Water Quality: Making the Connection Between You and the Water

Lesson Description

Sufficient quantities of good quality water are essential to us all. In addition to healthy water for drinking, we also depend on good water quality for irrigation, wildlife habitat, recreation, municipal and industrial uses, and simply enjoyment in the landscape. We all play a role in degrading our water supplies through our daily activities. This lesson explains the interaction between humans and water quality, laws that have been created to protect our water, and ways in which small acreage owners can better manage their properties to protect water resources.

Lesson Objectives

1. Understand how water quality laws apply to small acreage management, be familiar with the main parameters that are tested to determine water quality, and understand that in protecting water quality, we are also protecting ourselves, wildlife, and our communities.
2. Understand the foundation for regulations governing water quality and how this responsibility has been transferred to the states.
3. Understand the connection between groundwater and surface water and the landowner's role in protecting or polluting a watershed.
4. Be able to identify potential sources of pollution on your property and implement appropriate management practices to address the problem.

Module 3, Lesson 1

Water Quality: Making the Connection Between You and the Water

Activity Sheets

1. Stormwater Management Activity Sheet – fill out & use to design a runoff management plan for your property
2. Stormwater Paths Property Map - Map the direction of runoff water on your property

Supplemental Resources

Management Practices for Small Acreages: Keeping Water Clean, WSU Extension Clark County

Simple Steps to Protect Well and Surface Water, WSU Extension Clark County

Defining Water Quality, WSU Extension

Total Maximum Daily Loads (TMDLs) Information Sheet, page 1 of 2

(From http://www.epa.gov/owow/tmdl/overviewfs.html, May 2008)

(Note that Washington State now labels these as Water Quality Improvement Projects)

Over 40 percent of our assessed waters still do not meet the water quality standards states, territories, and authorized tribes have set for them. This amounts to over 20,000 individual river segments, lakes, and estuaries. These impaired waters include approximately 300,000 miles of rivers and shorelines and approximately 5 million acres of lakes. polluted mostly by sediments, excess nutrients, and harmful microorganisms. An overwhelming majority of the population, 218 million people, live within 10 miles of the impaired waters.

Under section 303(d) of the 1972 Clean Water Act, states, territories, and authorized tribes are required to develop lists of impaired waters. These impaired waters do not meet water quality standards that states, territories, and authorized tribes have set for them, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop TMDLs for these waters.

A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and allocates pollutant loadings among point and nonpoint pollutant sources. By law, EPA must approve or disapprove lists and TMDLs established by states, territories, and authorized tribes. If a state, territory, or authorized tribe submission is inadequate, EPA must establish the list or the TMDL. EPA issued regulations in 1985 and 1992 that implement section 303(d) of the Clean Water Act - the TMDL provisions.

While TMDLs have been required by the Clean Water Act since 1972, until recently states, territories, authorized tribes, and EPA have not developed many. Several years ago citizen organizations began bringing legal actions against EPA seeking the listing of waters and development of TMDLs. To date, there have been about 40 legal actions in 38 states. EPA is under court order or consent decrees in many states to ensure that TMDLs are established, either by the state or by EPA.

EPA Actions to Implement the TMDL Program

In an effort to speed the Nation's progress toward achieving water quality standards and improving the TMDL program, EPA began, in 1996, a comprehensive evaluation of EPA's and the states' implementation of their Clean Water Act section 303(d) responsibilities. EPA convened a committee under the Federal Advisory Committee Act, composed of 20 individuals with diverse backgrounds, including agriculture, forestry, environmental advocacy, industry, and state, local, and tribal governments. The committee issued its recommendations in 1998.

These recommendations were used to guide the development of proposed changes to the TMDL regulations, which EPA issued in draft in August, 1999. After a long comment period, hundreds of meetings and conference calls, much debate, and the Agency's review and serious consideration of over 34,000 comments, the final rule was published on July 13, 2000. However, Congress added a "rider" to one of their appropriations bills that prohibits EPA from spending FY2000 and FY2001 money to implement this new rule.

Total Maximum Daily Loads (TMDLs) Information Sheet, page 2 of 2

Current TMDL Program

The current rule remains in effect until 30 days after Congress permits EPA to implement the new rule. TMDLs continue to be developed and completed under the current rule, as required by the 1972 law and many court orders. The regulations that currently apply are those that were issued in 1985 and amended in 1992 (40 CFR Part 130, section 130.7). These regulations mandate that states, territories, and authorized tribes list impaired and threatened waters and develop TMDLs.

1997 Interpretative Guidance for the TMDL Program

EPA issued guidance in August, 1997, to respond to some of the issues raised as the program developed. The guidance includes a number of recommendations intended to achieve a more nationally consistent approach for developing and implementing TMDLs to attain water quality standards. These recommendations include:

- States, territories, and authorized tribes should develop schedules for establishing TMDLs expeditiously, generally within 8-13 years of being listed. EPA Regions should have a specific written agreement with each state, territory or authorized tribe in the Region about these schedules. Factors to be considered in developing the schedule could include:
    - Number of impaired segments;
    - Length of river miles, lakes, or other water bodies for which TMDLs are needed;
    - Proximity of listed waters to each other within a watershed;
    - Number and relative complexity of the TMDLs;
    - Number and similarities or differences among the source categories;
    - Availability of monitoring data or models; and
    - Relative significance of the environmental harm or threat.
- States, territories, and authorized tribes should describe a plan for implementing load allocations for waters impaired solely or primarily by nonpoint sources, including:
    - Reasonable assurances that load allocations will be achieved, using incentive-based, non-regulatory or regulatory approaches. TMDL implementation may involve individual landowners and public or private enterprises engaged in agriculture, forestry, or urban development. The primary implementation mechanism may include the state, territory, or authorized tribe section 319 nonpoint source management program coupled with state, local, and federal land management programs and authorities,
    - Public participation process, and
    - Recognition of other watershed management processes and programs, such as local source water protection and urban stormwater management programs, as well as the state's section 303(e) continuing planning process.

See http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/index.cfm for more information on TMDLs.

Sample 303(d) Listing For Local Watersheds in SW Washington, Information Sheet

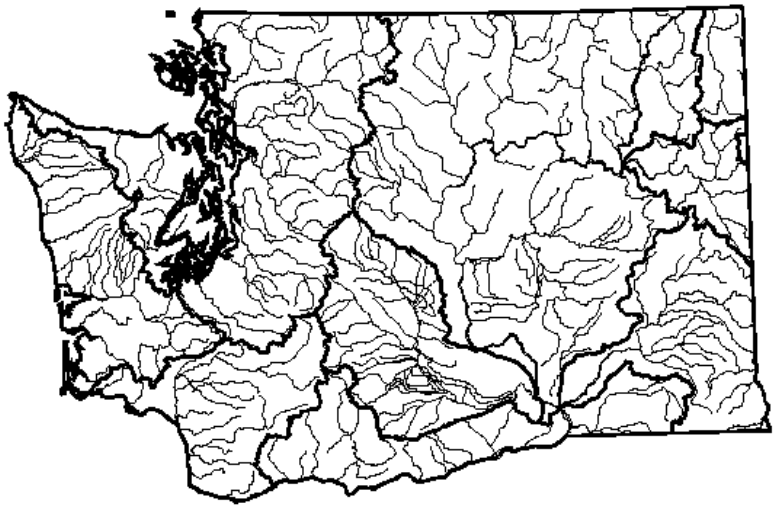
Below are the 2002/2004 303(d) listings for water bodies in Clark County, the most recent list currently available. Clark County contains two Watershed Resource Inventory Areas or WRIA's, which denote the major watershed basins in the area. An interactive mapping tool provides information on each water body at: https://fortress.wa.gov/ecy/wqamapviewer/default.aspx?res=1920x1080

Waterbody Name	Parameters Of Concern
Burnt Bridge Creek	Dissolved oxygen, fecal coliform,
Breezee Creek	Fecal coliform
Cedar Creek	Fecal coliform
China Ditch	Dissolved oxygen, temperature
Curtin Creek	Dissolved oxygen, Low pH
Dwyer Creek	Dissolved oxygen
Fifth Plain Creek	Dissolved oxygen, temperature
Gee Creek	Fecal coliform
Lacamas Creek	Dissolved oxygen, fecal coliform, pH, temperature
Lacamas Lake	Total PCB's, phosphorus,
Lake River	Temperature, fecal coliform
Lewis River, East Fork	Fecal coliform, temperature,
Lockwood Creek	Fecal coliform,
Matney Creek	Dissolved oxygen, temperature
McCormick Creek	Fecal coliform
Rock Creek	Fecal coliform
Round Lake	Dissolved oxygen
Salmon Creek	Dissolved oxygen, pH, temperature
Shanghai Creek	Dissolved oxygen, pH, temperature
Vancouver Lake	Fecal coliform, total phosphorus, total PCB's
Washougal River	Fecal coliform,
Weaver Creek	pH
Whipple Creek	Fecal coliform
Yacolt Creek	Fecal coliform

From: http://www.ecy.wa.gov/programs/wq/303d/2002/2004_documents/wria_pdfs-5final/kk-active-5-wria27.pdf and http://www.ecy.wa.gov/programs/wq/303d/2002/2004_documents/wria_pdfs-5final/kk-active-5-wria28.pdf

Module 3, Lesson 1—Water Quality
How is Washington's Water Quality?, Page 1 of 2

Washington



— Rivers
— Basin Boundaries
(USGS 6-Digit Hydrologic Unit)
— State Border

For a copy of the Washington 2000 305(b) report, contact:

Alison Beckett
Washington Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600
(360) 407-6456
e-mail: abec461@ecy.wa.gov

The report is also available on the Internet at: **http://www.ecy.wa.gov/programs/wq/303d/305b%20report/2000_305b.html**

Surface Water Quality

Washington reports that 46% of their assessed river and stream miles fully support all assessed uses. Sixty-two percent of Washington's lakes fully support state-defined "overall" use. Twenty-one percent of the surveyed estuarine waters fully support all assessed uses.

In rivers and streams, agriculture is the major source of water quality degradation, followed by hydrologic habitat modification, natural sources, and septic tanks. Causes of water quality impairment from these sources include thermal modification, pathogens, pH, metals, and low dissolved oxygen. Major causes of impairment in lakes include nutrients and noxious aquatic plants. Agriculture, nonpoint source pollution, and natural conditions are the predominant sources of impairment in lakes. Other sources include urban runoff, municipal point sources, septic tanks, and hydrologic modification. Agricultural runoff, municipal point sources, industrial point sources, and combined sewer overflows are the major sources of impairment in estuaries. Low levels of dissolved oxygen, temperature, pH, and fecal coliform bacteria are the major causes of impairment of designated uses in estuaries.

Washington did not report on the condition of wetlands.

Ground Water Quality

Washington reports ground water contamination by metals, trace elements, nitrates, pesticides, petroleum, and synthetic organic chemicals. Sources include industrial activities, agriculture, municipal wastewaters, mining, and onsite sewage systems.

Programs To Restore Water Quality

Washington provides financial incentives to encourage compliance with permit requirements, the principal vehicle for regulating point source discharges. The state also has extensive experience developing, funding, and implementing nonpoint source pollution prevention and control programs since the early 1970s. The state has developed nonpoint source control plans with best management practices for forest practices, dairy waste, irrigated agriculture, dryland agriculture, and urban stormwater. The state is now focusing attention on watershed planning. The watershed approach is designed to synchronize water quality monitoring, inspections, permitting, nonpoint activities, and funding.

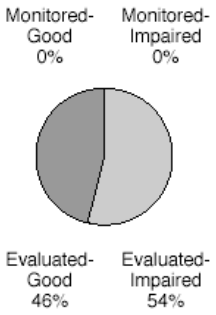
Programs To Assess Water Quality

Washington carries out an aggressive program to monitor the quality of lakes, estuaries, and rivers and streams. The program uses fixed-station monitoring to track spatial and temporal water quality changes to ascertain the effectiveness of various water quality programs and be able to identify desirable adjustments to the programs.

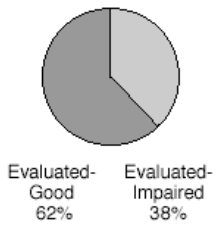
Data Quality

States report whether their assessments are based on recent monitoring data or older, more qualitative evaluated data. These pie charts show the proportions of waters assessed for Summary of Use Support that were based on each type of data.

Rivers



Lakes



Individual Use Support in Washington

Designated Use[a]	Percent Good (Fully Supporting or Threatened)	Percent Impaired (Partially Supporting or Not Supporting)
Rivers and Streams (Total Miles = 70,439)[b]		
Total Miles Assessed 70,439	60	40
58,990	26	74
70,439	84	16
Estuaries and Bays (Total Square Miles = 2,904)		
Total Square Miles Assessed 2,904	32	68
2,904	44	56
2,904	100	0

Summary of Use Support in Washington[c]

	Percent Good (Fully Supporting or Threatened)	Percent Impaired (Partially Supporting or Not Supporting)
Lakes (Total Acres = 249,277)		
Total Acres Assessed 243,749	62	38

[a] A subset of Washington's designated uses appear in this figure. Refer to the state's 305(b) report for a full description of the state's uses.
[b] Includes nonperennial streams that dry up and do not flow all year.
[c] A summary of use support data is presented because Washington did not report individual use support for lakes in their 2000 Section 305(b) report.

Note: Figures may not add to 100% due to rounding.

From: EPA's National Water Quality Report – 2000 http://www.epa.gov/305b/2000report/

The Coastal Zone Management Act Information Sheet, page 1 of 2

(From *Coastal Zone Management, May 2008,*
http://oceanservice.noaa.gov/topics/coasts/management/welcome.html#Anchor-Mandates-14210)

The nation's coasts are managed through a voluntary federal-state partnership that protects, restores, and responsibly develops our nation's diverse coastal communities and resources. This partnership is called the National Coastal Zone Management Program (CZMP). The Program takes a comprehensive approach to problem solving, balancing the often competing and occasionally conflicting demands of coastal resource use, economic development, and conservation.

The Program, administered by NOAA's Office of Ocean and Coastal Resource Management (OCRM), addresses a variety of coastal issues of national interest, such as ensuring that priority consideration is given to coastal dependent uses. The CZMP also seeks to establish an orderly process for siting facilities related to national defense, energy, aquaculture, recreation, ports, and transportation. OCRM provides state coastal management programs with technical and financial assistance to achieve these goals.

The Coastal Zone Management Program was created by the Coastal Zone Management Act of 1972.(CZMA) The Act, which also led to the creation of the National Estuarine Research Reserve System, established a national policy of protecting, and, where possible, restoring and enhancing coastal areas.

The National Coastal Zone Management Program fosters an effective partnership among federal, state, and local governments. By leveraging federal and state matching funds, the Program strengthens the capabilities of each partner to address coastal issues. The Program also gives states the flexibility to design a program that accommodates their unique coastal challenges along with their respective legal frameworks. Thirty-four of 35 eligible states and territories, encompassing more than 95,000 miles of coastline, currently participate in the voluntary federal-state partnership. Washington, Oregon and California are participants in the Program.

State and territory coastal management programs address a wide range of issues, including:

- coastal development,
- water quality,
- shoreline erosion,
- public access,
- natural resource protection,
- energy facility siting, and
- coastal hazards such as hurricanes and flooding.

The Coastal Zone Management Act Information Sheet, page 2 of 2

Additional components of the National Coastal Zone Management Program and related programs help coastal managers fully address these diverse issues. Through the CZMA Federal Consistency provision, states participating in the National Coastal Zone Management Program can review federal activities to ensure that the actions are consistent with the state's coastal management policies. Federal agency activities that have foreseeable effects on coastal uses and resources must be consistent with the enforceable policies of a state's coastal management program. Non-federal organizations applying for federal authorizations and funding must also be consistent with a state's coastal policies.

The Coastal Zone Enhancement Grants Program provides incentives for states and territories to enhance their coastal management programs within nine key areas, including wetlands protection, coastal hazards, cumulative and secondary impacts of development, public access to the coast, special area management planning, ocean governance, marine debris, government and energy facility siting, and aquaculture.

The Coastal Nonpoint Pollution Control Program requires states participating in the National Coastal Management Program to develop a comprehensive program to address polluted runoff in coastal areas.

The Coastal and Estuarine Land Conservation Program was established to protect coastal and estuarine lands considered important for their conservation, recreation, historic, ecologic, or aesthetic value within a state's coastal zone or coastal watershed boundary.

Through the Coastal Zone Management Program and other activities, OCRM consistently provides national leadership, guidance, and strategic direction to its partners in U.S. states, territories, and freely associated states.

See also: National Coastal Zone Management Program,
http://coastalmanagement.noaa.gov/resources/docs/CZM2007.pdf

Major Types of Pollutants in America's Waterways and Aquifers Information Sheet

Class	Examples	Major Sources	Major Effects
Nutrients	Nitrogen, phosphorus	Wastewater treatment plants, fertilizers, leaking septic tank systems, animal wastes, agricultural return flows, sediment	Production of excess algae. When algae die, decomposer organisms consume them. This process can use up most of the oxygen in the water, harming cold-water fish species and other aquatic organisms.
Sediments	Soil, sand, silt, dust, gravel	Erosion of soil by water or wind, road de-icing, storm drains	Harms habitat and reproduction of fish and other aquatic life.
Pathogens	Bacteria, viruses, parasites	Agricultural return flows, cattle, horses, humans, leaking septic systems, storm drains	Makes water unsafe for human consumption and recreation.
Toxic Chemicals	Hydrocarbons, heavy metals	Chemical spills, automobile products and emissions, street runoff, improper use of storm drains, leaking underground petroleum storage tanks, mining activities, industry, improper use of pesticides, etc.	Harms wildlife, fish and human drinking water.
Debris	Trash: old tires, cigarette butts, rusting metal, medical wastes, etc.	Illegal dumping, everyone and everything!	Unsightly, blocks flows, endangers livestock and wildlife, may contain toxic chemicals
Thermal Pollution	Increased water temperature	Agricultural return flows, geothermal springs, loss of streamside tree canopy	Water holds less dissolved oxygen; harms fish and other aquatic life.

What You Can Do to Prevent Nonpoint Source Pollution Information Sheet, page 1 of 3

Urban stormwater runoff

- Keep litter, pet wastes, leaves, and debris out of ditches, especially those that drain directly to lakes, streams, rivers, and wetlands.
- Apply lawn and garden chemicals sparingly and according to directions.
- Dispose of used oil, antifreeze, paints, and other household chemicals properly, not in streets, storm sewers or drains. If your community does not already have a program for collecting household hazardous wastes, ask your local government to establish one.
- Clean up spilled brake fluid, oil, grease, and antifreeze. Do not hose them into the street where they can eventually reach local streams and lakes.
- Control soil erosion on your property by planting ground cover and stabilizing erosion-prone areas.

Agriculture

- Manage animal waste to minimize contamination of surface water and groundwater.
- Protect drinking water by using less pesticides, including herbicides, and fertilizers.
- Reduce soil erosion by using conservation practices and other applicable Best Management Practices.
- Use planned grazing systems on pasture and rangeland.
- Dispose of pesticides, containers, and tank rinseate in an approved manner.
- Fill and mix pesticide and fuel tanks on a concrete pad; store fuel and chemicals in lined storage areas only.

Household chemicals

- Be aware that many chemicals commonly used around the home are toxic. Select less toxic alternatives. Use nontoxic substitutes whenever possible.
- Buy chemicals only in the amount you expect to use, and apply them only as directed. More is not better.
- Take unwanted household chemicals to hazardous waste collection centers; do not pour them down the drain. Pouring chemicals down the drain may disrupt your septic system or contaminate treatment plant sludge.
- Never pour unwanted chemicals on the ground. Soil cannot purify most chemicals, and they may eventually contaminate runoff.
- Use low-phosphate or phosphate-free detergents.
- Use water-based products whenever possible.
- Leftover household pesticide? Do not indiscriminately spray pesticides, either indoors or outdoors, where a pest problem has not been identified. Dispose of excess pesticides at hazardous waste collection centers or through your Department of Agriculture pesticide disposal program.

What You Can Do to Prevent Nonpoint Source Pollution Information Sheet, page 2 of 3

Landscaping and gardening

- When landscaping your yard, select plants that have low requirements for water, fertilizers, and pesticides.
- Cultivate plants that discourage pests. Minimize high maintenance grassed areas.
- Preserve existing trees, and plant trees and shrubs to help prevent erosion and promote infiltration of water into the soil.
- Use landscaping techniques such as grass swales (low areas in the lawn) or porous walkways to increase infiltration and decrease runoff.
- Other landscaping tips:
  - Install wood decking, bricks or interlocking stones instead of impervious cement walkways.
  - Install gravel trenches along driveways or patios to collect water and allow it to filter into the ground.
  - Restore bare patches in your lawn as soon as possible to avoid erosion.
  - Grade all areas away from your house at a slope of one percent or more.
- Leave lawn clippings on your lawn so that nutrients in the clippings are recycled and less yard waste goes to landfills.
- If you elect to use a professional lawn care service, select a company that employs trained technicians and follows practices designed to minimize the use of fertilizers and pesticides.
- Compost your yard trimmings. Compost is a valuable soil conditioner that gradually releases nutrients to your lawn and garden. Using compost will also decrease the amount of fertilizer you need to apply. In addition, compost retains moisture in the soil and thus helps you conserve water.
- Spread mulch on bare ground to help prevent erosion and runoff.
- Test your soil before applying fertilizers. Over fertilization is a common problem, and the excess can leach into groundwater or contaminate rivers or lakes. Also, avoid using fertilizers near surface waters. Use slow release fertilizers on areas where the potential for water contamination is high, such as sandy soils, steep slopes, compacted soils, and verges of water bodies. Select the proper season to apply fertilizers; incorrect timing may encourage weeds or stress grasses. Do not apply pesticides or fertilizers before or during rain due to the strong likelihood of runoff.
- Calibrate your applicator before applying pesticides or fertilizers. As equipment ages, annual adjustments may be needed.
- Keep storm gutters and drains clean of leaves and yard trimmings. Decomposing vegetative matter leaches nutrients and can clog storm drain systems, resulting in flooding.

What You Can Do to Prevent Nonpoint Source Pollution Information Sheet, page 3 of 3

Septic systems (covered in detail in the next lesson)

- Inspect your septic system annually.
- Pump out your septic system regularly. (Pumping out every three to five years is recommended for a three-bedroom house with a 1,000-gallon tank; smaller tanks should be pumped more often.)
- Do not use septic system additives. There is no scientific evidence that biological and chemical additives aid or accelerate decomposition in septic tanks; some additives may in fact be detrimental to the septic system or contaminate groundwater.
- Do not divert storm drains or basement pumps into septic systems.
- Avoid or reduce the use of your garbage disposal. Garbage disposals contribute unnecessary solids to your septic system and can also increase the frequency your tank needs to be pumped.
- Don't use toilets as trash cans! Excess solids may clog your drain field and necessitate more frequent pumping.

Water conservation

- Use low-flow faucets and shower heads, reduced-flow toilet flushing equipment, and water-saving appliances such as dish and clothes washers
- Repair leaking faucets, toilets, and pumps.
- Use dishwashers and clothes washers only when fully loaded.
- Take short showers instead of baths and avoid letting faucets run unnecessarily.
- Wash your car only when necessary; use a bucket to save water. Alternatively, go to a commercial car wash that uses water efficiently and disposes of runoff properly.
- Do not overwater your lawn or garden. Overwatering may increase leaching of fertilizers to groundwater.
- When your lawn or garden needs watering, use slow-watering techniques such as trickle irrigation or soaker hoses. Such devices reduce runoff and are 20 percent more effective than sprinklers.

Other areas where you can make a difference

- Clean up after your livestock and pets. Animal waste contains nutrients and pathogens that can contaminate surface water.
- Drive only when necessary. Driving less reduces the amount of pollution your automobile generates. Automobiles emit tremendous amounts of airborne pollutants, which increase acid rain. They also deposit toxic metals and petroleum byproducts into the environment. Regular tuneups and inspections can help keep automotive waste and byproducts from contaminating runoff. Clean up any spilled automobile fluids.
- Recycle used oil and antifreeze by taking them to service stations and other recycling centers. Never put used oil or other chemicals down storm drains or in drainage ditches. One quart of oil can contaminate as many as two million gallons of drinking water!

Stormwater Management Activity Sheet, page 1 of 3

Reducing Pollutants in Runoff

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Automotive wastes	Oil drips and fluid spills are cleaned up. Dirty car parts and other vehicle wastes are kept out of reach of stormwater runoff.	Drips and spills are not cleaned up. Car parts and other vehicle wastes are left on unpaved areas outside.	Used oil, antifreeze, and other wastes are dumped down the storm sewer, in a ditch, or on the ground.	❑ Low ❑ Medium ❑ High
Car washing	Cars and trucks are taken to a commercial car wash or spray booth.	Cars, trucks, or other items are washed on a lawn or gravel drive.	Cars, trucks, or other items are washed on a driveway, street, or other paved area.	❑ Low ❑ Medium ❑ High
Storage of pesticides, fertilizers, and other potentially harmful chemicals	Chemicals are stored in waterproof containers in a garage, shed or basement that is protected from stormwater.	Chemicals are stored in waterproof containers but within reach of stormwater.	Chemicals are stored in non-waterproof containers outdoors or within reach of stormwater.	❑ Low ❑ Medium ❑ High
Handling and use of pesticides, fertilizers, and outdoor chemicals	Spills are cleaned up immediately, particularly on paved surfaces. Minimum amounts of chemicals are applied according to label instructions. Applications are delayed to avoid rain.	Applications are not delayed to avoid rain.	Spills are not cleaned up. Products are used in higher amounts than what is recommended on the label. Applications are made when rain is expected.	❑ Low ❑ Medium ❑ High
Pet and animal wastes	Animal and pet wastes are flushed down the toilet; buried away from gardens, wells, ditches, or areas where children play; or wrapped and placed in the garbage for disposal.*	Animal wastes are left to decompose on grass or soil. Wastes are scattered over a wide area.	Animal wastes are left on paved surfaces, concentrated in pen or yard areas, or dumped down a storm drain or in a ditch.	❑ Low ❑ Medium ❑ High
Grass clippings, leaves, and other yard waste	Grass clippings, leaves, and other yard wastes are swept off paved surfaces and onto lawns away from water flow routes. Leaves and other yard wastes are composted.	Leaves and other yard wastes are piled on the lawn next to the street for collection.	Grass clippings, leaves, and other yard wastes are left on the driveways, streets, and other paved areas to be carried off by stormwater. Yard waste is burned on-site.	❑ Low ❑ Medium ❑ High

*Be sure to check local regulations regarding burying or landfilling pet and animal wastes.

*Source: Home*A*Syst: An Environmental Risk-Assessment Guide for the Home, NRAES-87.*

Stormwater Management Activity Sheet, page 2 of 3

Landscaping and Site Management to Control Runoff

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Bare soil in lawns and gardens	Bare spots in the lawn are promptly seeded and topped with a layer of straw or mulch. Bare soil in gardens is covered with mulch.	Grass or other ground cover is spotty, particularly on slopes.	Sloping areas in the lawn or garden are left without mulch or vegetation for long periods.	❑ Low ❑ Medium ❑ High
Bare soil during construction	Bare soil is seeded and mulched as soon as possible (before construction is completed). Sediment barriers are used until grass covers soil.	Soil is left bare until construction is completed. Sediment barriers are installed and maintained to detain muddy runoff until grass covers soil.	Soil is left bare and no sediment barriers are used.	❑ Low ❑ Medium ❑ High
Paved surfaces	Paved surfaces are minimized. Alternatives such as wood chips or paving blocks are used for walkways, patios, and other areas.	Some small areas are paved for patios, driveways, or basketball.	Paved surfaces are used extensively.	❑ Low ❑ Medium ❑ High
Basement protection	Stormwater is diverted from basement windows by window well covers and other devices. Yard is sloped away from the foundation. Downspouts direct roof drainage away from the house.	No special water diversion methods are installed, but stormwater has never entered the basement.	No water diversion methods are attempted. Stormwater runoff has entered the basement or flows near foundation.	❑ Low ❑ Medium ❑ High
Roof drainage	Downspouts and drip lines direct roof drainage onto a lawn or garden where water soaks into the ground.	Some downspouts and drip lines discharge water onto paved surfaces or grassy areas where water runs off.	Most or all drip lines or downspouts discharge onto paved surfaces, or downspouts are connected directly to storm drains.	❑ Low ❑ Medium ❑ High
Landscaping and buffer strips	Yard is landscaped to slow the flow of stormwater and provide areas where water soaks into the ground. Unmowed buffer strips of thick vegetation are left along streams or lakeshores.	No areas are landscaped to encourage water to soak in, but yard is relatively flat and little runoff occurs. Mowed grass or spotty vegetation exists adjacent to a stream or lake.	There is no landscaping to slow the flow of stormwater, especially on hilly, erodible properties. Stream banks or lakeshores are eroding.	❑ Low ❑ Medium ❑ High

*Source: Home*A*Syst: An Environmental Risk-Assessment Guide for the Home, NRAES-87.*

Stormwater Management Activity Sheet, page 3 of 3

Write all the risks you can think of that might apply to your property in the spaces below	What can you do to reduce the risks?	When will you complete the actions?
Sample: Animal waste is piled in areas where runoff occurs.	Pile waste on an impervious surface and redirect runoff away from the pile.	Two weeks from today: March 6

*Adapted with permission from Home*A*Syst: An Environmental Risk-Assessment Guide for the Home, NRAES-87.*

Stormwater Path Property Map Activity Sheet

Mark where runoff on your property goes – where does rainwater travel once it lands on your pastures, your roof and other structures. Do you have seasonal wetlands, ditches or creeks? Where does the water go after it leaves your property – to a neighbors, a creek or a stream?

Adapt Living on the Land *, Bozeman, MT*

Water Quality Glossary, page 1 of 3

Algal bloom: Large, visible masses of algae found in bodies of water during warm water periods, or following nutrient additions.

Anaerobic (anoxic): In the absence of oxygen.

Aquatic: Plants or animal life living in, growing in, or adapted to water.

Aquifer: A sand, gravel or rock formation capable of storing or conveying water below

the surface of the land.

Bacteria: Microscopic one-celled organisms that live everywhere and perform a variety of functions. While decomposing organic matter in water, bacteria can greatly reduce the amount of oxygen in the water.

Best management practices (BMP): Practices that have been determined to be the most effective, practical means of preventing or reducing water pollution from nonpoint sources.

Buffer zone, buffer strip: Neutral area that acts as a protective barrier separating two conflicting forces. An area that acts to minimize the impact of pollutants on the environment or public welfare. For example, a buffer zone is established between a composting facility and neighboring residents to minimize odor problems. A buffer strip is a grassed or planted zone that acts as a protective barrier between an area which experiences livestock grazing or other activities and a water body. Buffer strips can be streamside features to protect streams and streambanks or features built on slopes to slow water runoff velocities.

Coliform bacteria: A group of bacteria predominantly inhabiting the intestines of man or animals, but also found in soil. While harmless themselves, coliform bacteria are commonly used as indicators of the possible presence of pathogenic organisms.

Contaminant: Any physical, chemical, biological, or radiological substance causing an impurity in the environment.

Dissolved oxygen (DO): Oxygen dissolved in water and readily available to fish and other aquatic organisms.

Eutrophication: Degradation of water quality due to enrichment by nutrients, primarily nitrogen (N) and phosphorus (P), which results in excessive plant (principally algae) growth and decay. When levels of N:P are about 7:1, algae will thrive. Low dissolved oxygen (DO) in the water is a common consequence.

Evaporation: Loss of water to the atmosphere from the earth's surface by changing liquid water to water vapor. The process by which water is changed from a liquid to a vapor or gas.

Evapotranspiration (ET): The combined loss of water by both evaporation and transpiration from the leaves of plants. A calculation based on wind speed, temperature, humidity and precipitation that provides an accurate estimate of plant water needs for any given day.

Fertilizer: Any material of natural or synthetic origin (other than liming materials) that is added to a soil to supply one or more elements essential to the growth of plants.

Floodplain: 1. (geomorphology) The land bordering a stream, built up of sediments from overflow of the stream, and subject to inundation when the stream is at flood stage. 2. (hydrology) The area flooded by an event of some specific return frequency.

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Groundwater: The subsurface water supply in the saturated zone below the water table.

Heavy metals: Those metals that have high density; commonly includes copper, iron, manganese, molybdenum, cobalt, zinc, cadmium, mercury, nickel and lead.

Herbicide: Pesticide (chemical) used to specifically control undesirable plants and vegetation.

Hydrologic cycle: The movement of water in and on the earth and atmosphere through processes such as precipitation, evaporation, runoff, infiltration and combustion.

Infiltration: The rate at which water enters the soil. Infiltration depends on the texture, structure and the depth of the soil.

Insecticides: Pesticides (chemicals) used to specifically control insects.

Leaching: The washing out or flushing of a soluble substance from an insoluble one. Gardeners leach soil with water when they want to remove excess salts (see Salinity). In high-rainfall areas, rain water leaches good as well as harmful substances from the soil.

Loading: The quantity of a substance entering the receiving waters.

Manure: Organic material excreted from animals, used as fertilizer and organic amendment to enrich the soil.

Nitrogen: One of the three major nutrients in a complete fertilizer and the first one listed in the formulation on a fertilizer label (as **10**-8-6, for example).

Nonpoint source pollution: Pollution occurring from widespread or diffuse sources with no definite point of entry. The source is not from a readily discernible point such as a discharge pipe.

Nutrient: That portion of any element or compound in the soil that can be readily absorbed and assimilated to nourish growing plants. Substances required by plants for growth.

Pathogen: Disease-causing biological agent such as a bacterium, virus, or fungus.

Pesticide: Chemical used to kill pests, generally formulated for a specific pest. The responsibility falls on the person doing the application to have correctly identified the pest and used the pesticide correctly – ALWAYS READ THE LABEL. A chemical used to kill or damage pests of any kind. An herbicide is a type of pesticide used to kill plants or weeds.

pH: The symbol for the logarithm of the reciprocal of hydrogen ion concentration, used to indicate an acid or alkaline condition. On a scale from 1 to 14, a pH of 7 indicates neutral condition, less than 7 indicates acidic conditions, and greater than 7 indicates alkaline conditions.

Phosphorus: A nutrient required by all organisms for the basic processes of life. Phosphorus is a natural element found in rocks, soils and organic material. It clings tightly to soil particles and is used by plants, so its concentration in clean waters is generally very low. However, phosphorus is used extensively in fertilizer and other chemicals, so it can be found in higher concentrations in areas of human activity. One of the three major nutrients in a complete fertilizer, and the second one listed in the formulation on a fertilizer label (as 10-**8**-6, for example). Phosphorus can take two forms, soluble (most often orthophosphate, sometimes organic) and insoluble (inorganic phosphate).

Point source: Pollutant released from a pipe or discrete conveyance into a water body or a water-course leading to a body of water. For example, a wastewater treatment plant.

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Pollutant: Any substance of such character and in such quantities that when it reaches a body of water, soil, or air, it impairs the water, soil, or air's usefulness or renders it offensive.

Potassium: Referred to as "potash," potassium is one of the three major nutrients in a complete fertilizer and is the third listed in the formulation on a fertilizer label (10-8-**6**, for example).

Recharge: Downward movement of water through the soil to an aquifer, replenishing groundwater supplies.

Runoff: That portion of the precipitation or irrigation water that moves over the land surface and drains into surface streams or water bodies.

Sediment: The soil material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by erosion (by air, water, gravity, or ice) and has come to rest on the earth's surface either, above or below sea level.

Total dissolved solids (TDS): Concentration of all substances dissolved in water (solids remaining after evaporation of a water sample).

Total Maximum Daily Load (TMDL): A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and allocates pollutant loadings among point and nonpoint pollutant sources. By law, EPA must approve or disapprove lists and TMDLs established by states, territories, and authorized tribes.

Toxic chemicals, toxic: Substances that even in small quantities may poison, cause injury, or cause death when eaten or ingested through the mouth and stomach, absorbed through the skin or inhaled into the lungs.

Transpiration: The process by which water is drawn up through a plant and escapes, as water vapor, through the leaves and into the atmosphere. The release of moisture (absorbed largely by plant roots) through the leaves. Temperature, humidity, solar radiation, and wind speed affect transpiration rate.

Watershed (drainage basin): An area of land that collects rain and/or snowmelt and discharges much of it to a stream, river, or other water body, or to groundwater.

Water Quality: Making the Connection Between You and the Water

Web sites for further information

Washington's Water (WSU Extension), http://wawater.wsu.edu

Clark Conservation District, http://www.clarkcd.org/water/

Washington State Department of Ecology Water Quality Homepage
http://www.ecy.wa.gov/programs/wq/wqhome.html

Washington State Department of Ecology 303d Listing Homepage
http://www.ecy.wa.gov/programs/wq/links/wq_assessments.html

Washington State Department of Ecology TMDL or Water quality Clean up Plans by Watershed (look for water bodies under WRIA's 27 or 28)
http://www.ecy.wa.gov/programs/wq/tmdl/TMDLsbyWria/TMDLbyWria.html

EPA Surf Your Watershed: Washington State
http://cfpub.epa.gov/surf/state.cfm?statepostal=WA

USGS Water Science Glossary
http://ga.water.usgs.gov/edu/dictionary.html

USGS Water Science Webpage
http://ga.water.usgs.gov/edu/navguide.html

Colorado Water Resources Research Institute:
http://www.cwi.colostate.edu/

North Dakota State University Water Quality and Pesticide Information:
http://www.ag.ndsu.edu/waterquality/pesticides

Oregon Natural Resources Division, Agricultural Water Quality Management Program:
http://www.oregon.gov/ODA/programs/NaturalResources/Pages/AgWaterQuality.aspx

U.S. EPA, Office of Water, Total Maximum Daily Loads:
http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/index.cfm

U.S. EPA Office of Wetlands, Oceans and Watersheds:
http://water.epa.gov/aboutow/owow/

National Riparian Service Team (BLM and FS): http://www.blm.gov/or/programs/nrst/index.php