

CHAPTER 1

CONTEXT & SETTING

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Bainbridge Island is both an island and an incorporated city located in western Washington. It is in the central Puget Sound Basin east of Kitsap Peninsula and 9 miles west of downtown Seattle. The island is approximately 5 miles wide and 10 miles long consisting of almost 17,778 acres or 28 square miles of land and 37.9 square miles of water including Port Madison and Manzanita Bays, Murden Cove, Eagle and Blakely Harbors. It is one of the larger islands in Puget Sound.

Bainbridge Island shorelines border the main body of Puget Sound, Port Orchard Bay, and 2 high-current tidal passages, Rich Passage and Agate Passage. The island is characterized by an irregular coastline of approximately 53 miles with numerous bays and inlets and a significant diversity of other coastal land forms including spits, bluffs, dunes, lagoons, cusped forest lands, tide flats, streams and tidal deltas, islands, and rocky outcrops.

Bremerton and Poulsbo are located across Port Orchard Bay on Kitsap Peninsula to the west, Port Orchard across Rich Passage to the south, and Seattle across Puget Sound to the east.

Bainbridge Island is connected to the Kitsap Peninsula by the SR-305 Bridge across Agate Passage, and to the mainland by Washington State Ferries from Winslow in Eagle Harbor to Colman Dock in Seattle.

POLITICAL ORGANIZATION

Bainbridge Island has five separate public jurisdictions that operate within the same island-wide municipal boundaries: 1) Bainbridge Island Metropolitan Park & Recreation District (Park District); 2) City of Bainbridge Island (COBI); 3) Bainbridge Island School District (BISD); 4) Bainbridge Island Fire Department (BIFD), and Kitsap Regional Library, Bainbridge.

These five agencies collaborate with one another for the benefit of the public by forming interlocal agreements as needed for shared use of facilities and other services.

CLIMATE

Washington State's climate is strongly influenced by moisture-laden air masses created in the Pacific Ocean. The air masses may move into the region any time of the year, but particularly during fall, winter and spring seasons. The air flowing from the Pacific Ocean is interrupted first by the Olympic Mountains and then significantly by the Cascade Mountains. As a result of the mountain ranges, the west or windward sides of the Cascades receive moderate to heavy rainfall and the east or leeward side of the state located in the "rain shadow" of the Cascades receive a light to moderate amount of precipitation.

The Cascades also affect temperature ranges in the state. The west or windward side is influenced by maritime air masses generally milder than those that sweep down from the Canadian Rocky Mountains on the east or leeward side of the state. Consequently, eastern Washington usually has colder winters and hotter summers, while western Washington is milder and more frost-free.

On Bainbridge Island, average temperatures vary from a high of 74 degrees in July to a low of 34 degrees Fahrenheit in January with an average annual maximum temperature of 59 degrees and an average annual minimum temperature of 44. Average annual precipitation is about 37 inches with a mean growing season with temperatures above 32 degrees Fahrenheit for about 170-190 days. Approximately 80% of the precipitation occurs from October through March with less than 6% falling during June, July, and August.

Climate change may affect incidence of rain amounts as well as ambient air temperatures. Additional concerns relate to the rise in ocean level and changes in ocean acidity as well as increased wildfire risk.

Climate change also raises questions pertaining to increased migration to this area and specifically to the island due to a more favorable climate and the ensuing growth pressure this could bring.

Climate Change

Climate change is affecting precipitation levels and air temperatures. It is also linked to rising sea levels, changes in ocean acidity, and increased wildfire risk. Climate change is attributed to a rise in greenhouse gases, or gases in the air that trap energy from the sun that would otherwise be emitted into space, and which consequently warm the earth's surface and the air above it.

Different scenarios have been projected for the region and its future. Which scenario plays out will depend on efforts to affect the rate of greenhouse gas emissions.

The University of Washington has been active in leading efforts to project these different scenarios for the Puget Sound Region. Different models have been developed that simulate the interaction between the atmosphere, the ocean and other variables which include assumptions about human efforts to affect future emissions of greenhouse gases. These projections for precipitation rates and temperature ranges vary from low to high.

For more information, see the following UW link:

<http://cig.uw.edu/wp-content/uploads/sites/2/2015/08cmip3comparison.png>

Future guidelines to assist local agencies in assessing the effects of greenhouse gases are forthcoming from the WA State Recreation & Conservation Office.

EARTH

Bainbridge Island is located within the central basin of the Puget Trough section of the Cascade Mountain province of the Pacific Mountain System. The Cascade Mountains were created by continuous volcanic activity along the border of the underlying continental plates. The mountains were in turn, subject to the action of periodic glacial intrusions - the most recent being the Pleistocene glacial period more than 15,000 years ago. The Pleistocene glacial intrusion gradually carved and flooded Puget Sound, the lowland areas, and other valleys alongside the Cascade foothills. The 3,000-foot thick Vashon Glacier carved out central Puget Sound and Hood Canal Basins.

Topography

The island is hilly ranging from 0 to about 425 feet in the central and south sections of the island including the hilltops in the Grand Forest, Gazzam Lake Nature Preserve, and Fort Ward Park properties.

Soil Regions

Washington State soils were created by a combination of elements including the nature of the parent material or rock type, climate, and the characteristics of the local terrain. These combined processes created 11 principal soil regions in the state ranging from deposits with high concentrations of organic matter created by glacial and marine actions along Puget Sound and on the island.

WATER

Numerous continuous and intermittent streams drain the island into Port Madison, Manzanita, Fletcher, and Rolling Bays, Eagle and Blakely Harbors, Murden Cove, and elsewhere around the island into Puget Sound.

Hundreds of small ponds and wetlands are located throughout the island that are filled or flow into and out of these streams. The surface water area varies considerably in these systems depending on the time of year.

The City of Bainbridge Island Planning & Community Development Department has inventoried the wetlands that cover the island. The inventories identified and evaluated wetlands that included bogs, forested wetlands, scrub/shrub wetlands, wet meadows, shallow marsh wetlands, deep marsh wetlands, and open water wetlands (lakes or ponds). Wetlands were found distributed throughout the island, especially near principal stream corridors. For more information, see the following COBI link: <https://www.bainbridgewa.gov/DocumentCenter/View/497/Cobi-Watersheds?bidId=>

These wetlands perform a variety of functions including:

- providing habitat for fish and wildlife
- maintaining water quality by filtering pollutants, removing sediments, producing oxygen and recycling nutrients
- reducing floods
- recharging ground water

Gazzam Lake is the single largest surface water body on the Island at 14 acres and is located in the Park District's Gazzam Lake Nature Preserve. Other smaller surface water bodies on the island include Nute's Pond in the south end owned by the Park District, a pond to the north of Nute's Pond on the IslandWood property, and a pond wetland complex at Meigs Park.

WILDLIFE HABITAT & SPECIES

Habitat conservation areas are critical to the survival of Bainbridge Island's diverse plant and wildlife communities. Habitats encompass a variety of areas including large parcels of contiguous undeveloped land, special areas like streams or wetlands, and structural elements like rocky shorelines or standing dead trees.

The ecological value of an area depends on the quantity, quality, diversity, and seasonality of the food, water, and cover that it provides wildlife species. A particular site's value also depends on proximity to other usable habitats, the presence of rare species, and the rarity of the habitat type.

The preservation and restoration of critical habitat areas are keys to protecting the biological diversity of Bainbridge Island. Critical habitat can be lost or degraded due to urban and some rural land use activities. Critical habitat threats can be reduced with effective land use policies and regulations. In some instances, valuable habitat can also be restored or enhanced through preservation and conservation efforts.

Wildlife habitats are generally classified as marine, estuarine, freshwater, and terrestrial. Many wildlife species rely upon most, even all, of these habitat types for survival. Bainbridge Island has all 4 types of wildlife habitat. (See Appendix F for detailed information on references made in this wildlife section).

Marine Habitat

Marine habitats are salt water areas that extend outward from the upper limit of wave spray on land. On Bainbridge Island, marine habitats extend the complete circumference of the island including all bays, harbors, and coves.

Marine habitats provide critical plant, fish, and wildlife habitat that can be greatly affected by land and water-based activities. The waters of Port Madison, Manzanita, Port Orchard, Fletcher and Rolling Bays, Eagle and Blakely Harbors, and Murden Cove depend on the health of tide flats and the water column for

primary habitat production. Eelgrass, kelp, and phytoplankton provide the primary cornerstone for the grazing food chain, and shelter for both invertebrate and vertebrate animal species.

The deeper waters and narrow channels of Agate and Rich Passage, and off the eastern shores of the island, as well as the shallower waters of the island's bays, harbors, and coves produce a unique marine environment rich in nutrients hosting a remarkable diversity of fish and other animal life.

The open channels, rocky outcrops, and large bays of Bainbridge Island provide wintering and breeding habitat for a wide variety of marine birds including loons, grebes, cormorants, gulls, ducks, geese, shorebirds and alcids.

Fish & Wildlife Species:

There are a variety of priority habitats and species (or particular relationships between species and habitat) that rely on the marine habitat around and on Bainbridge Island for at least part of the year or part of their life cycle (WDFW 2018). These include:

Forage fishes: Pacific herring, surf smelt, and Pacific sand lance

Shellfish: geoduck, subtidal hardshell clam, hardshell clam, and oyster beds. Dungeness crab are also mapped within the marine waters of Bainbridge Island.

Salmonids: Coho salmon, Cutthroat/resident coast cutthroat, Pacific steelhead, and fall chum salmon.

The larger creeks around Eagle Harbor, Manzanita Bay, Blakely Harbor, and Lynwood Center were mapped as having breeding habitat and occurrence by these salmonid species.

Marine Mammals: harbor seal.

Birds: great blue heron.

Endangered Species Act (ESA) listed species utilizing the marine waters of Bainbridge Island include killer whale, humpback whale, Chinook salmon, Pacific steelhead, yellow eye rockfish, and bocaccio (NOAA 2019, USFWS 2019).

Kelp & Eelgrass Beds:

Kelp and eelgrass beds provide habitat, feeding, and rearing grounds for a large number of marine organisms including crabs, fish, and birds. Kelp is the large brown seaweed typically found in rocky intertidal and subtidal areas. Eelgrass is a vascular plant that grows most commonly in intertidal and shallow subtidal sandy and muddy areas.

Kelp beds provide a surface upon which other plants and animals grow. They are used as resting areas by birds and mammals including gulls, herons, waterfowl, shorebirds, and seals. Kelp beds also protect environments for intertidal plants and animals by reducing current, wave action, and inshore erosion on sand and gravel beaches. The beds provide a protected beach habitat for marine organisms that would not be present otherwise.

Eelgrass is a highly productive plant that provides trophic functions and nutrient infusions for the entire coastal zone. Eelgrass beds provide an important stopover and wintering area along the Pacific flyway for a variety of migratory birds. The eelgrass beds around the Island and in Puget Sound have been found to be three times more productive to diving birds, for example, than non-vegetated near-shore areas.

Kelp and eelgrass beds have declined in number and overall size in Puget Sound in recent years. The decline may be due to changes in water quality and turbidity resulting from urban development and forest cutting activities, or to natural fluctuations due to storms, unusually hot weather, or an increase in the population of grazing species. Eelgrass beds play a critical part in the overall health of Puget Sound.

Shellfish:

Commercial and recreational shellfish inhabit the mud, sands, and rocky substrata of the island's passages, bays, harbors, and coves. Intertidal areas support hardshell clams including butter clams,

native littleneck, manila clams, cockles, and horse clams. Geoducks typically burrow in subtidal areas up to 2 to 3 feet into the mud or soft sand. Shrimp, crab, and oysters also inhabit the shoreline areas. Dungeness crab frequent eelgrass beds, and red rock crab inhabit rocky terrain with less silt content.

Surf Smelt, Pacific Sand Lance & Pacific Herring Spawning Areas:

Surf smelt and Pacific sand lance are important food for marine mammals, birds, and fishes including most importantly, salmonids so they appear as priority species on the WDFW websites (WDFW 2019). They are generally present year-round but each spawn at different times of the year and in different areas around Bainbridge Island (WDFW 2019 Forage Fish Spawning Map – Washington State).

Smelt are known to spawn year-round in Puget Sound including Eagle Harbor (WDFW 2019). Spawning occurs in a mixture of coarse sand and fine gravel within the upper tidal zone. In Puget Sound, spawning typically occurs between July and April. Spawning areas for surf smelt on Bainbridge Island have the greatest extent of the three forage fish species. They spawn almost continuously around the west side beginning near Gazzam Lake Preserve north around Agate Point to the entrance of Port Madison Bay. Spawning areas on the east side of the island are patchier and occur near Fay Bainbridge Park, the Yeomalt area, and several areas in Eagle Harbor.

Sand lance spawn between November and February (WDNR 2019) on sandy intertidal beaches with freshwater seeps between mean higher high tide water and +7 feet. Sand lance spawning areas are not continuous and mainly occur in the Agate Point, Point Monroe, Battle Point, and Rich Passage areas. There are fewer sand lance spawning areas identified and mapped on Bainbridge Island.

Pacific herring consist of a mix of resident and migratory stocks that are present through Puget Sound. Most Pacific herring stocks spawn from late January through early April and their eggs are attached to subtidal eelgrass and marine algae anywhere between the upper limits of high tide and a depth of 40 feet. Pacific herring spawning areas are on the west side extending from Battle Point north around Agate Point, into Port Madison Bay and around Point Monroe. Pre-spawner holding areas are mapped north of Agate Point and Point Monroe as well as in Port Orchard Narrows. (WDNR 2019a).

Estuarine Habitat

Estuaries are semi-enclosed bodies of water that are freely connected with the open sea and within which saltwater mixes with freshwater drainage. Estuaries create transitions between marine, freshwater, and terrestrial environments that support a rich and diverse variety of wildlife species.

By definition, estuaries have a salt concentration from 0.5 parts per trillion up to 30 parts per thousand (NOAA 2017). Estuaries include sub-tidal and intertidal zones as well as lagoons, sloughs, and channels that meet this salinity definition. Estuaries are typically shallower with warmer water temperatures than marine habitat zones.

On Bainbridge Island, the estuarine environment may extend inland for some distance where freshwater from streams mixes with saltwater tidal currents. The largest estuaries on Bainbridge Island include Eagle Harbor and Manzanita Bay. Smaller estuarine communities are located within Murden Cove, Point Monroe lagoon, and in Blakely Harbor. Salinity content may be affected by the amount of freshwater flow that enters the saltwater, the strength of the tides, and the resulting amount of fresh to saltwater mixing. Salinity is not constant within such a mixing and may vary with depth and area of flow.

Wildlife Species:

Estuaries support many of the same species that are present in the marine environment described above (refer to “Species” section under “Marine Habitat”).

Freshwater Habitat

Freshwater bodies include lakes, streams, creeks, wetlands, riparian areas, and all other types of water bodies not included in estuaries or marine habitat that have a low ocean salt content. Freshwater habitats support different wildlife than saltwater systems, particularly species that depend on wetland vegetation. However, many fish and wildlife utilize both freshwater and marine habitats during some part of their life cycle. Freshwater wetlands provide sources of water to streams that rely on freshwater to provide spawning and rearing habitat. Streams can begin at a larger body of water and have associated riparian habitat. Estuarine wetland areas also rely on freshwater inputs for development of vegetation communities and support wildlife species that rely on the mix of freshwater and saltwater. Freshwater habitats are important as a source of water for drinking water, foraging, nesting, spawning, and migratory movements of a variety of terrestrial and freshwater wildlife species.

Riparian Areas:

These areas are the vegetated corridors located along streams, and springs. Riparian corridors have free-flowing water or moist conditions that result in high water tables, certain soil characteristics, and vegetation that is transitional between freshwater and terrestrial. The transitional edges are usually defined by a change in plant composition, relative plant abundance, and the end of high soil moisture content.

Riparian corridors transport water, soil, plant seeds, and nutrients to downstream areas, and thereby serve as important migration routes for many wildlife species. Riparian areas, though small in overall size, are one of the most important sources of wildlife biodiversity in the landscape.

Wetlands:

Freshwater wetland habitats are water bodies less than 20 acres in size or less than 6 feet in depth and include marshes, swamps, bogs, seeps, wet meadows, and shallow ponds (Cowardin et al 1979). Like riparian areas, wetlands are very productive, supporting diverse and dense populations of plants and animals. The wooded areas that are located adjacent to wetlands provide nesting areas, forage, and cover that are critical to wetland-dependent species, such as waterfowl and mammals including river otter, beaver and mink.

Riparian and wetland vegetation provide significant food and cover for wildlife. Generally, riparian areas and wetlands provide substantially more important wildlife habitat than drier forested areas. Riparian areas are also passageways for wildlife moving between or around developed areas. Riparian vegetation also helps maintain optimum fish spawning conditions by providing shade, bank stabilization, a breeding ground for insects, and a source of organic material for streams.

Lakes:

Lakes are water bodies greater than 20 acres in size and more than 6.6 feet in depth (Cowardin et al 1979). There is lake fringe wetland in some lakes and the limit of wetland designation is at a depth of 6.6 feet because most lake fringe wetland vegetation does not grow in this depth. The deeper waters and larger surface of a lake support many fish and wildlife species. However, many species prefer to nest and forage in shallower ponds and the lake fringe and forested/shrub wetlands that adjoin lakes.

Gazzam Lake at 14 acres does not qualify as a lake under the definition above, but it is the largest freshwater body on the island. It appears on the PHS map as a freshwater pond (WDFW 2019). Other smaller ponds include Nute's Pond, a pond on IslandWood property, and a small reservoir formerly a pond irrigation pond in the Grand Forest. These smaller ponds are identified as freshwater ponds on the PHS map (WDFW 2019). The pond at Sakai Park is classified as a wetlands system and is not technically a freshwater pond (Ecological Land Services, 2017, Joanne Bartlett, biologist).

Wildlife Species:

The PHS maps indicated that there is occurrence of such species as coastal and resident cutthroat trout, Coho salmon, steelhead, and fall chum that rely on the streams and ponds on Bainbridge Island for migration, spawning and/or rearing. Gazzam Lake, Nute's Pond, and Islandwood Pond are considered priority habitat but there are no priority species mapped as present within these freshwater habitats (WDFW 2019).

Fish Habitat & Species:

Island streams provide freshwater habitat for various species of anadromous fish, including salmon and coastal cutthroat that live in saltwater but return to spawn in freshwater. These fish species have evolved over time to fit the specific characteristics of their stream of origin and are uniquely imprinted compared with other members of the same species (NOAA 2019).

Anadromous fish require cool, uncontaminated water with healthy streambeds and insect populations. Vegetated riparian areas maintain stream habitats critical to fish by stabilizing water temperature, producing an insect supply, controlling erosion, and providing woody debris.

The larger streams on Bainbridge Island have documented occurrence and breeding areas of resident and coastal cutthroat, Coho salmon, fall chum, and steelhead. Of these species, only steelhead appears on the endangered species list (NOAA 2019). Steelhead are indicated only in the southern stream leading into Manzanita Bay (PHS 2019). Chinook salmon (Puget Sound) and bull trout, both of which appear on the endangered species list (NOAA 2019; USFWS 2019), were not indicated within any of the Bainbridge Island streams. Both species can be found within the marine waters of Bainbridge Island, but the streams are too small and the temperature is too high to support spawning habitat for bull trout and Chinook salmon. Most of the streams on Bainbridge Island have resident and coastal cutthroat breeding areas with several also having Coho salmon breeding areas. Fall chum salmon are found in only a couple of the streams mapped on PHS (WDFW 2019).

Factors that have contributed to the decline of wild runs of anadromous fish include:

- Forest clear cutting and land developments that create sediment loads which increase water turbidity and silt in gravel spawning beds;
- Clear cutting tree stand in riparian areas that remove natural shading which increases water temperatures; and
- Water diversions that restrict access to the upper reaches and spawning areas of streams.

Terrestrial Habitat

Terrestrial habitat includes those lands upland of marine waters, freshwater streams, and wetlands. These areas extend from the level lowlands that border marshes, rivers, etc., to the tops of bluffs and foothills on the island. Terrestrial habitats are important to wildlife and protection of critical areas because they provide habitat variability and buffers for marine waters, freshwater streams and wetlands. The more diverse upland habitats have a mix of different vegetation groups in close proximity that provide habitat for a variety of species.

Plants:

Natural plant communities are described in terms of broad vegetation patterns called vegetation zones. Washington plant communities are divided into three major vegetation groupings including:

- forests
- grasslands and shrub/grass communities
- timberline and alpine areas

Bainbridge Island contains one primary forested vegetation zone: the western hemlock zone (Franklin and Dyrness 1973). This zone is defined by elevation which affects temperature and vegetation types.

Much of the island is located within the western hemlock zone. This zone is the most extensive vegetation zone in all of western Washington, extending from the Pacific coast to an elevation of about 2,500 feet, and characterized by a mild and generally wet climate.

The western hemlock zone is the major source of commercially harvested coniferous trees including western hemlock, Douglas fir, and western red cedar. Grand fir, western white pine, and lodgepole pine also occur within this zone although on a less frequent basis.

Deciduous tree species, such as red alder, big leaf maple, and paper birch, are generally dominant on lands that have been cleared for urban and agriculture uses on the Island. Black cottonwood, willow, red alder and big-leaf maple also tend to grow along major watercourses (Franklin and Dyrness 1973).

Understory vegetation in the western hemlock zone varies depending upon soils, wetness, and other environmental factors. Some typical understory species in this zone include Oregon grape, salal, vine maple, Indian plum, ocean spray, and beaked hazelnut, salmonberry, and sword fern.

Development on the island has substantially reduced terrestrial habitat throughout the years. However, valuable habitat remains in undeveloped, large native forests that are prevalent on Bainbridge Island. Some wildlife species may feed in more than one type of habitat during the day but retreat for night and seasonal cover into upland wooded areas.

Some previously forested areas on the island have been converted to pastures and meadows which may contain agricultural crops, woody vegetation, grasses, and wildflowers. These areas provide food for migratory waterfowl and deer, habitat for birds and small mammals, and hunting grounds for predators like garter snakes, bald eagles, barn owls, red-tailed hawks, and coyotes.

Many wildlife species can tolerate urban development as long as some adjacent habitat and connecting migration corridors remain undisturbed, and large reserves remain connected by natural migration corridors. These corridors enable species to colonize new areas, forage for food, find mates, and exchange genes with neighboring populations.

Wildlife Species:

Priority Habitat and Species map (WDFW 2019) revealed that there are several wildlife species that rely on terrestrial habitat of Bainbridge Island at least part of the year or part of their life cycle include: great blue heron, pileated woodpecker, purple martin, big brown pallid bats; and mountain quail. In addition, deer, black bear, and cougar have been identified by island residents. Great blue heron is a species that uses both wetland and marine environments and terrestrial habitats. The main use is the establishment of rookeries within high deciduous trees. The PHS mapping showed at least three areas where rookeries currently occur. The big brown bat is mapped within Township 26 N, which encompasses the northern one fifth of Bainbridge Island. The mapping does not indicate that big brown bats have been observed within the mapped township. There are two areas where pileated woodpeckers were mapped on the PHS, one area of purple martin along Eagle Harbor, and one area of mountain quail in the southwestern portion of the island.

None of the species mapped by the PHS are on the state or federal endangered species lists. The pileated woodpecker appears on the state candidate species but does not appear on the federal list as endangered or threatened. Species on the federal endangered species list includes marbled murrelet, yellow billed cuckoo, and streaked horned lark (USFWS 2019). These species are not known to occur on Bainbridge Island according to the PHS maps (WDFW 2019).

Other Important Habitats

Bainbridge Island has a number of other specific habitat types that are critical to wildlife including caves, cliffs, urban natural open space, and snag-rich areas.

UNIQUE & THREATENED PLANT SPECIES

The WA State Department of Natural Resources' Natural Heritage Program has compiled a list of endangered, threatened and otherwise sensitive plant species in WA State. Currently, there are six species of threatened plant species that may still be found in Kitsap County (WDNR 2018). These include pink sand-verbena, golden paintbrush, Canadian St. John's-wort, bog clubmoss, western yellow oxalis and giant chain fern. These species are mapped in areas of Kitsap County including portions of what appears to be Bainbridge Island (Camp and Gamon WDNR). There is no data regarding the occurrence of these species on the island.

WILDLIFE HABITAT CONCERNS

Marine Habitat

Urban development and forest cutting practices along the shoreline can seriously impact the marine environment by increasing the amount of suspended solids, pollutants, or freshwater entering marine areas. Suspended solids introduced into saltwater can reduce light penetration, increase sediment deposition, increase water temperature, and affect dissolved oxygen and pH balance, thereby affecting all forms of marine habitat.

An increase in turbidity as slight as 1% can reduce light penetration and affect kelp and eelgrass beds. An increase in sedimentation levels can smother eelgrass beds in shallow areas, as can long term exposure to sewage effluent.

Sedimentation created by natural or urban erosion can cover shellfish beds and fish spawning gravel. Shellfish beds can also be contaminated by chemical and bacterial discharge, and viruses created by agriculture practices, failing septic drainfields, sewage outfalls, and stormwater runoff. Some contaminants may not harm shellfish, but may adversely affect birds and other animals that feed on the shellfish.

Toxic contaminants contained within urban stormwater runoff or industrial discharge can poison the marine water column and sediments creating tumors and poisonous concentrations in fish and invertebrate species.

Bulkhead, dock, and other waterfront structures can reduce the natural shoreline and affect the rate of natural beach deposition resulting in loss of vegetation and loss of the shoreline and intertidal habitat that support herring, smelt, and other fish.

State and local efforts are monitoring effects of climate change. These changes include a rise in ocean levels and probable changes in alkaline/ acidity levels in Puget Sound.

Estuarine Habitat

Some estuarine areas have been filled or drained in the past, especially around developed waterfront. The remaining unaltered estuarine areas may be protected by the Shoreline Management Act, which virtually prohibits further alterations.

Among the greatest risks to estuarine areas are contaminants that may enter the saltwater from oil transportation hazards (including oil spills), recreational boating activity and from freshwater by way of

general road runoff and storm water pollution from agriculture, septic failures, and other degradations. Water quality risks are dramatically increased where land development activities occur along freshwater streams that feed an estuary.

Effects of climate change will likely alter patterns of estuarine habitat and diminish traditional habitats.

Freshwater Habitat

Some freshwater habitats have been altered on the island by landfill or piped diversions. Past development activities adjacent to urban areas, particularly along the shorelines and waterfronts, have filled valuable wetland habitat areas.

Among the greatest risks to freshwater habitats are contaminants that may enter the storm water runoff from agriculture, septic failures, and other urban land uses. Water quality risks are also dramatically increased where land development or timber clearing activities increase erosion and siltation, and where vegetation is cleared within the riparian buffer along freshwater corridors.

Development activities most adversely affect the quality of freshwater habitat by removing vegetation, and increasing silt, organic debris, and other storm water contaminants that enter the natural drainage system. Generally, studies have determined that the hydrological balance of a stream begins to decline when 12% of the watershed becomes impervious.

Effects of climate change will alter existing patterns of freshwater habitat as a rise in temperature affects species and spawning patterns.

Terrestrial Habitat

Considerable terrestrial habitat has been permanently lost by the clearing of lands for agriculture and urban land developments. Commercial forest management practices have included replanting clear cuts with single species, thereby reducing wildlife diversity and isolating habitat and migration corridors, particularly along riparian areas.

Fire suppression, particularly of naturally occurring wildfires has reduced the amount and diversity of meadowlands and other open areas necessary for foraging activities.

The greatest risk to the terrestrial habitat, however, is the continued pace of urban land conversions, particularly land development patterns that block or demolish migration corridors, log timbered areas, remove riparian cover, erode productive topsoil, and introduce urban activities (including potentially intense recreational uses) into wildlife areas.

As the most important habitats are isolated, wildlife species decline in diversity and number. Urban tolerant species, like raccoons and crows, invade the remaining habitat from the urban edges, supplanting and driving out many native species.

LAND USE IMPLICATIONS

Marine, estuarine, freshwater, and terrestrial habitats contribute to the overall biological diversity of the region and provide a number of additional environmental functions and values of interest to Bainbridge Island residents. Many species depend on the constant interaction of all four of these habitat systems for food, cover, nesting, and other survival requirements.

Impacts on plant, fish, and wildlife habitat can be minimized by sensitive land use patterns, innovative design concepts, and performance oriented development standards that:

- Replant native vegetation along the shoreline and tidal boundaries, within the estuarine zone, and along drainage corridors,
- Remove artificial shoreline structures, barriers to the mixing of salt and freshwater, and freshwater impoundments or diversions,
- Control the content and quality of stormwater runoff that enters freshwater systems and marine and estuarine environments,
- Cultivate native trees and shrubs that support and retain native species, and
- Cluster roadways and other improvements to preserve natural shorelines and provide contiguous open spaces as common lands.
- Assist where appropriate to climate change solutions once officially recommended by the City of Bainbridge Island now underway or state of Washington.

Within a park setting, the most intense park activities should be separated from the most sensitive habitats by creating preserves, open space corridors, and other protected areas. This park, recreation, and open space plan seeks to preserve and enhance critical and unique habitat areas by purchasing development rights or title for natural area parks.

HISTORICAL DEVELOPMENT

Archaeological Sites

The arrival of people in the Pacific Northwest cannot be dated with great precision. However, archaeological investigations at the Manis mastodon site near Sequim on the Olympic Peninsula indicate humans were in the area as early as 12,000 years ago.

There are more than 5,000 Native American sites on record in the state, only a few of which have been professionally evaluated. Generally, sites are located at river conjunctions within valleys and along the shoreline. Known sites have been grouped into three rather broad time periods:

- **Early sites:** approximately 12,000-8,000 years old
- **Middle period sites:** between 8,000-3,000 years old
- **Late period sites:** approximate 3,000 years old

Native American Tribes

Many Native American tribes inhabit the Pacific Northwest region with diverse life-styles, languages and traditions. The people who lived in the Puget Lowlands depended largely on seafood, salmon and shellfish, supplemented by berries, roots, and game. The tribes built substantial cedar plank houses, often big enough to house a number of families clustered in villages. Cedar trees also provided transport, in the form of dugout canoes. The local Native American population is estimated to have declined by nearly 90% as a result of smallpox and other epidemics after European settlement.

The Suquamish people occupied Gig Harbor north to Appletree Cove and Admiralty Inlet, as far south as Case and Carr inlets, and on Blake, Bainbridge, and Whidbey Islands. Between Hood Canal and Admiralty Inlet, they occupied at least 3 autonomous villages. The Suquamish name was derived from the ancient native village (Suqua) that was located on the shores of Agate Passage on Kitsap Peninsula across the island.

The village of Suqua contained the famed “Ole Man House” which was 500 feet long and 60 feet wide and housed several families. The house was burned in the 1870s on the orders of a federal agent.

The Suquamish lived on seasonal harvests of fish, shell-fish, roots, and berries. They also traded with neighboring tribes for whale oil, razor clams, salmon, basketry, and beadwork as well as with the Hudson

Bay Company's Fort Nisqually post in the 1830s. The Suquamish produced carvings, weaving, and basket making as trade goods.

Chief Sealth (Seattle) of the Suquamish was born on Blake Island in 1786 and was largely responsible for the peaceful settlement of Seattle and the surrounding communities by European settlers. The Suquamish, however, were in a state of constant warfare with other tribes, particularly the Chimakum and Duwamish over territorial boundaries.

The Point Elliott Treaty of 1855 established the Port Madison Reservation on Kitsap Peninsula for the Suquamish peoples.

European Exploration

The first European exploration of Puget Sound was done in 1792 by British explorer Captain George Vancouver. Vancouver anchored for several days in his ship HMS Discovery off Restoration Point at the southern end of the island while boat parties surveyed other parts of Puget Sound. Vancouver spent a day investigating Rich Passage, Port Orchard, and Sinclair Inlet, though he failed to find Agate Passage. His original maps assumed Bainbridge Island was part of Kitsap Peninsula.

More detailed mapping was accomplished by Lieutenant Charles Wilkes in 1841. Wilkes sailed two ships for the Oregon Country entering the Strait of Juan de Fuca and anchoring in Port Discovery. The expedition explored the entire Puget Sound region including Bainbridge Island. Wilkes named the island after Commodore William Bainbridge, commander of the frigate USS Constitution in the War of 1812.

Religious missions and a nominal military presence were established in the region after the 1846 Oregon Treaty established the international boundary.

George Meigs located a saw mill at Port Madison in 1854. Port Madison was the only white settlement on the island at the time with 19 persons. Meigs built and operated a blacksmith shop, machine shop, and brass and iron foundry at the site. He ran an alcohol free town and encouraged families to locate and live at the site as a company town. The embezzlement by one of Meigs subordinates in 1857 cost the town the county seat and eventually closed the mill.

William Renton built the Port Blakely mill which was larger than Meigs' Port Madison mill. Port Blakely was considered to be one of the largest mills in the world even though it burned to the ground twice during its operation. During the mill's heyday from 1885 to 1895, the mill employed about 1,200 workers who supported a number of local saloons and hangouts, compared to Port Madison's dry company town environment.

In 1881, the Hall Brothers Shipbuilding Company relocated from Port Ludlow to a site next to the Port Blakely Mill to take advantage of the available and high quality timber. Hall Brothers built 77 schooners, barks, and barkentines between 1873 and 1903 at the site.

This early logging and industrialization cleared the island's interior and supported the development of commercial farming operations. Early agricultural immigrants came from Norway, and were soon followed by Japanese farmers who transformed the island economy. Strawberries were the signature crop, although some Japanese farmers grew greenhouse specialties including lilies, cucumbers, tomatoes, lettuce, geraniums, and chrysanthemums.

The berry farmers hired itinerant pickers during harvest season including Native Americans and Filipino immigrants during the 1920s. When World War II forced Japanese families into internment camps, Filipino caretakers typically continued raising crops in the owners' absence. The Filipino Community Hall was built on the island in 1930 and remains an active social center.

In 1902, the Hall Brothers Shipyards moved their company from Port Blakely to Eagle Harbor and enlarged their shipbuilding operations. Winslow Hall, for whom the town of Winslow was named, was one

of three brothers who learned shipbuilding in Cohasset, Massachusetts, and then came west to San Francisco, Port Ludlow, Port Blakely, and finally to Winslow following the supply of good quality lumber.

In Winslow, the shipyard built lumber schooners, stern-wheel steamers, and propeller steamers, and rebuilt the boats years later when new owners wanted improvements. After 1916, the yard changed ownerships but continued operating through both world wars often with women employees modernizing older vessels and building minesweepers. The shipyard ceased operation in 1959.

In the early 1880s, access to the island was provided exclusively by the Mosquito Fleet which consisted of a multiplicity of privately owned and operated stern-wheel and propeller steam boats that serviced waterfront towns and cities, business and agricultural centers, resorts, and other users throughout Puget Sound and the inland navigable freshwater ways.

The Mosquito Fleet serviced 36 different docks, piers, and other landings around the island, some of which are still visible as pilings, and one (Point White Pier) which is owned and maintained by the Park District at the southwest end of the island.

The SR-305 steel girder bridge was built across Agate Pass after World War II, providing vehicular access to Kitsap Peninsula. Ferry service was eventually consolidated between Winslow and Coleman Dock in Seattle when WA State established and operated the public ferry system on Puget Sound

During the strawberry heyday in the 1920s, farmers banded together to build a processing plant in Winslow. The berries were packed and kept in cold storage for shipment to Seattle where many were canned and sold under the name "Armour's Best".

Fort Ward & Other Military Sites

In the late 1890s, the army established a trio of forts to guard the entrance to Puget Sound, Forts Worden, Flagler, and Casey in Port Townsend and Whidbey Island. A few years later Fort Ward on Bainbridge Island was added along with Fort Lawton on Magnolia Bluff in Seattle to form a second line of defense.

Fort Ward's primary defense system was based on mines, known during World War I as "torpedoes" that were deployed in Rich Passage, the entryway to the Bremerton Navy Yard. In addition, 4-inch guns were installed in fixed emplacements along the beach with larger caliber guns on the bluff.

Shortly before World War II, the Navy acquired the fort and developed a state-of-the-art radio communications center with a transmitter at Battle Point, on the west side of the island, and receivers at Fort Ward. During World War II, Fort Ward deployed barrier nets that stretched across Rich Passage to prevent entrance by enemy submarines. The black wooden pilings that supported the heavy cables are still visible.

A portion of Fort Ward was eventually turned over to Washington State for a state park. In 2011, the State of Washington transferred Fort Ward State Park to the Park District. Other island parks that were former military sites include Battle Point Park as discussed above, and Strawberry Hill Park and Eagledale Park former Nike missile silo sites. These three parks once owned by the federal government became some of the island's first parks in the late 1960's. Prior to being owned by the federal government, Strawberry Hill Park was a strawberry farm that was owned by the Hayashida family.

Winslow

Incorporated in 1947 and annexed the entire island in 1991 as the City of Bainbridge. The city is now chartered as a Council/City Manager form of city government.

See Appendix G for a listing of historic sites on the island. More information about the history of Bainbridge Island can be obtained from the Bainbridge Island Historical Museum at 215 Ericksen Avenue NE, Bainbridge Island, WA 98110.

POPULATION & SOCIOECONOMIC CHARACTERISTICS

The information provided in this section was obtained from the United States Census Bureau, the WA State Office of Management & Budget, and the Puget Sound Regional Council. See related links below: (ACS) <https://ofm.wa.gov/washington-data-research/population-demographics/american-community-survey> and (PSRC) <https://www.psrc.org/data-and-resources/data-psrc>,

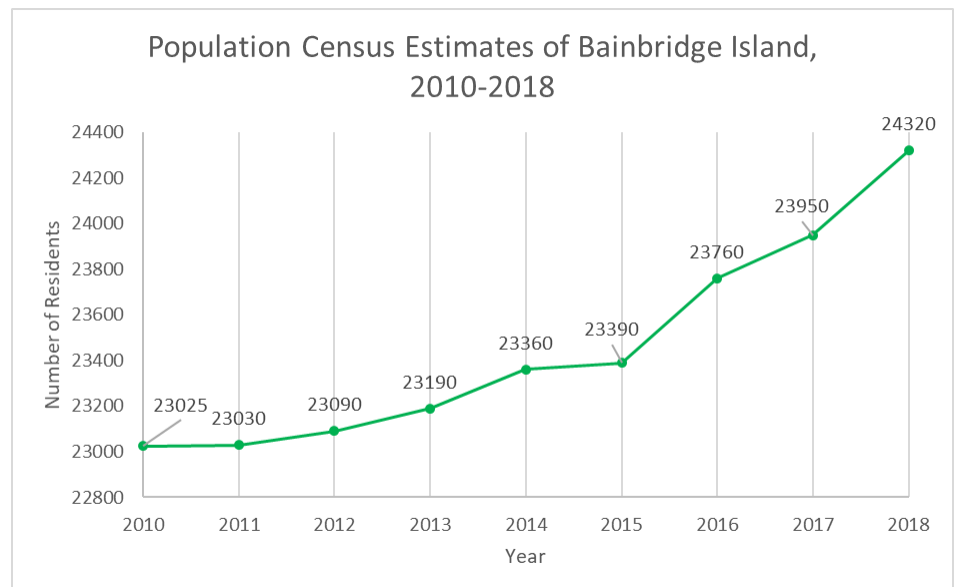
Population Trends

Bainbridge Island's population was estimated to be 23,025 in 2010 and 24,846 in the year 2019 - equal to an average annual increase of 0.70% per year over the 9-year period. By comparison, Kitsap County increased at an annual average rate of 0.81%, the Puget Sound Region by 1.46%, and Washington State by 1.29%

According to the Puget Sound Regional Council (PSRC) and Bainbridge Island's Planning & Community Development Department, the island's population is forecasted to increase to 33,300 persons by the year 2040, or by another 9,091 persons (37%).

The island's rate of population increase is estimated to be equal to an annual average increase of 1. % compared to .72. % for Kitsap County, 1. % for Washington State.

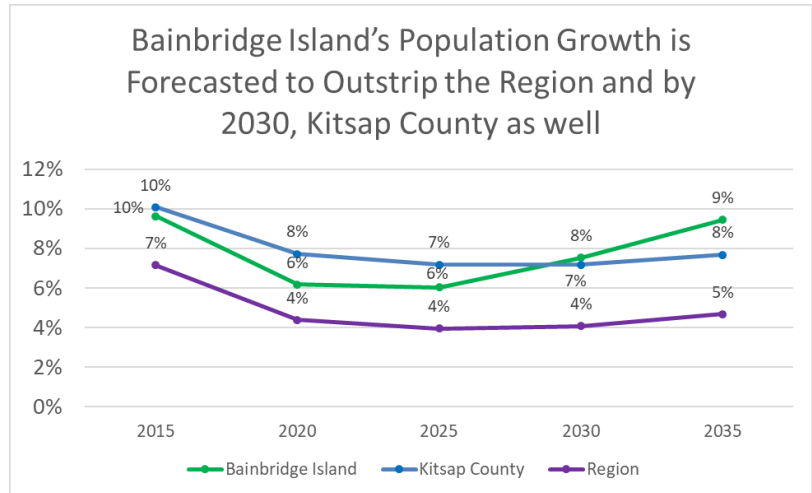
Most of this projected increase will come from the in-migration of households seeking to live, work, and retire on Bainbridge Island. The projected growth will be significant and will increase demand for park, recreation, and open space resources on the island.



Socioeconomic Characteristics: Age and Household Status

In 2017, the US Department of Census compiled demographic statistics on a jurisdictional basis for the entire United States including Washington State, Puget Sound (King, Kitsap, Snohomish, and Pierce Counties), Kitsap County, and Bainbridge Island. The statistical census information has been compiled in report format by the Puget Sound Regional Council (PSRC).

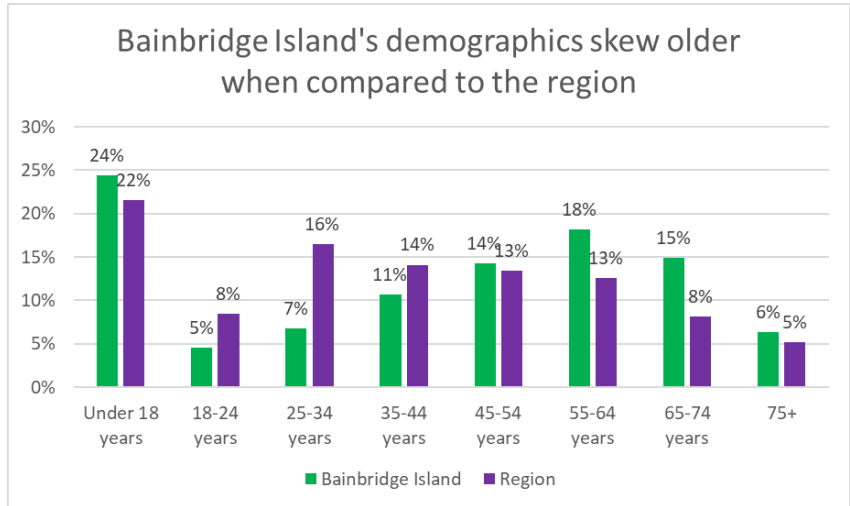
According to the statistical findings, the population on Bainbridge Island in 2017 had age and household characteristics that were significantly different than the averages typical of the nation, state, region, and county. For example:



- **Age groups** for the island had a greater concentration of more middle age and older adults than was common of Kitsap County, Puget Sound, WA State, and the USA. The island has attracted and retained a greater proportion of middle to older age adults with children than is typical of other comparable areas.
- **Median age** was 43.7 on Bainbridge Island compared with 39.1 in Kitsap County, 37.6 in WA State and 37.8 in the USA. Bainbridge Island attracts a population with a larger proportion of older age members than is common of the surrounding region. Most likely these older age residents have stayed on the island thorough family raising ages preferring to retire here than elsewhere compared to other comparable areas.
- **Average household size** was 2.43 persons per household on Bainbridge Island compared with 2.51 in Kitsap County, 2.55 in Washington State, and 2.63 in the USA. Bainbridge Island households average slightly less members than is common of the surrounding region and state.
- **Population under age 18** was 24.4% on Bainbridge Island compared to 20.9% in Kitsap County and 22.5% in WA State. Bainbridge Island attracts family households with children and younger age adults in a pattern typical of the surrounding more urban region.
- **Population over age 65** was 21.3% on Bainbridge Island compared with 16.4% in Kitsap County, 14.4% in WA State, and 14.9% in the USA. Bainbridge Island has retained a higher proportion of older age adults than is comparable to the region and state.

Socioeconomic Characteristics: Age and Household Status (continued)

These statistics indicate Bainbridge Island has retained somewhat older family-oriented households with slightly fewer children including a significant proportion of non-family adults living alone than is typical of the surrounding region and state. This household composition will tend to pursue active recreational activities that are varied and, in some instances, atypical of the region if this trend prevails.

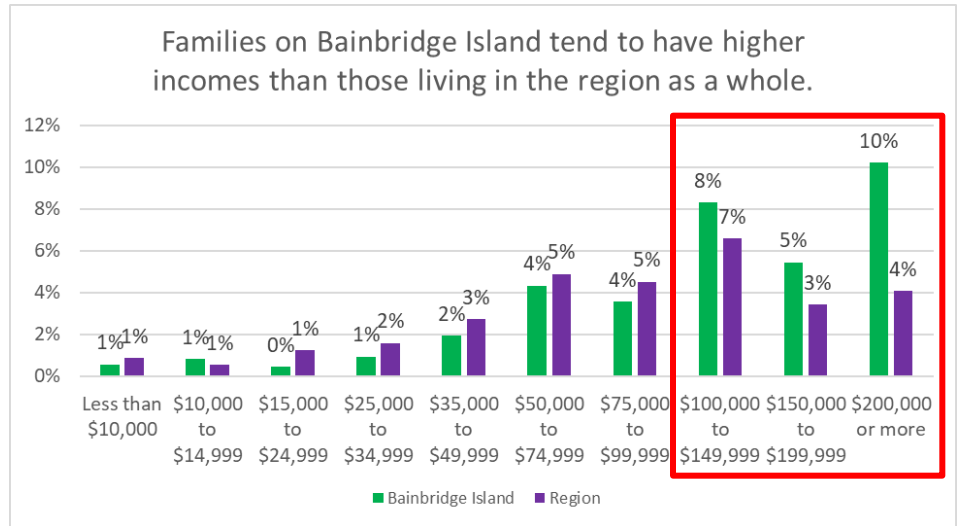


Education, Occupation, & Income

- **The percentage of persons over the age 18 with a bachelor's degree or higher** was 49.8% on Bainbridge Island compared with 22.5% in Kitsap County and 24.5% in WA State. Bainbridge Island contains a population with a higher proportion of upper educational degrees than is typical of all other comparable areas.
- **Median household income** was \$109,341 on Bainbridge Island compared with \$68,336 in Kitsap County, and \$66,174 in WA State, and \$57,652 in the United States. Bainbridge Island households, with greater educations, more professional and managerial occupations, and employment within the Seattle urban areas accumulate more income than is typical of other comparable areas.
- **Per capita income** was \$58,371 on Bainbridge Island compared with \$34,412 in Kitsap County, and \$34,869 WA State, and \$31,177 in the United States. Bainbridge Island households, with more college educated individuals and more service industry oriented employment average more income per person in smaller households than is typical of other comparable areas.
- **Persons living in poverty** was 4.8% on Bainbridge Island compared with 9.9% in Kitsap County, a region average of 6.8%, 12.2% in WA State, and 14.6% in the United States.

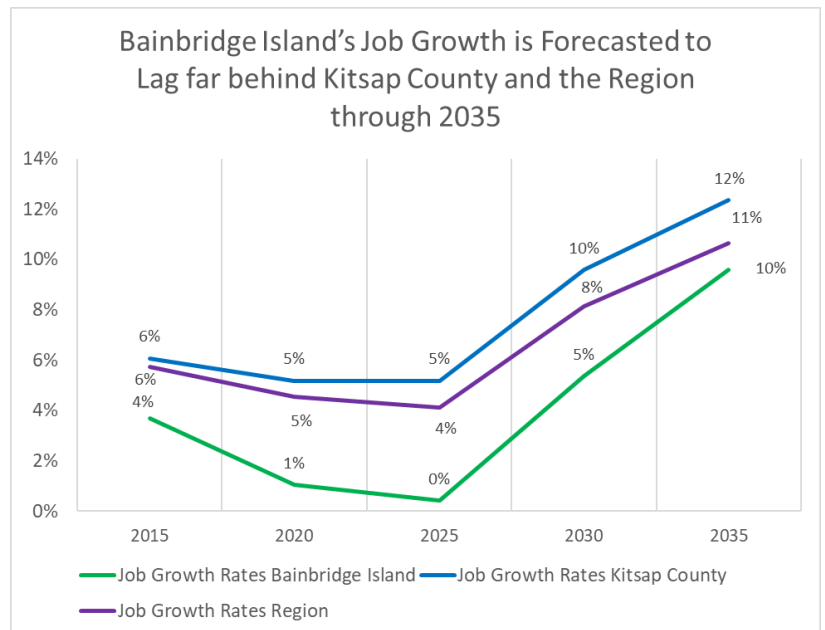
Education, Occupation, & Income (continued)

This snapshot on income indicates Bainbridge Island has attracted a population proportionately more composed of college graduates with service industry-oriented job skills, and more disposable income than is typical of other comparable areas. As a result, Bainbridge Island per capita incomes are and will remain higher than is typical of all comparable areas. If this trend continues residents will be able to choose to pay for and finance a greater variety of park, recreational, and open space facilities and program services. (ACS)



Job Growth

Local job growth on Bainbridge Island will lag in comparison to other regional job hubs. For the next decade forecasts foster what is characteristic a commuter dominated community, with working households dominated by workers that commute off-island for employment. (PSRC)



Housing Characteristics

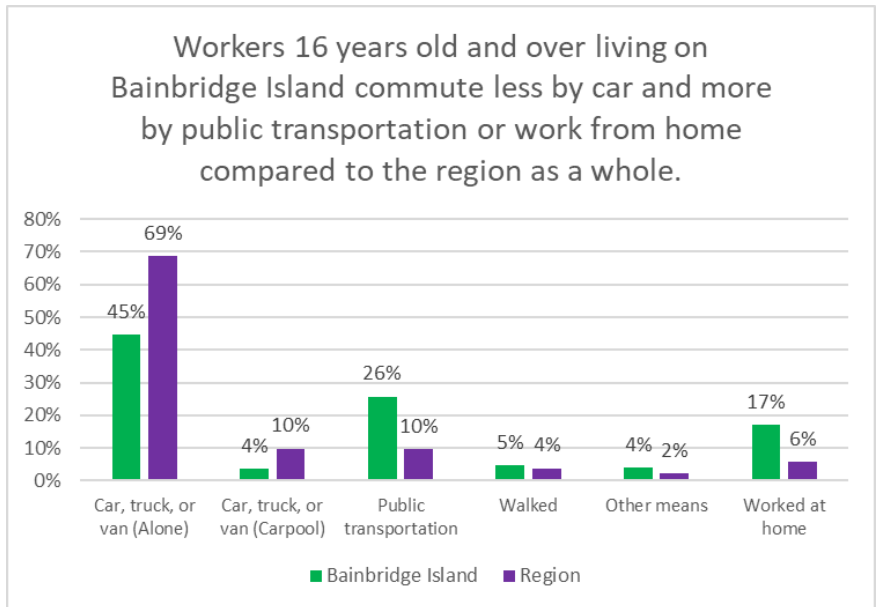
- **The percent of owner-occupied housing units** was 76.4% on Bainbridge Island compared with 66.8% in Kitsap C, 62.7% in WA State, and 63.8% in the USA. Bainbridge Island owner occupied statistics may be higher than the region because Bainbridge Island households have higher household incomes and the island has a lesser percentage of available rental housing properties.
- **The percent multi-family units are of all housing structures** was 20% on Bainbridge Island compared with 31% Kitsap County. Single family units may be the preferred choice of Bainbridge Island households and/or the past predominant market offering.
- **The median value of owner-occupied housing units** was \$624,200 (2017) on Bainbridge Island compared with \$277,500 in Kitsap County, \$286,800 in WA State, and \$193,500 in the USA.

The statistics indicate Bainbridge Island households are predominantly housed in owner occupied single family units considerably more expensive than the surrounding region.

Transportation Characteristics

Percent that commute to work in car, truck, or van alone was 45% on Bainbridge Island compared with 69% in Kitsap County, 69% in Puget Sound, 72% in WA State, and 76% in the USA, indicating Bainbridge Island residents are less dependent on automobiles and more dependent on walking, bicycles, buses, and ferries than other comparable areas.

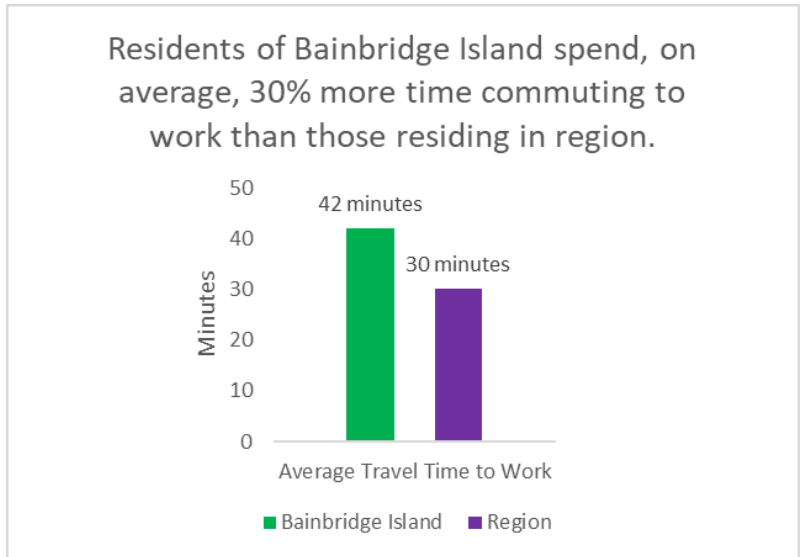
Approximately 4% on Bainbridge Island commuted in carpools compared with 8% in Kitsap County, 10% in Puget Sound, 10% in WA State, and 9% in the USA. (PSRC)



Transportation Characteristics (continued)

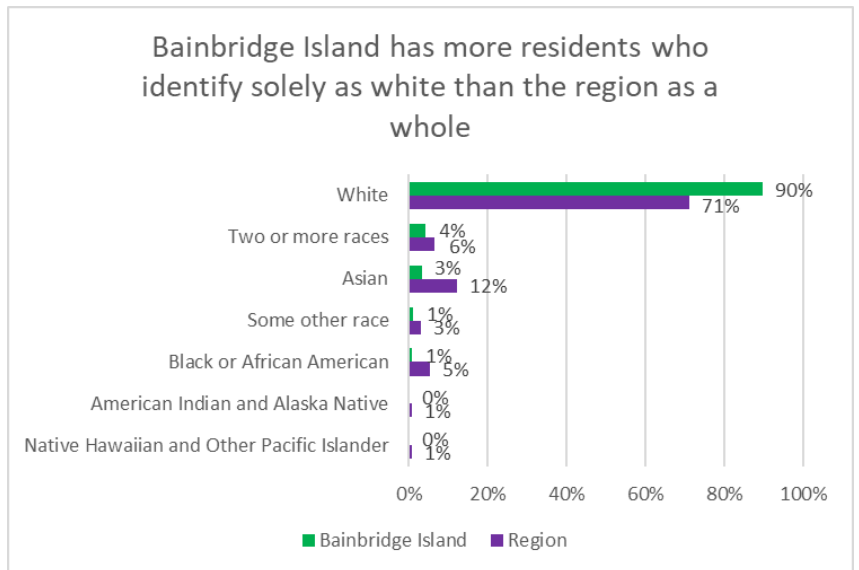
The mean travel time to work in minutes was 42 minutes on Bainbridge Island compared with 30 minutes in Kitsap County and the Puget Sound Region and 27 minutes in WA State. Bainbridge Island households may live closer to the Seattle ferry and drive on less congested roadways on average than employees in the surrounding areas, but commute for longer periods due to the 35-minute ferry travel time between the island and Seattle. (PSRC)

The statistics indicate Bainbridge Island’s working population is predominantly commuting to work by vehicles in somewhat longer travel times due to the off-island ferry commute to Seattle for most of the resident labor force. Bainbridge Island residents will continue to commute by ferry to off-island employment locations if this trend continues.



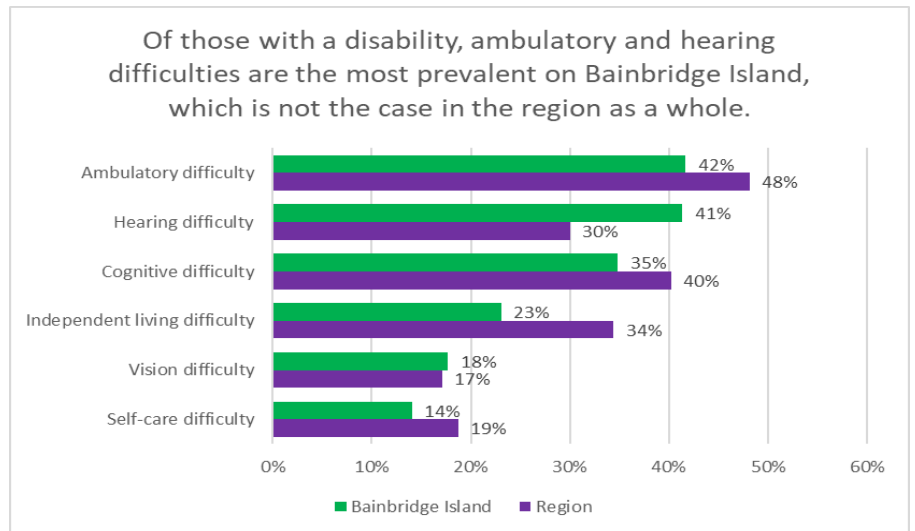
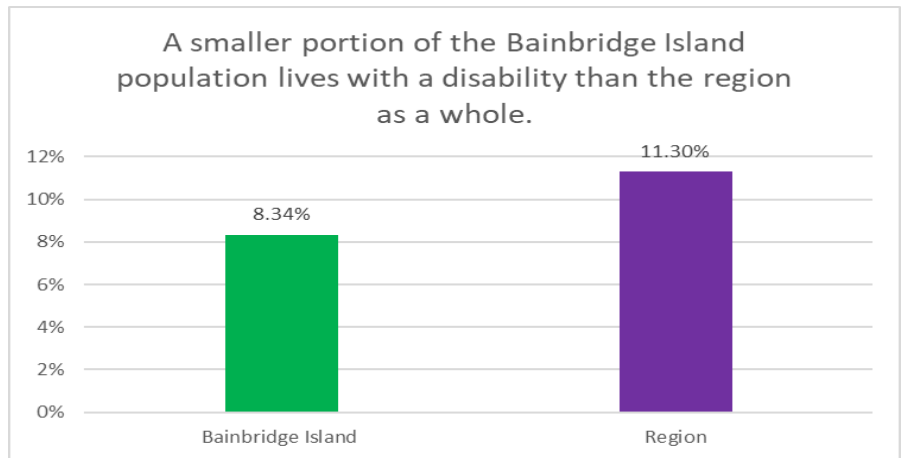
Race & Ethnicity Characteristics

Bainbridge Island is comprised of a population that identifies largely as Caucasian in ethnic origin. (ACS)



Disabilities Characteristics

Community indicators show a rate of disability at or somewhat below regional and United States disability rates.



Conclusion: Population & Socioeconomic Characteristics

Based on 2020 forecast data, Bainbridge Island park, recreation, and open space demands reflect a slightly older and more affluent population relative to Washington state residents as a whole. It appears that this trend will continue for the next six years of this planning cycle and on into the near future.

Climate change also raises questions pertaining to increased migration to this area and specifically to the island due to a more favorable climate and the ensuing growth pressure this could bring.