Summit to Sound:
A Tour of the Puyallup River Watershed
VERSION 6/9/03

SLIDE SHOW

1. Summit to Sound: A Tour of the Puyallup River Watershed
2. Puyallup River Watershed Council: Mission. The Puyallup River Watershed Council is a forum that promotes and implements programs that restore, maintain, and enhance the watershed in order to protect its environmental, economic, and cultural health. The council is composed of representatives from municipalities, government agencies, businesses, tribes, environmental organizations, educators, and citizens.
3. Themes: River systems (features and process), Impact of human activity (Land use, Changes to the watershed over time, Recreational opportunities)
4. What is a watershed? A watershed is all the land area that drains into a given body of water. We all live in a watershed.
5. Photo from Port to Mount Rainier: The Puyallup River Watershed extends from Mount Rainier to the Tacoma tideflats and Commencement Bay, with elevations ranging from 14,410 ft at the summit of Mount Rainier to sea level at Commencement Bay. The watershed is almost 1000 square miles in area and encompasses virtually every types of land use imaginable. Most of the watershed (about 85%) is in Pierce County; the rest is in King County. About 550,000 people live in the watershed. (Photo credit: Port of Tacoma)
6. Map: More than half of Mount Rainier drains into the Puyallup River Watershed. The meltwater from all of the glaciers on the north and west sides of the mountain form the tributaries that eventually join together to form the Puyallup River and flow into Puget Sound at Commencement Bay. (Map credit: Dee Molenaar)
7. Puyallup River System: Three major rivers and numerous small streams form the complex system of the Puyallup River Watershed.
8. Photo of Summit of Mount Rainier: The river system begins as meltwater from the glaciers on Mount Rainier. Mount Rainier National Park was established in 1899. The park includes Mount Rainier (14,410'), an active volcano encased in over 35 square miles of snow and ice. (Photo credit: Pierce Conservation District)
9. Watershed Map: This map of the watershed shows the major tributaries to the system – in particular those of the White River system. Also indicated are the location of Mud Mountain Dam and Lake Tapps. The triangles are the locations of USGS gauging stations. (Credit: US Geological Survey)

10. White River: The White River, the largest tributary of the Puyallup River, begins as meltwater from the Emmons, Frying Pand and Winthrop glaciers on the northeast side of Mount Rainier. In this view the river flows past the White River campground in the national park. The river flows in a valley carved by the glacier and the muddy appearance of the river is due to finely ground glacial sediments it carries away from the volcano. (Photo credit: Karen Dinicola)
11. Crystal Mountain Ski Area: Crystal Mountain Ski Area is located on the northeast side of Mount Rainier in the Snoqualmie National Forest provides one of the many recreational opportunities in the watershed. (Photo credit: Crystal Mountain Ski Area)
12. Mud Mountain Dam: This 432 foot high earthen dam controls flooding on the lower Puyallup River system. Construction began on the dam in 1939 and was completed in 1948. The picture on the left shows the dam during the dry season; the picture on the right is during the wet season. During the floods of 1996, the water behind the dam was 10 feet below the top of the spillway. The dam was constructed and is maintained by the Army Corps of Engineers. (Photo credit: Karen Dinicola and Priscilla Long)
13. White River Diversion: A flume was constructed in 1910-1912 to divert water from the White River to generate hydroelectric power. The diversion begins near Buckley and transports the water to Lake Tapps for storage. It flows out the northwest corner of the lake to the Puget Sound Energy hydroelectric plant. (Map credit: Save the Lake Tapps Coalition)
14. White River Diversion Dam: Constructed 1910-1912. (Photo credit: Bob Duffy)
15. White River canal: The 8 mile long diversion carries water in wooden flumes, a concrete canal, an unlined canal, and a large pipe from the White River to Lake Tapps. (Photo credit: Karen Dinicola)
16. Fish trap: Adult salmon migrating upstream are trapped at the PSE diversion dam on the White River and trucked around Mud Mountain Dam; this is a ten mile truck trip. (Photo credit: Karen Dinicola)
17. Fish screen: The fish screen at the diversion dam on the White River diverts juveniles migrating down stream safely back to the river. (Photo credit: Bob Duffy)
18. Lake Tapps: Lake Tapps is a man made reservoir on the plateau near Bonney Lake. This area originally was originally wetlands with a few small lakes. Earthen dikes were constructed to hold a total volume of 67,000 acre feet of water in the lake. Water is released through a ½ mile tunnel to the White River Powerhouse. The lake level is kept high in the summer and drawn down about 30 feet in the winter to meet high power needs and make room for storage of spring snow melt.

19. White River Powerhouse: This hydroelectric plant constructed 1909-1911 near Dieringer (between Sumner and Auburn). This facility produces 60 megawatts of electricity. Water is returned to the White River. Puget Sound Energy operates the facility. (Photo credit: Save Lake Tapps Coalition)
20. The Stuck River: Originally the White River flowed into the Green River and out to Puget Sound. The Stuck River flowed into the Puyallup River. (Map modified from the Save Lake Tapps Coalition)
21. Path of River Changed: In 1906, debris formed a natural dam in the river near Auburn and diverted its flow into the adjacent Stuck River and into the Puyallup River. A permanent dam was constructed in 1914 to prevent the river from returning to its original path. The Stuck River "disappeared" and the White River had a new path. (Pierce County River Improvement)
22. White River – Puyallup River: Aerial view of the confluence of the White River with the Puyallup River, near the intersection of Highway 167 with Highway 410. The Puyallup River flowing in from the south has a larger sediment load and creates the sediment plume observed at the joining of the rivers. The sediment load of the White River is much less due to Mud Mountain Dam. The City of Sumner occupies the right portion of the picture. Photo taken in April 2002. (Photo credit: City of Sumner)
23. Map of Puyallup River Watershed: The Puyallup River begins with the melting of glaciers on the west side of Mount Rainier – the North Mowich, Edmunds, South Mowich, Puyallup and Tahoma glaciers. (Credit: WA Department of Ecology)
24. Puyallup River Origins: After leaving the national park land, the river flows through managed timberlands. Note the wide channel and the meandering path of the river in it. (Photo credit: Pierce Conservation District)
25. Increasing Fish Passage: Numerous culverts have been replaced to improve fish passage on small creeks and streams in the system. This new culvert is located on a tributary to Kapowsin Creek. (Photo credit: Pierce Conservation District)
26. Electron Dam: The Electron Dam was constructed in 1902 on the Puyallup River above Orting. A fish ladder constructed in 2000 has provided fish passage up and down the river. (Photo credit: Pierce Conservation District)
27. Puyallup River near Orting: The Puyallup river enters increasingly mixed land use as it makes its way down the broad valley. This region has residential, agricultural and commercial in Orting. This section of the river is constrained by dikes and levees, some of which failed during the 1996 floods. (Photo credit: Pierce Conservation District)
28. New Setback Levee: Following the floods of 1996, new setback levees were constructed to allow the river to meander and migrate across a wider section of the valley floor. Segments of the old levees appear as near vertical lines of

either side of the river; these have been broken through by the new meander patterns. (Photo credit: Pierce Conservation District)

29. Carbon River Map: This map of the watershed shows the major tributaries to the system – in particular those of the Carbon River system in the middle of the watershed. (Credit: US Geological Survey)
30. Carbon River: The Carbon River is a major tributary to the Puyallup River. It begins at meltwater from the Carbon and Russell glaciers on Mount Rainier. (Photo credit: Bob Duffy)
31. Carbon River: The Carbon River system is comprised of many smaller rivers and creeks. This is a view of South Prairie Creek. Note the good riparian vegetation in this reach of the creek and studies of benthic macroinvertebrates indicates good stream health. This stretch of river has the largest fish returns in the river system. (Photo credit: Pierce Conservation District)
32. Carbon River – Coal Country: Rich deposits of coal were mined in various locations in the Carbon River valley in the late 19th and early 20th centuries. This photo shows the mine operations at Carbonado near the turn of the century. The Northern Pacific Railroad used this coal. Note the heap of coal in the river. (Photo credit: Ester Bowman/Nancy Irene Hall)
33. Carbon River: The Carbon River joins Puyallup River near Orting. Note the wide river channel and the large gravel bars in the channel. (Photo credit: Pierce Conservation District)
34. Puyallup River: The river meanders through the broad valley floor south of Puyallup and Sumner near Alderton. Trailer parks (the Bowman Hilton) in this view were damaged by floods in 1996 when sections of these levees failed. Note the oxbow lake that indicates a previous meander path of the river. (Photo credit: Pierce Conservation District)
35. Puyallup River: This view shows the Puyallup near the City of Puyallup. This is below the confluence of the White River with the Puyallup River. Note the density of residential and commercial land use. This level of development leads to large amounts of impervious surface and significant impact on water quality. (Photo credit: Pierce Conservation District)
36. Water Quality Monitoring: It is very important to monitor the effects of human activity on the chemistry of the river. Citizen volunteers participate in water quality testing efforts. The picture on the left is South Prairie Creek and the picture on the right is Clarks Creek. (Photo credits: Pierce Conservation District)
37. Straightening the River: The lower 8 miles of the river were straightened and levees were built between 1914 and 1919. Revetments were constructed to reduce bank erosion. The former path of the river is seen in the low green area with trees. (Photo credit: Pierce Conservation District)

38. Cut Off Map: This map shows the former path of the Puyallup River and the White/Stuck River shaded in yellow. The thick double lines indicate the present path of the rivers. The drift barrier and Auburn Dam are shown in the upper right corner of the map. The length of the Puyallup River was shortened by 1.6 miles. (Credit: Report of W. J. Roberts, 1920)
39. Constructing the Levees: The river channel was straightened and widened to reduce the risk of flooding. This picture shows a dragline in 1916. (Pierce County River Improvement)
40. More Levee Construction: Concrete revetments were constructed to reduce bank erosion. This lower stretch of river was called the Reservation cut-off. (Pierce County River Improvement)
41. Industrial Tacoma: As the river approaches Tacoma, it flows through industrial lands near the Port of Tacoma. Note the many highway and railroad bridges crossing the river. The last large undeveloped parcel of land in the intertidal estuary of the river system is in the foreground. It is owned by Union Pacific and attempts are being made to acquire it for fish habitat. A restoration project would create resting habitat for migrating fish. (Photo credit: Pierce Conservation District)
42. Puyallup River Tideflats: After a long journey, the Puyallup River reaches Commencment Bay where a delta is forming at its mouth. The picture on the left was taken in 1957. The Simpson Tacoma Kraft paper mill appears in the foreground of both pictures. The original saw mill was constructed on this site in 1889. In the 1957 phtograph, the waterway on the right is the Middle Waterway and the St Paul Waterway is between it and the mouth of the river. (Photo credit: Pierce Conservation District)
43. Hylebos Creek: A small tributary to the Puyallup system, the Hylebos Creek flows down through the city of Federal Way to the Hylebos waterway on the northeast side of the Tacoma tideflats. The photograph in the upper right was taken in 1952. Note the intertidal mudflat area which is now gone. This estuarine habitat was similar to that of Wapato Creek. A scientist is sampling the organisms (benthic macroinvertebrates) living on the river bottom. (Photo credit: City of Federal Way)
44. Commencement Bay: Various waterfront activities occur in Commencement Bay, including shipping, industrial activity, and recreation. Only 5% of the original intertidal mudflat habitat remains. The picture on the right is the Wheeler-Osgood waterway, one of the old mouths of the river. (Photo credit: City of Tacoma)
45. The End of a Journey: The waters of the Puyallup River system flow into Puget Sound and out into the Pacific Ocean, completing their water cycle. (Photo credit: Port of Tacoma)

46.For More Information and How To Get Involved

Puyallup River Watershed Council
http://www.salmoninfo.org/PRWCouncil.htm

Pierce Conservation District: Stream Team
http://www.piercecountycd.org/streamtm.htm

Friends of the Hylebos Wetlands
http://www.hylebos.org

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For Students

Learning Goals:

Be able to describe the features and processes of a watershed
Be able to discuss the human and natural history of this river system
Be able to identify recreational opportunities in the watershed

Questions to think about:

What are the geological features and processes of the watershed?
How does the human activity in the watershed affect the plants and animals in the watershed?
What are the land uses in the Puyallup River Watershed?
What natural changes have occurred to the river system?
What human changes have occurred to the river system?
What recreational opportunities are there in the watershed?
What can you do to help maintain and improve the health of the Puyallup River watershed?

Partial Answers:

Geological features and processes:
Volcano, erosion by glaciers, erosion by river, coal deposits, deposition by river, meandering river
Effect on plants and animals:
Trapping fish, cutting timber, water quality, removal of habitat
Land uses:
National Park (97% designated Wilderness), managed timberlands, mining, agricultural, residential, commercial, industrial
Natural changes:
Meanders, White River shifting from Green to Stuck
Human changes:
Dikes, levees, dams, diversions, Lake Tapps, culverts, water quality, dredging
Recreational opportunities:
Skiing, hiking, kayaking, canoeing, fishing, swimming, golfing
What can you do?
Water quality monitoring