perceived that tourists renting second homes are typically unaware of the limited water supplies and their behaviours are shaped by the fact that they are on vacation and have paid a great deal to enjoy themselves (Key Informant 7).

The majority of residents surveyed indicated they do not rent their residences (85%) (Table 31). However, 77 percent of them do make their home available to visitors between June and September for stays up to 20 days (Table 31).

Table 31. Rental and Visitor Access to Mayne Island Homes between June and September

Type of guest	Overall			Permanent residents			Non-permanent residents			Significance Value
	n	% Not at all	% ≤20 days	n	% Not at all	% ≤20 days	n	% Not at all	% ≤20 days	
Renters	73	85	11	43	81	14	30	90	7	0.677
Visitors	89	15	77	50	16	76	39	13	77	0.516
N = 99										

In summary, this section answered the research question concerning what differences might exist between permanent and non-permanent residents in their attitudes and values toward water resources. First, the water resource conservation awareness of permanent and non-permanent residents was presented. Overall, residents believed that limited citizen understanding of methods for conserving water supplies puts the greatest pressure on the Island's water quality and quantity. Additionally, non-permanent residents from urban areas were perceived to be less likely to be aware of small island water vulnerabilities compared to permanent residents.

Second, perceived social cohesion levels on the Island were presented. Despite the transient nature of non-permanent residents, it is felt that a relatively strong community social cohesion exists. This is important for enabling successful water policy and planning directives.

Third, divergent viewpoints existed amongst permanent and non-permanent residents with respect to water scarcity and residential development, water use and pricing. It was perceived that some residents felt development

should be halted due to water scarcity issues, while other residents felt alternative options, such as rainwater cisterns, for fresh water supply would enable sustainable residential development. Additionally, it was perceived by permanent residents that water abusive attitudes of non-permanent residents existed because of their transient residency and annual water fees.

Fourth, the challenges of volunteerism facing the community Water Districts were presented. Overall, non-permanent residents were perceived to lack participation in their water management initiatives.

Lastly, short-term vacation rentals of second homes were identified as being problematic for water conservation and use. While Mayne Island residents typically do not rent their homes to tourists, they do accommodate extensive visitor traffic.

Overall, it is apparent that the differences between permanent and non-permanent residents with respect to their attitudes and values toward water resources exist. There are varying views on how different groups of residents impact water resources. Nevertheless, both permanent and non-permanent groups indicated that they were motivated by recreation and natural factors as reasons to reside on the Island. They also suggested that water conservation was an important concern and that water conservation management was important to establish in a professional manner.

4.7 Water Resource Management Policy and Planning

This section highlights key findings from the research related to the following questions.

What management options are preferred by permanent and non-permanent residents for managing water resources?

- a. What is the perceived effectiveness of current water management strategies by permanent and non-permanent residents?
- b. What changes to the current policies and planning strategies would accommodate the perspectives and perceptions of permanent and non-permanent residents?

4.7.1 Future Water Conservation Management Efforts

Key informants suggested that expanded educational and awareness building initiatives were the best way of facilitating lower levels of water consumption. The Mayne Island Integrated Water Systems Society (MIIWSS) is a non-profit organization made up of “concerned citizens, water purveyors, sister Associations and industry, drawn from the Gulf Islands and Vancouver Island” (Mayne Island Integrated Water Systems Society, 2008) that promotes water conservation. It plays a key role in informing both permanent and non-permanent residents of the importance in conserving and respecting groundwater resources for both human and ecological purposes. The MIIWSS plays an important role in encouraging more effective water conservation actions (Key Informant 7).

Other water conservation promotion initiatives have been implemented by the B.C. provincial and federal governments. Collectively, permanent residents

and Ministry of Environment staff have placed water conservation awareness signs in various Island locations to inform both permanent and non-permanent residents (Key Informant 1, 3 & 5). Additionally, the Geological Survey of Canada created a poster series entitled 'Waterscapes of the Gulf Islands' that contains information about the water and conservation issues in the Gulf Islands. It is available on BC Ferries and other strategic locations for a small fee. The posters are also available for free on the Islands Trust website. Residents created placemats highlighting key aspects of these posters which facilitate discussions about water resource issues (Key Informant 1). Similarly, the Islands Trust produced a book entitled "A Place in the Islands" which includes a section on the importance of conserving water. This book is available in print via the Islands Trust for ten dollars, or can be downloaded for free from the Islands Trust website. It has also been distributed by real estate agents to new home buyers on Mayne Island. In addition, local newspapers and magazines contain promotional flyers concerning water conservation and awareness. Finally, the Mayne Island community website has a specific link addressing water management that can be accessed by the residents and other visitors of the Island (Mayne Island Water Systems Society, 2008; Key Informant 7). Several key informants perceived that these water conservation promotion strategies were somewhat effective in increasing awareness levels of permanent and non-permanent residents. However, they also believed that water conservation education needed to increase and to be improved upon.

The Water Districts on Mayne Island encourage residents within their jurisdiction to conserve water through a variety of actions. The majority of the Water Districts implement summer water use restrictions (Appendix G). Many of the Water Districts have rebate programs for residents purchasing low-flow toilets and showerheads (Key Informant 3 & 7). However, many of these programs are quite limited in their scope and compensation levels (Key Informant 8). Increasingly many of the Water Districts are unable to continue programs due to a lack of funding and the lack of participation of residents that utilized these water conservation initiatives (Key Informant 8).

4.7.2 Communicating With the Non-Permanent Residents

Engaging lifestyle migrants in water conservation and water management issues has proven to be problematic. The Islands Trust is developing a website and email lists to inform lifestyle migrants about Island events and activities (Key Informant 5). However, the residents must voluntarily subscribe to these lists. Additionally, the Islands Trust holds public meetings during the summer when the more transient non-permanent migrants are living on the Island (Key Informant 6). These meetings are complemented with information distributed via local newspapers and flyers. While resident emails are also used by the Water Districts and the MIIWSS, only those residents wanting information are contacted (Key Informant 6). The MIIWSS also uses an annual Fall Fair and Water Workshop to engage and inform Mayne Island residents. Through a combination of information booths and guest speakers they provide residents with knowledge related to well management and maintenance, septic systems, rainwater

harvesting, and other groundwater-related issues. Attendance by non-permanent residents has increased over the past four years, but there is still a need for increased participation levels from all residents (Key Informant 7).

This study's survey findings indicate that permanent and non-permanent residents prefer specific water conservation education communication methods (Table 32). Overall, the top three most preferred approaches were: 1) monthly water consumption reports from Water Districts (60%); 2) water conservation awareness signs (56%); and 3) pamphlets and flyers concerning water conservation strategies (53%) (Table 32). There were no significant differences between permanent and non-permanent residents concerning their preferred methods for water conservation education communication.

Table 32. Resident's Preferred Communication Approaches for Water Conservation Awareness

Communication Approaches	Overall		Permanent residents		Non-permanent residents		Significance Value
	n	%	n	%	n	%	
Monthly water consumption reports from Water Districts	95	60	53	55	42	67	0.411
Water conservation awareness signs placed on the ferries and at community public areas on the Island	97	56	55	55	42	60	0.612
Pamphlets & flyers concerning water conservation strategies located on BC Ferries & at various Mayne Island public locations	96	53	54	56	42	50	0.099
Water conservation booths at the Mayne Island Fall Fair	97	47	56	48	41	46	0.172
Water conservation workshops	97	45	56	48	41	41	0.652
Email mailing list with local Water Conservation society	94	43	54	46	40	38	0.721
Water conservation information and community blog on a Mayne Island website	98	39	56	41	42	36	0.906
Ferry announcements concerning the importance of conserving water on the Gulf Islands	97	45	55	53	42	36	0.215
Formal townhall meetings with local government officials and groundwater conservation specialists	96	32	54	37	42	26	0.145
N = 98							

4.7.3 Community Concerns

Permanent and non-permanent residents express similar views on water conservation and management. Overall over half (61%) of the respondents were satisfied with the management of fresh water resources on the Island (Table 33). However, respondents also felt that a number of implications for effective water resource management exist on Mayne Island (Table 33). Such issues need to be addressed in a water management plan.

Table 33. Respondent's Perceptions of Existing Water Resource Management Issues

Implications for Water Resource Management	Overall		Permanent residents		Non-permanent residents		Significance Value
	n	%	n	%	n	%	
Limited (often seasonal) precipitation	100	70	57	68	43	72	0.961
Insufficient information concerning summer water demand	100	57	57	60	43	53	0.545
Not enough natural areas for collecting rainwater	100	56	57	56	43	56	0.637
Limited seasonal resident awareness of water conservation options	98	53	55	29	43	47	0.483
High levels of runoff/evaporation of rainwater	100	52	57	61	43	40	0.084
Limited public information on surface water & groundwater resources	100	51	57	53	43	49	0.657
Limited permanent resident awareness of water conservation options	100	48	57	13	43	23	0.193
Limited availability of water storage sites for community-based supplies	100	47	57	53	43	40	0.580
Limited part-time resident awareness of water conservation options	100	46	57	53	43	37	0.311
Limited water treatment facilities (i.e. water treatment, storage and distribution facilities)	100	36	57	39	43	33	0.910
Shortages of qualified personnel to manage and run water systems	100	32	57	35	43	28	0.073
Unnecessary and poorly managed water extraction	95	28	53	38	42	17	0.064
N = 100							

Respondents also provided additional suggestions concerning how to inform water resource management policy and planning. Common perspectives

amongst the respondents were apparent for the following concerns or issues regarding water resource management on the Island:

- Concerns existed about increasing population and development and how it affects the sustainability of the water resources (22%);
- Concerns existed regarding water treatment and storage issues (20%);
- Residents believed that problems exist concerning the abuse of water resources unnecessarily amongst various residents (both permanent and non-permanent) (18%);
- Concerns existed about the disconnect amongst the various management systems for the community water districts (16%);
- Residents believed the current water pricing structure is ineffective, and desire a more equitable strategy such as a pay-per-use water fee (8%);
and
- Concerns existed about the minimal access and availability of water resources for fires and emergencies (2%).

In summary, this section answered the research question regarding how local governments are mitigating impacts associated with second-home migration. First, it addressed what water resource conservation strategies were being implemented on the Island. This demonstrated the important role that the MIIWSS plays in creating an awareness of the existing and potential water resource issues of the Island, and for educating permanent and non-permanent residents in water conservation. It was perceived that this organization is effective in this role and membership is increasing amongst permanent and non-

permanent members. Additionally, it presented the ways in which the various governing bodies promoted water conservation amongst the residents. However, it was felt that water conservation education still needs to increase and be improved upon.

Second, this section illustrated the challenges of communication concerning water conservation awareness and education. It demonstrated that preferred communication approaches exist for permanent and non-permanent residents. Overall, monthly water consumption reports from Water Districts were rated as the most effective communication method.

Lastly, community water resource management concerns were identified. Overall, residents were satisfied with the management of water resources, but they believed that numerous issues exist, such as limited precipitation for the Island. The ability for the implementation of effective voluntary and regulatory policies may be constrained by such water management issues. Other concerns identified included the existing disconnect amongst the Water Districts, the limited water storage infrastructure, and the current water pricing strategy. It is felt that these management issues need to be addressed to improve water conservation on the Island. Overall, this section informed how the current policies and planning strategies on Mayne Island might be changed to include the impacts of non-permanent migrations.

CHAPTER 5: DISCUSSION AND RECOMMENDATIONS

5.1 Discussion

The purpose of this research was to determine whether differences exist between permanent and non-permanent residents in their water use behaviour, attitudes and values, and to suggest how this can inform water resource management policy and planning. This section discusses the research findings and presents a number of recommendations for improving water resource management on Mayne Island.

5.1.1 Revisiting the “Tourism-led Migration and the Transformation of Place” Framework

The conceptual framework linked to this research describes how tourism-led migration might transform ‘place’. In this framework, tourism-induced residential migrations are representative of the flow of people, capital and knowledge to the rural destination. Differing perceptions concerning water conservation and management held by permanent and non-permanent residents may exist based on power relations (Few, 2002; Ryan, 2002; Stokowski, 2002; Reed, 1997) and changing political structures (Macnaghten & Urry, 1998; Mair et al., 2005) might form. Consequently, the water resource management politics of such places may be impacted (Kemmis, 1990; Hall, 2003; Allen, 2003). Through the interaction of varying community members and organizations, a number of transformations for water resource management can take place. Mechanisms

within the political arena may include contestation, conflict and negotiation (Woods, 2007). The dynamics amongst permanent and non-permanent residents can affect policy directives within a destination and drive community management strategies.

The potential transformation of Mayne Island's water resources is connected to the social values and attitudes held by permanent and non-permanent residents regarding matters related to water conservation. Water supplies on the Island are impacted by the summer migration of residents who increase water use and demand. Saltwater intrusion and lowered groundwater tables are examples of existing quality and quantity issues. These impacts to fresh water supplies can be attributed to population pressures and additional water consumption that not only degrades the water resources but may also lead to conflict amongst residents. The research findings suggest that varying opinions were perceived to exist amongst residents in matters related to water scarcity and development. Additionally, it was perceived that non-permanent residents had concerns with the pricing of water distributed by Water Districts. Some informants suggested that this led to attitudes and water use behaviours that were not conservation-minded. Policy directives for water pricing, such as seasonal rates, may alleviate this conflict by changing the pricing strategy to ensure equitability amongst residents. Overall, community collaboration to improve policy, programs and tactics for water conservation and management is necessary in order to address the emerging water resource issues.

It is apparent that a more pressing issue on Mayne Island is how to engage the second-home migrants in community water resource related events. This research raises some fundamental questions concerning the degree to which the second-home migrants want to participate, and what preferences they might have for such participation. According to the research findings, 40 percent of the second-home migrants indicated they would not move into their second homes on a permanent basis. Another 24 percent indicated they would, while the remaining 36 percent were uncertain. It would be more productive for the community to focus on those migrants that are either certain of their desire to live permanently on the Island, and those that are still uncertain. These second-home migrants are more likely to want to become involved and to build a stronger tie with the community. This is not to suggest that the remaining 40 percent who indicated they would not move permanently to the Island should not be included in the engagement attempts, but that it might be more difficult to gain their participation. The most effective strategies for engaging the second-home migrants would include informal activities and events that promote a more enjoyable and entertaining environment, and would not require an extensive amount of time for participation. This might include festivals, pub nights, “wine and cheese” events, and living room discussions. However, voluntary action from second-home migrants might also need to be complemented with the use of regulatory management strategies. This would ensure that the more critical water resource issues could be addressed without requiring the migrants to volunteer their time. Regulatory strategies might include summer water pricing,

compulsory installation of eco-efficient and water conserving appliances, and obtaining legislative support for groundwater extraction licensing and source protection initiatives.

The following sections of this chapter provide further discussion of the findings emanating from this research and how they might link to the conceptual framework developed by Gill and Williams (2008). This includes recommendations for each discussion section that might improve water resource management practices on Mayne Island.

5.1.2 Community-led Water Conservation Efforts

This research indicates that Mayne Island water conservation efforts are improving. This change is due in part to the efforts of the Mayne Island Integrated Water Systems Society (MIWSS). MIWSS promotes water conservation and education which encourages water use behavioural changes by both permanent and non-permanent residents. Members of the organization are comprised of both resident groups. According to a MIWSS representative, the numbers of non-permanent residents participating in the organization are increasing each year. For the past four years the society has facilitated a workshop focused on water resource issues and conservation promotion. The participation of both resident groups in the annual workshop has been increasing. The awareness of groundwater issues has improved partly due to promotional activities of the MIWSS, such as the annual water workshop, Fall Fair, and the organization's informative website.

Several regulatory and voluntary water conservation measures are being enacted by various community organizations. For instance, Water District organizations have established summer water use restrictions that are mostly enforced through neighbour to neighbour peer pressure. However, the transient nature of the non-permanent residents makes it difficult for Water Districts to fully engage them in compliance. Voluntary efforts are required by all types of residents to ensure that the Water Districts objectives are met. Through collaborative efforts of the residents in each Water District, it may be possible to develop more effective management strategies.

The transient nature of the second-home migrants makes it difficult for the remainder of the community to obtain regular participation from these residents in water conservation events and community management practices. It is apparent from the key informant interviews that this is particularly problematic for the management of the Water Districts on the Island. The Islands Trust, the Water Districts and the MIWSS need to establish better mechanisms for engaging permanent and non-permanent residents in water conservation activities. A Public Participation Toolbox has been developed by the International Association for Public Participation (IAP2) that provides techniques to share information, compile and provide feedback, and to bring people together (International Association for Public Participation, 2006). This toolbox is available online.

5.1.2.1 Recommendation 1

1. Promote water conservation strategies through education and increased resident awareness.

- a. Based on the research findings the following communication approaches were preferred by the respondents:
- i. The most preferred communication approach was via monthly water consumption reports provided by the Water Districts (60%).
 - ii. For non-permanent residents the top three preferred approaches were: 1) Monthly water consumption reports (67%); 2) Water conservation awareness signs placed on the ferries and at community public areas on the Island (60%); and 3) Pamphlets & flyers concerning water conservation strategies located on BC Ferries & at various Mayne Island public locations (50%).
 - iii. For permanent residents the top three preferred approaches were: 1) Pamphlets & flyers concerning water conservation strategies located on BC Ferries & at various Mayne Island public locations (56%); 2) Monthly water consumption reports (55%); and 3) Water conservation awareness signs placed on the ferries and at community public areas on the Island (55%).
- b. Other potentially effective communication strategies presented by respondent comments include: 1) Distribution of water conservation

information packages to each new resident via the real estate agents and the Islands Trust; and 2) Including water conservation information with each resident's water tax bill.

2. Specific techniques from the IAP2 Toolbox that might work best for Mayne Island, or need to be continued, include:

- a. Featuring stories about water-related issues and projects within local media;
- b. Ensuring water conservation information, including progress reports for projects, current and potential issue analysis, and water conservation strategies for the household, is available at public locations such as the library, city hall, schools, and other well travelled public spaces;
- c. Creating a water conservation fact sheet that can be distributed through mail, internet or the local media;
- d. Providing access to technical information contacts to the public;
- e. Holding small meetings within neighbourhoods (at people's homes or coffee shops) to instigate effective dialogue;
- f. Holding computer-assisted meetings where interactive computer technology is used to register opinions;
- g. Holding a facilitated community dialogue event during the summer to allow residents to have an open discussion about water issues on the Island.

3. Increase water conservation education efforts of the MIIWSS by facilitating additional educational workshops at a smaller scale throughout the summer when permanent and non-permanent residents are residing on the Island.
 - a. For example, residents could participate in various workshops focused on the following themes: 1) Water well monitoring and maintenance; 2) Xeriscaping/Drought-resistant gardening; 3) Rainwater harvesting and installation; 4) Cost-effective water conservation practices; and 5) Current and potential water quality and quantity issues on the Island.
 - b. Incentives for residents to participate in such events could include draw-prizes, free snacks and beverages, and the opportunity to speak with professionals in the field of water resource management.
 - c. Funding for such workshops could be provided by the Islands Trust, Capital Regional District (CRD), or from the provincial government.
 - d. This form of communication is also suggested in the IAP2 Toolbox. Examples of communities that facilitate water conservation workshops include: the Capital Regional District (CRD), B.C. (Capital Regional District, 2008); the City of Calgary (Alberta Environmental Network, 2008); The City of Santa Rosa, California (City of Santa Rosa, 2007); and The City of Chandler, Arizona (Arizona Municipal Water Users Association, n.d.)

5.1.3 Perceived Water Resource Issues

Second-home tourism can impact water resource quality and quantity, and lead to a number of transformative consequences (Gössling, 2001; Belle & Bramwell, 2005; Assimakopoulos, n.d.; Garcia & Servera, 2003). The research findings suggest that Mayne Island residents face several potential water quality and quantity issues, including: incidents of saltwater intrusion; lowering of the water table; and water quality deterioration due to increased levels of arsenic, manganese and iron in some of the wells. In addition, there is uncertainty regarding potential climate change impacts that could further influence water quality and quantity. Ultimately these changes could transform the capacity of the island to support its human and ecological populations. Without effective management of the water resources, the potential for such issues is likely to worsen.

The majority (68%) of the research respondents believed that the sustainability of the Island's fresh water resources was in jeopardy. This perspective exists despite their current satisfaction with water quality on the Island. A few (10%) of the permanent and non-permanent survey respondents connected to Water Districts indicated they purchased bottled water for drinking purposes. Additionally, non-permanent residents are significantly less likely than their permanent counterparts to drink well water. It can be inferred that permanent residents are more likely to drink their well water because of the level of maintenance and responsibility required to ensure safe drinking water from a private well. Non-permanent residents using a private well might not have the same level of awareness or experience in managing their own water supplies

that a permanent resident would have. Additionally, it can be inferred by these research findings that both resident groups question the security in the maintaining the quality of their fresh water supplies in the future. This includes water supplies from either a private well, or through the Water District distribution system.

5.1.3.1 Recommendation 2

1. Water District managers should provide timely and accurate information to all residents connected to their distribution system concerning the quality and quantity of water available.
 - a. This should be undertaken each month to provide regular information about water quality and quantity, in addition to an overall annual report presented at the end of a fiscal year.
 - b. This can be accomplished by: 1) Posting the results at a convenient and acceptable location in each Water District; 2) Emailing each resident the information; and 3) Posting the results on the MIIWSS website.
2. Private well owners should:
 - a. Take the responsibility themselves to ensure their water wells are tested on a regular, annual basis.
 - b. Be aware of the changes in water quality and quantity of neighbouring Water Districts because of the interconnectivity of the fresh water aquifers.

- c. Post their individual well water quality and quantity issues on the MIIWSS website in a discussion format in order to enable communication amongst other residents using private wells for water supplies.
- d. Lobby the government to gain access to legislated quality control mechanisms for private well water that could provide free well testing on an annual basis.

5.1.4 Fresh Water Supplies and Seasonal Migration

The findings reveal that on Mayne Island, the greatest demand for water resources is during the drier, summer months. The Water Districts have limited water storage capacity. Throughout the summer when the population increases substantially, it is difficult for them to maintain adequate supplies of fresh water for the residents. Rainwater cisterns are an effective method for building fresh water supplies for both residents receiving their potable water from Water Districts and for private well owners. Their main functions are: 1) Collect rainwater from a roof and gutter system; 2) Transport the water via downspouts and piping to the cistern tank; 3) Remove debris and filter the water; and 4) Store the rainwater (Rainwater Connection, 2006). The amount of rainfall that an individual cistern can collect is dependent on annual rainfall, roof size and type, wind, vegetation cover, and pipe size (Rainwater Connection, 2006). Further information about rainwater harvesting, installation, and how to calculate personal rainwater storage needs specific to the Gulf Islands is available online (Rainwater Connection, 2006).

To complement the use of rainwater harvesting, low flow facility installation can be a valuable, cost-effective method for substantially reducing water consumption. The top three facilities used by households that consume the largest percentage of water are: 1) Showers and baths (35%); Toilets (30%); and Laundry and Cleaning (25%) (Environment Canada, 2008). By installing water efficient toilets and showerheads a household can reduce indoor water consumption by about 35% (Brandes et al., 2006).

Brandes et al., (2006) have illustrated ten effective methods for communities to save water and money. Mayne Island should evaluate these methods and use the specific suggestions from this document that will help improve water conservation on the Island. The top ten water and money conservation methods include: 1) Educate; 2) Design communities for conservation; 3) Close the urban loop; 4) Rainwater as a source; 5) Plan for sustainability; 6) Price water right; 7) Link conservation to development; 8) Make managing demand part of daily business; 9) Stop flushing the future; and 10) Fix the leaks. More detailed information concerning each method and an implementation strategy is available online (Brandes et al., 2006).

Girard and Gartner (1993) examined the perceptions of permanent populations concerning the impacts of second-home development on water quality in Wisconsin, U.S.A. They concluded that negative perceptions exist. In this study of Mayne Island, the perceptions of water use differ between groups concerning each other's water use practices. This research revealed that exterior water use and general domestic water consumption is perceived to be similar

between the resident groups. However, each resident group perceives the other to put more excessive pressure on fresh water resources. Although permanent residents are more likely to have installed water conservation appliances, according to the survey results, non-permanent residents are interested in obtaining further information about such devices.

Syme et al. (2004) in a study in Perth, W.A., suggest that gardens are seen as an important 'quality of life' aspect that second-home migrants seek. Their study identified correlations between the significance of a garden to home owners and the amount of external water consumed. The findings of this research of Mayne Island suggest that second-home migrants enjoy participating in gardening activities (mean % = 47), much like the permanent population. However, both groups appear to also value gardens that are more water conservation-oriented (mean % = 77), and a small number are inclined to install water-conserving irrigation facilities (mean % = 18).

Population demographics can play a role in water conservation behaviour (Corral-Verdugo et al., 2003). For instance, resident households will consume varying amounts of water depending on household size (Aitken et al., 1994). The population on Mayne Island continues to be significantly comprised of permanent and non-permanent residents either approaching or at retirement age. While many of these 'empty-nesters' probably place less pressure on water supplies, the addition of summer visitors of both permanent and non-permanent residents will likely off-set these reductions.

5.1.4.1 Recommendation 3

1. Homeowners should be encouraged to install rainwater cisterns to conserve available potable water needed for consumption.
2. Water Districts should increase their service fees gradually on an annual basis and use a portion of these funds as a form of financial assistance for residents wanting to install rainwater cisterns.
3. Neighbours should collaborate and share rainwater cisterns which may help to alleviate the costs and maintenance responsibilities.
4. Residents should make it a priority to upgrade their water use appliances, such as showerheads, faucets and toilets and make use of rebate programs.
5. The MIWSS and the Water Districts should lobby for adequate funding for rebate programs to promote rainwater cistern and low flow fixture installations to increase sustainable fresh water supplies.
 - a. To gain access to funding for such programs, the community should encourage the Islands Trust, the Capital Regional District, the Ministry of Environment and other organizations or agencies to provide financial support for such installations.
 - b. Other communities that have used rebate programs for advocating water conservation amongst residents include: Barrie, O.N.; Coquitlam Water District, B.C.; District of North Vancouver, B.C.; North Cowichan, B.C.; and the Town of Cochrane, A.B. (ToiletRebate, 2008). Barrie, Ontario provides evidence of the success such a program can have. Between 1995 and 1999, 10,

000 households replaced their toilets, showerheads and aerator fixtures, and between 1998 and 2002, 3,000 rebates for purchasing efficient washing machines were utilized by residents (The Corporation of the City of Barrie, 2007). Their success was based on the flexibility of the program. Detailed information about the program and its results are available online (Ontario Ministry of Environment, 1998).

6. Implement a pricing scheme that includes communication mechanisms, maintenance, upgrades, management, rebate programs and most importantly, environmental costs.
 - a. There are a number of possible pricing schemes that can be used (Brandes & Brooks, 2005): 1) Seasonal rates; 2) Increasing block rates; 3) Marginal cost pricing; 4) Daily peak-hour rates; and 5) Sewer and waste water charges (Appendix F).
 - b. For example, a seasonal pricing rate might include charging residents a base fee on water use thresholds that reflect water supply availability at various seasons of the year. This might include charging for water consumed during the summer months at a significantly greater cost than that for other wetter seasons of the year.
 - c. The City of Barrie provides an example of a community that initiated a rate structure that increases water costs as

household consumption increases. This was implemented to address summer water use demand by providing a financial incentive to residents to reduce water consumption (The Corporation of the City of Barrie, 2007).

5.1.5 Resident Values and Attitudes Contributing to Water Resource Issues

In this study, it was perceived by the key informants that non-permanent residents were less aware than permanent residents of the vulnerabilities of their water resources. Key informants suggested that non-permanent residents were perceived by some permanent community members to lack awareness of the finite nature of the water supplies on the Island. However, non-permanent residents claimed they were aware of the Island's various water resource management issues.

There were no substantial differences between permanent and non-permanent residents in their valuation for water resources. Both residents groups were perceived to have strong environmental values and were water conservation-minded. This was interpreted partly from the survey findings concerning the New Environmental Paradigm-Human Exception Paradigm scale. This strong environmental valuation should provide a foundation for water conservation. Based on the survey findings, it is inferred that permanent and non-permanent residents are interested in improving their water conservation behaviour. Geller et al. (1983) found that if a water conservation program was implemented at a community-wide level it could substantially increase water savings without a financial burden. They described such an initiative that was

administered by the U.S. Department of Energy as part of their conservation program. They followed up with the effectiveness of this initiative with a telephone survey that revealed a 29% installation rate. This would alleviate water quality and quantity transformations attributed to supply and demand issues on the Island.

5.1.5.1 Recommendation 4

1. Implementation of a program that can benefit all residents, and promote water conservation amongst its members.
 - a. Such a program could involve the installation of low-cost flow limiters and shut-off valves in toilets, showerheads and faucets in each household.
 - b. This could be accomplished with the assistance of the local and/or provincial governments who could provide such devices at no cost to the resident, as accomplished by the U.S. Department of Energy as part of their conservation program.

5.1.6 Divergent Viewpoints and Water Conservation Behaviour

Divergent community viewpoints were perceived to exist with respect to water availability and development, and water use and pricing. This may influence the politics of future water resource use on the Island. According to several key informants and the resident survey findings, both permanent and non-permanent residents are perceived to have concerns about water scarcity on the Island and residential development. The informants described the two

perceived opposing groups as: 1) Those who felt that either development should be prevented entirely, or that other land use planning regulations should prohibit developments that threatened the sustainability of water supplies; and 2) Those residents who felt that alternative sources for water supplies, such as rainwater cisterns, could be used to address these concerns. It is possible that some residents opposing further second-home tourism development might not be aware of current Mayne Island Official Community Plan land use by-laws that address potable water availability and residential development proposals.

Another area of perceived social tension exists between non-permanent and permanent residents with respect to Water District resource use. Permanent residents perceived that non-permanent residents connected to a Water District were excessive in their use of fresh water resources. They felt the current system of charging non-permanent residents an annual fee for seasonal use probably encouraged excessive consumption during their summer visits. Alternative pricing schemes can be implemented to promote water conservation to ensure human and ecological needs are met and sustained. On Mayne Island, water meters are installed in the homes of residents receiving fresh water supplies from a Water District. However, this system is not being used as effectively as it could be. The current pricing scheme for the Water Districts does not promote the conservation by permanent or non-permanent residents. Equitable changes to Water District water pricing may help to alleviate the perceptions (or reality) of non-permanent resident over consumption of water (see Recommendation 3, #6).

The politics of place emerge as water use conflicts between permanent and non-permanent residents. Most of these tensions are based on personal perceptions. The survey findings indicated that non-permanent residents (mean % = 51) also perceived permanent residents to be excessive in their water use. Ultimately, it will be necessary for all residents to improve their water conservation awareness and behaviour.

5.1.6.1 Recommendation 5

1. Increase community discussion and communication to increase community awareness and knowledge of water resource issues and how they can be addressed through various management strategies and land use planning systems. This could be achieved through:
 - a. Development of a community Blog specific to discussions concerning water resource issues on either the Islands Trust (Mayne Island specific) or MIIWSS websites.
 - b. Implementation of public forum opportunities during the summer months organized by the Islands Trust and/or the MIIWSS.
 - c. Utilization of other public participation approaches from the IAP2 Toolbox (International Association for Public Participation, 2006).
2. The Islands Trust should collaborate with groundwater specialists when reviewing and amending their land use by-laws to ensure that appropriate, effective, and enforceable regulations are included.

5.1.7 Perceived Water Resource Management Issues

Based on the survey findings, the six most critical water resource management issues facing Mayne Island are perceived to be: 1) Limited (often seasonal) precipitation (70%); 2) Insufficient information concerning summer water demand (57%); 3) Not enough natural areas for collecting rainwater (56%); 4) Limited seasonal resident awareness of water conservation options (53%); 5) High levels of runoff/evaporation of rainwater (52%); and 6) Limited public information on surface water & groundwater resources (51%).

5.1.7.1 Recommendation 6

1. To address the water resource management issues, there are a number of water conservation strategies and initiatives that could be used by the Islands Trust, the MIWSS and by the Water Districts.
 - a. Install rainwater cisterns to help alleviate stresses on potable water supplies during the drier months.
 - b. Conduct a study that compares monthly consumption trends for each Water District.
 - i. The results of the study could be posted on the MIWSS website and on a bulletin at each Water District facility.
 - c. Continue the distribution of water conservation information pamphlets throughout the summer months.
 - i. These should be made available at the beginning of the summer season at various public locations on the Island,

and could be put in resident mailboxes, in addition to MIIWSS and Islands Trust website postings.

- d. The Earth Sciences Sector of Natural Resources Canada is establishing an Aquifer Mapping program that will provide the public with access to information concerning groundwater resources. An aquifer assessment has been completed for the Gulf Islands aquifers. This information could be accessed by Mayne Island residents. The MIIWSS could provide the link to this program on their website (Natural Resources Canada, 2007).

5.1.8 Relationships between Water Districts

The primary issue mentioned with respect to water resource management on Mayne Island was the lack of integration between the various community Water Districts. This was outlined by several key informants who felt that this impeded the effective management of water resources for the entire Island. These Water Districts are run separately and managed without standardized policies and regulations aside from government legislation ensuring that appropriate standards of water quality for drinking water purposes are maintained. It was also evident from the key informant interviews that a lack of valuable communication amongst the Water Districts existed. This makes it difficult to promote effective water resource management on the Island. It was unclear how each Water District deals with the seasonal population pressures, and it would be more effective if there was collaboration amongst the Water Districts to deal with such migrations. Currently, the Water Districts lack

professional and qualified personnel to run their systems. Professional water managers would have specific training and experiences to draw on to make informed decisions and to effectively manage the Water Districts.

The Water Districts rely on the voluntary actions of local residents for their management. This is becoming more problematic due to the region's aging population and transient nature of the Island's residents. In particular, key informants suggested that non-permanent residents were perceived to be less inclined to volunteer their time to participate in the management of the Island's Water Districts. They were also perceived by key informants to lack experience and knowledge in managing such systems.

The lack of experience and knowledge preventing volunteerism is perceived to be particularly apparent amongst non-permanent residents, but it also might exist in the Island's permanent population. Key informants suggested that many permanent residents expressed their discomfort with assuming such responsibilities. They claim that they had little understanding of what is required for the task. Without professional and certified water resource managers running these Water Districts, the systems may not operate as well as they might otherwise.

5.1.8.1 Recommendation 7

1. Standardize the management of the Water Districts through their integration, and operate under one Island-wide umbrella that could be facilitated by the Islands Trust or the MIIWSS.
 - a. This could be achieved by:

- i. Developing an Island-wide management system to improve the effectiveness and efficiency of the various tasks associated with managing the Water Districts.
 - ii. Implementing common summer water use restrictions and water pricing system across the Water Districts.
 - iii. Pooling financial and human resources amongst the Water Districts to ensure that promotion initiatives are administered in a cohesive fashion, and make available sufficient funds for water conservation promotion initiatives, rebate programs, maintenance, and emergencies for the entire population by increasing the annual service fee for water.
 - iv. Increasing communication between Water Districts.
 - v. Pooling human resources for training and capacity building purposes as recommended by professional water managers.
 - b. This could be constrained by:
 - i. The lack of human resources to facilitate the integration of the Water Districts;
 - ii. The lack of legislation in place to enable such a collaboration; and
 - iii. The lack of desire from the community to have an integrated management approach for the Water Districts.
2. Create an Island-wide inventory of the water management skills of permanent and non-permanent residents in order to identify a pool of the

residents to draw on for specific water issues. This would also help build on the community's social capital – especially between permanent and non-permanent residents.

3. Build strategic ties with the Capital Regional District (CRD) to obtain support in water resource management decision-making processes that require expert knowledge and experience.
 - a. This should be done with respect to acquiring professional and technical advice on water issues.
4. Lobby the government to mandate the requirement of certified Water District operators to run each Water District, and to access funding to certify current residents managing them.

5.1.9 Water District Management Strategies

Mayne Island primarily focuses on supplying potable water with very few demand-side management policies in place to promote water conservation. For example, a number of the Water Districts established low-flow toilet rebates programs for their residents. However, for unknown reasons they were unsuccessful in promoting this program and lacked participation from residents. To encourage residents to take advantage of the rebates the Water Districts should aggressively promote such programs via a combination of on-line and print media options.

Water Districts rely on peer pressure as an important means of assuring water use restrictions are followed by residents. This can be difficult due to the variability in the residents' length of stays on the Island – many homes are vacant

for significant periods of time. However, peer pressure without supporting legislation is not a long-term solution to ensuring water conservation practices.

Ultimately, little attention has been placed on creating a clear set of policies or plans to guide water management from either supply or demand side perspectives. This makes it difficult for the community to make proactive decisions with respect to fresh water supplies. The Water Districts need to develop not only the human-oriented aspects of water management but also focus on sustaining the surrounding ecosystems and their functions.

5.1.9.1 Recommendation 8

1. Water Districts should:
 - a. Develop a more collaborative and inclusive approach to water policy and program development in order to increase the probability of regulation compliance.
 - i. Connick and Innes (2003) researched the use of collaborative dialogues on water policy making in California. They found that this case study “produced robust and lasting outcomes that extend well beyond the resolution of specific disputes” (Connick & Innes, 2003, p. 195).
 - ii. According to Connick and Innes (2003) this process for collaboration should involve:
 1. Representation of all relevant stakeholders;
 2. A shared desire to develop water policy and programs;

3. Self-organization;
 4. Engagement of the participants in learning and interacting;
 5. Encouragement of challenging assumptions and fostering creativity;
 6. Inclusion of various forms of high-quality information;
 7. Building consensus upon fully explored issues and interests; and
 8. Finding creative responses to differences.
- b. Develop a more integrated water resource management approach so that water and land resources are managed together, and all relevant stakeholders are included in decision-making processes.
- i. Infrastructure Canada (INFC) has initiated an Integrated Water Resource Management program that enables municipalities to access funding for water and wastewater management assistance. To obtain the funding, the municipalities must commit to the development of an Integrated Watershed Management (IWM) plan. Secondary plans often included in the implementation phase of the IWM planning process might include a Water Conservation Plan/Water Demand Management Plan/Water Efficiency Plan. More information about this initiative is available online (Infrastructure Canada, 2008).

2. Focus on implementing demand-management strategies (Appendix F).
 - a. Mayne Island could benefit most from implementing the following:
 - i. Create and administer a water resource management plan that includes water policy and a water-use permitting system;
 - ii. Develop landscaping ordinances;
 - iii. Introduce high water consumption fines and penalties;
 - iv. Introduce a seasonal rate water pricing structure;
 - v. Permit only the use of efficient irrigation systems;
 - vi. Enforce regular leak detection and repair of water distribution systems; and
 - vii. Lobby the provincial government for the ability to install legal water reuse and recycling systems.

5.1.10 Lack of Groundwater Legislation

A number of tools exist for addressing water resource policy and management options for small island and coastal communities. Steps to improve policy development for water resources exist (Dobson, 2003). These could assist Mayne Island in its efforts to introduce community based water resource policies. The steps that would be most appropriate for Mayne Island include: 1) Define the institutional and legislative jurisdictional uncertainties that exist for all stakeholders, ensuring that all stakeholders are included in decision-making processes as they relate to tourism development and watershed impacts; 2) Include science-based information in policy decision-making; 3) Improve the

monitoring and enforcement of tourism activities; and 4) Enhance the link between education and policy-making for sustainable tourism and watershed management.

Pigram (1999a) outlined a number of opportunities that could improve the water management of small island communities. Two of these recommendations in particular could be useful for Mayne Island. First, the water supply infrastructure should be planned so that it can cope with the increased summer population. This includes upgrading failing systems and ensuring adequate storage is available, in addition to seeking financial programs to assist in rainwater cistern installations. Second, the organizational and institutional capacity of the community Water Districts need improvement to enhance management, operations, and maintenance, including the addition of qualified professional water system operators. Having professional managers would alleviate the pressures on both permanent and non-permanent residents for managing the Water Districts. Without qualified and informed water resource managers, community organized Water Districts will likely either be taken over by the Capital Regional District entirely, or will require some other management regime such as creating an Island-Wide Water Management system.

In addition, residents may have conflicting views on how the Water Districts should be managed based on time availability, interest and knowledge. For instance, some residents might prefer the Capital Regional District to take over the management of all of the Water Districts because it would ensure the staffing of qualified water managers. In contrast, other residents may want to

maintain community control over the Water Districts because it is typically cheaper, and they prefer the ability to monitor their own water resources and to ensure conservation strategies are being considered. Most importantly, preferences might vary between permanent and non-permanent residents which might lead to conflicting power relations. Therefore, the politics of place could play an important role in determining how the community transforms its water management regime. To begin such a transformation it would be necessary for the community to design and follow a specific collaborative planning process.

The San Juan Islands provide an example of an existing water resource management plan. This series of small islands located south of the Gulf Islands in the U.S., have a similar geography and a similar form of lifestyle migrations. They have developed a water resource management plan that could have some applicability to the Mayne Island situation. Its objectives include the integration of growth management planning and water supply planning. The plan includes two volumes: The Watershed Management Action Plan (2000) and the Water Resource Management Plan (2004). It has been reported (San Juan County, n.d.) that the Watershed Management Action Plan has been very successful in its implementation. Information about the planning processes for the Water Management Plan and the actual plans are available online (San Juan County, n.d.). Additionally, they developed an implementation plan to ensure that the recommendations found within the Water Resource Management Plan are implemented within a specific time-frame. It also includes interim milestones to measure their progress. Mayne Island in particular, could use the San Juan

Islands management plan as a base for developing a plan specific to their situation.

5.1.10 Recommendation 9

1. Change the water resource management regime to one that is focused on a more integrated approach through a collaborative planning process.
 - a. This could involve charette designs to enable all stakeholders to be represented and encourage transparency of the plan development.
 - b. This should involve managing both land and water resources together, and enabling various stakeholders (users, planners, and policy makers) within decision-making processes.
2. The Islands Trust should pressure the provincial government (Ministry of Environment) to establish water management plans, in accordance with the provisions to do so within the amendments to the Water Act, for Mayne Island and the other Gulf Islands. The San Juan Island Water Management Plan could be used as a reference.
3. Develop a community-driven water management plan for Mayne Island if the Islands Trust is unsuccessful in gaining legislative support to do so.
 - a. This plan could be enforced by a collaborative water district association and additionally, by the development of a private well owner's association for the Island.
4. Continue to lobby the provincial government for more control over the management of groundwater resources to:
 - 1) Gain the authority to enforce regulations concerning groundwater extraction licensing and

source protection; 2) Obtain supportive legislation for compulsory installation of rainwater cisterns in all new residential developments with changes to the building code; 3) Obtain financial support for the establishment of rebate programs to assist in the installation costs of rainwater cisterns in existing housing; and 4) Obtain supportive legislation for the mandatory requirement of certified personnel to manage the Water Districts.

CHAPTER 6: CONCLUSIONS

6.1 Concluding Remarks

This research set out to assess whether differences exist between permanent and non-permanent residents in their water use behaviour, attitudes and values, and to suggest how this can inform water resource management policy and planning. A case study of Mayne Island, British Columbia examined the extent to which such differences existed.

Permanent and non-permanent residents express strong support for water conservation on Mayne Island as a result of their responses to particular survey questions concerning increasing their water conservation efforts. However, informants and survey respondents indicate that water conservation awareness and education needs to increase amongst all residents of Mayne Island. The Island's aging population may decrease their water consumption demands, but this is off-set by a perception that summer visitors of permanent and non-permanent residents will continue to stress demands for water resources. It is inferred that the perceived divergent viewpoints amongst the permanent and non-permanent residents may have created conflict concerning the pricing of water. This is related to the perceptions held by the permanent residents that non-permanent residents have occasional excessive consumption habits in order to "get their money's worth" of water because they only live on the Island part-time but have to pay an annual fee for their water supplies. Additionally,

perceived conflict exists amongst permanent and non-permanent residents concerning increased development and water supply issues. Such conflicts require attention and could be resolved through increased communication amongst community members. Lastly, a number of community concerns exist regarding water management on the Island. For example, overall 47 percent of the respondents believed that the limited availability of water storage sites for community-based supplies needs to be addressed. A water management plan could be developed to address the challenges the Island has with managing its fresh water resources.

This research suggests that the reality for Mayne Island is that water resource issues are emerging. Recent incidents are an indication of what is to come if water quality, quantity and management issues are not addressed effectively. This is also necessary to prevent the possibility of the Island facing a tragedy of the commons in the future as a result of these emerging water resource management issues. A tragedy of the commons is believed to be influenced by how individuals perceive each other's conservation ethics, and believed to direct the actions of an individual toward environmental resources. The research findings indicate that perceptions of permanent and second-home migrants on the Island are substantial concerning water use behaviour, conservation and awareness levels. Therefore, the relationship between permanent and second-home migrants with respect to perceptions in water use behaviour, attitudes and values are important to consider when managing water

resources on the Island. Without appropriate policies, guidelines, programs and tactics to assist all stakeholders, political contestation may arise.

Changes in how Water Districts are managed would help to address issues stemming from seasonal pressures. Water conservation programs should be encouraged, especially with respect to building water conservation skills. Transformations in the overall behaviour of Mayne Island residents (permanent and non-permanent) are needed with respect to water resources on Mayne Island. The MIWSS plays an important role in pushing the water conservation agenda to both community members and all levels of government. The community requires both regulatory initiatives for water management and voluntary water conservation action by all its members.

Overall, Mayne Island is moving towards a resolution of its emerging water management challenges. Other small islands could learn from the Mayne Island example to inform policy and planning in similar destinations. Lifestyle migrations, in the form of second-home tourism, continue to be an important economic driver for small island communities. With appropriate, effective and proactive management strategies that promote water conservation, this form of tourism can become more sustainable from a water management perspective.

6.2 Considerations for Further Research

This study stimulates other research opportunities. Potential areas of future research that could be explored are as follows:

1. The examination of how GIS applications could help integrate land use planning with water resource management. For instance, GIS techniques

could be used to determine optimum lot size with groundwater supplies in proposed lifestyle migration residential developments. Individual residential lots require a separate well. When multiple wells are in close proximity the cumulative effects of pumping groundwater are amplified and can induce saltwater intrusion. GIS mapping could be used to determine the optimum placement of wells so as to prevent saltwater intrusions.

2. The examination of how second-home tourism and water resource planning compares between various Gulf Islands. Such work might identify how collaborative efforts might address both common and pressing water issues associated with lifestyle migration at a regional scale.
3. The examination of how to develop a sustainability management framework for second-home tourism's effects on addressing water conservation issues in the Gulf Islands. Such a framework might enable planners and resource managers to establish sustainable water and tourism policies, strategies and tactics, and create indicators to monitor their progress towards achieving their community water resource management objectives.
4. The examination of how to better engage second-home migrants in community events concerning water resource issues, management and conservation. This might involve surveying second-home migrants to determine the level of participation they would like to have within the

community, and their preferred forms of involvement. This could result in the creation of a second-home migrant engagement toolbox.

APPENDICES

Appendix A – Key Informant Participant Request Letter

Dear Participant,

I am a graduate student in Simon Fraser University's School of Resource and Environmental Management. Currently I am conducting thesis research on water resource management issues associated with small island lifestyle communities.

This project is part of a larger SFU research program examining the ways and extent to which 'lifestyle migrants' are changing the character of destination communities, and how these places are responding to such pressures. In this research, 'lifestyle migrants' are people moving to small communities primarily because of the destination's surrounding natural and cultural qualities.

My research focuses on Mayne Island. It explores the perceptions, attitudes and behaviours of both permanent residents and second-home/seasonal lifestyle migrants concerning a range of water resource management issues. The intent is to provide local decision makers with insights into how small island communities such as Mayne Island are addressing current and emerging water resource use pressures creating by the growing population of lifestyle migrants visiting such places. It is hoped that lessons learned from the Mayne Island experience will be helpful to other marine based island destinations also accommodating 'lifestyle' migrants.

Because of your experience in the Gulf Islands, I would like to interview you concerning your perspectives on this topic. If you agree, our conversation will be recorded and eventually transcribed (copies can be made available for your review at your request). Your individual comments will be kept strictly confidential and will only be reported as part of the collective record provided by you and other key informants. However, should the need exist to quote you specifically, I will seek your approval before doing so. Transcripts of your interview will be destroyed upon completion of the study. The interview should take approximately 45 minutes. Further information concerning the areas of questioning follow.

I would appreciate the opportunity to sit down in person or speak with you by phone at a time and location of your choosing. Please do not hesitate to call if you have any questions about this survey or your participation in it. You can contact me (phone/email address), or my research supervisor, Dr. Peter Williams (phone/email address).

My thanks,

Shelagh Thompson
Master's Candidate, Center for Tourism Policy and Research
School of Resource and Environmental Management
Simon Fraser University, Burnaby BC V5A 1S6
<http://www.sfu.ca/~dossa/>

The project is expected to be completed by March, 2009. Electronic copies of the research will be made available to you upon request.

This research has been approved by the Director, Office of Research Ethics, on behalf of the SFU Research Ethics Board in accordance with University policy R20.0, www.sfu.ca/policies/research/r20-01.htm.

Should you wish to obtain information about your rights as a participant in research, or about the responsibilities of researchers, or if you have any questions, concerns or complaints about the manner in which you were treated in this study, please contact the Director, Office of Research Ethics by email at hal_weinberg@sfu.ca or phone at 778-782-6593.

To start every appendix on a new page, modify the format of the style "Head2_no number" to add "Page Break before." This will leave the heading "Appendices" alone on the page. To make it clear to the reader not to expect additional text on this page, click on the heading, and use format/paragraph to add additional "space before" to this one heading, to lower it on the page. See example of "templates appendices" heading. Try about 204-224 pts of "space before". Also consider making it "right aligned" instead of left.

To start only later appendices on a new page, use Head2_no number" and use format/paragraph/ to add "Page Break before" to each of the headings, or use page breaks where desired.

Only one Appendix? Then use only the "Appendices" heading, but change it to the singular, i.e. "Appendix", delete all the instructional text on this page, and start your content on this page.

Appendix B – Key Informant Interview Consent Form

SIMON FRASER UNIVERSITY

The University and those conducting this research study subscribe to the ethical conduct of research and to the protection at all times of the interests, comfort, and safety of participants. This research is being conducted under permission of the Simon Fraser Research Ethics Board. The chief concern of the Board is for the health, safety and psychological well-being of research participants.

Should you wish to obtain information about your rights as a participant in research, or about the responsibilities of researchers, or if you have any questions, concerns or complaints about the manner in which you were treated in this study, please contact the Director, Office of Research Ethics by email at hweinber@sfu.ca or phone at 778-782-6593.

Your signature on this form will signify that you have received a document which describes the procedures, whether there are possible risks, and benefits of this research study, that you have received an adequate opportunity to consider the information in the documents describing the study, and that you voluntarily agree to participate in the study.

Title: Assessing water resource management in a small island lifestyle community

Investigator Name: Shelagh Thompson

Investigator Department: School of Resource & Environmental Management

Having been asked to participate in the research study named above, I certify that I have read the procedures specified in the Study Information Document describing the study. I understand the procedures to be used in this study and the personal risks to me in taking part in the study as described below:

Purpose and goals of this study:

This proposed project is part of a larger research program currently underway at Simon Fraser University's Centre for Tourism Policy and Research. It assesses the ways and extent to which 'lifestyle migrants' are changing the character of destination communities, and how these places are responding to such pressures. In this program, 'lifestyle migrants' are people moving to small destination communities primarily because of the areas' natural and cultural qualities. My proposed research on Mayne Island explores the perceptions, attitudes and behaviours of both permanent and second-home/seasonal lifestyle migrants concerning existing and emerging water resource management issues.

This includes exploring their reactions to a range of alternative water resource management policies. The goal is to determine what water resource management issues currently exist on Mayne Island, and what are the preferred ways of dealing with them. By exploring these issues from the perspectives of permanent and seasonal residents, I hope that common approaches and areas of collective action will emerge.

What the participants will be required to do:

The participants will be required to participate in an active key informant interview that involves both open and closed questions concerning water and water management. The interview will be recorded with the participant's permission. The participant can end the interview session at any time during the interview. A household survey may be developed based on the information obtained from the key informant interviews, and administered to adult permanent and seasonal residents of Mayne Island to obtain further information concerning lifestyle migration and water resource management issues on Mayne Island.

Risks to the participant, third parties or society:

The risks of this study are minimal. Some participants may be concerned about the disclosure of their particular views about water and water management on Mayne Island. To mitigate this concern, participant identities will be kept confidential, participants may decline to answer any question, and participants may withdraw from the study at any time.

Benefits of study to the development of new knowledge:

The relationships between tourism and migration have only been recently examined through critical analysis or conceptual/theoretical development. The emergence of such case studies is growing in number however, more research is necessary to increase the understanding of the impacts and management strategies required to make such migration more sustainable. Through the evaluation of this research, it is intended to provide local decision makers with insights into how small island communities can adapt, cope with and utilize the growing population of lifestyle migrants to achieve water resource management goals. The proposed research will enable those communities to use proactive rather than reactive management and planning strategies to deal with the addition of lifestyle migration. It is hoped that lessons learned from the Mayne Island experience will be helpful to other marine based island destinations accommodating growing numbers of 'lifestyle' migrants.

Statement of confidentiality:

The data of this study will maintain confidentiality of your name and the contributions you have made to the extent allowed by the law.

Your signature on this form will signify that you have received information which describes the procedures, possible risks, and benefits of this research study, that you have received an adequate opportunity to consider the information in documents describing the study, and that you voluntarily agree to participate in the study. Any information that is obtained during this study will be kept confidential to the full extent permitted by the law. Knowledge of your identity is not required. You will not be required to write your name or any other identifying information on research materials. Unless your consent is explicitly requested and granted, no specific names or identifiers will be used in the final report that would allow readers to attribute a reference to a particular person. With your permission the interview will be recorded and materials will be maintained in a secure location.

Interview of employees about their company or agency:

The interview is voluntary in nature. Consent will not be obtained from the participants' employers, agencies or other organizations with which they are affiliated. The choice of whether to participate or not will be left up to those individuals contacted. The participant can choose to not answer any of the questions and can end the interview at any time.

Inclusion of names of participants in reports of the study:

Your identity will be kept confidential to the full extent permitted by the law. In any reports, publications or presentations arising from this research your name will not be used when citing information acquired from you, and only those demographic characteristics that would help in the understanding of the findings will be reported. I request your permission to refer to you by a title in any reports, presentations or publications arising from this research. You may choose a title that describes your position, or remain as an anonymous participant.

Contact of participants at a future time or use of the data in other studies:

Please state whether or not you can be contacted again at a future time to obtain further information pertaining to this research as necessary. The data obtained from this research will not be used in other studies.

I understand that I may withdraw my participation at any time. I also understand that I may register any complaint with the Director of the Office of Research Ethics.

Dr. Hal Weinberg
Director, Office of Research Ethics
Office of Research Ethics
Simon Fraser University
8888 University Drive

Multi-Tenant Facility
Burnaby, B.C. V5A 1S6
hal_weinberg@sfu.ca

I may obtain copies of the results of this study, upon its completion by contacting:
shelaght@sfu.ca peterw@sfu.ca

I understand the risks and contributions of my participation in this study and agree to participate:

The participant and witness shall fill in this area. Please print legibly

Participant Last Name:

Participant First Name:

Participant Contact Information:

Participant Signature (for adults):

Witness (if required by the Office of Research Ethics):

Date (use format MM/DD/YYYY)

Contact at a future time (yes/no)

Appendix C – Key Informant Interview Questionnaire

How are small island local governments managing their water resources and mitigating the water resource impacts associated with second-home seasonal lifestyle migration in a case study of Mayne Island?

Operational Questions:

- a. What are the management strategies for water resources in the affected communities? Who are the key stakeholders responsible for this management?
- b. How effective have current water management strategies been?
- c. What changes to the current policies and planning strategies are necessary to include the impacts of second-home lifestyle migration?

Line of Interview Questioning

To what extent are the following water resource management issues apparent on Mayne Island?

Issue	Not at all an Issue	Somewhat an Issue	Definitely an Issue	Not Sure
Limited (often seasonal) precipitation				
Not enough catchment areas				
High levels of runoff/evaporation				
Limited availability of water storage sites				
Infrastructure deficiencies (e.g. water contamination, insufficient distribution and access, insufficient base line information for water demand)				
Limited information on surface water and groundwater resources				
Shortages of qualified personnel (e.g. water managers; water systems operators)				
Limited awareness of water conservation options				
Inadequate environmental impact assessment of projects that could be detrimental to water resources				
Unmanaged and unnecessary water extraction				

What strategies (if any) need to be implemented to respond to these groundwater resource issues on Mayne Island?

Are there command and control policies (e.g. legislation and regulations, bans, permitting) currently in place to shape water use on Mayne Island? What are these policies?

What strategies (if any) are currently effective in reducing water consumption on Mayne Island? Which need improvement?

How effective are water management strategies incorporated into Mayne Island's OCP?

How effective would water conservation incentives be in reducing water consumption? What types might work? What incentives are currently in use or could be used in the future?

What water conservation technologies are being used in new residential developments, and what policy options are being considered?

What areas on Mayne Island are the most vulnerable to overexploitation of groundwater resources and contamination? Are these areas protected from housing development or other construction?

Are seasonal home owners relatively slow compared to permanent residents in the implementation of demand management strategies⁷ (e.g. low-flow services, water pricing, cisterns)? If so, why do you believe this to be?

How difficult is it to have a sustainable second-home tourism industry on Mayne Island, given the natural vulnerabilities of this area? What guidelines are needed to make the water resources needed to support second-home tourism available on a sustained basis?

What progress exists in creating effective groundwater legislation in British Columbia and how might the Island's Trust benefit from such initiatives, especially with respect to emerging water use pressures from seasonal lifestyle migrants?

How does the Island's Trust use the results from groundwater mapping on the Gulf Islands?

To what extent do you find the following recommendations for creating a more sustainable approach to tourism-related water conservation and management appropriate on Mayne Island?

Recommendation	Not at all important	Mildly important	Unsure	Important	Very important
Improving the knowledge and understanding of local communal demands and the needs for water in a range of uses (survey prior to tourism development).					
Planning of water supply infrastructure adequate to cope with current community base demands and peak tourism demands, and also to address future demands					
Providing water treatment facilities adequate to service both tourism and island community water needs at a high standard.					
Provisioning of facilities for treatment, recycling and reuse/disposal of wastes and waters containing wastes, according to agreed guidelines to avoid water resource and marine contamination.					
Monitoring of performance of water supply infrastructure and treatment facilities to detect and correct deficiencies					
Controlling deforestation and reforestation and integrated catchment management to correct adverse effects on watersheds and water supplies.					
Strengthening the capacity of local organizations and institutions to develop and implement effective water resources management tactics.					

What are the impacts that second-home lifestyle migration has on the quantity and quality of water resources in a case study of Mayne Island?

Operational Questions:

- a. How does the water use and consumption of non-permanent residents compare to that of permanent residents (including permanent lifestyle migrants) on Mayne Island?
- b. What are the current and potential water quality and quantity issues for Mayne Island? How are these issues affected by second-home tourism?

Line of Interview Questioning

What are the current water resource issues that Mayne Island is facing?

What are the potential water resource issues that Mayne Island could face?

Who would you classify as the lifestyle migrants on Mayne Island? (permanent, seasonal, retirees)

What are the quality of life amenities that Mayne Island has to offer lifestyle migrants? Does the seasonal flow of lifestyle migrants to Mayne Island affect water resource use and consumption on Mayne Island? If so, how?

What is the approx. percentage of second home owners who rent to tourists('vacation' rentals) during the peak summer season, and how does it affect water resources on Mayne Island?

Do you feel that tourists use more water than seasonal/permanent residents on a daily basis?

Do the consumption sources in the home of permanent and seasonal residents differ? (e.g.. Do seasonal residents have a greater tendency to have pools, hot tubs or extensive gardens?)

What factors contribute most to current water resource quantity and quality on Mayne Island?

Operational Questions:

- a. What differences exist (if any) in the values and attitudes of second-home residents and permanent residents with respect to water resources and conservation?

Line of Interview Questioning

To what extent do you feel that the seasonal lifestyle migrants are active 'players' within the community on matters related to water conservation efforts?

To what extent do you feel that the seasonal lifestyle migrants support water resource management policy which promotes conservation?

To what extent do you feel that permanent residents are active 'players' within the community on matters related to water conservation efforts?

To what extent do you feel that permanent residents support water resource management policy which promotes conservation?

Are there divergent viewpoints between community member groups concerning water resource conservation on Mayne Island? Which community member groups (if any) do you believe have the most divergent viewpoints concerning water conservation, and why?

Is the non-potable water use (such as lawn/garden irrigation, pool and hot tub use, car washing) during the summer months creating a negative effect on overall annual water consumption on Mayne Island? If yes, how aware do you believe permanent and

seasonal residents are of this impact?

To what extent do you believe that water consumption on Mayne Island depends largely on the following factors:

Factors	Not at all	Somewhat	Definitely	Unsure
Household size				
Household values toward water resources				
The value and perception individuals place on gardens				
Economic income				
The value individuals place on pools and hot tubs				
Lawn and garden irrigation				
Washing of vehicles				

Are there noticeable differences between seasonal residents and permanent residents on Mayne Island regarding these factors? If so, what?

Do you believe that any of these factors make it problematic for achieving sustainable water resource management on Mayne Island? If so, which factors and why?

Approximately what percentage of new seasonal homes are being built on waterfront locations for seasonal migrants who maintain a permanent residence elsewhere?

To what extent do you feel that public services and infrastructure (e.g. Water districts) currently in place on Mayne Island are of sufficient capacity to meet the demands placed on current summer water supply?

To what extent do you feel that public services and infrastructure (e.g. Water districts) currently in place on Mayne Island are of sufficient capacity to meet the demands placed on future (10 years) summer water supply? If not, how will this be addressed?

What is the current summer groundwater carrying capacity of the Island, and how well does it match the needs of the area's total population?

What is the expected growth in Mayne Island's population over the next ten years, and what impact will this have on the quality and quantity of water resources available?

To what extent do you believe the growth (if any) in population will be a result of second-home owners retiring into their second homes?

Appendix D – Resident Survey Request Letter

Dear Mayne Island Resident,

I am a graduate student in Simon Fraser University's School of Resource and Environmental Management. Currently I am conducting thesis research on water resource management issues in small island lifestyle communities. The Islands Trust has assisted me in my research by distributing this letter to their mailing list of Mayne Island property owners.

This project is part of a larger SFU research program examining the ways and extent to which 'lifestyle migrants' integrate into small island communities. In this research, 'lifestyle migrants' are people moving to small communities primarily because of the destination's surrounding natural and cultural qualities. My research focuses on Mayne Island. It explores the perceptions, attitudes and behaviours of both permanent residents and part-time/seasonal lifestyle migrants concerning a range of water resource management issues.

Why you should participate:

The information provided by you and many other Mayne Island residents will provide local decision makers with insights into how small island communities, such as Mayne Island, can address current and emerging water resource issues resulting from both permanent and seasonal residential pressures.

What is required of you:

As a resident of Mayne Island, it is my hope that you will complete the on-line survey concerning fresh water use on Mayne Island. Your individual responses will be kept strictly confidential and will only be reported as part of the collective record provided by all participating residents. Within the survey many opportunities are available to make short answer as well as more personalized responses. We encourage you to do both! Depending on the information you are able to share, the survey should take about **20 minutes** to complete. By logging into the survey, your consent to participate in this research will be formally recorded. I will be pleased to share the collective findings of the survey with you, once my research is complete.

Survey Link: XXXXXX Completing this survey by **July 31, 2008** would be most appreciated.

Draw Prize: As a token of my appreciation for your completion of this survey, I am extending an invitation to enter your name into a draw for a gift certificate from the Mayne Island Glass Foundry. Further information concerning this draw is found within the survey itself.

My thanks,

Shelagh Thompson
Master's Candidate, Centre for Tourism Policy and Research
School of Resource and Environmental Management
Simon Fraser University, Burnaby BC V5A 1S6

By logging onto this survey at the above link, you will also be providing your consent to participate in this research. This research has been approved by the Director, Office of Research Ethics, on behalf of the SFU Research Ethics Board in accordance with University policy R20.0,

www.sfu.ca/policies/research/r20-01.htm. Should you wish to obtain information about your rights as a participant in research, or about the responsibilities of researchers, or if you have any questions, concerns or complaints about the manner in which you were treated in this study, please contact the Director, Office of Research Ethics by email at hal_weinberg@sfu.ca or phone at 778-782-6593.

Appendix E – Resident Survey

Online Consent Form

My research on Mayne Island explores the perceptions, attitudes and behaviours of both permanent and second-home/seasonal lifestyle migrants concerning existing and emerging water resource management issues. The goal is to determine what water resource management issues currently exist on Mayne Island, and what are the preferred ways of dealing with them. By exploring these issues from the perspectives of permanent and seasonal residents, I hope that common approaches and areas of collective action will emerge.

As a resident of Mayne Island, it is my hope that you will complete the on-line survey concerning fresh water use on Mayne Island. Your individual responses will be kept strictly confidential and will only be reported as part of the collective record provided by all participating residents.

The risks of this study are minimal. Some participants may be concerned about the disclosure of their particular views about water and water management on Mayne Island. To mitigate this concern, your identities will be kept confidential, you may decline to answer any question in the survey, and you may withdraw from the survey at any time.

The information provided by you and many other Mayne Island residents will provide local decision makers with insights into how small island communities, such as Mayne Island, can address current and emerging water resource issues resulting from both permanent and seasonal residential pressures.

Any information that is obtained during this study will be kept confidential to the full extent permitted by the law. Identity of respondents will be kept confidential and only aggregate results will be reported. The results of this survey will be stored on a server located in Portland, Oregon USA and according to US Patriot Act may be searched by the law enforcement agencies.

By filling out this survey, you are consenting to participate. The results of this survey will be compiled and published as a Masters thesis through Simon Fraser University.

Yes, I agree to the above consent form

No, I do not agree to the above consent form

Introduction

Thank you for your interest in this research project and for volunteering your time to complete this survey! The information provided by you and many other Mayne Island residents will provide local decision makers with insights into how small island communities, such as Mayne Island, might address current and emerging water resource issues resulting from both permanent and seasonal residential pressures.

There is a total of 27 individual questions to which I would appreciate your answers. You are not obligated to answer a question if you do not wish to do so. Your individual responses will be kept strictly confidential and will only be reported as part of the collective record provided by all participating residents. Within the survey many opportunities are available to make more personalized responses. We encourage you to do both! Depending on the information you are able to share, the survey should take about 20 minutes to complete.

As a token of my appreciation for your completion of this survey, I am extending an invitation to enter your name into a draw for a gift certificate from the Mayne Island Glass Foundry. Further information concerning this draw is found at the end of the survey.

By logging onto this survey you have provided your consent to participate in this research.

This research has been approved by the Director, Office of Research Ethics, on behalf of the SFU Research Ethics Board in accordance with University policy R20.0, www.sfu.ca/policies/research/r20-01.htm.

Should you wish to obtain information about your rights as a participant in research, or about the responsibilities of researchers, or if you have any questions, concerns or complaints about the manner in which you were treated in this study, please contact the Director, Office of Research Ethics by email at hal_weinberg@sfu.ca or phone at 778-782-6593.

Section 1: About Your Residency On Mayne Island

1.1 Which type of Mayne Island resident do you consider yourself to be?
(Please place a check mark in the box which best matches your situation)

- Long time permanent resident (Resided on Mayne Island year-round for 5 years or more/ This is my primary place of residence)
- Recent permanent resident (Resided on Mayne Island year-round for less than 5 years/ This is my primary place of residence)
- Long term part-time resident (Resided on Mayne Island on most weekends and vacations year-round for 5 years or more/My permanent residence is elsewhere)
- Short term part-time resident (Resided on Mayne Island on most weekends and vacations for less than 5 years /My permanent residence is elsewhere)
- Long term seasonal resident (Resided on Mayne Island primarily between June and September for 5 years or more) /My permanent residence is elsewhere)
- Short term seasonal resident (Resided on Mayne Island primarily between June and September for less than 5 years/My permanent residence is elsewhere)

1.2 To what extent were each of the following reasons important or unimportant in your decision to reside on Mayne Island. (Please place a check mark in the box which best matches your situation)

Reasons	Not at all Important	Somewhat Unimportant	Uncertain	Somewhat Important	Very Important
Social reasons (e.g. family/friends already resided here)					
Recreation reasons (e.g. opportunities to take part in recreation activities existed)					
Tourism					

Reasons	Not at all Important	Somewhat Unimportant	Uncertain	Somewhat Important	Very Important
reasons (e.g. initially visited as a tourist and liked the tourism facilities and services available)					
Economic reasons (e.g. employment opportunities; job transfer; affordable housing existed)					
Natural factors (e.g. favourable climate; scenery; waterfront access existed)					
Cultural reasons (e.g. arts and culture opportunities existed)					
Others (Please specify)					

1.3 Do you rent or own your place of residence on Mayne Island? (Please check the box which best matches your situation)

Rent

Own

If you are a full-time permanent resident of Mayne Island, please go directly to question 1.6

If you are a part-time or seasonal resident of Mayne Island, please continue to question 1.4

1.4 If you are a part-time or seasonal resident on Mayne Island, about how many days did you actually reside here during 2007. (Please indicate the approximate number of days in the monthly category boxes provided below)

	Jan – March	April – May	June – Aug	Sept – Oct	Nov - Dec	I did not reside here in 2007
Approx. # of days						

1.5 If you are a part-time or seasonal resident on Mayne Island do you anticipate that you will become a full-time permanent resident here in the future? (Please check the box which best matches your situation)

Yes No Uncertain

1.6 On average, how often do you make your home on Mayne Island available to other people (e.g. visitors or renters) during the months of June to September?

Visitors: Not at all
 1-5 days
 6-10 days
 11-20 days
 21-30 days
 31+ days

Renters: Not at all
 1-5 days
 6-10 days
 11-20 days
 21-30 days
 31+ days

Section 2: About Mayne Island Fresh Water Quality and Use

2.1 What sources of fresh water do you use on Mayne Island and which do you use for drinking purposes (Please check the boxes which best match with your situation)

Fresh water sources	Source Only	Drink It	Don't Know
Single well			
Cistern rain water			
Community organized water system			
Other (Please specify)			

2.2 Over the past 5 years has your supply of high quality freshwater on Mayne Island:

Increased Decreased Remained Constant Uncertain

2.2 Do you have any of the following freshwater use facilities or practices in place at your residence on Mayne Island (Please check the boxes which best match your situation)

Facilities & Practices	Yes	No	Unsure
Hot tub			
Swimming pool			
Low-flow shower head			
Low-flush toilets (6L or less)			
Dual-flush toilets			
Eco-efficient dishwasher			
Eco-efficient washing machine			
Water meter			
Well Watcher			
Garden Practices			
Non-native flower garden			
Vegetable gardens			
Native landscape plantings			
Drought-resistant plantings			
Irrigation System			
Drip or trickle irrigation			
Drip system connected to a rain barrel			
Sprinkler - underground			
Portable lawn sprinkler			
Manual watering-- buckets, hose, or watering cans			
Sprinkler timers			
Lawn Care Practices			
Use of Pesticides/Fungicides for weeds in the lawn &/or garden			
Fertilizers used for lawn care			
Use Organic/Biodegradable lawn & garden care products			

Section 3: Your Views About Mayne Island Water Resources

3.1 To what extent do you agree or disagree with the following statements concerning the quality of Mayne Island's water supply (Please check the boxes which best match your opinion).

	Strongly Disagree	Mildly Disagree	Neutral	Mildly Agree	Strongly Agree	Unsure
The quality of Mayne Island's water is satisfactory						
The sustainability of Mayne Island's supply of high quality groundwater is in jeopardy						
Saltwater						

	Strongly Disagree	Mildly Disagree	Neutral	Mildly Agree	Strongly Agree	Unsure
intrusion is a growing challenge to Mayne Island's fresh water supply						
Septic contamination is a growing challenge to Mayne Island's groundwater supply						
Arsenic, iron and manganese contamination are a growing challenge to Mayne Island's groundwater supply						

3.2 To what extent do you agree or disagree with each of the following statements (Please check the boxes which best match with your opinion):

	Strongly Disagree	Some-what Disagree	Un-certain	Some-what Agree	Strongly Agree
1. There is much water available on Mayne Island. We just have to supply it to our homes					
2. Water is a very cheap natural resource, that should be available free of charge					
3. Science and technology will solve any existing or potential water scarcity issues on Mayne Island					
4. Science and technology will solve any existing or potential water quality issues on Mayne Island					
5. Drinkable water is an unlimited resource on Mayne Island					
6. Water scarcity is not a current issue on Mayne Island					
7. Water scarcity will not be an issue on Mayne Island in the future					

	Strongly Disagree	Some-what Disagree	Un-certain	Some-what Agree	Strongly Agree
8. Drinkable water on Mayne Island will exhaust if we do not take efforts to conserve it					
9. The most effective way of preventing water exhaustion on Mayne Island is to use it only when absolutely necessary					
10. Water conservation is necessary to ensure both human and ecosystem needs are met for present and future generations					

Section 4: Your Views About Water Consumption On Mayne Island

4.1 How significant do you feel each of the following factors is putting undue pressures on the quality/quantity of Mayne Island's fresh water supply? (Please check the boxes which best match with your opinion)

Factors	Not at all Significant	Not very Significant	Uncertain	Somewhat Significant	Very Sig-nificant
Limited citizen understanding of methods for conserving water supplies					
Excessive use of water for hot tubs and pools					
Excessive use of water for lawn and garden irrigation					
Excessive use of water for washing vehicles (boats, cars, other recreational vehicles/ equipment)					

4.2 To what extent do you feel the following water user groups put excessive pressure on Mayne Island's fresh water resources?

	Not at all Significant	Not Very Significant	Uncertain	Somewhat Significant	Very Significant
Long time permanent residents					
Recent permanent residents					
Long term part-time residents					
Short term part-time residents					
Long term seasonal residents					
Short term seasonal residents					
Summer visitors of any of the resident types specified above					
B&B owners and their visitors/ tourist accommodations					

Section 5: About Your Awareness of Potential Water Management Issues

5.1 To what extent do you feel the following water resource management issues exist on Mayne Island?

Issue	Not at all an Issue	Somewhat an Issue	Definitely an Issue	Uncertain
Limited (often seasonal) precipitation				
Not enough natural areas for collecting rainwater				

Issue	Not at all an Issue	Somewhat an Issue	Definitely an Issue	Uncertain
High levels of runoff/evaporation of rainwater				
Limited availability of water storage sites for community-based supplies				
Limited water treatment facilities (e.g. water treatment, storage and distribution facilities)				
Insufficient information concerning summer water demand				
Limited public information on surface water and groundwater resource quality and quantity				
Shortages of qualified personnel to manage and run water systems				
Limited permanent resident awareness of water conservation options				
Limited part-time resident awareness of water conservation options				
Limited seasonal resident awareness of water conservation options				
Unnecessary and poorly managed water extraction				

5.2 To what extent do you feel the need for water conservation practices has increased or decreased on Mayne Island over the past five years?

	Decreased A Lot	Somewhat Decreased	Uncertain	Somewhat Increased	Increased A Lot
The need for water conservation practices on Mayne Island					

5.3 If free information concerning the following potential water conservation techniques were available, would that be of interest to you? (Note: Information will not be sent if you click yes)

Conservation Techniques	Yes	No
Low-flow toilets		
Eco-efficient washing machine		
Eco-efficient dishwasher		
Low-flow appliances (ie. shower heads)		
Fixing leaks		
Water metering and pricing schemes		
Rainwater harvesting systems		
Grey water systems		
Xeriscaping (Native and drought-tolerant gardens)		
Other (Please specify)		

Section 6: Your Views on Mayne Island Water Conservation and Management

6.1 Overall, to what extent are you satisfied or dissatisfied with the management of Mayne Island's fresh water resources?

	Strongly Unsatisfied	Dis-satisfied	Uncertain	Somewhat Satisfied	Strongly Satisfied
Management of Mayne Island's fresh water resources					

6.2 To what extent is it important or unimportant for you personally to increase your fresh water conservation actions on Mayne Island over the next 5 years?

	Not at all Important	Somewhat Unimportant	Uncertain	Somewhat Important	Very Important
Increase your fresh water conservation actions on Mayne Island					

6.3 To what extent are you willing to implement each of the following water conservation practices at your residence on Mayne Island over the next five years?

Conservation strategies:	Not at all Willing	Somewhat Un-willing	Uncertain	Some-What Willing	Very Willing	Have Already done so
Low-flow toilets						
Eco-efficient washing machine						
Eco-efficient dishwasher						
Low-flow shower head						
Fixing leaks						
Water metering						
Rainwater harvesting system						
Grey water systems						
Xeriscaping (Native and drought-tolerant gardens)						
Other (Please specify)						

6.4 What constraints may keep you from implementing any of the preceding water conservation strategies at your Mayne Island residence over the next five years? (Please specify in the space provided)

--

6.5 If you wanted more information concerning various approaches to personally managing Mayne Island freshwater, how well would the following communication approaches work for you?

Water conservation learning opportunities	Not at all	Somewhat	Very Well	Un-certain
Water conservation workshops				
Water conservation booths at the Mayne Island Fall Fair				
Monthly water consumption reports from Water Districts				
Pamphlets & flyers concerning water conservation strategies located on BC Ferries & at various Mayne Island public locations				
Water conservation awareness signs placed on the ferries and at community public areas on the Island				
Ferry announcements concerning the importance of conserving water on the Gulf Islands				
Formal townhall meetings with local government officials and groundwater conservation specialists				
Water conservation information and community blog on a Mayne Island website				
Email mailing list with local Water Conservation society				
Other (Please specify)				

Section 7: Concluding Remarks

If you have any other perspectives you would like to submit with this survey, please feel free to report them in the space provided here.

Section 8: About You

Please help us by providing some information about yourself. Your answers to this section will help us categorize and analyze the collective answers provided by all the people who took part in this survey.

8.1 Where is your primary place of residence?

Which city (if any):

Which island:

8.2 What is your age? 20-44 45-64 65-74 75+

8.3 What is your sex? Male Female

8.4 What is your highest level of education?

- Less than high school
- Graduated high school
- Post-secondary certificate and diploma
- University degree – Undergraduate
- University degree – Graduate (Includes Master's or Doctoral)
- Post-doctoral degree

8.5 What is your average family household income per year?

- Less than \$49,999
- \$ 50,000 - \$ 59,999
- \$ 60,000 - \$ 69,999
- \$ 70,000 - \$ 79,999
- \$ 80,000 - \$ 89,999
- \$ 90,000 - \$ 99,999
- \$100,000 - \$124,999
- \$125,000 - \$149,999
- \$150,000 and over

Appendix F – Common Water Demand Management Measures

Socio-political strategies	<ul style="list-style-type: none"> ▪ Information and education ▪ Water policy ▪ Water-use permits ▪ Landscaping ordinances ▪ Water restrictions ▪ Plumbing codes for new structures ▪ Appliance standards ▪ Regulations and by-laws ▪ Turf limitation by-laws ▪ Once-through cooling system bans
Economic strategies	<ul style="list-style-type: none"> ▪ Rebates for more efficient technologies (e.g. toilets, showers, faucets, appliances, drip irrigation) ▪ Tax credits for reduced use ▪ Full-cost recovery policies and life-cycle analysis ▪ High-consumption fines and penalties ▪ Pricing structures: <ul style="list-style-type: none"> - Seasonal rates - Increasing block rates - Marginal cost pricing - Daily peak-hour rates - Sewer and waste water charges
Structural and operational strategies	<ul style="list-style-type: none"> ▪ Metering ▪ Landscape efficiency ▪ Soil moisture sensors ▪ Watering timers ▪ Micro and drip irrigation ▪ Cisterns ▪ Rain sensors ▪ Efficient irrigation systems ▪ Soaker hoses ▪ Leak detection and repair in trunk lines ▪ Repair teams to reduce leaks in buildings ▪ Water audits ▪ Pressure reduction ▪ System rehabilitation ▪ Efficient technology <ul style="list-style-type: none"> - Dual flush toilets - Low flow faucets - Efficient appliances (dishwashers/washing machines) ▪ Recycling and Reuse – ranging from cooling and process water, to grey water for toilets or irrigation, to treating and reclaiming wastewater for reuse

Source: Brandes & Brooks, 2005, p. 15 by permission

Appendix G – Mayne Island Water Districts

Water System	Type of Water System	# of Lots Within Water System	# of Connections to Water System	# of Wells	Total Annual Fee for Service (\$)	Water Use Restrictions	Incentives
Bakerview Holdings Ltd.	Co-op Development	13	12	2	200.00	No watering of gardens or washing of cars	None
Bennett Bay Waterworks District	Improvement District	152	132	3	Taxes and Tolls: 350.00 Connection Fees: 500.00 deposit Other taxes apply for 2nd connections, B&Bs, and commercial properties, dis-connection and re-connection	District water is for household use only	\$100.00 rebate per low flush toilet for any retrofit
Campbell Bennett Bay Improvement District	Improvement District	152	128	4	Taxes and Tolls: 400.00 Connection Fees: 650.00	Domestic use only	None
Laura Point Water Society	Private Society	17	16	1	Full-time occupancy: 100.00 Part-time occupancy: 90.00	June 1 to approx. October 31: total water restriction	None
Lighthouse Point Waterworks	Improvement District	101	98	4	Taxes and Tolls: 240.00 Connection Fees: 250.00 + meter costs	Household use only; year-round	None
Mount Parke Estates Improvement District	Improvement District	72	65	3	Taxes and Tolls: 340.00 Connection Fees: 250.00 base	No water use outside of the home for any purposes between May 1 and October 31	None
Skana Waterworks Ltd.	Private System with CRD Management	75	38	2	Taxes and Tolls: 1038.00 Connection Fees: minimum 1000.00 or	As required	None

Water System	Type of Water System	# of Lots Within Water System	# of Connections to Water System	# of Wells	Total Annual Fee for Service (\$)	Water Use Restrictions	Incentives
					actual cost		
Surfside Water System	CRD management	126	61	?	Taxes and Tolls: 1096.10 Connection Fees: 400.00 minimum	None	None
Village Point Improvement District	Improvement District	278	220	5	Taxes and Tolls: 398.00 Absorption Fee Tax and Toll: 598.00 Connection Fees: 250.00	Assessed as needed	None

Source: Mayne Island Integrated Water Systems Society, 2008

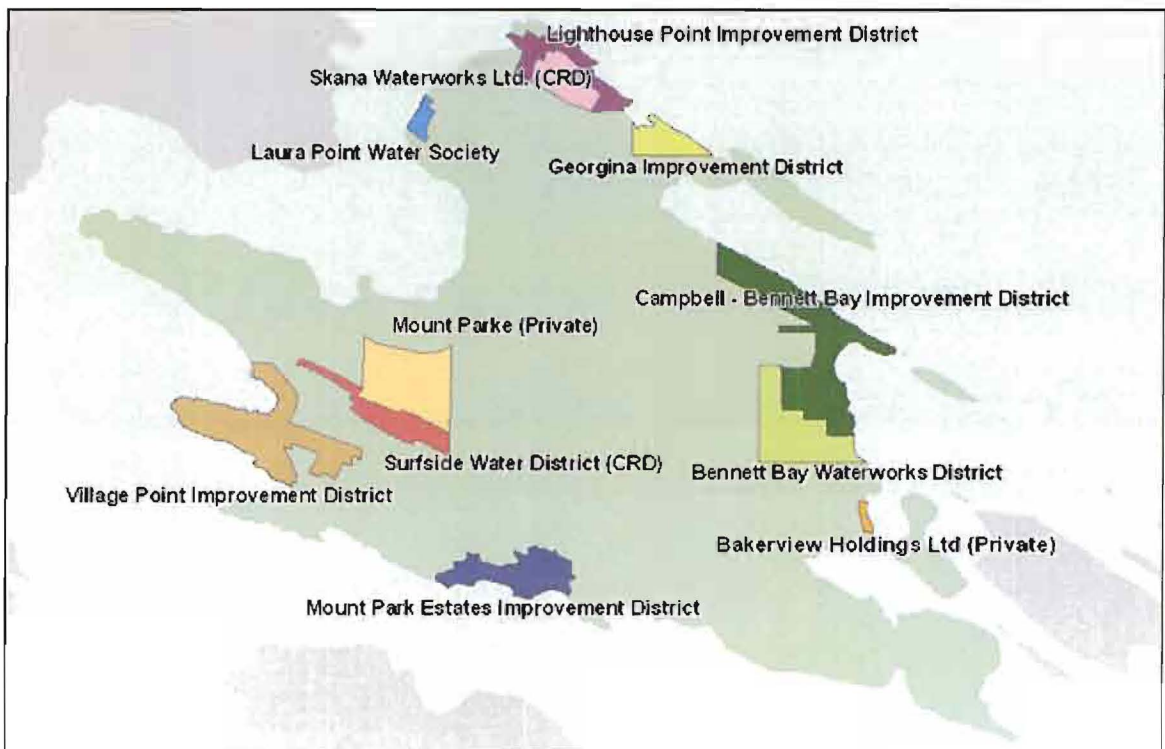


Figure 5. Location of 11 Water Districts of Mayne Island

(Mayne Island Integrated Water Systems Society, 2008 by permission)

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