



# *Padilla Bay National Estuarine Research Reserve*

## THE ESTUARY GUIDE

### LEVEL 3 HIGH SCHOOL

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# Table of Contents

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<b>Introduction</b>	i
---------------------	---

## **Chapters**

---

Chapter 1 - Estuary Formed - Geology	1
Chapter 2 - Estuary Settled - Local History	7
Chapter 3 - Estuary Alive - Ecology	17
Chapter 4 - Estuary Inspired - Literature & Arts	39
Chapter 5 - Estuary Developed - Human Use	53

## **Activities**

---

1 - Taking Your Own Estuary Field Trip	65
2 - Plankton Study	68
3 - Water Quality Monitoring	73
4 - Keeping a Marine Aquarium	91
5 - Writing With Estuaries	94
6 - Thinking Globally about Estuaries	99
7 - What We Can Do For Estuaries	100

## **Resources**

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Estuary Ecology Resources	
Field Guides	117
Water Monitoring Equipment	117
Marine Aquarium Guides	118
Estuary Protection Resources	
Environmental Action	118
Government Agencies	118
Organizations	119
Places	120
Curricula	121
Publications	122
Estuary Arts and Literature Resources	
Books	122
Short Stories/Excerpts	123
Poems	124
Paintings	124
Music	125
Writing	125

<b>Field Guide to Padilla Bay Organisms</b>	126
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<b>Answers to Questions</b>	134
-----------------------------	-----

<b>Glossary</b>	138
-----------------	-----

<b>Bibliography</b>	141
---------------------	-----

# Introduction

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Estuaries -- where fresh water meets the salt water of the sea. They are one of our most valuable marine systems, serving as nurseries for many animal species, vital links in migratory pathways, and rich habitat for a complex community of organisms. They filter impurities, absorb flood water, and recycle nutrients. And they are disappearing at an alarming rate.

We need an "educated" public in order to change the current trend of filling, dredging and polluting these important places.

Our belief is that people cannot make responsible, informed decisions regarding resources such as estuaries unless they know what they are dealing with. In the past, estuaries were considered worthless areas, easy to use and improve. Today we know that they are, in fact, critical ecosystems on which many animals -- including humans -- depend.

The goal of this curriculum is to promote responsible decision-making by:

- \* Teaching *what* estuaries are, what lives there, how they function, and how we depend on them;
- \* Providing opportunities to practice making *decisions* affecting estuaries; and
- \* Encouraging students to examine their *daily behaviors* that affect their estuary.

## How to Use This Curriculum

Our educational system tends to compartmentalize learning, isolating individual subjects and ignoring the important connections that make learning relevant and useful. The component parts of this curriculum can be taught independently and infused into the traditional disciplines of geology, history, humanities, or biology. Ideally, however, the Padilla Bay estuary will serve as a theme for learning, illustrating how the various subjects interact as a coherent whole. A team of teachers from different disciplines might coordinate to present a tangible theme, bringing the real world into the classroom.

The various relationships humans have with estuaries are numerous and complex. These include economic, legal, emotional, intellectual, and other relationships. The problems that estuaries face today are equally complex. This curriculum is based on the concept that decisions and solutions which address a larger number of perspectives will result in more effective and successful actions.

Please take some time to complete and return the evaluation at the end of this curriculum. We plan to make revisions to this first edition and need your input.

The first five sections of this guide are intended to be used as background information for the teacher or as student reading material. The activities that follow should serve as the curriculum's core, building on the

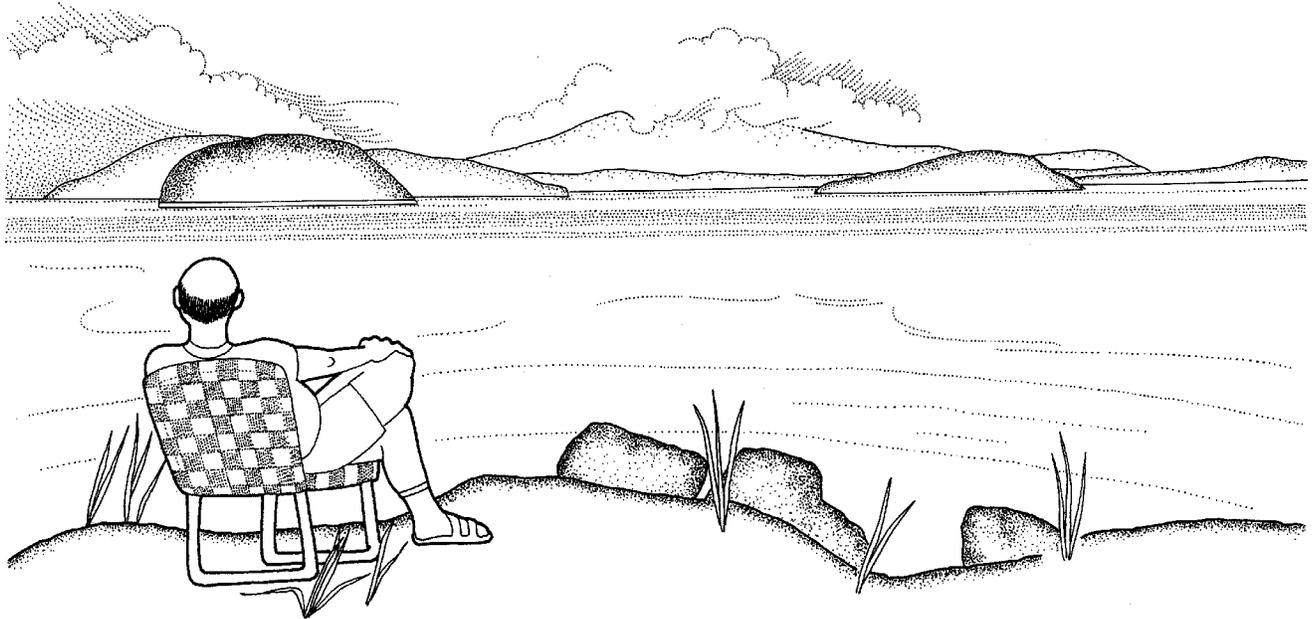
background information and providing relevant, hands-on experience. Key words are italicized and listed in the glossary.

### **Padilla Bay National Estuarine Research Reserve**

Padilla Bay is part of the National Estuarine Research Reserve System. This program was established in 1972 under the Federal Coastal Zone Management Act. The purpose of this program is to set aside estuaries in different biogeographical regions of the United States for research and education. Today, 21 sites throughout the coastal United States and Puerto Rico protect over 300,000 acres of estuarine habitats.

The Breazeale Interpretive Center provides educational and research facilities which include interpretive exhibits, aquaria, curriculum library, and research laboratory. An upland trail, shore access, and shore trail provide public access to the estuary.

For researchers, Padilla Bay Reserve offers one of the largest concentrations of eelgrass on the West Coast, along with a distinct collection of invertebrates, fish, birds, and marine mammals. Research topics in Padilla Bay have ranged from primary productivity, seagrass distribution, and Dungeness crab habitat to toxic sediments, pesticide run-off and suspended sediments. The information gained from such research is important to decision makers who must preserve and manage valuable habitats. Educational programs include school programs, adult education, teacher workshops, youth programs, films, guided walks, and family programs.



## 1 - Estuary Formed - Geology

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The vacationing insurance salesman from Indiana unfolds his chair and relaxes on a bluff overlooking Padilla Bay, Washington. He gazes across an expanse of rippling water, watching sea birds in the distance. He feels a sense of permanence with his surroundings; a sense that this bay looks like it always has and as it always will be in the future. His own experience tells him that the earth is reliable and unchanging and he sinks into a peaceful sleep. But he awakens in a new world. What was once an expanse of rippling water is now a field of hissing, fragrant mud. The hoosier rubs his eyes in disbelief. The passing time and *ebbing tide* have introduced this visitor to a place rich with life and marked by dramatic changes -- the estuary.

Estuaries are regions where rivers meet the sea. They occur all over the world and come in many shapes and sizes. The most commonly used definition of an estuary was written by Cameron and Pritchard (1963);

"An estuary is a semi-enclosed coastal body of water which has a free connection with the open sea and within which sea water is measurably diluted with fresh water derived from land drainage."

This definition is useful for describing the physical conditions present in an estuary, but it does not convey the essence of the estuary -- the productive grasses, the sanctuary for juvenile fish, the lush bird habitat, the inspiration for a poet, the natural harbor. Estuaries are these, too.

From the time humans made their appearance, estuaries have been important centers of commerce. They provided wild food, fertile agricultural land, sheltered harbors, and navigational access to the inland areas. Estuaries continue to be places of human activity. Today, most of the world's largest cities are on estuaries, and many have been transformed beyond recognition.

### Types of Estuaries

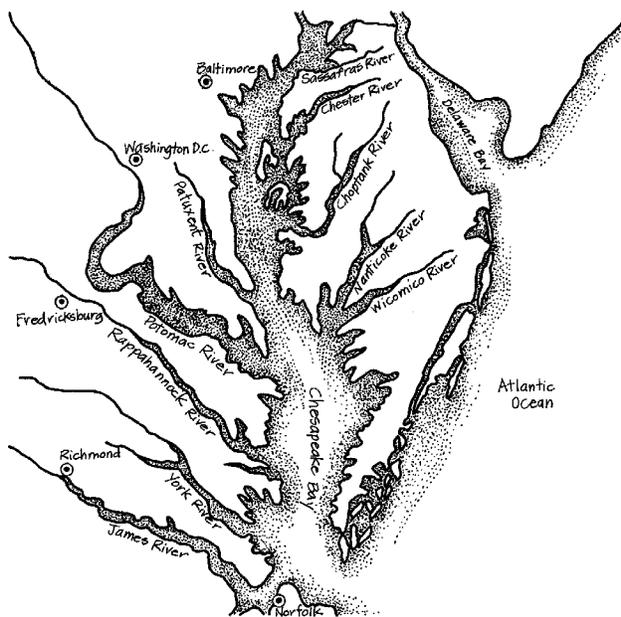
So many different physical factors interact in estuaries that they exhibit incredible variety. This variety makes estuaries difficult to classify. Some scientists have classified them according to their geologic formation. *Coastal plains estuaries* (like Chesapeake Bay) are river valleys which were flooded with sea water when the sea level rose after the last ice age. *Fjords* (like Hood Canal) are estuaries whose deep sides

were carved out by glaciers. *Tectonic estuaries* (like parts of San Francisco Bay) were formed by movements of the earth, such as slipping along a fault line. *Bar-built estuaries* are formed at the mouths of large rivers where river sediment is deposited as a sand or mud bar across the mouth. But these are not hard and fast distinctions. For instance, the Columbia River has a protective bar across the mouth, but it is also a flooded river valley.

Other characteristics which are sometimes considered in classifying an estuary include the shape of its basin. (Is it a long, narrow tidal river, a coast that is protected by a barrier island or reef, or an *embayment* with a narrow, restricted outlet to the sea?) How much fresh water enters the estuary? How is it affected by tides? How does the water circulate in the estuary? (Is it *stratified* with distinct layers of salt and fresh water or non-stratified?) What is the chemical make-up of the estuary water? All these things are considered when examining estuaries. Often, one estuary represents several ecosystem types or physical characteristics.

The Indiana salesman didn't realize that he was looking at a shallow bay characterized by mud flats and seagrass meadows, located in the Columbian/Puget Sound biogeographic region of the United States. He knew nothing of the fresh water input or geologic formation. What he did understand, however, was that time had erased his view of rippling water. An estuary is a place marked by change.

Changes can occur in short periods of time (short, relative to human experience, that is), as the Indiana tourist discovered. Mount St. Helens provides a familiar example of "quick change." The 1980 eruption created a gaping crater in only a



Chesapeake Bay is an example of a *coastal plains estuary*, a "drowned" river valley.

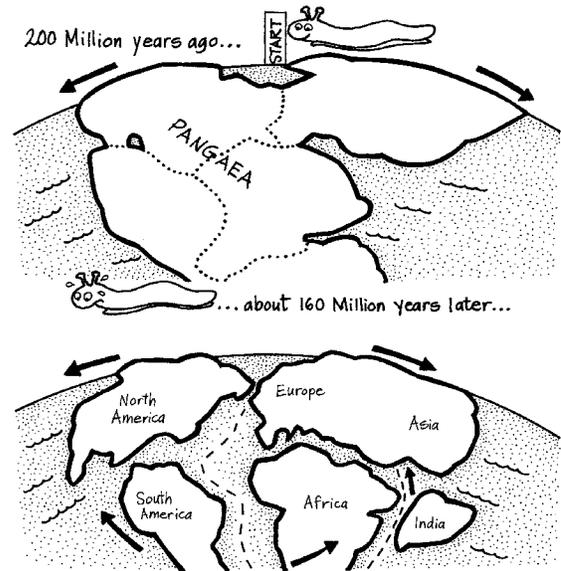
few minutes. Earthquakes can also be agents of quick change as California residents can testify. Phenomena such as storms, waves and currents are convincing evidence of the unceasing change that characterizes our planet and our universe; convincing, because they all occur within our time frame.

Long-term change -- change over thousands or millions of years -- is harder to understand. Scientists estimate that the earth completed its formation about 4.6 billion years ago and its permanent crust began to form about 4.1 billion years ago. We humans have been around for only a brief instant of the earth's history; short-timers, so to speak. Working toward a perspective of "long-term change" will aid in understanding Padilla Bay and the entire earth on which we live.

Like the man from Indiana, we must remember that time makes all the difference!

### Assembling the Pieces

About 200 million years ago, theory holds, North America, South America, Europe and Africa were all connected, forming a huge supercontinent called Pangaea. But a rising column of hot rock from the earth's interior began to put pressure on the continental crust, causing the land mass to split and move apart. The newly formed Atlantic Ocean filled in the gaps created as these giant jigsaw puzzle pieces separated. When birds and mammals first appeared on the scene and dinosaurs still dominated the earth, the American continents were moving away from Europe and Africa at the rate of about 2 to 3 inches per year -- a slow pace when compared to human standards but in geologic time, quite fast. At that rate a continent will cover 32 miles in a million years and in 200 million years, 6400 miles! These processes continue today. As we continue to move westward, the



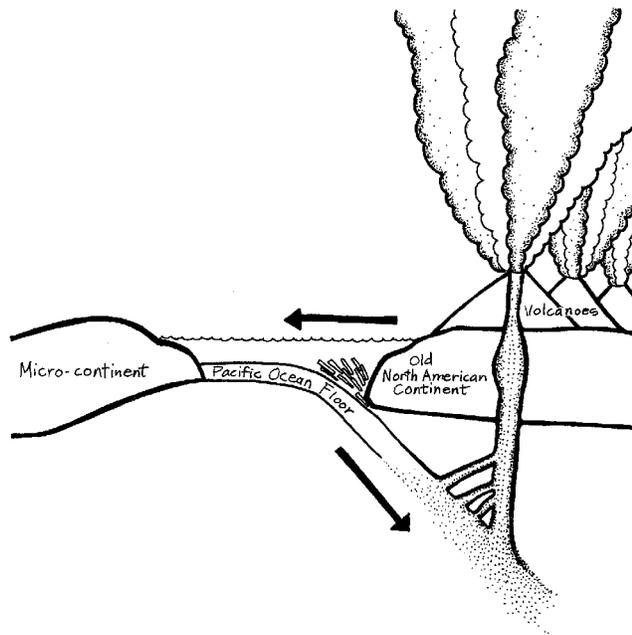
The continents are drifting quickly by geologic standards, but slower than a slug.

Pacific Ocean shrinks while the Atlantic Ocean expands.

When North America began its westward voyage 200 million years ago, the Pacific Ocean was dotted with small, island microcontinents. Borneo, New Zealand, New Guinea and Japan are among those remaining. Any that happened to be in the path of the "fast moving" North America collided and were welded on. Several of these "add-ons" now make up areas of Washington, British Columbia, and Alaska.

One collision, about 60 million years ago, created a large mountain range in what is now northeastern Washington. As these mountains eroded, rivers washed huge amounts of sand and silt into the adjoining ocean.

These sediments, up to 20,000 feet thick, were compressed into Chuckanut sandstone. The large palm leaf fossils found in Chucknut sandstone indicate that the world



The westward moving North American continent added on small Pacific islands.

climate was warmer then. These fossils are remains of plants that may have grown in estuaries 45 to 55 million years ago.

As the North American Continent continued west, riding up over the Pacific Ocean floor and colliding with other micro-continent, massive rocks have been twisted and contorted, forced deep under the earth's surface, crushed and heated, then spewed out in periods of extensive volcanism.

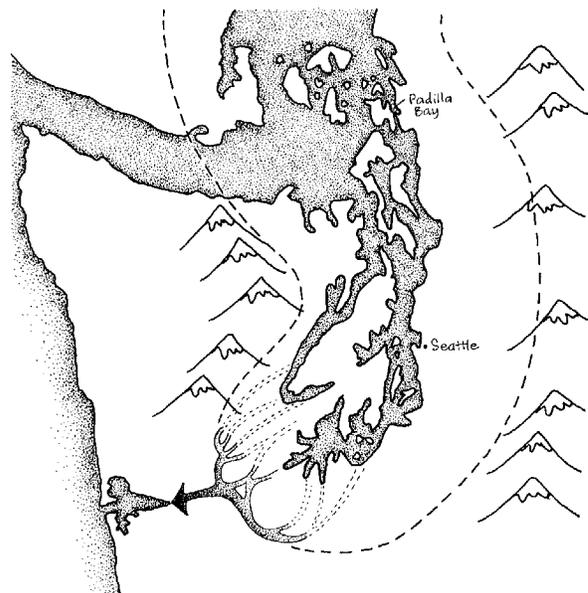
So when the Indiana salesman looked out at the calm bay encircled by peaceful mountains, he was actually riding a great heaving plate of moving earth. At any moment, the next magnitude eight earthquake could rock his chair as North America jumps forward and the mountains push up a little more.

### Carving Out the Details

The finishing touches to the Puget Sound area occurred a mere ten to twenty thousand years ago when the world climate was colder than it is today. A massive sheet of ice carved and deposited the details of the landscape.

The upper third of Washington state was covered with ice at least twice and perhaps seven times during the *Pleistocene Epoch*. The tongue of ice that pushed south into the Puget Lowland all the way to Olympia is known as the Puget Lobe. It completely covered the area between the Olympic and Cascade Mountains. Padilla Bay, for example, was buried under ice more than a mile thick! At the top of Mount Erie, just west of Padilla Bay, scratches made by the glacier can still be seen in the solid bedrock.

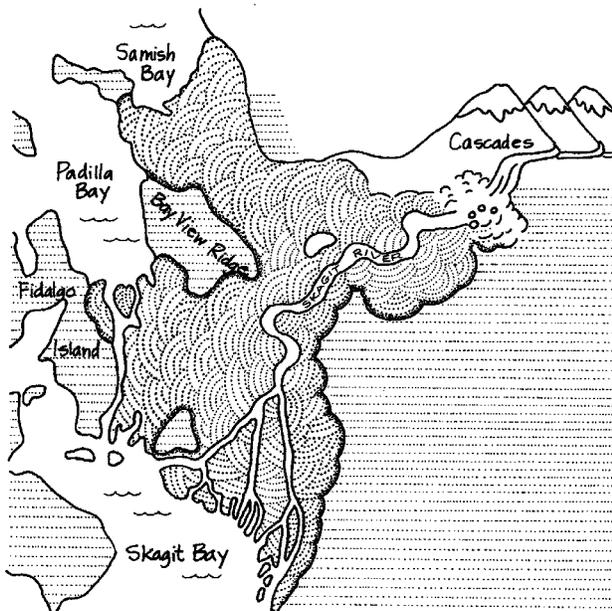
As the climate changed, the Puget Lobe began to melt, creating a lake in the



The approximate limits of the Puget Lobe. Grays Harbor was created from the melted glacier water flowing to the southwest.

depression it had occupied. The lake would have drained naturally out to the Pacific Ocean had it not been for a remnant of ice blocking the Strait of Juan de Fuca. The scene must have appeared quite different than it does today. Huge piles of rock, sand, and gravel (glacial till) that had been scraped up in the glacier's path became islands, while the lowlands were covered with water. Eventually the dam gave way to the pressure of the confined lake waters, releasing torrents into the Pacific. The leftover piles of glacial debris are still around, visible today as eroding bluffs around the shores of Puget Sound.

Meanwhile, the Skagit River was flowing hard and fast out of the Cascades, bringing with it mountains of sediment and depositing it in an advancing *delta*. Now, some ten thousand years later, the Skagit River sediments have filled one-hundred thousand acres of what was once part of Puget Sound. Sediments have reached the mound of glacial debris we call Bayview



10,000 years of advancing river sediments have made Padilla Bay a flat and shallow estuary.

Ridge, once an island far from the shore. One result of this process is Padilla Bay, a shallow bay supplied with fresh water from the Skagit River.

The Indiana tourist has long since departed in his RV. The tide still comes in and goes out without him. Indeed, to the casual observer, everything seems tranquil. But the Indiana tourist was struck from his carefree, vacation bliss with a bolt of **time**. Certainly Padilla Bay is not as it always has been. This estuary is in its fragile infancy, only recently born to the earth.

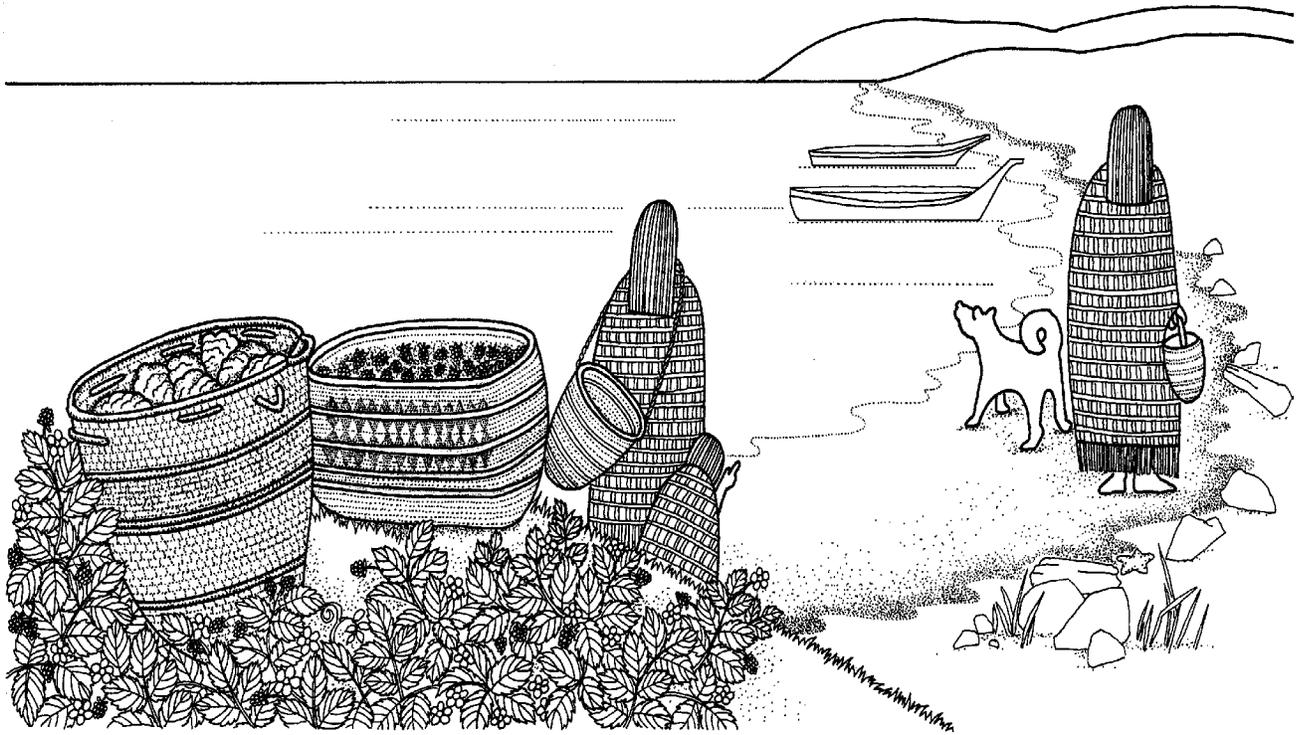
### **Related Activity:**

*Creative Exercises* in Activity 6.

### **Questions**

1. List five factors that might be considered when classifying an estuary.
2. Match the estuary with its geologic category.

Hood Canal	tectonic
Chesapeake Bay	bar-built
Columbia River	coastal plains
San Francisco Bay	fjord
3. List three geologic processes involved in forming the shorelines in the Puget Sound region.
4. From what you've read about geologic processes in this chapter, make a list of evidence you have seen that the Puget Sound region is still changing today. (Don't include changes from human activities.)
5. Describe some geologic processes that might change the Puget Sound in the next 10,000 years.



## 2- Estuary Settled - Local History

History is usually studied as a series of events. We know when famous people were born and died. We know when wars were fought and treaties were signed. What makes history significant is not only the sequence of events, but also how attitudes and behaviors change over time. Unfortunately, attitudes are more difficult to record and understand. We can see what people did, but do not always know what they thought or what motivated them. If we could live the events, read the letters, and see the art, we would have a clearer picture of their attitudes.

This section is a chronicle of events, but as you read of the people and events that have shaped Padilla Bay's past, try to imagine the rest. Look beyond the names and dates to a story of changing attitudes.

### The First Inhabitants

In the early 1820s, a fur trader named John Work described some people he visited

near Padilla Bay as "fine looking Indians."

"I passed 12 houses belonging to these people on the east side of our road, not far separated, in the opposite side of the bay I counted at least 12 houses in a village, besides which at a great distance, the smoke of two other villages appeared."

What John Work saw was part of a flourishing culture that, by Work's time, had been subjected to a series of devastating epidemics. It is to the credit of the Indian people of the region that both they and their culture continued and adapted to the tide of human events.

An 1855 map indicates that the Samish and Swinomish lived in the area around Padilla Bay. Modern anthropologists still do not agree where these people came from but their own oral history says that they originated right here in the Pacific

Northwest. The name that the Samish have for themselves (pronounced SEE opsh) is translated "The First People." In any case, they lived for ten thousand years on the calm bays of the Skagit Valley, with abundant food and a temperate climate. Indeed, the spring-fed, forested area around Padilla Bay must have been a tempting place to settle as it provided everything they needed for a comfortable life and safe access to an efficient marine highway.

All the aspects of modern culture which are represented by our modern institutions of church, school, medicine, industry, and politics were integrated into the daily lives of these native people. In the summer they lived in portable dwellings made of cattail mats as they moved from place to place gathering the gifts of the land and water, storing berries, farming and processing bulbs and roots, and collecting seaweed and other sea foods for the cold wet seasons ahead. Before the arrival of European settlers, the lands around Padilla Bay were an immense and productive wetland. They were like a vast public market where various groups came together by consent to harvest the plentiful resources. In the winter native people lived in permanent wooden houses where they shared and gave thanks for their abundance with friends and relatives.

This way of living was passed down from generation to generation via the oral tradition: a chain of knowledge connecting the present with the past and the future. The chain was almost broken in recent history due to pressures brought on by cultures from another part of the world. The first to strike were the European diseases which decimated the population. Next came the Europeans themselves with their concept of ownership of resources. By the end of the nineteenth century, it was made illegal to possess artifacts such as drums, masks, and artwork

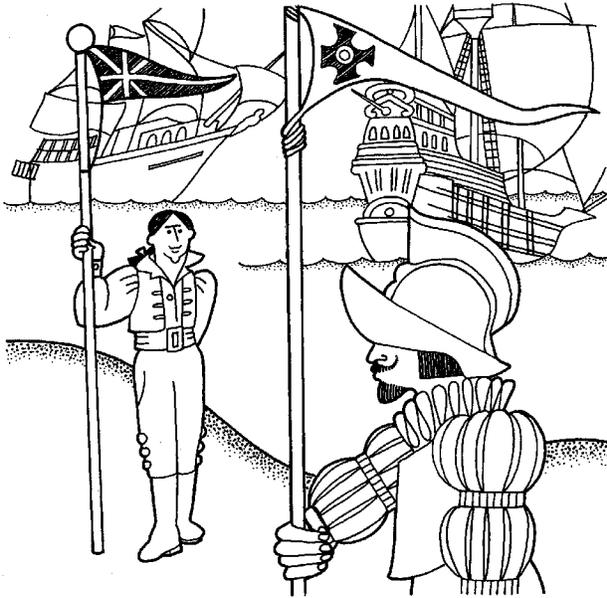
which were used in the practice of the native way of life. At that time, the oral tradition went underground and many teachings were passed on in secret.

The *Treaty of Point Elliott*, signed in 1855, created the reservation system we see today. In exchange for ceding their land to the white settlers, the Samish and others were promised a reservation with adequate land, education, money payments, and medical help. They had to wait many years for some of the promised compensations. Others have never been fulfilled. Many people believe that though the Point Elliott Treaty ceded land to the United States, the accompanying resources were reserved from the treaty and never negotiated away. Today, many Native Americans are asking for access to resources they feel were set aside for them.

Our society is beginning to realize that there is value in a way of life that does not disrupt natural systems. The Native way of life recognizes a closeness with the plants and animals, air, water, and earth. This philosophy recognizes an equal right to a healthful living, and that it is up to humans to be sure it is maintained. According to the oral tradition of the Samish Tribe, this was the agreement between the First People and the Creator.

### **Exploration and Expansionism**

When Spanish explorer Jose Narvaez sailed through Guemes Channel in the summer of 1791, he described the shallow bay that lay before him as "a great sand flat with one-half fathom of water on it . . . and an extended piece of flat land beyond the horizon. In the sandflat could be seen many Indians after shellfish." Narvaez was sailing under the orders of the governor of Spanish North America, Viceroy Juan Vicente de Guemes Pancheco de Padilla Horcasitas y



Both the Spanish and British explored Puget Sound in an effort to claim new territory.

Aguayo, conde de Revillagigedo. Narvaez named the bay "Seno de Padilla" or "embrace of Padilla."

He was not here sightseeing, nor was he here to learn more about the native way of life. The Spanish were exploring the area as part of a national policy to acquire territory, expand trade, and spread Catholicism. This highly competitive struggle among world leaders of the eighteenth and nineteenth centuries is referred to as *expansionism*. Narvaez sailed here hoping to beat the British and secure these lands as the Imperial possessions of Spain. Shortly after the Spanish visit, English sea captain George Vancouver mapped the Sound completely and then named the southern reaches after his lieutenant, Peter Puget. He assigned new place names to various mountains, rivers, islands and other bays; names which quickly replaced most (but obviously not all) awarded by the Spanish. Vancouver's reports

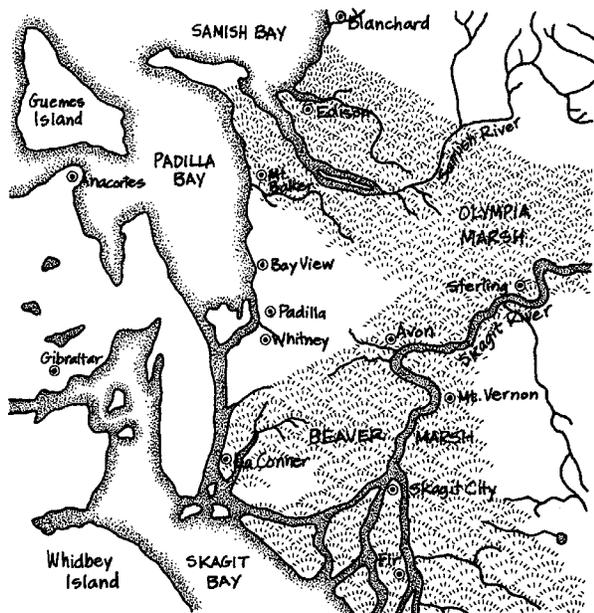
were quickly published in Europe while those of Spanish expeditions were kept secret, since Spain did not want to advertise this area of the new world. Ultimately, Spanish power was broken both on the seas and at home. By 1795, Spain had relinquished its claims on the Northwest to the British.

Meanwhile, another hungry giant, equally intent on expansionism, was rising in the east and claiming land in a westerly direction. In 1792, Robert Gray, in the armed ship, *Columbia*, claimed the Oregon country for the United States, and in 1804-1805 the Lewis and Clark Expedition provided detailed reports of the Pacific Northwest. Finally, the expansionist administration of President James K. Polk proposed that American claims should extend up to the southern boundary of Russian Alaska. The British rejected the idea at first but agreed to compromise after hearing reports of trapped-out fur and over five thousand Americans already living in Oregon. On June 15, 1846, the Oregon Treaty was signed by the United States and Great Britain establishing the boundary between Canada and the U.S. along the 49th parallel and out through the middle of the Straits of Juan de Fuca.

### **Settlement**

Trappers were probably the first European inhabitants of the region. Between 1800 and 1835, almost every well-dressed man in the East and in Europe wore a beaver hat. The trappers were apparently too preoccupied with the accumulation of beaver pelts (almost to the point of the beaver's extinction) to leave written records of their visits. They did, however, leave trade agreements, transportation routes, and tools. Much like the natives, these trappers viewed the land as a common resource rather than as a commodity to be owned.

European settlement began in earnest after the signing of the Oregon Treaty. Immigrants came overland by covered wagon to the Columbia River, then north to the southern part of Puget Sound, finishing the trip by water. Many came by sea around Cape Horn or across the Isthmus of Panama. Still others took the train to Sacramento (completed in 1867) and completed the journey by sailing north out of San Francisco. In all cases the last leg of the journey was by sea. Consequently, islands such as Whidbey, Camano, Fidalgo, Guemes and Samish were the first areas to be settled.



The wetlands surrounding Padilla Bay around 1860.

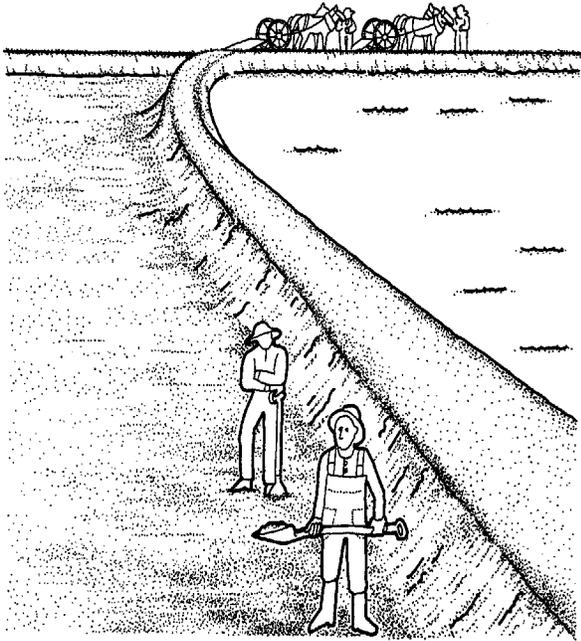
About 1863, Samuel Calhoun, who worked in a lumber mill on Camano Island, hired an Indian to take him to the mainland by canoe. They went up a branch of Sullivan Slough and landed at Pleasant Ridge, east of present day La Conner. He climbed the ridge for a better perspective but could see nothing because of the dense forest of virgin cedar. (Similar stands of huge cedars, some in excess

of 48 feet in circumference, covered most of the higher ground, including Bay View Ridge.) Calhoun climbed a tree and was finally able to get a view of his surroundings where deep forests gave way to marshes and sloughs. It was the marshy ground that caught his attention. Calhoun knew of diking techniques that yielded farm land from salt marsh. He decided to return to the area and carve out a farm from the marsh.

So the face of the land began to change -- much more quickly than it had during the thousands of years of glaciation and sedimentation. Early *dikes* were built by men with shovels, wheelbarrows and visions of ownership and profit. The early dikes were about eight feet wide at the base, two feet at the top and about four feet high. They had to extend along the entire salt water margin of the claim and far enough up the major *sloughs* to be beyond the reach of high tides. Many early diking efforts failed but when Calhoun and his partner, Michael Sullivan, finally raised a crop of barley on 40 acres of diked land and sold it on the spot for \$1,600, the smell of success gave new energy to others.

Eventually, dike building machines were invented and implemented. Large sloughs were diked and made navigable to farm houses and granaries. Small sloughs were simply filled. Additional protection in more exposed areas was provided by *piles* driven just outside the dikes to stop the washing of waves. (The remnants of these piles are still visible in Padilla Bay.) Much of the salt marsh around Padilla Bay that formerly provided habitat for fish, waterfowl, muskrats, mink and otters was now producing agricultural crops.

The dikes did not end the problems for the early "salt farmers". The farms, while relatively safe from intrusion by the sea, were



Building and maintaining a dike was no easy task.

now subject to periodic attacks from the rear when the Skagit River flooded. Because the dikes kept the fresh water from filtering out into the sound, the entire valley would flood. With each flood, the profitable farm land became further damaged. Cattle were drowned and farm houses floated away. Cutting the dike to release the water was an obvious necessity; however, the dikes were privately owned, and each farmer felt that someone else's dike should be sacrificed. Some farmers tried to dike just the areas of the river that overflowed onto their property. Because these efforts were so fragmented, they had limited value. The diking of the river required a higher degree of organization in order to succeed. It wasn't until the 1890s that the settlers began to realize that a cooperative effort would benefit all.

Another resource that drew attention to the Padilla Bay area was the virgin timber that had grown on Bay View Ridge for 10,000 years. Logging began on the ridge around

1876. Initial efforts proved fairly easy. The timber near the water could be felled directly into the bay and easily transported to the mill. The size of the trees being harvested presented about the only problem. Some exceeded eight feet in diameter at the base. The saws were not long enough to cut such widths, so loggers chopped wedges into the trunk, inserted "springboards" on which to stand, and sawed through the trunk eight to ten feet above the base. Since the logs seemed limitless, no one worried about waste. By 1882, there were 11 logging camps in the area producing 38 million board feet of timber annually.

Early loggers came from the Great Lakes where forests had been decimated by the 1880s. Others came from Maine and New Hampshire where forests were also depleted. Still others came from eastern Canada, New Brunswick and Prince Edward Island, rushing to stay ahead of a resource that couldn't possibly keep up with even primitive harvesting methods.

In 1902, the splendid old growth of Bay View Ridge caught the attention of the Ballard Lumber Company. They purchased 1,700 acres, and the town of Bay View became home to one of the largest logging concerns in the state. The "modern" company replaced *skidroads* and oxen with a 4-mile-long railroad from the eastern top of the ridge down to the water near Bay View. Logs were transported from the cutting sites (often with just a single log fitting on a flatcar!), dumped into the bay and floated or boomed to the company mill in Ballard. In a short time the Ballard Company was harvesting 65,000 to 75,000 board feet of first-growth cedar, fir and spruce daily.

Fires soon followed. As the old growth timber was removed, the normally wet under story dried from exposure to the sun and fires raged through the areas, unchecked until the rains came. The worst fire on record was the 1909 "Ridge fire." The town of Bay View had to build and rebuild often as a result of fires in the early 1900s.

By 1910, the Ballard Lumber Company had logged off all of its land, or about two-thirds of the timber on Bay View Ridge. Stumps, abandoned skidroads and fire scars awaited the next wave of settlers.

As the saying goes, beauty is in the eyes of the beholder. As the large trees were removed, the area attracted those intent on farming. To a farmer, the forest of stumps seemed much less intimidating than a forest of dense trees. The Great Northern Railroad offered reduced rates to entice farmers to come to Washington State, advertising fertile land that logging companies were eager to sell.



A "skid road" and logging camp.

Clearing a stump farm was a huge undertaking. The most efficient method of removal was dynamite but most early pioneers couldn't afford such luxury. Some planted crops between the stumps, some burned them, some cut them up for firewood or sold them to a shingle mill. Still others had "logging bees" to clear the land. These were work/social occasions where human labor was rewarded with good food and stiff drink.

By the early part of the 20th century, the personality of the Padilla Bay region had changed. The raucous, get-rich-quick logging operations gave way to a more stable element: settlers looking for a permanent situation in which to raise a family and make a living from a new land that they could call their own.

### How To "Use" Padilla Bay

As the land became occupied, interest turned to the economic potential of the bay itself. Several enterprising ideas were proposed beginning in the 1920s.

In 1925, commissioners of the newly formed County Diking District accepted bids for the diking and reclamation of 10,000 acres of tideland in Padilla Bay. The proposed dike was to span the outer margin of the tidal lands from Samish spit to Hat Island and from Hat Island to the south end of the bay. Work began in 1929, starting at the mouth of Indian Slough. After only 1.5 miles of dike was completed, the contractor went broke and the project died.

In 1930, 943 one-acre tracts were platted in southern Padilla Bay, creating the "Associated Oyster Tracts." Each parcel was a long, narrow triangle -- only six feet wide and over two miles in length! A management company oversaw the overall project, with

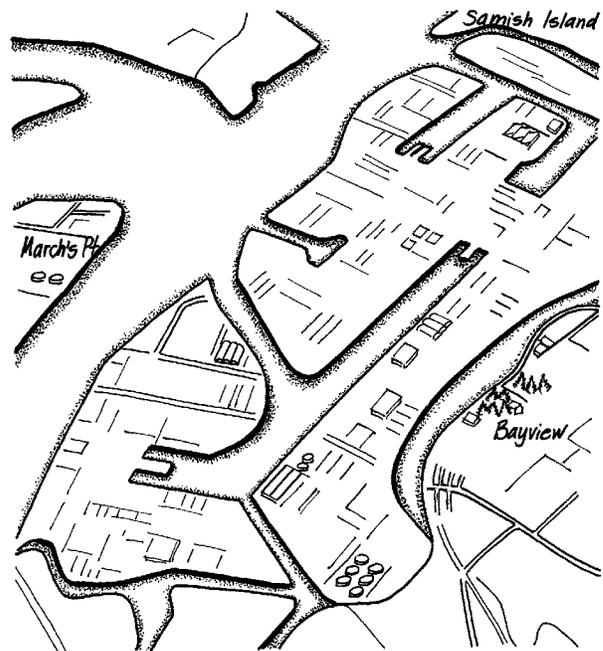
the goal of planting and harvesting Japanese oysters.

Initially, the oyster farming seemed promising but after a few years, production and quality began to decline. Pollution, the lack of fresh water and the reproductive success of predators were speculated as causes for failure. The oyster company claimed pollution as the culprit and sued the Scott Pulp Company for destroying the oyster habitat. The judge ruled against the company on the basis that the oysters' failure was due to a lack of nutrients.

In 1961, investors had another idea. Padilla Bay was to be the site of the largest industrial park in the state. The plans included dredging a three-mile-long, 60-foot deep waterway to accommodate ship traffic. The dredged material would then be used for filling 9,400 acres. Some local people, interested in preserving Padilla Bay, began to protest. However, the County Commissioners claimed to be powerless to intervene, since the land was owned and controlled by the promoters of the project. By 1963, after plans failed to secure a 1.4-million dollar Federal industrial loan, the tracts were sold at auction to the Seattle-based Orion Corporation.

The Orion Corporation thought the bay would be perfect for the development of a "Venice-like" housing project with meandering channels, beaches and boat launches, and a marina to complete the scene; home to 30,000 people. The project won unanimous support from the Skagit County Development Association. Again, the locals protested.

Then, in 1965, the Area Development Administration funded a feasibility study to determine the potential of using 600 acres of



A 1961 proposal for a deep water port and industrial park.

Padilla Bay for industry. The results indicated that the eventual profits would far outweigh the costs, and it was thumbs up for another industrial venture.

In the meantime, area residents who favored preserving the bay had organized the Citizens Committee for the Preservation of Padilla Bay. Their efforts were successful in stalling both the housing and industrial projects until 1971 when help arrived in the form of the state Shoreline Management Act. Shortly after the Act's passage, the Washington State Department of Ecology began preparing policies and guidelines to assist local governments in their development of rules to protect coastal resources. In 1976 the state-approved Skagit County Shoreline Management Program was adopted, creating a regulatory framework for public input and protection of the county's shorelands. This program, reflecting the opinion of the state

legislature, designated Padilla Bay as a "Shoreline of Statewide Significance" to be "managed with the interest of all the people in mind, and whose natural character should be preserved."

Beginning in the mid-1970s, the Washington State Department of Ecology began evaluating potential sites for participation in a federal program called the National Estuarine Research Reserve System. Administered by the National Oceanic and Atmospheric Administration (NOAA), this program protects a variety of estuary resources around the U.S. in order to conduct long-term research and educational programs. After extensive review along with many committee meetings and public hearings, the Padilla Bay National Estuarine Research Reserve was designated in 1980. The purchase of tidelands within the proposed 13,535 acre boundary began immediately, with the state purchasing only from willing sellers based on appraised values.

The policies and regulations found in the county's Shoreline Master Program and the state Shoreline Management Act have made some types of development in Padilla Bay impossible. Residential and agricultural uses are currently prohibited, while other uses such as crab or salmon fisheries and others may be enhanced by habitat protection and wise management practices.

The Orion Corporation, still owning a large portion of the bay, filed suit against the State of Washington and Skagit County. They claimed that the development rights for their tidelands had been removed by state and county governments without a fair offer of compensation. The state argued that fair market value had been offered for the property. The suit will significantly test the legal strength of state and federal laws to protect the environment. The fundamental issue of

private ownership versus environmental protection will be influenced by the court's decision.



### **Edna Breazeale**

A description of the events surrounding Padilla Bay since the turn of the century would be incomplete without mention of Edna Breazeale. Miss Breazeale came to Padilla Bay as a small child in 1901. Her father had taken advantage of the inexpensive land being offered in the early 1900s and purchased a parcel one-half mile north of the present interpretive center, overlooking the bay. Her childhood was spent collecting agates on the beach, sitting silently in the uplands observing coveys of quail, and developing an environmental ethic long before it was fashionable. She rode the train from Whitney (across from the present Farmhouse Inn Restaurant) to Burlington Edison High School until her graduation in

1912. The train was the only practical means of transportation at that time. The land between Burlington and Bay View Ridge was an extensive wetland called Olympia Marsh. Edna Breazeale described the boggy area as a place where one could jump up and down and cause twenty acres of land to quake in all directions. After high school, she attended the University of Washington, where she graduated with honors in 1917. She taught school for the next 40 years, inspiring students and fellow teachers alike.

Edna Breazeale retired from teaching in 1957 and returned to live with her brothers Fred and Marcellus on their farm overlooking the bay. When rumors began to circulate of plans to fill the bay, she initiated a campaign to save the area that she had learned to value as a child. She, and a handful of other committed area residents, carried a petition from "the hills above Concrete to the taverns of Anacortes," Breazeale recounted. She volunteered for the tavern duty herself, thinking no one would dare laugh at an old lady with gray hair. She was right; two thousand citizens signed the petition to save the bay. So, for ten years, a small group of citizens with no financial backing held off powerful business interests. In 1971, government finally caught up with the foresight of Breazeale and others; the State Shoreline Management Act, spawned by the voters' initiative process, was passed.

Edna Breazeale's contribution did not end there. In 1981, on behalf of herself and her two brothers she donated the farm to the Padilla Bay National Estuarine Research Reserve. It is on this site that the Breazeale-Padilla Bay Interpretive Center now stands. Miss Breazeale and her brothers felt that "something should be kept for people who want green, open space . . . so much is 'keep off, keep off.' "

At a ceremony honoring her involvement in the creation of the Padilla Bay National Estuarine Research Reserve in 1980, Edna told the audience, "I believe that what we have worked for will be remembered long after all of us are gone." She died September 16, 1987, at the age of 92. Indeed, Edna Breazeale and her family will be remembered.

Edna Breazeale showed how one person's actions and values can shape history. She was one person, but she was not alone. Similar values were expressed elsewhere. The famous Wisconsin Wildlife Manager, Aldo Leopold wrote:

We abuse the land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.

-from "*A Sand County Almanac*"

***Related Activity:***

"Creative Exercises" in Activity 6.

***Questions***

1. How had local Native American tribes already been changed when John Work saw them in 1820?
2. "Many people believe that though the Point Elliott Treaty ceded land to the United States, the accompanying resources were reserved from the treaty and never negotiated away." (See p. 8.) What does this mean? What repercussions does this belief have today?
3. List four nations that have claimed land in the Puget Sound region.
4. Why did early settlers choose to settle near estuaries rather than sites further inland? (List as many reasons as you can.)
5. List the plans to develop Padilla Bay and why they failed.
6. How have attitudes towards estuaries changed in the past 200 years?
7. Why do you think Edna Breazeale fought against development interests?