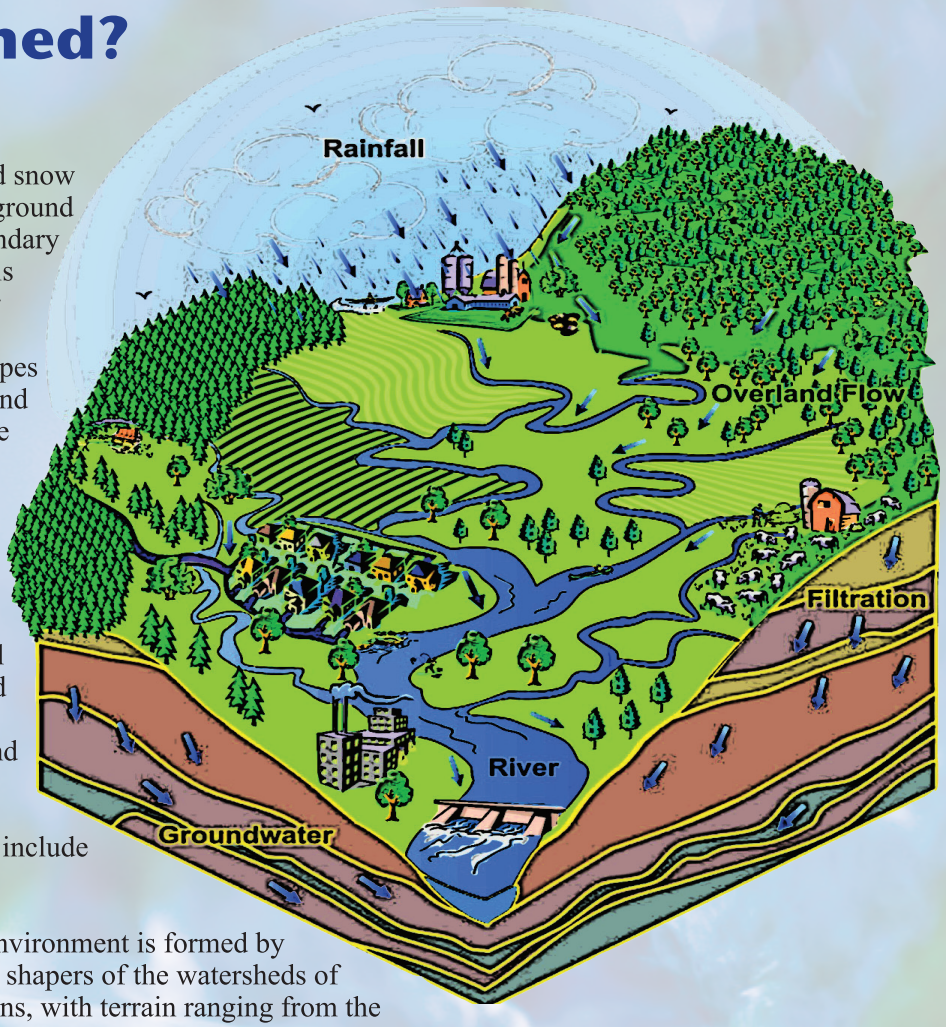
What is a Watershed?

A watershed is your home

It is a natural area of land that catches rain and snow and drains into a marsh, stream, river lake or ground water. Basically, a watershed is a natural boundary determined by the direction water travels. This includes the area that contributes groundwater to aquatic ecosystems, as well as the surface water that we can see. We are used to landscapes being defined by roads, property lines, cities and counties. Mountaintops, ridges, and the shape of the land, however, define the boundaries of watersheds.



Watersheds come in all shapes and sizes. Some are millions of square miles; others are just a few acres. Homes, farms, ranches, forest, lakes, small towns and big cities can all exist within a single watershed. The watershed where you live or work may be a mixture of forestry, agriculture, commercial, industrial and residential uses.

Watershed boundaries can extend beyond and include county, state, and even international borders.

In the Pacific Northwest region the physical environment is formed by a variety of forces. Glaciers were the primary shapers of the watersheds of the Olympic Peninsula and Puget Sound regions, with terrain ranging from the steep slopes of the Olympic Mountains to coastal lowlands.

It is important to know about the physical properties of your watershed and to understand watershed processes (the delivery, movement and loss of water, sediment, nutrients, toxins, pathogens, and large woody debris). Water is essential to all life, finite in quantity, and must be kept clean and healthy for everyone's sake.

Produced by WSU Extension with Funding by National Institute for Food & Agriculture

USDA United States Department of Agriculture

Applying knowledge to improve water quality
Pacific Northwest Regional Water Program
A Partnership of USDA NIFA & Land Grant Colleges and Universities

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"It's your Watershed: Water Matters" is based on "Welcome to your watershed: Water Matters," May, 2008. Pat Pearson, Project Director, WSU Jefferson County Extension, Washington. Subject Codes: 371, 376, 500, 700, MISC0568E.

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Elements of Watersheds

Trees & Forests

Plants have been around for over 450 million years, starting with simple forms of single layers of cells. Today plants are among the most complex of life systems and they are also the oldest and most successful. The first plants stood upright about 420 million years before the fist animals could. Plants, over time, have adapted to the harshest environments on the planet. Trees are relatively long-lived (some for thousands of years). Trees are important components of the natural landscape, human landscaping, and agriculture.

A forest is an area with a high density of trees. These plant communities cover over 30% of the earth's surface. They constitute one of the most important aspects of the earth's biosphere, function as habitat for over two-thirds of our known terrestrial species, collect and store water, modulate water movement, digest carbon dioxide, and conserve soil. The type of forest in a given area depends on many elements, including climate, soil, water source, rainfall patterns, seed sourcesand human influence

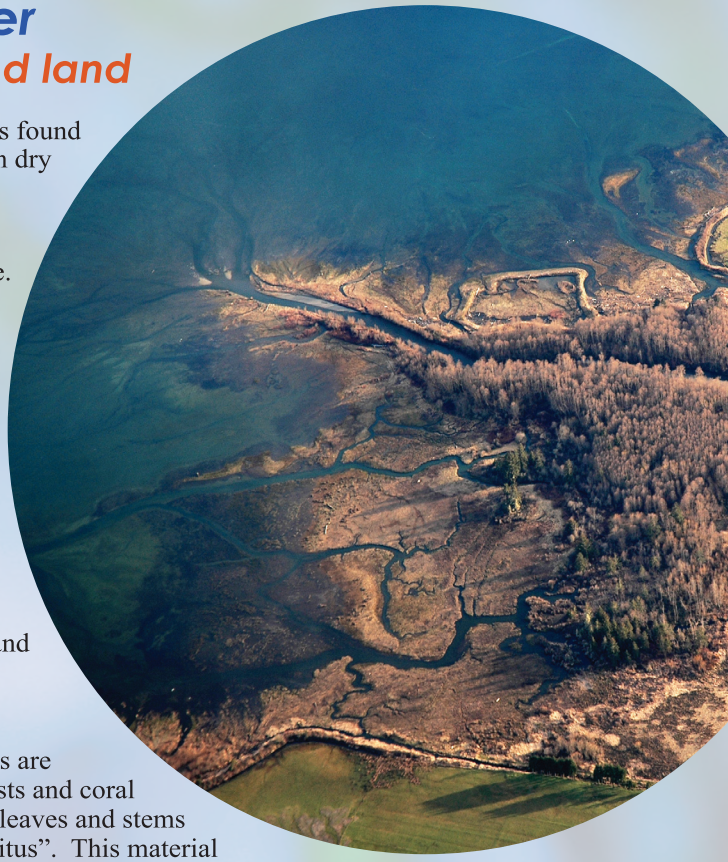
Forests are often referred to as the earth's air purifiers or lungs, absorbing carbon dioxide during photosynthesis and releasing oxygen into the atmosphere in return. Carbon dioxide, a greenhouse gas is a major requirement of photosynthesis (the production of energy in the presence of light by chlorophyll-containing plant parts). This means forests act as "carbon guzzlers" for the carbon dioxide produced as a result of animal respiration and burning of fossil fuels. The added bonus for people is that a by-product of photosynthesis is oxygen.

The world's population needs for fuel, shelter, and income makes a significant impact on the amount of forestland available, but so do fires, diseases, and herbivores. Even though trees are a renewable resource, scientists estimate that the current amount of global forest cover is half of what it was 8,000 years ago. This reduction in one of the earth's largest and most productive types of ecosystems has not only changed the amount and character of habitat available for wildlife, but the biological interrelationship of plants, animals, and microorganisms interacting with non-living elements, including soil, climate, water, organic debris, and rocks.

PHOTO CREDIT: *Columbia Gorge Cape Horn Etliebe: View of the Columbia River from Cape Horn Trail, facing east toward Beacon Rock (in distance on left), May 2009, from http://en.wikipedia.org/wiki/File:ColumbiaGorge_CapeHorn.jpg. Accessed June 2012.*

Wetlands- Nature's Sponge and Filter

Wetlands are a vital link between water and land



"Wetland" is the collective term for marshes, swamps, bogs, and similar areas found in generally flat vegetated areas, in depressions in the landscape, and between dry land and water along the edges of streams, rivers, lakes, and coastlines.

Because they are so varied, wetlands can be difficult to recognize. Some are wet all of the time; some may look completely dry most of the time. Some wetlands are large and some are very small.

All wetlands share a few common characteristics:

- They have at least periodically water-logged soil
- The soils and water support the growth of a water-loving plant community.

Not long ago, wetlands were often regarded as wastelands- sources of mosquitoes, flies, unpleasant odors, and disease, and therefore place to avoid or eliminate. Largely because of this negative views, less than half of the wetlands that existed when the United States was first settled remain. This land was either converted to crops, houses, industrial facilities, or municipal solid waste sites.

We now know that wetlands are, in fact, valuable natural resources. Wetlands are among the most productive ecosystems in the world, comparable to rain forests and coral reefs. Wetlands can be thought of as "biological supermarkets." Dead plant leaves and stems break down in the water to form small particles of organic material call "detritus". This material feeds many aquatic insects, shellfish, and small fish that are food for larger predatory fish, reptiles, amphibians, birds, and mammals.

Wetlands also provide a variety of ecosystem functions including. . .

Water retention and flood control: Many people refer to wetlands as the "sponges" in a watershed. In this capacity, wetlands store snowmelt, rainfall, and excess runoff releasing the water gradually downstream. They can also slow surging floodwater, reducing flood damage downstream of the wetlands. Studies show that flooding can occur if more than 20% of the land is covered with impermeable surfaces such as buildings or concrete.

Water purification: Wetlands also act as the "kidneys" of the ecosystem. Wetland soils filter out organic wastes such as heavy metals, salts, and pollutants. As wetlands slow water down they reduce the energy of the water. With less energy, the water cannot hold nor move as much material. Therefore, these dissolved and suspended particles simply "drop out" of the water and settle in the wetland soils. Estimates are that up to 90% of the dissolved and suspended sediments entering a wetland are filtered out before the water exits the wetland.

Critical Habitat: Up to 43% of the federally listed endangered or threatened species depend on wetland habitats for at least a part of their lives. Some organisms live entirely within the wetland ecosystem and some organisms use wetlands for food, shelter, breeding or water. Wetlands also provide critical habitat for 75-90% of the nation's commercial fish and shellfish species.

Groundwater recharge: Wetlands serve as a link between surface water and underground drinking water. Wetlands recharge aquifers that supply ½ of the U.S. drinking water supply.

Recreational Activities: Activities that depend on healthy wetland ecosystems include hunting, fishing, boating, and photography.

PHOTO CREDIT: Aerial view of the Big Quilcene River. Used by permission from photographer Katy Laveck.
Redwing Blackbird. U.S. Fish and Wildlife Service. From http://en.wikipedia.org/wiki/File:Redwingblackbird1.jpg Accessed June 2011.

Major Threats to Wetlands include

Urban Sprawl

Development over wetland areas to build homes, industrial and commercial buildings, and roads results in the filling of wetlands and the overall loss of wetland function. Development increases the amount of hard impervious surfaces in the watershed, and makes the area more susceptible to runoff surges, rainfall, and flooding. Water that was once filtered by wetlands now passes quickly through the watershed carrying with it all of the pollutants. An increase in pollution of water bodies downstream of developed areas has been strongly linked to the filling of wetlands.

Logging

Timber harvesting in or near wetland areas can cause the destruction of the wetland and all the functions it provides. The removal or eventual death of the large root system of these trees loosens the soil and increases erosion in logged areas. As these soils are carried away by rainfall runoff, the ability of the wetlands to "sponge" water and filter pollutants is washed away.

Agriculture

The 1997 Status and Trends Report by U.S., Fish and Wildlife Service (USFWS) found that "the conversion of wetlands for agricultural uses accounts for 79% of the yearly destruction of wetlands in the lower 48 states." From 1985-1995, the net loss of wetlands due to agricultural practices alone was more than 695,000 acres.

The U.S. Congress passed legislation in 1972 to conserve wetlands when they recognized that 50% of the nation's original wetlands had been lost to clearing, filling, draining or flood control.

The goal introduced by President George Bush (1988-1992), and supported by President Bill Clinton (1992-2000) is a "no net loss of wetlands" policy.

Unfortunately, according to the USFWS report of 1997, we were still losing wetlands habitat at an astonishing rate of 117,000 acres per year.

Shorelines & Estuaries

Vital Parts of the Watershed

Estuaries are bodies of water partly surrounded by land where fresh water from rivers and streams runs into and mixes with salt water from the ocean. Estuary is another name for bay, sound, inlet, harbor, lagoon - anywhere there is the mixing of fresh and salt water. There are 102 estuaries in the U.S. according to the EPA. Of these, 28 have been designated by their states and the federal government to be of national importance.

Estuaries have many different types of habitats including shellfish beds, sea grass meadows, salt and fresh marshes, forested wetlands, beaches, river deltas, and rocky shores. Among the most productive natural systems on earth due to the mixing of nutrients from land and sea, estuaries provide more food per acre than the richest Midwestern farmland. Estuaries and coastal waters provide essential habitat for over 75% of the commercial fish catch and 80-90% of the recreational catch of fish.

As more and more people move to our coastlines and estuaries, it is important to understand the role these areas play in healthy watersheds.

To lessen our harmful impacts, it is important to minimize bulkheads, docks, and shoreline structures. When possible consider soft erosion control methods which use natural materials such as gravel, sand, logs, and root masses to absorb wave energy.

It is natural for beaches to erode. The average erosion rate for a beach is slow- 1/10th of a foot per year or one foot per decade.

Salmon & Watersheds Depend on Each Other

Salmon and watersheds evolved together with the glacier.

Many of our watersheds' processes that shape the land, control water flow and content, and govern biological activity have evolved with and depend on salmon. Over 137 species of birds, mammals, amphibians and reptiles depend on salmon for one or more stages of their life. Scientists believe that salmon are a key species whose recovery will benefit overall ecosystem health and biodiversity.

In most parts of the West, salmon have been in decline. Loss of habitat, low stream flows, warming temperatures in streams from loss of streamside vegetation, increased sediments, and pollution all contribute to the loss of native salmon populations. Extensive efforts are taking place to restore salmon habitat.

In 1999, the Puget Sound's Chinook, bull trout and Hood Canal chum populations were listed as "threatened" under the Endangered Species Act. Federal officials usually write endangered species plans. Regional leaders felt a new approach was needed to recover Puget Sound salmon and that planning should come from the local level. Since 1999, the Shared Strategy for Salmon Recovery planning effort has engaged local citizens, tribes, businesses, farmers, technical experts and policy makers to build a practical, cost-effective recovery plan endorsed by the people living and working in these watersheds.

In 2005, Shared Strategy released a draft plan for salmon recovery for the whole Puget Sound basin. The ten common action areas in the plan are: Estuaries; Floodplain Areas; Riparian Areas; Fish Access; Water Quality/ Pollution; Shoreline and Marine Areas; Harvest Management; Harvest/Hatchery/Habitat Integration; Hatchery Management.

There is continuing dispute over salmon recovery in the Columbia and Snake rivers. There, salmon plans advanced by the Clinton and Bush administrations have been repeatedly challenged in court and rejected by federal judges. Those plans did not- as recommended by the Shared Strategy- reflect a regional consensus reached over long negotiations. Shared Strategy is likely to become a model for other regions of how to do salmon recovery.

SUGGESTIONS INCLUDE:

- *Removal of riprap, sea walls and other shoreline-hardening features in favor of more natural beaches*
- *Protection of remaining natural shorelines, with trees planted to improve shade.*
- *Placement of log piles in rivers and streams to create pools to harbor young salmon.*
- *Replacement of pipes that carry streams under roads so salmon can reach better spawning grounds.*

DIFFERENT SPECIES LIKE DIFFERENT HABITATS!

Silvers- small tributaries
Chum- lower stretches of river
Pinks- lower stretches of river
Sockeye- rivers with lakes
Kings- fast or long high volume rivers

Soils are a Part of the Watershed

Soil is a mixture of weathered rock fragments and organic matter on the earth's surface. It is biologically active and a home to countless microorganisms, invertebrates, and plant roots. Soil varies in depth from a few inches to five feet or more. Soil is roughly fifty percent pore space- this space forms a complex network of pores of varying sizes, much like pores in a sponge.

Soil provides nutrients, water, and physical support for plants as well as oxygen for plant roots. Soil supplies 13 essential plant nutrients and each nutrient plays one or more specific roles in plants.

Soil abounds with life.

Besides the plant roots, earthworms, insects, and other creatures you can see, soil is home to an abundant and diverse population of microorganisms. A single gram of topsoil (about ¼ teaspoon) can contain as many as one billion microorganisms.

Soil organisms are nature's recyclers, breaking down the remains of plants and other organisms and releasing energy, carbon dioxide, and water to fuel new life.

Organic matter helps build and stabilize soil structure in fine-textured and compacted soils, thus improving permeability and aeration and reducing the risk of runoff and erosion.

When organic matter decomposes, it forms humus, which acts as a natural glue to bind and strengthen soil aggregates. Organic matter also helps sandy soils hold water and nutrients.

A soil nutrient is classified as a primary nutrient, secondary nutrient, or micronutrient, based on the amount needed by plants.

13 Essential plant nutrients

Primary nutrients
- Nitrogen
- Phosphorus
- Potassium

Secondary nutrients
- Sulfur
- Calcium
- Magnesium

Micronutrients
- Zinc
- Iron
- Copper
- Manganese
- Boron
- Molybdenum
- Chlorine

PHOTO CREDIT: "Hands Holding a Seedling and Soil" from http://www.corbisimages.com/stock-photo/royalty-free/CB055265/hands-holding-a-seedling-and-soil/?ext=1 Accessed June 2011. Value Royalty-Free by L.Clarke/Corbis / "February Renewal" from http://www.flickr.com/photos/djotai/385985475/Accessed June 2011. Photo taken by David Josef, Israel. Used by permission from photographer.