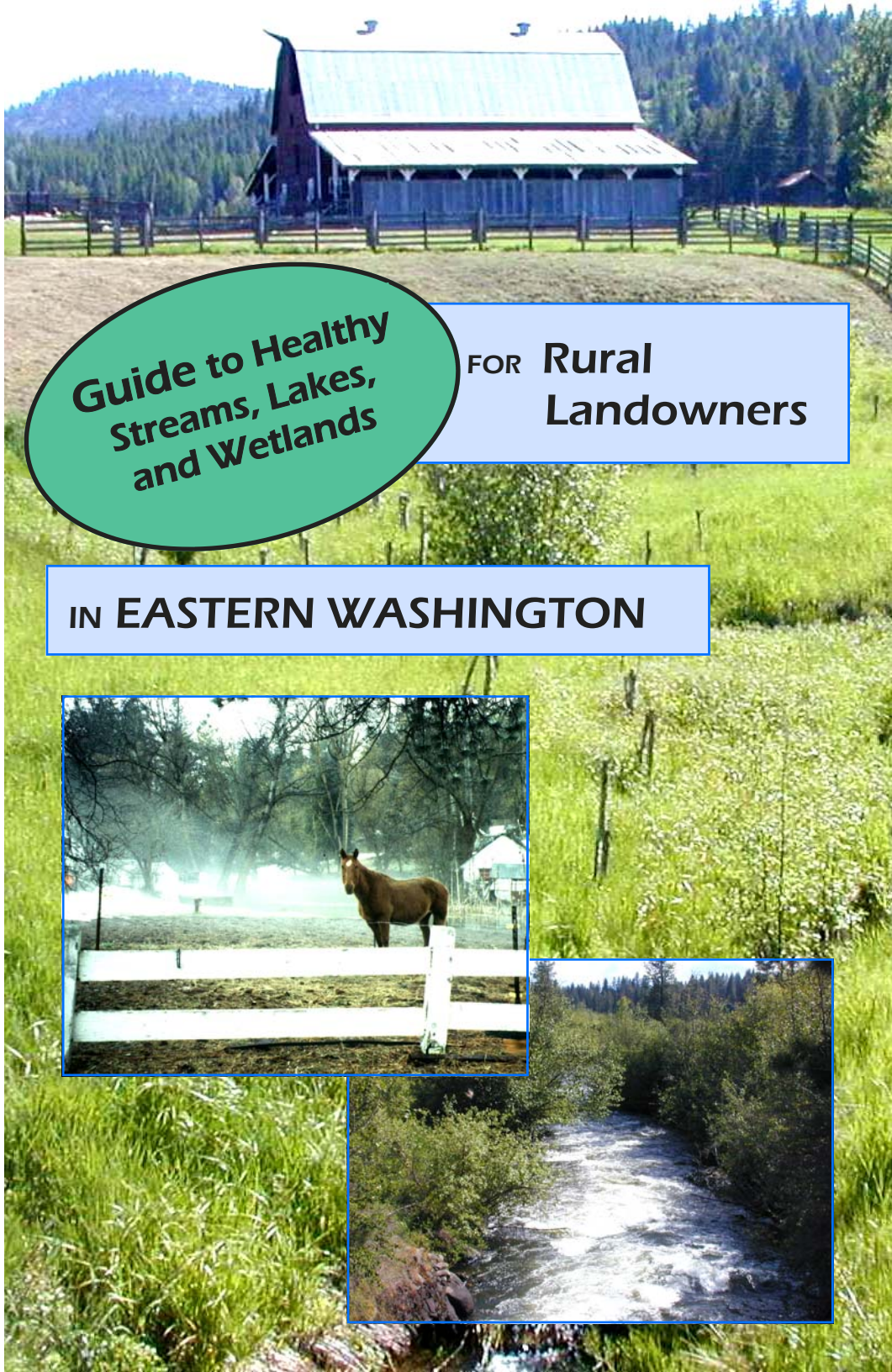
WASHINGTON STATE DEPARTMENT OF ECOLOGY

Department of Ecology
4601 N Monroe Street
Spokane, WA 99205-1295



Guide to Healthy Streams, Lakes, and Wetlands

FOR Rural Landowners

IN EASTERN WASHINGTON

Healthy Streams, Lakes, and Wetlands

ITS ALL IN THE WATERSHED

⇒ A watershed is actually land. It includes all the land that water flows across or under on its way to a stream, river, lake or ocean. The high areas and ridgetops define the boundaries of a watershed.

The watershed above shows the diverse land-use found in most Eastern Washington watersheds. Our streams pass through forest lands, agricultural areas, as well as towns and cities. If we are to have healthy streams, lakes ,and wetlands all of us living here must consider the effect our actions will have on our resources. We must also consider how they will impact our watershed neighbors!

The Watershed

The water in a watershed moves downhill through a system of drainage pathways. These pathways converge into streams and rivers, which become progressively larger as the water moves downstream, eventually reaching the ocean.

Every stream, tributary, or river has an associated watershed, and small watersheds join to become larger watersheds. Any activity that affects the water quality, quantity, or rate of movement at one location can affect locations downstream. For this reason, everyone living or working within a watershed needs to cooperate to ensure good watershed conditions.

To learn more about your watershed and on-going activities to protect it, call the Department of Ecology at (509) 329-3400 or check out the website http://www.ecy.wa.gov/watershed/

Quiz! All residents in eastern Washington live in the Columbia River watershed. Can you identify the smaller watersheds (sub-watersheds) in which you live?

HINT: Take a look at a map. Identify the location of your home and the streams in the area. Think about the areas high in elevation near your house. If you were to pour a glass of water on your property and it all ran across the surface of the ground which direction would it go? What stream might it enter?

EASTERN WASHINGTON CONSERVATION DISTRICT & WSU EXTENSION OFFICES

County	Conservation District Office	WSU Extension Office
Adams	(509) 659-1553	(509) 659-3209
Asotin	(509) 758-8012	(509) 758-5147
Columbia	(509) 382-4773	(509) 382-4741
Ferry	(509) 775-3473	(509) 775-5235
Franklin	(509) 545-8546	(509)545-3511
Garfield *(Pomeroy CD)*	(509) 843-1998	(509) 843-3701
Grant *(Upper Grant CD)*	(509) 754-2463	(509) 754-2011
Lincoln	(509) 725-4181	(509) 725-4171
Pend Oreille	(509) 447-5370	(509) 447-2401
Spokane	(509) 535-7274	(509) 477-2048
Stevens	(509)685-0937	(509) 684-2588
Walla Walla	(509) 522-6340	(509) 527-3260
Whitman *(Whitman CD)*	(509) 397-4636	(509) 397-6290
Whitman *(Palouse CD)*	(509) 332-4101	____
Whitman *(Palouse-Rock Lake CD)*	(509) 648-3680	____
Whitman *(Pine Creek CD)*	(509) 285-5122	____
Check out the following website for more info: http://www.scc.wa.gov/districts/map/		

What is the Natural Resource Conservation Service?

The Natural Resource Conservation Service (NRCS) used to be called the Soil Conservation Service (SCS). Several years ago its name was changed to better represent the agencies expanding role to assist agriculture with nearly all natural resource issues. Local NRCS offices are in all eastern Washington counties and are often located with the conservation district offices. The NRCS Washington website is http://www.wa.nrcs.usda.gov/nrcs/

Land Trust: Preserve and protect your land for the future

Many people are looking for a tool to protect their land from future development. Land trusts are experts at helping landowners find ways to protect their land. A land trust is a nonprofit, voluntary organization that works with landowners to protect land through donation and purchase, conservation easements (permanent deed restrictions that prevent harmful land uses), or by devising other plans to maintain open space. In addition to the environmental benefits of protecting land from future development, property owners can receive tax benefits by working with a land trust.

Blue Mountain Land Trust
PO Box 1473
Walla Walla, WA 99362-0027
Phone: (509)525-3136

Inland Northwest Land Trust
35 W. Main Ave. Ste. 210
Spokane, WA 99201-2325
Phone: (509)328-2939 Fax: (509)328-4733

Yakima Greenway Foundation
111 S 18th St
Yakima, WA 98901-2149
Phone: (509)453-8280 Fax: (509)453-0318

Palouse Land Trust
PO Box 8506
Moscow, ID 83843-1006
Phone: (208)882-5248 Fax: (208)882-5437

Tapteal Greenway
PO Box 3007
Richland, WA 99352-1540
Phone: (509)942-0354

The Nature Conservancy, Washington Office
217 Pine St Ste 1100
Seattle, WA 98101-1582
Phone: (206)343-4344 Fax: (206)343-5608

Healthy Streams, Lakes, and Wetlands

WHO TO CONTACT FOR ASSISTANCE

What permits are needed for work in the riparian area?

There are many situations where work in and around water requires a permit. The purpose of the permit is to make sure the work is being done in a proper manner and that impacts to water quality and fish habitat are avoided. While efforts have been made to make the permitting process easier and more straight forward, make sure to plan ahead to obtain permits. Some of the permits that may be required include:

Local Permits-

Shoreline permit: Land use, work, construction, development within the 100 year floodplain of certain waterbodies may require a shorelines substantial development permit.

Floodplain permit: A floodplain development permit is required within the 100 year floodplain for many activities including building, mining, filling, dredging, grading, etc.

State Permits-

Hydraulic permit: Activities that will use, divert, obstruct or change the natural flow or bed of any water of the state may require a written hydraulic project approval.

SEPA: Some projects near waterbodies will have to go through SEPA. The State Environmental Policy Act (SEPA) is designed to identify potential environmental impacts.

Other processes that may be necessary include Water Quality Standard Modification and/or Certification, Aquatic Lands Lease and/or Authorization, or Forest Practices approval. For information on permits contact the Department of Ecology Permit Assistance Center at (509) 329-3460. We will help explain and streamline the permitting process. You can also check out the website at http://www.ecy.wa.gov/programs/sea/pac/index.html

What money is available for riparian area improvements on your property?

Continuous Conservation Reserve Program (CRP) is a federal program that provides annual payments to agricultural landowners to fence and plant trees within the riparian area. The program also provides cost-share money to off-set the cost of trees and fencing.

Conservation Reserve Enhancement Program (CREP) is very similar to continuous CRP except that it designed specifically for streams that provide habitat for anadromous (sea-going) fish such as salmon or steelhead. CREP provides greater annual payments and signing bonuses.

Wetlands Reserve Program is designed to provide opportunities to landowners to protect, restore, and enhance wetlands. This program offers three options including permanent easments, 30-year easments, or 10-year restoration cost-share agreements.

319 Grants and Centennial Clean Water Funds are available to all non-profit or government organizations in the state. Landowners can work with a Conservation District or a local non-profit group to obtain money to make riparian area improvements on their property.

Additional programs are available. Contact the Department of Ecology, your Conservation District, or the Natural Resources Conservation Service for more information.

Contact us, we can help!

Washington State Department of Ecology
Eastern Regional Office, Spokane .....(509) 329-3400
Central Regional Office, Yakima .....(509) 575-2490

"We shall never achieve perfect harmony with land, any more than we shall achieve absolute justice or liberty for people. In these higher aspirations the important thing is not to achieve, but to strive."

Aldo Leopold

⇒ Every person lives within a watershed, therefore, everyone's activities can have an impact on the streams and rivers their watershed creates. Take steps to help protect your watershed.

Purpose of this Guide Book

When you look out the window of your house you see the land that is part of a watershed. Any water that falls on the land moves downhill to create streams, lakes, and rivers .

The purpose of this book is to provide you with a better understanding of the many components that make up a healthy watershed. In addition, this book explains what you can do on your property to protect the lakes, streams, and wetlands that make eastern Washington such a wonderful place to live!

Contents

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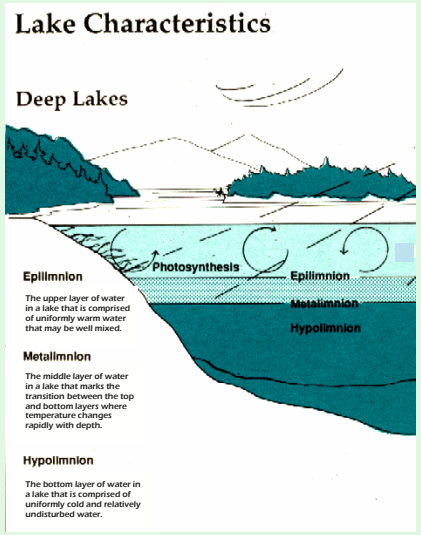
Healthy Streams, Lakes, and Wetlands

UNDERSTANDING LAKES AND STREAMS

⇒ Streams and lakes provide many benefits. We use them for recreation, irrigation and a source of drinking water. They also provide habitat for wildlife.



The Dynamic Lake

Even without human disturbance, lakes change gradually over time, becoming more and more productive as they grow older and fill with sediment. This process is called *eutrophication*. Eutrophication normally takes hundreds to thousands of years. In lakes that are affected by human actions, this process can occur in one persons lifetime. Productivity is a measure of the level photosynthesis, respiration and decomposition. Productivity can be increased by adding nutrient pollutants from septic systems, livestock, and fertilizers.

Oligotrophic: A young lake with low productivity.
Mesotrophic: A middle aged lake with moderate productivity.
Eutrophic: An older lake that is highly enriched with nutrients and is very productive.

What is Stratification?

Water temperature and currents can cause a deep lake to form layers that are very different from each other. This is called *stratification*. Because the upper layer (epilimnion) receives sunlight, photosynthesis makes it very productive. This layer is mixed by the wind and Is very uniform.

The lower layer of water in the lake is called the Hypolimnion. This layer receives little or no light and not much photosynthesis occurs. Instead, there is a lot of decomposition of dead organic matter. Decomposition uses oxygen instead of producing it. This layer may become oxygen poor during the late summer until turnover or mixing occurs in the fall.

Types of Water Pollution

A lot has been accomplished over the last 30 years to reduce the pollution from ***point sources*** such as factories and sewage treatment plants. Much of our water pollution today comes from ***nonpoint sources***, the small sources that we all generate which seem insignificant by themselves but collectively pose a huge threat to water quality in eastern Washington. Only when individuals take personal responsibility can we control nonpoint pollution.

"Every man is under the natural duty of contributing to the necessities of society; and this is all the laws should enforce on him."

Thomas Jefferson

⇒ The state legislature has created several laws to protect our water and has directed state agencies to enforce these laws.

What is a Water Right?

A water right is a legal authorization to use public water for specific purposes. A water right is necessary if you plan to divert any amount of water for any use from lakes, rivers, streams, and springs. A water right is also necessary if you wish to draw more than 5,000 gallons of ground water per day. There is a formal process that a person must go through to obtain a water right. Call the Department of Ecology for more detail. See page 29.

Wetlands and the Law

Several laws are in place to protect and restore wetlands. Check out page 5 for more detail.

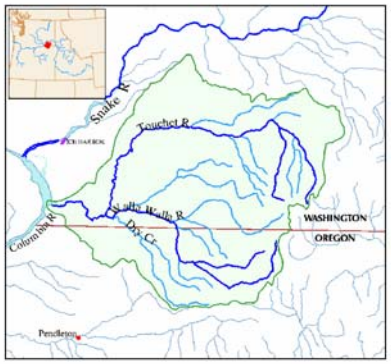
The Endangered Species Act

The Endangered Species Act is a federal law that makes it illegal to possess, kill or harm a listed species. Landowners, as well as state and federal agencies, can be subject to endangered species "takings" that may result in heavy fines and/or criminal prosecutions.

Many stocks of salmon are listed as threatened or endangered around the state. Although some areas in eastern Washington are no longer home to salmon, bull trout are also listed as threatened and are found in many streams in this region.

It is very important that you know whether or not the stream that you live on or near is home to endangered species and that you take steps to protect water quality and habitat!

The Walla Walla River Watershed



What is Watershed Planning?

Because of diminishing water availability, loss of fish habitat, and the increasing need for clean water, the 1998 State legislature passed the Watershed Management Act.

This law creates a framework where citizens, local governments, tribes, and others work together to solve water issues in the state.

The act enables groups to create "planning units " to assess water resources and needs, and recommend management strategies for a particular Water Resource Inventory Unit or WRIA.

Check out the following website for more information (http://www.ecy.wa.gov/watershed/) and get involved in your area!

Did you Know?

Many counties have critical area ordinances and shoreline master plans that limit activities that can occur near streams, lakes, and wetlands on your property.

Healthy Streams, Lakes, and Wetlands

WATER RELATED LAWS AND REGULATIONS

⇒ As the population has grown in our state so has the pressure we place on our streams, lakes and wetlands.

Dragoon Creek, North Spokane County

Waters of the State

Waters of the state include lakes, rivers, ponds, streams, inland waters, underground waters, salt waters and all other surface waters and watercourses within the jurisdiction of the state of Washington. In other words, most streams & lakes on private property belong to Washington State.

Chapter 90.48.080 of the revised code of Washington (RCW) says that it is unlawful for anyone to do anything that will pollute waters of the state. The Revised Code of Washington is law written by the state legislature.

What is a TMDL?

The federal Clean Water Act requires each state to identify its polluted waterbodies and submit this list to the Environmental Protection Agency (EPA). The list includes estuaries, lakes, and streams that fall short of state surface water quality standards.

EPA requires the states to set priorities for cleaning up these waters and establish a *Total Maximum Daily Load* (TMDL) for each. A TMDL, or water cleanup plan, is an analysis of how much pollution a waterbody can take and still remain healthy. The plan also includes recommendations for controlling the pollution. For more information, check out the website: http://www.ecy.wa.gov/programs/wq/tmdl/index.html

The Hydraulic Code

The hydraulic code is a set of rules designed to protect aquatic life from harm due to the construction of projects in or near water. The rules also protect against any work that will use, divert, obstruct, or change water flow. For more info, check out the WA Department of Fish and Wildlife website: http://www.wdfw.wa.gov

The Shoreline Management Act

The original Shoreline Management Act (SMA) was passed by the legislature in 1971. The goal of the SMA is "to prevent the inherent harm in an uncoordinated and piecemeal development of the state's shorelines."

Under the Act, each city and county adopts a shoreline master program based on state guidelines but tailored to specific geographic, economic and environmental needs of the community. The program provides regulations to address shoreline use and protection. The master program also places emphasis on protecting the natural character and the many ecological and economic benefits of shorelines.

A shoreline is defined as: all marine waters; streams with a mean annual flow greater than 20 cubic feet per second; lakes greater than 20 acres; upland areas 200 feet from the edge of the water; and in some cases wetlands, and the floodplain and deltas of rivers.

For more information call the Department of Ecology at (509)329-3400 or go to the Shorelands website: http://www.ecy.wa.gov/programs/sea/shorelan.html

"When we try to pick out anything by itself, we find it hitched to everything else in the universe."

John Muir

⇒ Lakes and streams have great ecological value. Before we can discuss how to protect and restore them, it is important to understand some of their characterisitics.

The Stream — A Sediment Mover

Streams are also very dynamic. They are constantly moving and changing while carrying material downstream. They carve through rock and carry sand and sediment dispersing it along their path. This material often contains organic nutrients that are deposited throughout the floodplain creating rich soils and fertile agricultural lands.

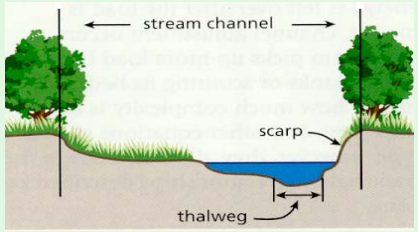
Anatomy of a Stream

Stream channels are formed by the water and sediment carried by the stream and can take many different forms. The steep bank is called the ***scarp*** while the deepest pat of the channel is the ***thalweg***.

Sometimes streams have many channels called ***braids***. Braided streams can be the result of several different factors but are most often created by dramatic changes in flow rates. These dramatic changes can occur naturally as in the case of a mountain stream, or can be caused by human development in the watershed.

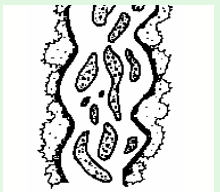
Streams rarely flow straight for very long. The movement of a stream back and forth is called ***sinuosity***. Sinuosity is generally a function of elevation change and flow rate. The more gradual the elevation change and the slower the flow rate the more sinuosity.

Regardless of the shape of the channel, all streams have deep and shallow areas called pools and riffles. The number of pools is very important for fish habitat, but can be altered significantly by human impacts to the stream or to the watershed. Streams that have been straightened for urbanization or agricultural purposes or streams with heavy grazing in the riparian area often have few pools .



A Stream in Equilibrium is More Stable

Stream channel size and shape is determined by four variables: Amount of sediment, sediment size, flow rate, and elevation change. If a change occurs in one or more variables, stream stability or *equilibrium* will be temporarily lost. The stream will then adjust itself to regain equilibrium. Human impacts can take a stream out of equilibrium. Exposed soil on the bank or a deeply cut channel is often a sign that a stream is unstable and trying to regain equilibrium.



Braided Stream

Sinuosity

Did you Know?

Streams that have water all year are *perennial*. Those that only have water in the spring or when it rains are *seasonal or intermittent.*

Healthy Streams, Lakes, and Wetlands

THE BENEFITS OF WETLANDS

⇒ Wetlands are areas of great value. Many of Washington's wetlands have been lost or degraded due to human activities.

The Vital Wetland

It was once a national policy to remove wetlands. We now understand the importance of preserving rather than eliminating our wetland resources. Wetlands perform many important ecological functions . They improve water quality by trapping sediment, pollutants and nutrients. They absorb water into the soil and recharge groundwater, maintain stream flows, control runoff, store flood waters, reduce erosion, and stabilize shorelines. Wetlands also provide critical habitat for fish and wildlife. Additionally, wetlands offer many recreation and scenic opportunities .

Restoring Wetlands

Flooding, degraded water quality, limited water supplies, habitat loss, and erosion are some of the most common environmental problems we face in eastern Washington. As wetlands are lost upstream these problems increase downstream. Declining fish populations can also be tied to the decline and degradation of wetlands and riparian vegetation. By restoring wetlands, we can regain many of the important ecological benefits wetlands provide. To learn how to restore wetlands on your property, refer to the contact information to the right.

Regulating Wetlands

Rules for protecting wetlands are developed and enforced by various agencies depending on the situation. The Department of Ecology, The Department of Fish and Wildlife, and the Department of Natural Resources are authorized to protect wetlands in Washington. The Growth Management Act also gives local governments the authority to implement local wetland regulations.

While this can sometimes be complicated, the goals of all agencies are the same: A short term goal of "no overall net loss in acreage and function of Washington's remaining wetlands base" and a long term goal to "increase the quantity and quality of Washington's wetlands resource base." For additional information on regulating wetlands go to the website: http://www.ecy.wa.gov/programs/sea/wetlan.html

"For in the true nature of things, if we rightly consider, every green tree is far more glorious than if it were made of gold and silver."

Martin Luther

⇒ If our forests are properly managed we can have the timber we desire and the many environmental benefits forests provide.

Forest Practices Rules

The Forest Practices Rules are legal requirements that private landowners must follow when harvesting timber on their land. They are enforced by the Department of Natural Resources (DNR) and provide guidelines for timber harvest, road construction and maintenance, reforestation, wetland and stream protection, etc. The DNR produces a manual of Best Management Practices (BMPs) to assist you in making important harvest decisions. For more information, call (509) 684-7474, or check out the website: http://www..dnr.wa.gov

What is the RMZ?

The acronym "RMZ" stands for "Riparian Management Zone." The RMZ is the area near streams where the forest practices rules provide increased protection. The size of the RMZ depends on the type of trees, the land near the stream, the size of the stream, and the method of harvest you choose. The level of protection for the RMZ is also dependent on whether the stream supports endangered species. Make sure you clearly understand these rules when you plan the timber harvesting on your property.

Backyard Forest Stewardship for Eastern Washington

The Department of Natural Resources publishes a guide for people that live in the woods. The guide provides information on how to keep your home and family safe from wildfire, keep your forest healthy and attractive, and improve wildlife habitat. You can obtain a copy by calling 1-888-STEWKIT. It is also available on-line at http://www.dnr.wa.gov/htdocs/rp/stewardship/bfs/

Did you Know?

Permits are required for nearly all timber harvesting activities. Contact the Department of Natural Resources for more information.

Road Construction

Poorly constructed roads can have a large impact on water quality and fish habitat . They can deliver large amounts of sediment to streams across their surfaces. They can erode, releasing large amounts of soil into a stream. Furthermore, poorly designed water crossings may erode and alter the stream channel. New roads should be located well away from surface water and water crossings should be limited. Check out the DNRs Best Management Practices for additional information on road construction and maintenance.

Small Forest Landowner — Forestry Riparian Easement Program

The state legislature felt that the new forest practices rules would erode small landowners economic viability and willingness to keep lands in forestry use. To address these concerns, a program was created to acquire forest easements from landowners along streams and rivers. By paying small landowners for these easements, salmon and other aquatic resources are protected as well as the economic viability of a small landowner. Call the Department of Natural Resources in Colville (509) 684-7474 or Ellensburg (509) 925-8510 for more info.

Healthy Streams, Lakes, and Wetlands

MANAGING TIMBER AND WOODLOTS

⇒ Cleared forest land can have a tremendous negative impact on water quality and fish and wildlife habitat.

Tucannon River, Southeast Washington

Forests and Water Quality

Eastern Washington forests provide tremendous resource benefits. In addition to timber and wood products, forests provide fish and wildlife habitat, opportunities for outdoor recreation, and great natural beauty.

Forests also act as physical and biological filters providing us with clean water. Forests slow run-off and capture sediment. The porous organic rich forest floor absorbs moisture like a sponge and tree roots and debris hold soil in place.

On the other hand, lands that have been cleared of trees serve as conduits for pollutants and eroding soils that flow directly into streams and rivers.

What is the Forests & Fish Agreement?

The Forest and Fish Agreement is a voluntary pact signed in 1999 by both public agencies and private interest groups to protect fish habitat on private forest lands. The plan gives Washington the greatest level of fish habitat protection in the United States for forested land. The agreement is designed to protect 60,000 miles of streams running through private forest land. To accomplish this, the forest practices rules create new road construction standards, require wider uncut buffer areas along streams, and decrease the amount of land exempt from natural resource protection rules.

Sustainable Forest Practices

Sustainable forestry aims to preserve the integrity, stability, and beauty of the biotic community while providing the wood and paper products we need. Sustainable practices enables us to meet the needs of the present without compromising the ability of future generations to provide for themselves. Examples of sustainable forest harvest practices include:

- Leave buffer strips along streams to protect water quality and fish habitat.
- Leave travel corridors for wildlife.
- Build temporary roads that can be easily removed when harvesting is finished.
- Consider genetic diversity when replanting
- Understand the role that disease and fire play in determining tree populations.
- Recognize species diversity — avoid turning forests into monoculture tree farms.

Note: If you contract to have your timber removed, do not assume that the contractor is going to use logging practices that reduce impacts to water quality and fish and wildlife habitat. Educate yourself and make certain that he or she has acquired the appropriate permits and the logging plans protect natural resources. Ask to look at work the contractor has done elsewhere so you feel confident about the harvesting that will be done on your land.

"Hope and the future for me are not in lawns and cultivated fields, not in towns and cities, but in the impervious and quaking swamps."

Henry David Thoreau

⇒ We have a tremendous opportunity in eastern Washington to protect and restore our very important wetland resources.

The Value of Wetlands

Wetlands have great ecological value. They also have great ***economic*** value! Here are a few ways that wetlands protect the pocketbook for you and others in eastern Washington.

Flood Control: Wetlands store flood waters and then release them slowly reducing the damage caused by flooding. Tax payers and private landowners spend millions each year fixing damage caused by floods.

Sediment Control: Wetlands capture sediment that otherwise must be removed from shipping channels and behind dams.

Water Supply: Wetlands capture and filter run-off providing clean drinking water throughout the year. Wetlands reduce the expense of treating drinking water and reduce summer water shortages.

Wildlife Habitat: Wetlands provide habitat for ducks and geese, a source of food during hunting season for many Washington families.

Recreation: Wetlands improve hunting and fishing opportunities in eastern Washington. This is a tremendous source of income for businesses in our region.

Protect Wetlands on Your Property!

If you think you have wetlands on your property it is important to take steps to protect them. The Department of Ecology can determine if they are wetlands and provide info on how to keep them protected. Contact the office in Spokane at (509) 329-3400 & check out the website: http://www.ecy.wa.gov/programs/sea/wetlan.html

Do You Have Wetlands on Your Property?

- ✓ Are there natural channels on your property that drain to a low area?
- ✓ Is there a place where the ground is soggy during the spring?
- ✓ Are there places where water pools in the spring or after a heavy rainstorm?
- ✓ Do you avoid taking equipment into areas in the spring to prevent getting stuck?
- ✓ Is there an area on your property that has been ditched or tiled to keep it dry?
- ✓ Are there springs or seeps present?
- ✓ Are there places with different color soils compared with the rest of your property?
- ✓ Do you have areas where wetland plants such as cattails, sedges or rushes grow?

If you answered yes to any of these questions you may have wetlands on your property! You have a great opportunity to restore and/or conserve wetlands!

Quiz!

Approximately what percentage of Wetlands in Washington state do you think have been drained, removed, and/or converted?

A. 20%
B. 40%
C. 75%

Answer: It is estimated that approximately 75% of Washington wetlands have been lost to agricultural and urban uses. Much of the remaining wetlands have been degraded .

Healthy Streams, Lakes, and Wetlands

RIPARIAN BUFFERS ARE THE KEY

⇒ A healthy riparian area is the key to healthy streams, lakes, and wetlands. Riparian buffers will:

Slow bank erosion by holding the soil in place during periods of high water.

Reduce flood damage and sedimentation by slowing runoff and capturing the sediment that would otherwise be carried downstream.

Keep water cool in the summer. Riparian vegetation shades the water during the hot summer months.

Improve water quality by keeping sediment, nutrients, pesticides, pathogens and other pollutants from reaching the water.

Create fish and wildlife habitat . A healthy riparian buffer improves habitat for fish and also provides the space, food, water and cover wildlife needs.

Enhance summer stream flow by improving water absorption and storage. During the spring, water is captured by the riparian buffer and is absorbed into the soil. This water slowly feeds the creek during the summer months.

How big should the riparian buffer be?

- The bigger the buffer the more benefit it provides to the stream, lake, or wetland.
- The size required for maximum benefit varies depending on soil type, topography, the size and type of stream or wetland, and the activities occurring in the watershed.
- As a rule of thumb, the height of the tallest native tree that grows in your area is a good width for your riparian buffer .
- Some counties or cities have ordinances requiring a minimum buffer size. Call your county public works or planning office for details.
- If you are concerned about buffer size start smaller and work up from there.
- Any size buffer is better than none!

Riparian Buffer Maintenance

It is very important to maintain the buffer for several years after it has been planted. Make sure to:

- Replant trees that die.
- Pull weeds from around the base of plantings to protect against competition and damage from rodents.
- Water trees and shrubs during July and August.
- Fix damage to fences preventing livestock from entering the riparian area.

Did you Know? A healthy riparian area on your property not only benefits you but your neighbors downstream!

"What is the use of a house if you haven't got a tolerable planet to put it on?"

Henry David Thoreau

⇒ By taking a few simple steps you can reduce noxious weeds, protect water quality, and enjoy a healthy environment.

Integrated Pest Management

Integrated Pest Management, or IPM, is a program that can be used to control noxious weeds in gardens, pastures, and crops. Integrated pest management techniques do not try to eliminate weeds, but create an ecologically sound balance that de-emphasizes chemical herbicides and instead depends upon biological controls. IPM also uses prevention and mechanical techniques and carefully targeted herbicide applications.

- Utilize biological controls including fungi or insects that attack specifically the weed you are trying to control.
- Hand pull weeds or cultivate.
- Use mulches in the garden to prevent germination of weed seeds.
- Apply herbicides to trouble spots rather than large areas.
- Consider timing. Plant garden or crops to out compete weeds.
- Use drip irrigation which waters single plants and not the surrounding soil.
- Use crop rotation and proper pasture management to avoid infestations.

County Noxious Weed Board

All counties in eastern Washington have noxious weed control boards. They can provide you with information on weed species and control strategies. The Washington State Noxious Weed Control Board website is http://www.nwcb.wa.gov

Safely Using Herbicides

Chemical herbicides are poisons that will harm or kill more than the intended weed if not used properly. Consider the following:

- Never spray when it may rain and wash herbicides into surface water.
- Do not spray on windy days.
- **Read the label first** and never apply more than the recommended amount.
- Do not spray herbicides near streams, lakes or wetlands.

Safely Disposing of Herbicides

Many of the chemicals you use to control weeds are considered hazardous waste. Consider the following:

- Never dump chemicals into sewers, drains, toilets or storm drains.
- Rinse containers and apply rinse water.
- Dispose of containers at landfills capable of handling hazardous waste.
- Call the recycle hotline (1-800-RECYCLE) for disposal information.

Quiz! What is the most important step you must take before applying a pesticide on your property?

Answer: Read the label first! Even before you purchase it. By not reading the label in detail you may render the pesticide ineffective, you may harm the environment, waste money and land yourself on the wrong side of the law. Remember, use only the amount detailed on the label. When it comes to pesticides, the "if a little is good, then more is better" approach ***does not*** apply.

Healthy Streams, Lakes, and Wetlands

CONTROLLING NOXIOUS WEEDS

⇒ Improperly controlling weeds can impact water quality. Weeds can also reduce habitat and create problems for your livestock.

Four Ways to Control Weeds on Your Property

Prevention — Prevention is the first option in weed control and should always be used in conjunction with other techniques if it is unsuccessful by itself. Crop & pasture rotation and using certified seed are examples of ways to prevent weed outbreaks.

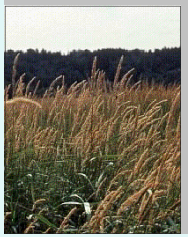
Mechanical Control — Mechanical control involves removing weeds before they go to seed by mowing or removing them by hand.

Biological Control — Biological control relies on natural enemies of the weed including certain fungi and insects. Biological controls typically reduce but don't eliminate problem weeds. They can provide a permanent, economic solution if you can live with a few weeds and supplement biological control with prevention and mechanical controls.

Chemical Control — Chemical herbicides are the last resort in the control of weeds. They can be expensive as well as harmful to the environment.

The Invasion of Reed Canary Grass!

This nasty invader was once planted purposefully as a forage grass . It out competes native grasses, plugs waterways and prohibits the establishment of woody plants.



RCG does not tolerate shade. The best method for control is to plant and maintain native trees and shrubs to provide shade.

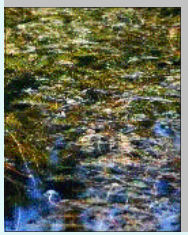
Purple Loosestrife on the Loose!

Also known as lythrum, this aggressive Eurasion weed invades wetlands, replacing native vegetation such as cattails, sedges, & rushes. It has degraded wetlands throughout eastern Washington.

Currently, purple loosestrife is controlled using mechanical cutting or pesticide application.

Milfoil Control Costs Millions!

Eurasian milfoil has invaded many of our lakes. It is easily spread from lake to lake when it hitches a ride on boat trailers.



A lot of money is spent every year in an attempt to control milfoil. Prevention is the best method. Other methods include hand pulling, dredging and herbicide application.

Managing Other Aquatic Weeds

There are many other aquatic weeds that can impact our lakes, streams, and wetlands. Many of these are noxious weeds.

For more information, contact your weed board or the Department of Ecology and check out the website: http://www.ecy.wa.gov/programs/wq/links/

Remember!

The application of pesticides in or near water requires a permit. Call us before applying chemicals.

" Man who say it cannot be done should not interrupt man doing it."

Chinese proverb

⇒ ***Riparian buffers*** are lightly-used zones of native vegetation along streams, lakes and wetlands.

How do I know if the riparian area is degraded?

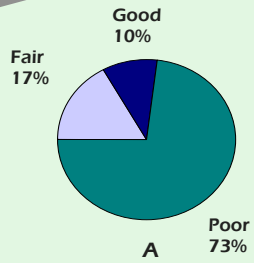
Sometimes it can be difficult to evaluate the condition of a stream and the riparian area, especially when it is degraded slowly over time or when changes occurred many years ago. Some of the signs of an unhealthy riparian area include:

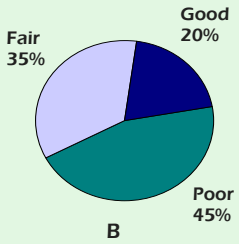
- Shallow-rooted vegetation and a lack of trees and woody shrubs along the banks.
- A wide stream channel that is sometimes braided with shallow and/or muddy water.
- A stream channel that is straight and does not meander from side to side.
- Exposed soil on the bank of the creek and/or eroded, rocky soil in the riparian area.
- Invasion of non-native, undesirable plants.

Healthy riparian area

Unhealthy riparian area

Quiz! Which pie do you think best represents the current condition of Washington's Riparian Habitat?





Answer: A is the correct answer. Due to urbanization, development, logging, farming, mining, and other impacts, the Department of Fish & Wildlife estimates that only 10% of our riparian habitat is in good condition and 73% is in poor condition.

Healthy Streams, Lakes, and Wetlands

MANAGING LIVESTOCK AND PASTURES

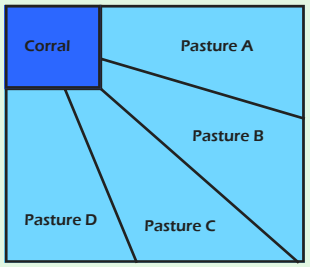
⇒ No one questions the importance of agriculture, but by taking small steps viable agriculture and healthy riparian areas can coexist.

How do you provide water away from the stream?

Livestock usually prefer to get water from a tank than to maneuver down a slippery bank and into a stream. There are many ways to provide off-stream water. You can use electric or solar powered pumps, gravity fed pumps, as well as nose pumps to get water to the animals.

Remember, the Department of Ecology allows landowners to pump small amounts of water from a stream to a stock tank without a water right. Call us for more information.

Horse Drinking From a Nose Pump



Grazing and Water Quality

Proper grazing techniques not only protect water quality but also the health of your animals. Here are some things to consider when grazing livestock on your property:

- Eliminate single pasture year-long grazing. Subdivide your pasture into smaller pastures and design a rotation system.
- Hold animals in a confinement area away from water during winter when pasture is wet and grass is not growing.
- Know your soil. Your soil type will determine the amount of water it can hold and when you can release the animals into pasture during the spring.
- Allow rest periods and use a high-intensity, short duration grazing system. This enables grass to develop good root systems that hold soil in place and increases pasture production.
- If your total acreage is limited you may need to confine animals year round and use the majority of your land for exercise only.

Pasture Design

Pasture design and rotation is very important to reduce erosion and protect water quality. The above diagram is an example of a pasture design. You should begin grazing when grass is 6" to 8" high and move animals to a different pasture when 3" - 4" of grass remain. You will need to pipe water to each pasture from a central source.

Pasture Management

Pasturing too many animals or allowing them to graze for too long in the same area reduces plant vigor and compacts soils. When soils are compacted absorption capacity and pasture recovery is reduced. Overgrazing is the main reason for pasture decline. Rest periods are critical for proper pasture growth. Divide pastures into separate units (paddocks) if possible. Four or more equal-sized paddocks is recommended for starting a rotational grazing system.

Horses are especially hard on pastures. They graze plants down to the soil surface, so regrowth takes more time. They do not graze evenly and trample much of the forage area. If you have horses your pasture management plans should include controlled grazing and rotation. Contact your local conservation district for more information.

"A good garden may have some weeds!"

Thomas Fuller

⇒ Consider making minor changes that will protect water quality, leave money in your wallet and time to do things you want to do!

Are you an organic gardener? If not, why not?

A few weeds and pests in your garden or lawn doesn't mean that it is unhealthy. Good organic gardening techniques produce high quality fruits and vegetables ***and*** protect water quality. Consider introducing these organic practices to your garden this year:

- Test soil to determine level of organic matter (humus) in the soil. You can increase your organic levels by adding compost and/or organic fertilizer.
- Pull weeds or spray broadleaf weeds with a mix vinegar, dry molasses, and citrus.
- Release ladybugs and green lacewings regularly to control aphids, spider mites, whiteflies and lacebugs.
- Adjust watering schedule to allow for deep infrequent waterings. Watering schedule should be dependent on your soil type.

The Essentials of Composting

Composting not only reduces the amount of waste you have to take to the landfill, it also reduces the need for chemical fertilizers. Composting is part of the normal process of biological growth and decay. By managing our compost we can create a high temperature, fast compost that kills weeds and pathogens. Consider the following composting tips:

- A mixture of one part high nitrogen and moisture sources combined with two parts low nitrogen and moisture sources is ideal for rapid composting.
- Mix materials thoroughly throughout the pile, do not layer.
- Piles must be large enough to the hold heat generated by microbial activity. 3' x 3' x 3' is typically a manageable size that promotes hot composting.
- Compost should be moist but not soaking wet. You may have to add water during the summer months to maintain appropriate moisture levels.
- Most of the beneficial organisms in compost are aerobic, meaning they require oxygen to perform cellular activities. Make sure to turn pile regularly to improve aeration.

High moisture & nitrogen

- Grass clippings
- Fresh manure
- Vegetable waste
- Fruit waste
- Garden trimmings

Low moisture & nitrogen

- Wood chips
- Saw dust
- Grass hay
- Wheat straw
- Pine needles

Quiz!

Compost will go through a hot phase and then a cool phase. What temperature should the compost maintain during the hot phase?

A. 100˚F - 120˚F
B. 120˚F - 150˚F
C. 150˚F - 175˚F

Answer: The answer is B. A properly managed compost pile should maintain a temperature between 120˚F and 150˚F to kill weed seeds and pathogens.

Healthy Streams, Lakes, and Wetlands

LANDSCAPING AND GARDENING FOR CLEAN WATER

⇒ Tradtional style landscaping and gardening can be very time intensive and expensive not to mention pollute lakes and streams.

Gardening & Landscaping Websites

WSU - Gardening in Eastern Washington
http://www.spokane-county.wsu.edu/spokane/eastside/

USDA - Gardening Information
http://www.usda.gov/news/garden.htm

EPA (mid-west region) - Green Landscaping with Native Plants
http://www.epa.gov/greenacres/

Slow Release vs. Fast Release

Use slow release fertilizers when possible. They are not as likely to contaminate surface or groundwater. If you use quick-release fertilizers, make several small applications rather than a lot all at once.

Six Things to Consider when Landscaping near Streams, Lakes, or Wetlands

1. Maintain a natural shoreline — a natural shoreline will shade the water keeping it cool, capture polluted run-off and provide habitat for wildlife.
2. Make a narrow gravel footpath to the water — pavement may deliver pollutants.
3. Limit the amount of lawn — lawns are sources of chemical pollutants.
4. Use compost — compost is much safer for water than chemical fertilizers.
5. Use native plants —ornamental shrubs and trees require chemicals and extra work.
6. For lakes use small floating docks — solid docks destroy wildlife habitat, alters current, and causes erosion elsewhere.

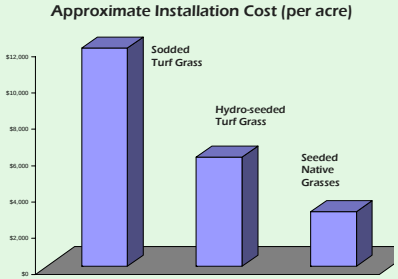
Did you Know?

Washington State University Coop Extension has books on landscaping and gardening on-line at http://pubs.wsu.edu/

What is natural landscaping?

The term "natural landscaping" applies to a wide array of landscaping techniques that help retain natural landscape features, including wetlands, woodlands, and natural drainage features. Natural landscaping reduces the use of turf grasses and ornamental shrubs and, instead, uses native trees, shrubs, grasses and flowers. Natural landscaping techniques also use more vegetation and less concrete and asphalt . By reducing the amount of non-permeable surface you can reduce damage from storm run-off, reduce temperatures, improve water quality, and increase wildlife habitat.

Natural landscape techniques also make economic sense. They can significantly reduce the costs of landscape installation and maintenance, reduce the expense for storm water management facilities, create an enjoyable landscape that strengthens property values, and reduce the time it takes to mow the lawn!



"Burn down your cities and leave our farms, and your cities will spring up again as if by magic; but destroy our farms and the grass will grow in the streets of every city in the country"

William Jennings Bryan

⇒ Consider planting native plants, fencing livestock away from the stream, and providing off-stream water to protect water quality.

Livestock and Stream Health

Livestock can impact water quality and stream, lake, or wetland habitat. Livestock may:

- trample banks increasing the sediment load to the water;
- remove riparian vegetation causing flooding and erosion problems and increasing water temperature; and
- urinate and defecate in or near the water resulting in high levels of nutrients and fecal coliform bacteria.

It can be done!

Here the cattle have been fenced out of the riparian area and part of the flood plain. As a result:

- Water quality and habitat for fish and wildlife is improved.
- Cattle still have access to a section of the stream for drinking and most of their range.

This rancher made these changes voluntarily, recognizing the importance of water quality and wildlife habitat to his family and generations to come.

Choosing the Right Fence

The right kind of fence can depend on several factors. Types of available fencing include:

Barbed Wire Inexpensive, controls cattle and sheep. May injure horses and wildlife.

Wooden Rail Attractive but expensive. Very durable in the short term but will rot over time. Horses often chew.

Smooth Coated Wire Inexpensive. Requires more strands than barbed wire but less harsh. Horses may catch legs between strands.

Woven Wire Good control for horses. Requires maintenance often. May be combined with electric wire.

Portable Electric Inexpensive and easy to move for pasture rotation. Not a true physical barrier and not very durable.

High Tensile Electric Inexpensive and good control of animals. Less of a barrier than some.

Did you Know?

Programs and grants are available that may cover much of the expense for fencing and off-stream watering. Check out page 29.

Healthy Streams, Lakes, and Wetlands

MANAGING LIVESTOCK AND ANIMAL WASTE

⇒ Manure and mud can have serious water quality impacts and can also impact the health of livestock.

Why is manure management important?

- Livestock that live in manure are susceptible to disease. Poor health means high vet bills and a decrease in productivity.
- Manure on the ground creates more mud and a breeding ground for insects including flies that can harbor disease.
- Poor manure management can create an odor nuisance for you as well as your neighbors.
- Manure has organic matter, nutrients, salts and bacteria that can harm water quality.

Managing Animal Waste to Protect Water Quality

Manure contains high concentrations of bacteria, nutrients and organic matter. These are pollutants when they enter streams, lakes, or wetlands. Good farm management keeps manure away from surface water and groundwater and uses it as an effective fertilizer.

Manure Storage

- Locate barnyards, stockyards, feeding and watering areas well away from surface waters to prevent runoff from polluting them.
- Collect manure regularly when animals are being confined.
- Cover stored manure so that rain and snow do not absorb it and become polluted.
- Divert run-off from snow melt and rain storms away from manure piles.
- Make sure to store manure away from wells to avoid ground water contamination.

Manure Utilization

- Apply manure evenly as a fertilizer to pastures, fields and gardens.
- Apply only as much as your crop or pasture can use. Excess manure will wash off into surface waters or leach into groundwater systems.
- Till manure evenly into soil to maximize nutrient use and minimize runoff.
- Do not apply when soils are frozen, or when plants will not use the nutrients.
- Leave a buffer strip between manure application sites and surface waters.
- Test soil to determine how much manure to apply.

Your local conservation district can help you calculate appropriate manure application rates for your property to protect water quality and save money. See page 29 for information.

Quiz! What is the average total annual nutrient level in the manure from a one thousand pound horse?

A	B	C
Nitrogen 80 lbs. Phosphorus 12 lbs. Potassium 56 lbs.	Nitrogen 110 lbs. Phosphorus 26 lbs. Potassium 91 lbs.	Nitrogen 74 lbs. Phosphorus 20 lbs. Potassium 80 lbs.

Answer: The answer is B. When utilized properly, manure can save you a lot of money on fertilizer costs.

"Like winds and sunsets, wild things were taken for granted until progress began to do away with them. Now we face the question whether a still higher 'standard of living' is worth its cost in things natural, wild, and free. For us of the minority, the opportunity to see geese is more important than television, and the chance to find a pasque-flower is a right as inalienable as free speech."

Aldo Leopold

⇒ You can enjoy the great moments of beauty, relaxation, and education that watching wildlife can provide.

Does your property attract wildlife?

Just like us, wildlife have basic needs. One of those needs is ***space***. The need to provide space becomes important as more and more land is lost every day to development. You can offset this loss by setting aside an area, such as a riparian buffer.

Buffers can provide the ***food*** and ***cover*** wildlife need. In addition, such areas will improve access to ***water***. When you provide space, food, cover, and water you provide ***habitat!***

For information on creating a backyard wildlife sanctuary take a look at the web site: http://www.wa.gov/wdfw/wlm/byw.prog.htm

Controlling damage from wildlife

Avoid planting certain kinds of trees, such as cedar that attract deer.

Hang bars of soap on trees that are susceptible to deer damage and try commercial deer repellents.

Use tree cones or wire mesh until trees are established.

Avoid attracting unwanted wildlife by covering feed, plugging holes in outbuildings and barns, and moving pet food indoors during the night.

What are the benefits of wildlife on a small farm?

Insect Control — Birds and bats on a farm consume insects including mosquitoes. Certain species can eat hundreds per day!

Rodent Control — Hawks and owls can help reduce the number of rodents that may invade your outbuildings and damage your crops and/or gardens.

Food — Wildlife not only disperse seeds for a variety of fruits and nuts, but birds, bees, and butterflies also pollinate crops and the plants in your garden.

Enjoyment — Watching wildlife on your property can be one of the more enjoyable things you and your family can do!

Critter Crossings!

As more land is developed and used for houses, roads, shopping malls, parking lots , grazing livestock, and growing crops, the ability for wildlife to move and migrate becomes increasingly difficult. Buffers along streams and lakes provide the cover wildlife need to be able to move from place to place. These areas are called ***travel corridors*** and are critical for wildlife to successfully find food and mates. See page 30 for contacts that can help you create travel corridors by establishing buffers or conservation easements .

Did you Know? Leaving dead trees, or ***snags,*** encourages visits and the nesting of raptors such as osprey, eagles, and hawks!

Healthy Streams, Lakes, and Wetlands

IMPROVING FISH AND WILDLIFE HABITAT

⇒ Streams, lakes, and wetlands can attract a great number of wild creatures. With a few modifications, you can make these areas on your property even more suitable for fish and wildlife.

It's good for the fish!

There are a number of things you can do to make a stream fish-friendly:

1) Create a riparian buffer. Salmon and trout are dependant on cool, clean water. Trees along a stream provide shade to cool the water as well as capturing pollutants that would otherwise flow overland into the stream.
2) Leave fallen logs in the stream. Logs provide hiding places from predators.
3) Allow streams to meander in the floodplain to create the pools and riffles necessary for fish.
4) Plant native plants to provide food for the insects that fish feed upon.
5) Do not dredge. Dredging eliminates pools and riffles, increases erosion, and removes spawning gravel.
6) Reduce erosion by planting native vegetation on stream bank. The silt from erosion covers spawning gravels and chokes the stream.
7) Do not allow cattle in the stream. Manure and urine pollute the water. Cattle can trample banks causing erosion as well as damage salmon & steelhead nests called redds.

Plant native plants in the riparian buffer

It is important that when you plant in the riparian area for bank stabilization or for fish and wildlife habitat that you use plants that are native to the area. Here are a few reasons why:

- Native plants are adapted to the climate of eastern Washington and can handle the winter and summer temperature extremes.
- Wildlife utilize native plants for both food and cover.
- Native plants will not have the unintended ecological impacts that non-native plants may have.
- Native plants have natural defenses against local insects and disease.

Where can you purchase native plants?

Many local conservation districts have annual native plant sales. There are also a number of private nurseries that sell native trees and shrubs. You can contact the Washington Native Plant Society and the Idaho Native Plant Society for member nurseries that sell native plants.

Washington Native Plant Society
7400 Sand Point Way NE
Seattle, WA 98115
(206) 527-3210
http://www.wnps.org

Idaho Native Plant Society
PO Box 9451
Boise, ID 83707
(in Couer D' Alene (208) 683-2407)
http://www.idahonativeplants.org

"Water is the most critical resource issue of our lifetime and our children's lifetime. The health of our waters is the principal measure of how we live on the land"

Luna Leopold

⇒ Consider the ways that you can improve manure management and reduce the amount of mud on your land.

Animal Waste Disposal Options

On-site composting — Inexpensive and provides a cheap source of nutrient rich soil.

Spreading on pastures — A Cheap source of fertilizer. It is dependent on land availability and can increase the chance for water contamination.

Commercial nurseries — Plant nurseries as well as mushroom farms can use a lot of manure. Nurseries and mushroom farms are most interested in working with farms that produce a significant quantity of manure waste.

Home & Organic Gardeners — Home gardeners and organic gardeners are often interested in manure. There may be gardening organizations in your area.

The best choice is dependent on your land, the amount of manure your farm produces, and the availability of commercial facilities in your area.

What's the problem with mud?

- Livestock that constantly stand in mud and manure are more likely to get diseases such as abscesses, scratches, rain scald, or thrush.
- Mud and manure is a breeding ground for insects including mosquitoes and flies
- Farms that are muddy are aesthetically unpleasing and may be an odor nuisance.
- Standing in mud can lower animals body temperature. This can cause health problems and reduce productivity.
- Mud makes working on your property more difficult and unpleasant.
- Mud increases the chance for polluted run-off to impact streams, lakes and wetlands.

Techniques to Reduce Mud on Your Property

- Create riparian buffers along streams and wetlands. Provide off-stream watering.
- Use good pasture management techniques, including pasture rotation, to avoid overgrazing that creates bare, muddy areas.
- Try to provide feed under cover so livestock are not standing in a single outdoor location for long periods of time.
- Create a winter confinement area so that you can remove livestock from pastures when little or no grass is growing.
- Plant a vegetation buffer around the winter confinement area and pastures to absorb moisture and capture run-off.
- Use permeable, good footing materials like gravel or wood chip for high traffic areas.

Get your mind *on* the gutter!

Gutters on barns and out-buildings can reduce the amount of rain and snowmelt that reaches animal confinement areas. Divert this water to gravel-lined ditches where it can be absorbed into the ground. Do not direct run-off into an open ditch that flows directly into a stream.

Healthy Streams, Lakes, and Wetlands

CONTROLLING EROSION AND FLOODING

⇒ Erosion and flooding not only have environmental costs, but they can also cause significant property damage.

What Causes Erosion?

Erosion is a natural process. Streams and rivers constantly carry sediment from higher to lower elevations. Over time, erosion and deposition have created our rich, productive floodplains.

Typically, erosion occurs slowly. When erosion occurs quickly it can do a tremendous amount of property and environmental damage. Unfortunately, human activities have created a situation in which erosive forces can now accomplish in a few years what used to take a century.

Severe erosion is often a sign that the stream has been modified by ditching, straightening, and removal of natural riparian vegetation. If you have erosion problems on your property you can reduce erosion by planting native plants as described below. You may also want to look upstream and assist neighbors in making improvements on their property.

Controlling Erosion with Vegetation

The best way to reduce erosion is to plant native woody shrubs and trees on the banks and in the riparian area. The roots provide support to the bank and hold soil in place. The vegetation also slows run-off and traps sediment. The following is a list of species often found in eastern Washington riparian areas. Your local conservation district can help you design a planting that best protects your property from erosion and is ecologically appropriate for your land. They also have information on planting techniques. Check page 29 for contacts.

- Black Cottonwood
- Common Chokecherry
- Douglas Hawthorn
- Drummond Willow
- Mackenzie Willow
- Pacific Willow
- Quaking Aspen
- Scouler Willow
- Thin Leaf Alder
- Water Birch
- Western Paper Birch
- Blue Elderberry
- Common Snowberry
- Golden Current
- Coyote Willow
- Red-Osier Dogwood
- Service Berry
- Woods Rose
- Ocean-Spray

Avoid Rock Rip Rap!

People oftentimes use rock or unnatural materials to try to stop bank erosion. While this may be necessary in rare situations, it can have negative impacts.

- Rock rip rap speeds up water and increases scour and bank erosion downstream and/or on the opposite bank.
- If not done correctly, it may make erosion worse on the bank that you are trying to protect.
- It damages fish and wildlife habitat.

It is not necessary to change....Survival is *not* mandatory!

W. Edwards Deming

⇒ Many of the new methods not only protect water quality, but also make long-term economic sense for the producer.

Sustainable Agriculture

Sustainability is a long-term goal that requires growers to balance conserving resources, maintaining profits, and providing safe, abundant food products. Sustainability implies that we not only account for on-farm costs, but also environmental costs. Sustainable agriculture uses strategies such as conservation tillage, diverse crop rotations, increased use of perennial crops, and integrated pest management. These techniques can reduce the need for non-renewable inputs such as pesticides and fertilizers and can reduce soil erosion. Sustainable farms also provide healthy, long-term fish and wildlife habitat.

The Ideal Farm Design

The ideal farm design involves many of the important concepts discussed here. An ideal farm can have buffer strips along streams, protected wetlands, use integrated pest management and strip cropping techniques, as well as utilize conservation tillage practices such as direct seeding with a diverse crop rotation. This ideal farm can also be profitable!!! Contact your local conservation district office or the Natural Resource Conservation Service for additional information about introducing any of these techniques into your farm practices.

Conservation Planning

The Natural Resource Conservation Service can assist you in developing a complete, comprehensive conservation plan for your farm that considers all natural resources (soil, water, air, plants, and animals) and the human concerns (economic and social). Give them a call or call your local conservation district to get additional information.

Did you Know?

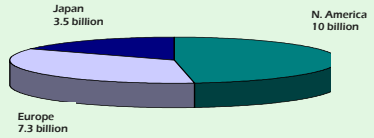
Direct Seeding is a world wide phenomenon. Farmers everywhere are using direct seed techniques and competing on world markets.

Organic Agriculture

Organic agriculture is the growing of crops without the use of synthetic pesticides and fertilizers. Instead, farmers rely on ecological interactions to improve yields, reduce pests, and build soil fertility. Crop rotation, biological & mechanical pest controls, and diverse planting patterns are some of the techniques used. A grower may certify crops as organic if he or she agrees to use specific farming methods. For more information check out the Washington Department of Agriculture website at http://www.agr.wa.gov/foodanimal/organic/default.htm

Organic Means Money!

Organic agriculture is thriving due to increased consumer demand. The current market for certified organic products is more than $20 billion dollars in North America, Japan, and Europe



Some experts expect the American market to expand rapidly perhaps reaching $100 billion in the next five years!

Healthy Streams, Lakes, and Wetlands

MANAGING AGRICULTURAL LANDS

⇒ Methods for raising crops are always evolving in response to technological improvements and changing social values.

What is conservation tillage?

Conservation tillage are techniques of tilling and seeding that minimize soil disturbance and water loss by retaining crop residue on the ground. By leaving residue and the soil surface rough, water and wind erosion can be significantly reduced. It is estimated that conservation tillage techniques can reduce erosion potential by approximately 30% and run-off by 60%. Soil loss can be reduced by as much as 90% over traditional methods of tillage and seeding.

There are several conservation tillage practices. The most effective at reducing erosion is no-till or "direct seeding." Direct seeding is a one pass operation where the seed and fertilizer are placed into the standing straw of the previous crop without tillage. This practice is steadily gaining popularity throughout eastern Washington. Growers are finding that yields can be maintained or improved while reducing inputs, making it economically feasible. At the same time, soil organic matter is increased and soil erosion is dramatically reduced.

Integrated Pest Management

Integrated pest management, or IPM, is a program for controlling pests using natural predators, special crop combinations and rotations, and carefully targeted pesticide applications to control pests. IPM does not eliminate pests, but attempts to create a balance that makes economic sense. Profits are maximized because the small reduction in yield is off-set by reducing the use of high-cost chemicals. Take a look at the Washington State University IPM website: http://pep.wsu.edu/hortsense/

Best Management Practices

Best management practices, or BMPs, are farming techniques that reduce soil erosion and protect water quality and habitat. Contact your local conservation district office, a WSU cooperative extension office, or the Department of Ecology for more details.

Using Cover Crops

Cover crops are plants grown to cover the soil during idle periods. Cover crops can provide many benefits including protecting against soil erosion, supplying nutrients, replacing soil organic matter, and suppressing weeds. Call your conservation district for more info.

Protecting Ground Water

We pump groundwater for many purposes including municipal supplies, crop irrigation, and household use. Percolation of water from the land replenishes ground water. When water moves through surface layers it can carry excess nutrients, pesticides, oil, and other contaminants. By not applying excess manure, fertilizers, & pesticides and by not dumping waste oil on the ground you protect groundwater. For more info contact the Department of Ecology or your local WSU Coop Extension office.

"The significant problems we face cannot be solved at the same level of thinking we were at when we created them."
Albert Einstein

⇒ Riparian vegetation growing on and near banks slows flood water, holds soil, and reduces erosion.

Why do some streams seem to flood more often now than years ago?

Many people report that flooding occurs on the stream near their home more frequently than it did when they were younger. Given the many changes we have made to the land within the watershed, this can often be the case. We have altered the natural hydrology of streams and watersheds reducing the streams ability to handle snow melt and storm run-off.

Instead of the forests, grasses, wetlands, and soils collecting and storing rain and spring snow melt, this water is now more likely to flow across the land and immediately into the stream. Traditionally, much of this water would flow more gradually toward the stream, seep into the soil to become slow moving ground water, be taken up by plants, or evaporate back into the air.

Impervious surfaces such as roofs, roads, and parking lots as well as the removal of natural vegetation for farming, timber, and other human activities have changed run-off patterns. These changes have increased the potential for major flooding. In turn, this flooding may cause increased erosion and sedimentation in the stream.

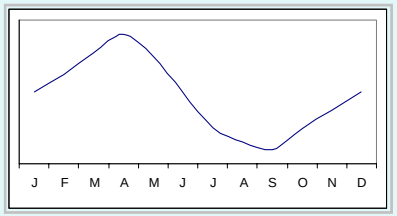
Much of the damage from increased stream flows can be prevented by maintaining healthy riparian areas. Refer to page 7 for info. about the benefits of riparian areas and how you might create a riparian buffer on your property.

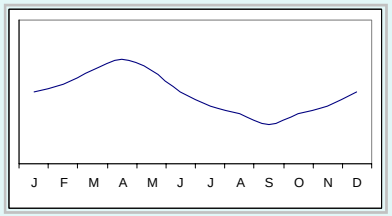
Ditch the Ditch!

Ditches deliver storm water and snow melt to streams very rapidly. While this may work well to divert run-off from your land, it can cause property damage and water quality problems downstream. Consider creating catch basins or preferably, natural wetlands to absorb the run-off on your farm. Call your conservation district or the Department of Ecology for more info.

Quiz!

The following graphs represent annual stream flow. Which represents historic flow and which suggests human influence?





ANSWER: The graph on the right represents historic annual flow and the graph on the left represents current flow. Notice that flow is now higher during the spring and lower during the summer. This results from a lack of vegetation in the riparian area and in the watershed as a whole. Higher spring run-off means increased flooding, erosion and property damage.

Healthy Streams, Lakes, and Wetlands

THE COMPONENTS OF CLEAN WATER

"When the well is dry, we know the worth of water."
Benjamin Franklin

⇒ **Many of the streams and lakes in Eastern Washington fail clean water standards for temperature, dissolved oxygen, and/or fecal coliform bacteria. Increases in water temperature and a decrease in dissolved oxygen create a distressing and potentially lethal environment for all aquatic life. Fecal coliform may be an indication of bacteria associated with human and animal waste that are harmful to people.**

Water Quality Problem	Cause	Solution
Temperature	Increased temperatures may be the result of several factors. Removing vegetation that would otherwise shade the stream, slowing of water in a stream by damming, or reducing total flow through diversions or withdrawals can all contribute to an increase in water temperature.	Plant riparian vegetation that provides shade to the stream. Reduce water withdrawals during the warm summer months. Look for opportunities in your community to create wetlands, parklands and storm water management systems that improve the ability for the watershed to capture and retain rainfall to increase summer flow rates.
Dissolved Oxygen	The amount of oxygen in a stream or lake is, in part, dependant on water temperature. The warmer the water the less capable it is of holding oxygen. Oxygen levels may also be reduced by increased bacterial and fungal activity that result from nutrient contamination. Sources of nutrient contamination include livestock, septic systems, and fertilizers.	Plant riparian vegetation that provides shade to the stream and catches nutrient pollutants in surface run-off. Cover manure and store it away from the water. Avoid placing yard and garden waste in the stream, lake or wetland or onto the bank. Do not fertilize near the water.
Fecal Coliform Bacteria	Fecal coliform may indicate the presence of potentially harmful bacteria. The major sources of fecal contamination include livestock and improperly functioning septic systems. Wildlife, such as geese, may exacerbate fecal coliform problems.	Plant riparian vegetation to capture and keep polluted run-off from reaching the water and fence livestock away from the riparian area. This will prevent cattle or horses from defecating near or in the water. Properly maintaining a septic system can also reduce fecal coliform contamination.

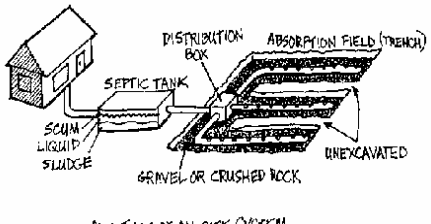
Quiz!

What water quality issues might the stream below be facing? What are the solutions?

ANSWER: This stream lacks a healthy riparian area. As a result, this stream may be facing problems with both temperature and dissolved oxygen. If the surrounding land is grazed by livestock the stream may also have fecal coliform bacteria problems. The solution is to create a riparian buffer by planting native vegetation and fencing livestock away from the stream. If a stream you know is in a similar condition, refer to the contact list on page 30 to reach those who can provide assistance.

Did you Know?

Maintaining a properly functioning septic system can go a long way to improving the water quality of lakes and streams.



ONE TYPE OF ON-SITE SYSTEM

Septic System Tips

- Check and pump tank regularly.
- Do not cover drain field with a non-permeable surface like plastic or cement.
- Do not flush material that will not easily decompose (hair, diapers, tampons, etc).
- Do not flush chemicals into the system.
- Balance water use throughout the week to avoid overloading the system.