

Appendix A: Setting

Puyallup boundaries - are generally described as extending:

- **North** - across the Puyallup River between 5th Street NE on the east and 82nd Avenue East on the west and Valley Avenue/Todd Road on the north,
- **East** - Valley Avenue/SR-162,
- **South** - 120th Street SE, and
- **West** - Woodland Avenue East.

Puyallup is located at 47°10'33"N 122°17'37"W (47.1757,-122.2936).

According to the United States Census Bureau, the city has a total area of 14.04 square miles, of which 13.93 square miles is land and 0.11 square miles is water, mainly consisting of the Puyallup River estuary.

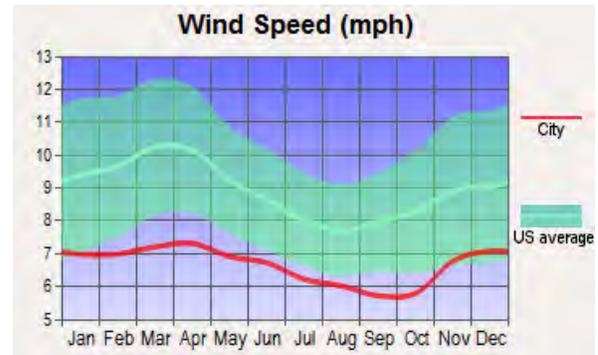
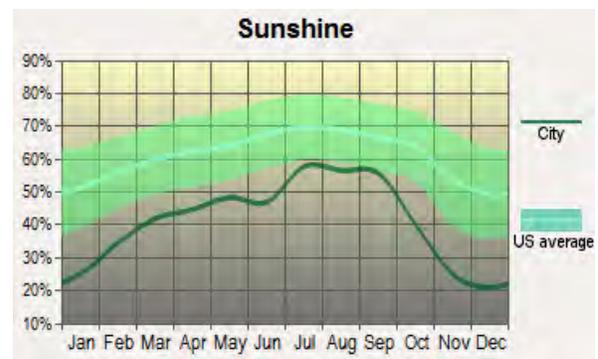
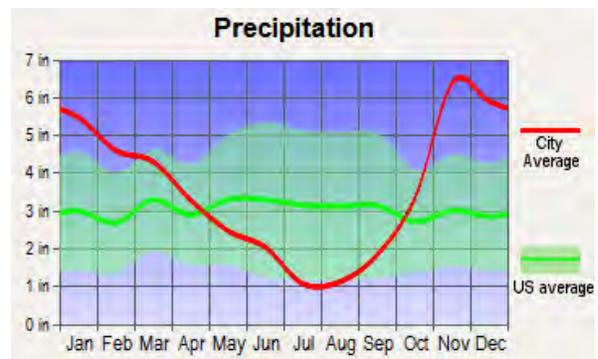
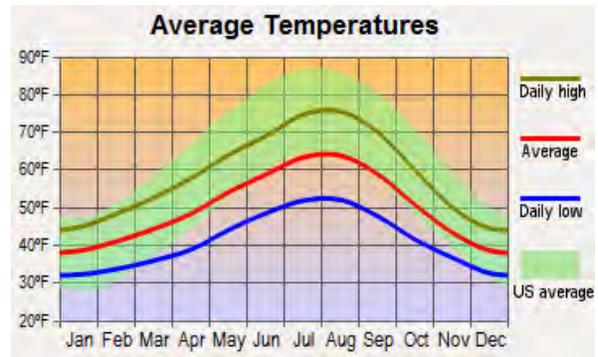
Climate

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.

In Puyallup, mean temperatures vary from a high of 73 degrees in August to a low of 33 degrees



Fahrenheit in January with extreme variations recorded at 0 to a high of 105 degrees Fahrenheit.

Average annual precipitation is about 38 inches with a mean growing season with temperatures above 32 degrees Fahrenheit for about 300 days. Approximately 80% of the precipitation occurs from October through March with less than 6% falling during June, July, and August.

On average, Puyallup may receive up to 6 inches of snow in January with sunshine for about 20% of the time and between 50- 70% sunshine during July and August. Wind speeds average between 7- 9 miles per hour in January and 6-8 miles per hour in September.

Earth

Washington is divided into three principal physiographic divisions - the Pacific Mountain System, the Rocky Mountain System, and the Intermontane Plateaus.

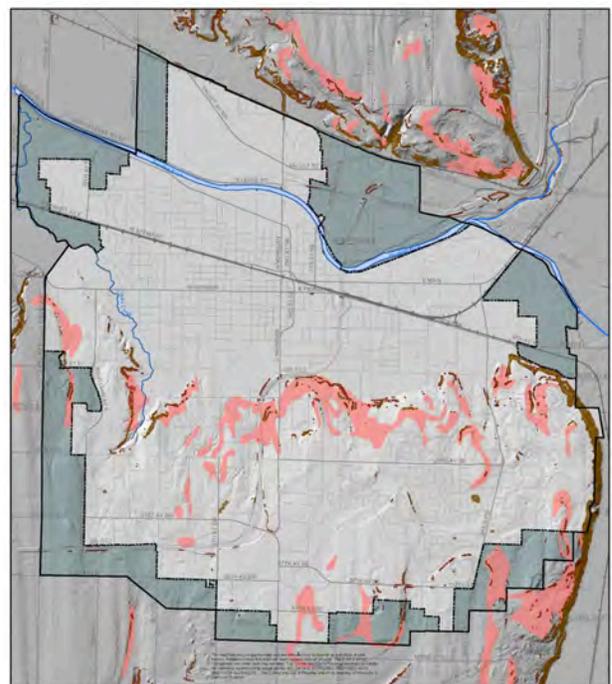
Pacific Mountain System - is defined by the Olympic Peninsula (the Pacific Border province) and the Cascade Mountain range and includes all counties that contain portions of the Cascade Mountains (the Cascade Mountain province).

Northern Rocky Mountain System - is defined by the foothills of the Rocky Mountain ranges and includes all counties that are located north of the Columbia River and east of the Cascade Mountain system.

Intermontane Plateau - is defined by the high plateaus created by the uplift between the Cascade and Rocky Mountain ranges and includes all counties that are located along the southern drainage basins of the Columbia River.

Puyallup is located within the eastern edge 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.

Puyallup is located within Puget Sound with topography ranging from 0 to about 40 feet above sea level. The hilltops overlooking Puyallup River Valley drop off abruptly to the north and east in places, with slopes ranging from 25 to 50%. As a result, the steeper slopes are subject to landslide hazard.

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.

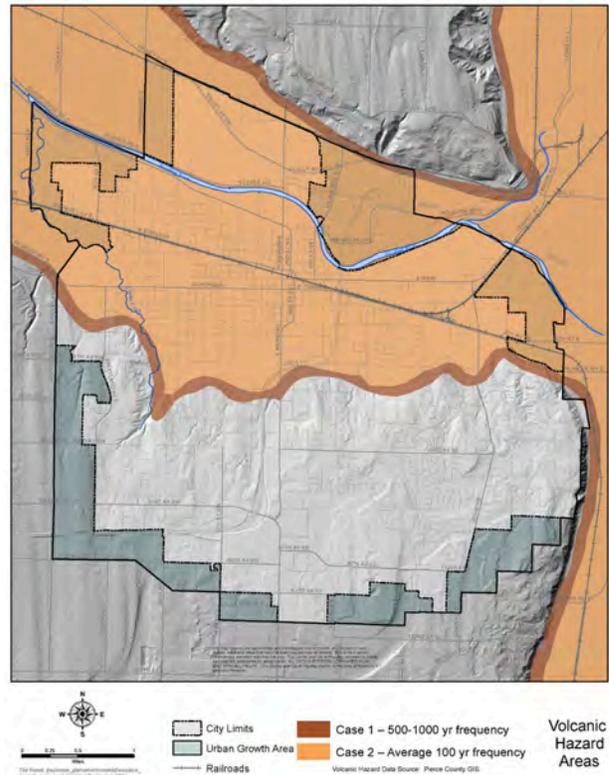
These combined processes created 11 principal soil regions in the state ranging from deposits with high concentrations of organic matter created by glacial and marine actions along Puget Sound to deposits with very low organic matter located in the eastern arid portions of the state.

Mount Rainier

Mount Rainier, also known as Tahoma or Tacoma, is a large active stratovolcano in Cascadia located 20 miles east of Puyallup in Mount Rainier National Park. With a summit elevation of 14,411 feet, it is the highest mountain in the U.S. state of Washington, and of the Cascade Range of the Pacific Northwest, the most topographically prominent mountain in the contiguous United States, and the tallest in the Cascade Volcanic Arc.

Mount Rainier consists of lava flows, debris flows, and pyroclastic ejecta and flows. Its early volcanic deposits are estimated at more than 840,000 years old and are part of the Lily Formation (about 2,900,000 to 840,000 years ago). The early deposits formed a "proto-Rainier" or an ancestral cone prior to the present-day cone. The present cone is more than 500,000 years old.

The volcano is highly eroded, with glaciers on its slopes, and appears to be made mostly of andesite. Rainier likely once stood even higher than today at about 16,000 feet before a major



debris avalanche and the resulting Osceola Mudflow approximately 5,000 years ago. In the past, Rainier has had large debris avalanches, and has also produced enormous lahars (volcanic mudflows), due to the large amount of glacial ice present.

Its lahars have reached all the way to Puget Sound, a distance of more than 30 miles. Around 5,000 years ago, a large chunk of the volcano slid away and that debris avalanche helped to produce the massive Osceola Mudflow, which went all the way to the site of present-day Tacoma and south Seattle. This massive avalanche of rock and ice removed the top 1,600 feet of Rainier, bringing its height down to around 14,100 feet. About 530 to 550 years ago, the Electron Mudflow occurred, although this was not as large-scale as the Osceola Mudflow.

After the major collapse approximately 5,000 years ago, subsequent eruptions of lava and tephra built up the modern summit cone until about as recently as 1,000 years ago - as many as 11 Holocenetephra layers have been found.

The most recent recorded volcanic eruption was between 1820 and 1854, but many eyewitnesses reported eruptive activity in 1858, 1870, 1879, 1882, and 1894 as well.

Seismic monitors have been located in Mount Rainier National Park and on the mountain itself to monitor activity. An eruption could be deadly for all living in areas within the immediate vicinity of the volcano and an eruption would also cause trouble from Vancouver, British Columbia, Canada to San Francisco because of the massive amounts of ash blasting out of the volcano into the atmosphere.

Mount Rainier is currently listed as a Decade Volcano, or one of the 16 volcanoes with the greatest likelihood of causing great loss of life and property if eruptive activity resumes. If Mount Rainier were to erupt as powerfully as Mount Saint Helens did in its May 18, 1980 eruption, the effect would be cumulatively greater, because of the far more massive amounts of glacial ice locked on the volcano compared to Mount Saint Helens, the vastly more heavily populated areas surrounding Rainier, and the simple fact that Mount Rainier is a much bigger volcano, almost twice the size of St. Helens.

Lahars from Rainier pose the most risk to life and property, as many communities including Puyallup lie atop older lahar deposits. According to the United States Geological Survey (USGS), about 150,000 people live on top of old lahar deposits of Rainier. Not only is there much ice atop the volcano, the volcano is also slowly being weakened by hydrothermal activity.

According to Geoff Clayton, a geologist with a Washington State Geology firm, RH2 Engineering, a repeat of the 5,000-year-old Osceola Mudflow would destroy Enumclaw, Orting, Kent, Auburn, Puyallup, Sumner, and Renton. Such a mudflow might also reach down the Duwamish estuary and destroy parts of downtown Seattle, and cause tsunami in Puget Sound and Lake Washington. Rainier is also capable of producing pyroclastic flows and expelling lava.

The areas of Puyallup most subject to volcanic lahars are the lowlands of the Puyallup River Valley. While the South Hill area is above the lahar

flow it and the rest of the city and valley would still be subject to volcanic ash.

Water

Puyallup River - is about 45 miles long formed by glaciers on the west side of Mount Rainier. The river and its tributaries drain an area of about 948 square miles in Pierce County and southern King County. The river's watershed is the youngest in the Puget Sound region, having been formed from a series of lahars starting about 5,600 years ago.

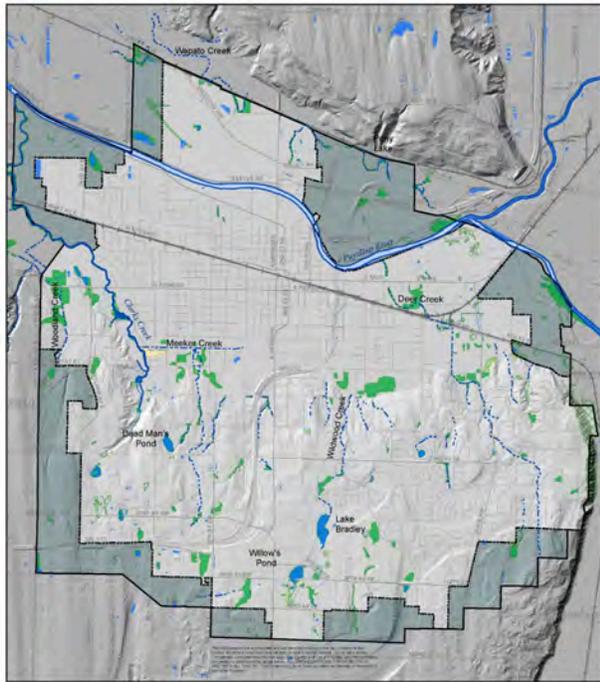
The North Puyallup River and the South Puyallup River originate at glaciers on Mount Rainier. The North Puyallup River flows from the toe of Puyallup Glacier, while the South Puyallup River flows from Tahoma Glacier. The two streams flow through the western part of Mount Rainier National Park, joining just outside the park boundary and forming the Puyallup River proper.

The main Puyallup River flows north and northwest from Mount Rainier. The tributary Mowich River, which also flows from glaciers on Mount Rainier, joins the Puyallup from the east.

Below the Mowich confluence, the Puyallup River flows through a rugged region of mountains and foothills. The river is dammed at Electron Diversion Dam shortly below the Mowich confluence. The dam diverts a portion of the Puyallup River into a long flume, which runs for several miles to Electron, where the water is passed through turbines in a hydroelectric powerhouse before being returned to the river. The Puyallup River passes through a steep and narrow gorge between Electron Dam and the powerhouse.

After Electron the river turns north and flows by the city of Orting where joins with the Carbon River from the east. Like the Mowich, the Carbon River also originates at a glacier on Mount Rainier (the Carbon Glacier). The Puyallup continues its northerly course after Orting.

At Sumner, the river is joined by the White River, another glacier-fed river. At the White River



confluence, the Puyallup River turns northwest, flowing by the cities of Puyallup and Fife, and through the Puyallup Indian Reservation, before emptying into Commencement Bay at the Port of Tacoma, part of the city of Tacoma.

Clarks Creek - tributaries include Rody, Diru, Woodland, and Meeker Creeks. Clarks Creek flows year-round out of Maplewood Springs. Its tributaries flow primarily in the wet season.

Clarks Creek is a salmon-bearing stream supporting chinook, coho, and chum salmon, steelhead, and cutthroat trout.

Low dissolved oxygen levels, excess fine sediment and sand, and the overgrowth of elodea (*Elodea nuttallii*) create conditions in Clarks Creek that harm fish and their supporting habitat. Clarks Creek and its tributaries do not meet water quality standards for fecal coliform.

The Washington State Department of Ecology (DOE) is working with local governments, residents, and others to restore water quality to

state standards.

Woodland Creek - is an intermittent stream that flows north near the WSU Research Center then into the Puyallup River on the west city boundary line. The creek/stream feeds some large wetlands located along the city's western limits.

Wildwood Creek - is an intermittent stream that flows north into the valley from Bradley Lake during the wet season. The creek/stream feeds a number of wetlands located at the base of the hills.

Deer Creek - is an intermittent stream that flows north from the eastern hillside to feet wetlands located at the base of the hills and north of the railroad before emptying into the Puyallup River.

Wapato Creek - is an intermittent stream that flows west from its headwater at the base of the hillside on the city's north boundary to empty into Commencement Bay at the Port of Tacoma.

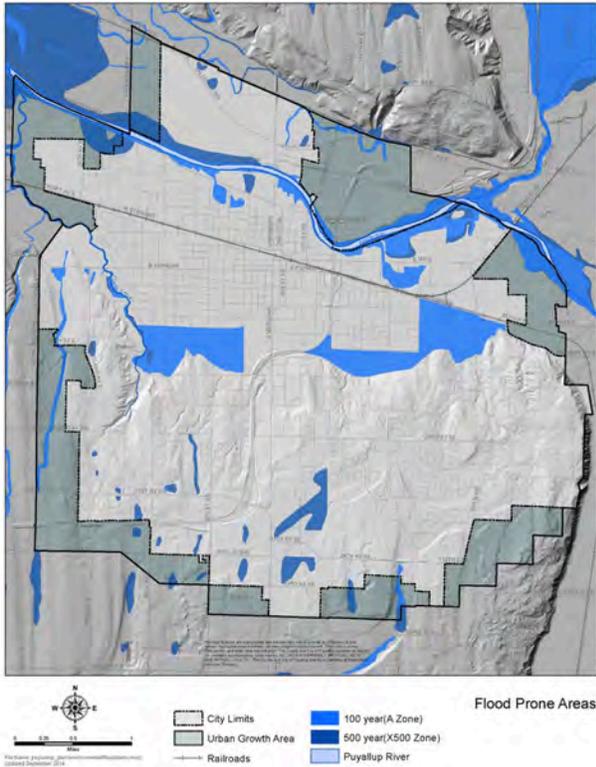
Lake Bradley - is a 12-acre water body at an elevation of 439 feet located at the headwaters of Wildwood Creek on South Hill. The lake was originally a peat bog, and was created after 30 years of peat farming. It is estimated that three to four hundred thousand yards of peat were removed during this time span. The lake was formed after the peat was removed and a dam was constructed on the north end of the former bog.

Lake Bradley is stocked annually with hatchery rainbow trout and also supports naturally reproducing populations of largemouth bass, black crappie, yellow perch, and brown bullhead catfish.

Ponds - are water bodies less than 20 acres in size or less than 6 feet in depth. There are numerous natural and stormwater ponds including Dead Man's Pond located in the valley close to Meeker Creek's drainage, and Willow's Pond located on South Hill.

Wetlands

Small or moderate sized wet spots, bogs, peat and muck deposits of from 1 to 5 acres are scattered throughout Puyallup with some large natural and



mitigated wetlands in the river bottom lands and along the base of the South Hill slopes.

Floodplains

Floodplains and flooded areas include alluvial soils - which are former riverbeds and streambeds, and retention ponds that fill during heavy rainfall, sometimes infrequently, often for extended periods during rainy seasons.

The Puyallup River channel is within the floodplain but is controlled by a series of dikes on both sides of the river through Puyallup.

The base of South Hill is subject to storm flooding from the overflow of Clarks, Wildwood, and Deer Creeks.

Floodwater depths are shallow but can become extensive causing damage to commercial and residential uses that are located within the floodplain including recreational facilities.

Wildlife habitats

Habitat conservation areas are critical to the survival of 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 biological diversity. 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.

For ease of discussion, wildlife habitats are generally classified as marine, estuarine, freshwater, and terrestrial categories. Many wildlife species rely upon most, even all, of these habitat categories for survival. Puyallup has 2 categories of wildlife habitat.

Freshwater habitat

Freshwater bodies include lakes, rivers, 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, 87% of all wildlife and fish species are estimated to depend on streams, wetlands, or other freshwater bodies during some part of the species life cycle for drinking water, foraging, nesting, and migratory movements.

Riparian areas - are the wooded or vegetated corridors located along rivers, streams, and springs. Riparian corridors possess free flowing water or moist conditions that support high water tables, certain soil characteristics, and vegetation that are transitional between freshwater and terrestrial habitat zones. 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 bio-diversity in the landscape.

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, shallow ponds, and lakes.

Like riparian areas, wetlands support species in great diversities, densities, and productivity. The wooded areas that are located adjacent to wetlands provide nesting areas, forage, and other cover that is critical to wetland-dependent species like most waterfowl or small mammals like beaver.

Wetlands - there are 2 principal wetland types within Puyallup:

- **Scrub/shrub wetlands** - with seasonal flooding, characterized by hardhack, willow, red alder or redosier dogwood, and
- **Shallow marsh** - deep marsh, and open water wetlands.

Riparian and wetland vegetation provides significant food and cover for wildlife habitat. Generally, riparian zones and wetlands provide substantially more important wildlife habitat than forested areas.

Riparian zones are also passageways for wildlife migrating 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 the stream.

Riparian zones are located along the undeveloped shoreline of the numerous creeks in Puyallup, the numerous tributary streams within their drainage corridors, and the numerous ponds and wetlands. These areas are covered with riparian vegetation and should be considered important wildlife corridors.

Wildlife species - freshwater zones support terrestrial and aquatic insects and resident and migratory fish species.

Anadromous fish species include coho, chinook, and chum salmon, and steelhead. Naturally occurring or established species include largemouth bass, brown bullheads, bluegill, and black crappie.

Freshwater zones also support a variety of birds and mammals including salamanders, frogs, osprey, ducks, river otter, and beaver.

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Urban and agricultural developments have substantially reduced wildlife habitat through the years. However, valuable habitat qualities may still remain in the undeveloped, large native vegetation tracts and around the remaining wetlands and riparian (streamside) forests of the Wapato, Woodland, Clarks, and Wildwood Creeks, the numerous tributary streams within their drainage corridors, and the numerous ponds and wetlands.

Wetlands and riparian zones may support muskrat, mink, otter, beaver, raccoon, and weasel. Water bodies, wetlands, and adjacent fields also provide suitable nesting and feeding habitat for mallard ducks, American widgeons, green-wing teal, common coot, common merganser, blue-wing teals and great blue heron, and lesser and greater Canadian goose.

Portions of the Wapato, Woodland, Clarks, and Wildwood Creeks drainage areas may also provide habitat for the bald eagle and osprey. The northern bald eagle is listed as a potentially threatened or endangered species on Washington

State's endangered and threatened lists. No other endangered or threatened species are known to occur in the Puyallup area.

Fisheries - the lower reaches of some Puyallup creeks that have not been affected by culverts and farmland drainage channels may provide freshwater habitat for species of anadromous fish, including steelhead, walleye, and salmon species, 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.

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

Anadromous game fish that have been identified in the Possession Sound shoreline include rainbow trout, cutthroat, dolly varden, eastern brook trout, whitefish, largemouth bass, perch, crappie, and catfish.

These species spawn and rear in medium sized gravel beds that are provided medium velocity water flow along creek channels, swamps, marshes, perennial and seasonal streams.

Factors that have caused the diminishment of the wild runs include:

- **Forest clear-cutting and land developments** - that create sediment loads increasing water turbidity and silting in gravel spawning beds;
- **Clear-cutting tree stands in riparian areas** - that remove natural shading increasing water temperatures; and
- **Water diversions** - including dams and dikes, that restrict access from the upper reaches and spawning areas of stream and river runs.

The Washington Department of Fisheries & Wildlife and various Tribal Governments supplement the natural stocks in order to maintain river runs for most of these species.

Terrestrial habitat

Terrestrial areas are the upland lands located above freshwater, estuarine, and marine water zones. The zones may extend from the level lowlands that border marsh or creek banks to the tops of the bluffs, hills, or foothills located around the Cascade Mountain range.

Plants - natural plant communities are described in terms of broad patterns called vegetation zones. Washington plant communities are divided into 3 major vegetation groupings including:

- Forests,
- Grasslands and shrub/grass communities,
- Timberline and alpine areas.

The plateaus overlooking the Puyallup River valley include some forested vegetation zones. The zones are defined by the different climates created by different elevations and the distinctive vegetation type that becomes dominant in a climax forest after the forest has progressed through successive stages of natural development. The dominant species defined by the zone usually reproduces to maintain dominance until some disturbance, such as fire, alters the zone's environment.

Deciduous tree species such as red alder (*Alnus rubra*) or big leaf maple (*Acer macrophyllum*) or golden chinkapin are generally dominant on the lands that have been cleared for urban and agriculture uses. Black cottonwood and Oregon ash, along with red alder and big-leaf maple, tend to grow along major water corridors.

Portions of Puyallup - particularly the wooded hillsides and ravines along the Puyallup River valley and South Hill, include several second growth lowland forested cover types including coniferous, deciduous, and mixed coniferous/deciduous forests.

This forest type has marginal value as commercial timber or as unique vegetation. The majority of commercially important timber resources have been harvested, usually along with associated residential land development.

Grasses, agricultural crops, and riparian vegetation cover the lowland areas of the Puyallup River drainage corridors - the latter

prevalent along creek floodplains and at the edge of wetlands or open bodies of water.

Deciduous hardwood trees including red alder, cottonwood (*Populus trichocarpa*), Oregon Ash (*Fraxinus latifolia*), willow (*Salix* sp.), and associated understory species are dominant within the wetland areas.

Species - terrestrial zones support a variety of insects, amphibians, reptiles, lowland and upland birds, large, and small mammals. Some species, such as eagles, osprey, and murrelets, forage in other habitats but nest in upland locations in wooded areas in or near riparian zones.

Other species may forage in all of the zones, particularly during the winter months, but retreat for night and seasonal cover into the upland wooded areas. Examples include a variety of game species such as pigeon, grouse, rabbit, and deer within the lowlands, and even bear and cougar in the Cascade foothills that occasionally migrate into the urban areas.

Mature forested areas provide thermal cover during winter months allowing larger game mammals to forage up to 3,000 feet in elevation during normal winter season or 2,000 feet during especially harsh winters.

Animals - urban and agricultural developments within Puyallup area have substantially reduced wildlife habitat through the years. However, valuable habitat qualities still remain in undeveloped, large native vegetation tracts along the hillsides, and around the remaining wetlands and riparian (streamside) forests along Puyallup Creek corridors and the Puyallup River shoreline and estuary.

Wooded areas support a wide variety of large and small mammals, birds, reptiles, and amphibians. The most common mammals within the wooded areas include chipmunks, rabbits, marmots, skunks, and raccoons.

A small number of larger mammals including black-tailed deer, coyote, and cougar likely occur at the edge of the upper reaches of the Cascade foothills where large contiguous forested areas remain though they can also migrate into the urban areas on occasion.

Crows, jays, nuthatches, woodpeckers, sparrows, winter wrens, ruffed grouse, blue grouse, quail, band-tailed pigeon, turtle dove, pheasant, partridge, Merriam's turkey, owls, hawks, Osprey, and eagles can find suitable habitat for feeding and nesting in the upland forested areas, creek and stream corridors.

Many of these species can tolerate adjacent urban development so long as some habitat and connecting migration corridors remain undisturbed.

Portions of the Puyallup creek drainage corridors, the Puyallup River bottomlands, and other low-lying areas are now devoted to pastures and meadows with some woody vegetation, grasses, and wildflowers. These materials provide food for migratory waterfowl and deer, habitat for rodents and other small animals, and prey for predators like garter snakes, barn owls, red-tailed hawk, and fox.

Large and rural contiguous parcels of land provide habitat for wildlife that compete successfully with other species in deeper cover, like birds and larger mammals like deer, bobcat, and possibly even bear at the upper most edges of the Cascade foothills.

Important terrestrial habitat elements for these species include tall trees along the shoreline, mature forests with snags and fallen trees, and undisturbed mature forest near or surrounding wetlands. These habitat elements are primarily important to bird species that nest and perch in the trees, and to small mammals like beaver and river otter that rely upon an interface between the undisturbed terrestrial and aquatic areas.

Other important habitats - migratory songbirds rely on the habitat provided by large wooded areas. These species do not adapt well where clear-cutting practices or urban land developments have fragmented the forest habitat.

Smaller wooded tracts are suitable for many plant and animal communities and may provide temporary cover for some species for foraging or migratory movement. Large parks and open spaces can serve as wildlife refuges in urban areas - including DeCoursey, Clarks Creek,

Bradley Lake, and Wildwood Parks. However, the number and diversity of species declines in direct relation to the size of the habitat and where the habitat has been isolated from other natural areas.

The size and extent of the terrestrial habitat can be improved where natural migration corridors connect small tracts and large reserves. Natural migratory corridors enable species to colonize new areas, forage for food, find mates, and exchange genes with neighboring populations.

Ideally, according to studies, successful wildlife migratory corridors should be at least 100 feet wide along streams with additional buffers about severe slopes and extensive wetland areas.

Unique and threatened species

Unique species

The Washington Department of Natural Resources lists a number of sensitive species in danger of becoming extinct within the freshwater and terrestrial habitats including:

Freshwater habitat

- Bog clubmoss - that grows in wetlands adjacent to low elevation lakes,
- Chain-fern - that grows along stream banks and moist seep areas, mostly near saltwater.
- Bristly sedge - that grows in marshes and wet meadows,
- Water lobelia (*lobelia dortmania*) - that grows in emergent freshwater wetlands,
- White meconella (*meconella oregana*) - that grows on open ground where wet in the spring, and
- Woolgrass (*scirpus cyperinus*) - that grows in wet low ground.

There are 4 threatened or endangered plants that could occur including:

- Flowered sedge - found in and near sphagnum bogs,
- Choriso bog orchid - found in wet meadows and bogs,
- Frinshed pinesap - found in deep shady woods at moderate to low elevations especially in old forest, and
- Golden Indian paintbrush - found in moist lowland meadows and prairies.

Freshwater and terrestrial habitat

- Western yellow oxalis - that grows in moist coastal woods and dry open slopes.

Terrestrial habitat

- Fringed pinesap - that grows in duff and humus of shaded, low-elevation coniferous forest,
- Gnome plant - that grows in deep humus in coniferous forest,
- Chick lupine (*lupinus micipcarpus*) - that grows in dry to moist soils, and
- Great pole monium (*pole monium corneum*) - that grows in thickets, woodlands, and forest openings.

Priority habitat

The Washington Department of Fisheries & Wildlife has listed the following species as being species of concern, threatened, or endangered:

Marine, estuarine, freshwater, and terrestrial habitat

- Bald eagle - a threatened species that depend on coniferous, uneven-aged forests near rivers, lakes, marine, and estuarine zones for nesting and foraging food,
- Osprey - a species of concern that depend on tall trees or dead snags near large bodies of water,
- River otter - a threatened species that depend on wooded streams and estuaries for food, forage, and cover, and
- Harlequin duck - that depend on trees and shrub streams, banks, boulder and gravel shorelines, and kelp beds.

Estuarine, and freshwater and terrestrial habitat

- Cavity nesting ducks - (Barrow's goldeneye, bufflehead, wood duck, hood mergansen) that depend on tree cavities adjacent to sloughs, lakes, beaver ponds, and other open water wetlands.

Freshwater and terrestrial habitat

- Blue goose - that depend on open foothills created by fire or small clearcuts with streams, springs, and other water features,
- Band-tailed pigeon - that depend on coastal forests with diverse tree ages, and farmland, mineral springs, and streams with gravel deposits,

- Sea-run and coastal cutthroat, and chinook salmon - that depend on wetlands and riparian corridors for spawning and rearing,
- Steelhead - that depend on wetlands and riparian corridors for spawning and rearing,
- Greenbacked heron - that depend on wooded ponds, and
- Beaver - that depend on wetlands and streams for food, forage, and cover.

Terrestrial habitat

- Purple martin - a species of concern that depend on tree cavities in low lying forests,
- Pileated woodpecker - that depend on mature second growth coniferous forests with snags and fallen trees,
- Columbian black-tailed deer - that depend on deep forest for cover,

Wildlife habitat concerns

Freshwater habitat

Some freshwater courses, particularly the Puyallup creek drainage tributary streams and Puyallup River bottomlands, have been altered by landfill or piped diversions, dikes, and channeling. Past development actions adjacent to urban areas, particularly the shorelines and waterfronts have filled valuable wetland habitat areas.

The greatest risks to freshwater zones are contaminants that may enter the stormwater runoff from agriculture, septic failures, and other urban land uses. Water quality risks are also dramatically increased where land development or timber clear-cutting increases erosion and silt and/or clear vegetation within the riparian buffer along the freshwater corridor.

Development activities most adversely affect the quality of freshwater habitat by removing vegetation, increasing silt, organic debris, and other stormwater 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.

Terrestrial habitat

Lands cleared for agriculture and urban land development have permanently lost considerable

terrestrial habitat. Commercial forest management practices have replanted timber clear cuts with single species reducing wildlife diversity and isolating habitat and migration corridors, particularly along riparian areas.

Fire-fighting practices, particularly of wildfires that would otherwise occur from natural forces, have reduced the amount and varying availability of meadowlands and other open areas necessary for foraging activities.

The greatest risk to the terrestrial habitat, however, is the continued pace of commercial logging and 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 - potentially including intense recreational uses - into wildlife areas. Careless logging practices have often led to serious soil erosion and the degradation of slopes.

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

Land use implications

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 Puyallup residents. Many species depend on the constant interaction of all habitat systems for food, cover, nesting, and other survival requirements.

Some plant, fish, and wildlife habitat have irretrievably been lost as the Puyallup area developed and as the pace of development continues. These impacts can be minimized, however, by sensitive land use patterns, innovative design concepts, and performance oriented development standards that:

- Replant - native vegetation along the Puyallup creek shorelines and along tributary stream drainage corridors,

- **Remove** - artificial shoreline constructions and freshwater impoundment or diversions,
- **Control** - stormwater runoff content and quality that enters the natural drainage system and within the watershed in natural impoundment on-site where pollutants can be separated from natural drainage,
- **Cultivate** - berry or fruit plants that support and retain native species, and
- **Cluster** - roadways and other improvements to preserve natural shorelines and contiguous open spaces as common lands.

Portions of the most critical remaining habitat, like mature shoreline trees, snags, and downed logs, if retained, can sometimes allow wildlife species to coexist in urban areas.

The most effective preservation strategies, however, separate the most intense urban activities from the most sensitive habitats by creating woodland conservancies, open space corridors, and other protected areas.

Where appropriate, the park, recreation, and open space plan should preserve and enhance the most critical and unique habitat areas by purchasing development rights or title for resource conservancy parks such as DeCoursey, Clarks Creek, Bradley Lake, and Wildwood Parks.

Historical development

Prehistoric setting

The arrival of Indian groups 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 man was in the area as early as 12,000 years ago. Sea level rises approximately 5,000 years ago, however, may have inundated even older sites.

Known sites have been grouped into the following rather broad time periods and cultural sequences:

- **Paleoindian** - approximately 11,000+ BP consisting of highly mobile, small groups that subsisted on marine, shoreline, and terrestrial resources with stone, bone, antler, and perishable technological materials illustrated by Clovis points.

- **Archaic** - 10,500-4,400 BC consisting of highly mobile small groups subsisting on marine, shoreline, and terrestrial resources with stone, bone, antler, and perishable technological materials illustrated by Olcott points.
- **Early Pacific** - 4,400-1,800 BC consisting of increased sedentism in seasonal villages subsisting on shoreline resources, expanded marine resources harvesting camas and shellfish with an increase in ground stone, bone, antler, and perishable technological materials illustrated by Cascade points.
- **Middle Pacific** - 1,800 BC - 500 AD consisting of winter villages of plank houses and seasonal camps subsisting on marine and riverine resources with food storage technologies with a decrease in stone tools, diversification of tools of bone, antler, perishable technological materials and canoes.
- **Late Pacific** - 500 - 1775 AD consisting of large permanent villages and special use camps subsisting on specialized marine, riverine, and terrestrial resources with extensive food storage with very little stone tools.

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.

Native American history

A large number of different Indian tribes and bands inhabited the Pacific Northwest region with varied life-styles and different languages, dress, ceremonies, and adornments.

Tribal characteristics are generally distinguished between the coastal tribes of western Washington and those of the interior. In general, the coastal tribes depended on the rivers and tidal waters for staple foods whereas the interior tribes relied more heavily upon plants and berries, as well as game and other animals.

Native peoples similar to the Nisqually and Puyallup Indians are believed to have lived in the Puget Sound region some 6,000 years ago, their way of life essentially unchanged for hundreds of generations.

The Puget Sound native peoples, including the Duwamish, Nisqually, Puyallup and other tribes,

were of the Coast Salish language group, part of the highly developed Northwest Coast Indians, one of the most sophisticated nonagricultural societies in the world.

In contrast to nearly every other native group in North America, these people enjoyed freedom from want with:

- An abundance and variety of food, including salmon, other fish and shellfish;
- Limitless quantities of building materials (principally cedar, which they were highly adept at fashioning into canoes, longhouses and hundreds of other items);
- Easily caught fur-bearing animals (providing skins for winter clothing);
- A mild climate;
- Ample leisure time;
- Remarkable and enduring artwork; and
- Development of a status-based culture that included the distribution of surplus wealth (the "potlatch" ceremony) and the owning of slaves.

Probably the single most important source of sustenance—physical, spiritual and artistic—for the Indians of Puget Sound was the salmon. Each year these fish returned to Puget Sound rivers and streams by the millions to spawn and die at the source of their birth. The Indians took advantage of the spawning runs of several different species of salmon, devising ingenious methods of catching and drying these fish.

The Puyallup - or Spuyalepabs or S'Puyalupubsh (pronounced: Spoy-all-up-obsh) ("generous and welcoming behavior to all people (friends and strangers) who enter our lands.") are a federally recognized Coast Salish Native American tribe. The name Puyallup has also been associated with a Native word meaning "shadow" because of the dense forest shades of Puyallup lands. It is also said to mean "crooked stream".

At certain seasons of the year the tribe occupied various places beside the Puyallup River from Commencement Bay 15 miles east up the river as well as Carr Inlet and southern Vashon Island.

The Puyallup were among the various peoples who traded at the Hudson's Bay Company's Fort Nisqually, which was established in 1833 at the

southern end of Puget Sound. They were also among those who met the Roman Catholic missionaries in the early 1840s.

The tribe was forcibly relocated onto reservation lands in Tacoma in late 1854, after signing the Treaty of Medicine Creek with the United States. Today they have an enrolled population of 4,000, of whom 2,500 live on the reservation.

The Puyallup Indian Reservation, a land area of 28.5 square miles, is one of the most urban Indian reservations in the United States. It is located primarily in northern Pierce County, with a very small part extending north into the city of Federal Way, in King County. Parts of seven communities in the Tacoma metropolitan area extend onto reservation land; in addition the tribe controls off-reservation trust land. In decreasing order of included population, the communities are Tacoma, Waller, Fife, Milton, Edgewood, Puyallup, and Federal Way.

The Puyallup, as with other Native American tribes, have long assimilated other ethnicities through intermarriage and adoption. They have brought up ethnically mixed children to identify with the tribe, both culturally and ethnically.

Early explorations

In 1792 British naval Captain George Vancouver, on a mission to settle British fur-trading claims against Spain, surveyed the northwest coast of North America and determined the existence of the fabled "Northwest Passage," sailing into Puget Sound on his ship Discovery.

Vancouver charted the entire area, providing more than 200 geographical names, including Vashon (Island), Mount Rainier, and Puget Sound (named after Lieutenant Peter Puget, the officer in charge of one of the survey boats). Puget and Joseph Whidbey, the expedition's master sea surveyor, would take a week-long tour of southern Puget Sound, charting the waters and landmarks together in the Discovery's launch and cutter.

Vancouver followed them in Discovery's yawl and the cutter of her sister ship, the Chatham. He proceeded south through the Sound's main channel along the eastern shore of Vashon Island

where he saw dense clouds of smoke blanketing the thick forests crowding the water's edge.

(Puget Sound Indians routinely set fire to the woods to make foot travel easier, drive out deer and other game, and create open spaces where berries and other sun-loving plants could thrive.)

After Vancouver's expedition, Puget Sound remained essentially unexplored by Europeans for the next 32 years. Then, in 1824, a 40-man expedition led by James McMillan of the Hudson's Bay Company set out from Astoria to find a passage for small boats (probably Indian canoes, to start with) between the Columbia and Fraser Rivers.

By 1833 the Hudson's Bay Company had established posts on the Fraser River and at Fort Nisqually, making Puget Sound an important canoe route between the two. At the time, the Oregon Country was jointly ruled by the US and Great Britain.

In 1841 Lieutenant Charles Wilkes was placed in command of US Pacific and Arctic explorations and proceeded to survey Northwest Coast rivers and harbors, naming many geographical features, including Elliott Bay, Williams, Blake Island, Point Roberts (now Alki Point), Maury Island, Quartermaster Harbor and Point Pully, named for Robert Pully, a quartermaster in one of Wilkes' crews.

Like Vancouver, Wilkes used 2 boats in charting Puget Sound. Cadwalader Ringgold, one of his lieutenants, set out in the "USS Porpoise" to survey the eastern shore of Puget Sound from Commencement Bay to Elliott Bay.

Early settlement

In 1833, the Puyallup Valley was a maze of creeks and old forest growth. It was subjected to frequent floods and massive logjams from the meandering river.

The first white settlers were part of the first wagon train to cross the Cascades at Naches Pass in 1853. Native Americans numbered about 2,000 in what is now the Puyallup Valley in the 1830s and 1840s. The first European settlers arrived in the 1850s.

In 1877, Ezra Meeker platted a townsite and named it Puyallup after the local Puyallup Indian tribes, 11 years after departing from Indiana.

The town grew rapidly throughout the 1880s, in large part thanks to Meeker's hop farm, which brought in millions of dollars to Puyallup, leading to it eventually being incorporated in 1890, with Ezra Meeker as its first mayor.

The turn of the 20th century brought change to the valley with the growth of nearby Tacoma and the interurban rail lines. The Western Washington Fairgrounds were developed giving local farmers a place to exhibit their crops and livestock.

During the early part of World War II, the fairgrounds were part of Camp Harmony, a temporary Japanese American internment camp for more than 7,000 detainees, most of whom were American citizens. Subsequently, they were moved to the Minidoka relocation center near Twin Falls, Idaho.

Socioeconomic characteristics

The US Bureau of the Census conducts the decadal census consisting of a detailed and comprehensive assessment of employment, housing, income, and other statistics every 10 years that is used to determine electoral districts, income sharing, and other federal measures. The decadal census is based on census tracts that are statistical boundaries for the collection of information that are organized and grouped into jurisdictional areas consisting of census designated places (CDP) as well as cities, counties, and states.

The US Bureau of the Census initiated the American Community Survey (ACS) to provide more current information on an annual basis. The ACS is based on annual random statistical sampling of civil divisions that are collated over a multiple years span to provide an accurate projection of socioeconomic conditions and trends.

The following statistics and charts are drawn from a comparison of socioeconomic characteristics for the United States, Washington State, Puget Sound (King, Kitsap, Pierce, and

Snohomish Counties), Snohomish County, and Puyallup from the 2009-2013 ACS survey.

Household size - in Puyallup (2.50) is significantly smaller than Pierce County (2.66), Puget Sound (2.59), Washington State (2.57), and the US (2.64).

Percent of households in families - in Puyallup (62%) is significantly smaller than Pierce County (66%), Puget Sound (63%), Washington State (64%), and the US (66%).

Median age - in Puyallup (38.3 years) is slightly higher than Pierce County (36.0), Puget Sound (37.0), Washington State (37.3), and the US (37.3).

Percent of the population 65+ - in Puyallup (15%) is significantly higher than Snohomish County (13%) and Puget Sound (12%), but comparable to Washington State (14%), and the US (14%).

Percent employed in civilian labor force - in Puyallup (65%) is significantly higher than Pierce County (57%), Puget Sound (62%), Washington State (59%), and the US (58%).

Percent employed in base industries (forestry, fisheries, agriculture, and manufacturing) - in Puyallup (20%) is slightly higher than Pierce County (18%), Puget Sound (18%), Washington State (19%), and the US (19%).

Percent employed in services (retail and wholesale trade, transportation, communications, education, entertainment, and government) - in Puyallup (80%) is slightly lower than Pierce County (82%), Puget Sound (82%), Washington State (81%), and the US (81%).

Median house value - in Puyallup (\$278,900) is significantly higher than Pierce County (\$239,400), Washington State (\$269,300), and the US (\$184,700) but significantly lower than Puget Sound (\$342,891).

Median rent - in Puyallup (\$1,125) is similar to Pierce County (\$1,068), Puget Sound (\$1,210), Washington State (\$1,056) but higher than the US (\$949).

Percent of all housing in detached single-family units - in Puyallup (57%) is significantly lower

than Pierce County (65%), Puget Sound (60%), Washington State (63%), and the US (62%).

Mean travel time to work in minutes - in Puyallup (23.4 minutes) is significantly lower than Pierce County (30.5), Puget Sound (29.6), Washington State (26.5), and the US (26.1).

Resided in same house 1 year ago - in Puyallup (79%) is significantly lower than Pierce County (83%), Puget Sound (82%), Washington State (82%), and the US (85%).

Percent of all occupied housing units owner occupied - in Puyallup (53%) is significantly lower than Pierce County (61%), Puget Sound (60%), Washington State (62%), and the US (64%).

Percent of all occupied housing units renter occupied - in Puyallup (47%) is significantly higher than Pierce County (39%), Puget Sound (40%), Washington State (38%), and the US (36%).

Median family income - in Puyallup (\$82,492) is significantly higher than Pierce County (\$73,426), Washington State (\$76,507), and the US (\$67,871) but comparable to Puget Sound (\$90,479).

Median per capita income - in Puyallup (\$33,866) is significantly higher than Pierce County (\$29,750), Washington State (\$32,999), and the US (\$29,829) but significantly lower than Puget Sound (\$38,095).

Percent in multifamily units of 20+ units - in Puyallup (11%) is significantly higher than Pierce County (7%) and the US (9%) but comparable to Puget Sound (14%) and Washington State (10%).

Percent with no vehicles available - in Puyallup (5%) is significantly higher than Pierce County (3%) but comparable to Puget Sound (5%), Washington State (4%), and the US (5%).

Hispanic or Latino of any race - in Puyallup (8%) is slightly lower than Pierce County (10%), Puget Sound (9%), Washington State (12%), and the US (17%).

Language other than English - in Puyallup (11%) is significantly lower than Pierce County (15%), Puget Sound (21%), Washington State (19%), and the US (21%).

Percent of population in poverty - in Puyallup (10.6%) is slightly lower than Pierce County (12.7%), Washington State (12.7%), and the US (15.1%) but comparable to Puget Sound (10.8%)

Total families in poverty - in Puyallup (6.7%) is significantly higher than Pierce County (8.8%), Washington State (8.4%), and the US (11.0%) but comparable to Puget Sound (7.1%).

Summary

Puyallup has accumulated older, mobile households, nonfamilies, in base industry employments, with moderate house values, high renter tenures, in multifamily housing units, with modest family and per capita incomes, without vehicles, shorter travel to work times, with low ratios of Hispanic and speaking language other than English, with lower percentages in poverty income levels than Pierce County, Puget Sound, Washington State, and the United States.

Puyallup's future socioeconomic characteristics will depend on the unique attractions the city retains and/or develops in the future particularly in its park and recreation programs and facilities.

Socioeconomic projections

The Puget Sound Regional Council (PSRC) projected the future composition of population, employment, income, and housing within the region based on regional and national trends.

Population and households - will continue to increase in the Puget Sound region due to continued in-migration as well as some natural increase. The average household size, however, will continue to decline as a larger proportion of all households age past childbearing ages and mortality rates decline.

Percent of the population under age 4 - has fluctuated due to the "ripple" affects of the baby boom generation aging through childbearing years and concentrating births in a similar fashion. The percent of young children is expected to stabilize between 6-7% in the future, down from a high of 8% in the recent past.

Percent of the population over age 65 - will increase due to the aging of the baby boom generation and declining mortality rates or longer life expectancies.

Ratio of population to employees - will gradually decline as a larger proportion of the population ages beyond working ages and a lesser proportion of working adults emerge in the workplace.

Percent of all housing multifamily - has and will continue to increase as empty nester and older households, as well as nonfamily households increase as a proportion of the population and the Puget Sound region continues to urbanize developing more townhouses, condominiums, mixed-use mid to high rise structures.

Conclusion

Based on the year 2014-2018 American Community Survey (ACS) characteristics, Puyallup park, recreation, and open space demands are expected to reflect slightly older age populations with moderate income, in older modest valued housing than would be typical of the park, recreation, and open space demands of the surrounding county, region, state, and nation. The increase in population projected to occur in the next 20 years may continue to attract the atypical age and household population groups that have been typical of the city to date.

In most respects, the expected additional in-migrant population will be attracted by and in turn impact the park, recreation, and open space facilities Puyallup proposes to provide current residents accordingly.

