

Purpose:

The purpose of the lesson is to help learners understand the importance of watersheds and ways in which water pollution occurs. After understanding the importance of the watersheds, they will recognize that wise usage of their local watershed is an example of stewardship.

Duration:

Two forty-five minute class periods

Objectives:

The learner will:

- write a definition for watershed. (the land area that drains into a particular lake, river, or ocean).
- draw a picture of their watershed.
- write a short story detailing at least one way their watershed could become polluted.
- list three reasons why it is important to protect their watershed.

Materials:

- Per group or individual:
scrap paper, water-based markers (blue, black, brown, & red), paper towel, spray water bottle
- Computer access (for teacher)
- For water pollution demonstration (optional) – see instructions for details:
two clear 2-Liter bottles, utility knife, drill, coffee filter, two inches of sand (six cm.) tape, water, red food coloring
- Maps of your local watershed (see Bibliographical References)
- Colored pencils for each student
- Overhead projector
- Markers
- Transparency of local watershed
- Drawing paper
- Examples of fish, plant life, or animals found in your watershed area
- Writing paper and pencils

- A recording of the song *Under the Sea*

Instructional Procedure(s):

Anticipatory Set:

While music from The Little Mermaid is playing (“Under the Sea”), ask learners to write five ways that they use water. They should use one self-sticking note for each response. After 3-5 minutes, discuss their answers and post various responses on a large sheet of paper. You may want to then create different categories for the various uses and give them labels (ex. Recreation, health, household, etc). They may place their self sticking note under the appropriate category. This should lead to a discussion of why water is so important to us.

Share the following information to further your discussion:

| Water Usage | Number of Gallons Used |
|----------------------------------|------------------------|
| Flush a toilet | 5 |
| Full bath in tub | 36-50 |
| Wash hands (with water running) | 2 |
| Brush teeth (with water running) | 2-10 |
| Dishwasher | 60 |
| Wash clothes | 50 |
| Drinking water | 2-12 |
| Cooking | 10 |
| Washing the car | 100 |

****On the average in the U.S., a person uses 100 gallons of water a day**

****A dairy cow must drink 3 gallons of water to produce 1 gallon of milk**

****An ear of corn needs 26 gallons of water to grow**

****A meal at a fast food restaurant can take 1,400 gallons of water to make (burger, fries, and drink)**

Information from the Saginaw Bay Watershed Middle School Curriculum Guide- lesson “Some Ways

We Use Water.”

- Ask learner where they think water comes from. (They may indicate a well or nearby lake.)

- Ask learners if they have ever heard of the term “watershed.” Provide a simple definition for a watershed – the land area that drains into a river, lake, or other body of water. **Teacher Note - boundaries are high points of land that slope downward toward the body of water. The Earth is made up of numerous watersheds, some containing more of the Earth’s (fresh) water than others.**

- Do the following activity to demonstrate what a watershed is. It can be done individually or in groups. Ask each group or individual to:
 - Crumple a piece of paper into a loose ball.
 - Partially open the paper, and place it on a desk. The paper should still be crumpled enough to have portions that resemble mountain ridges and valleys. Be sure there is a paper towel under the paper.
 - Using a blue water-based marker, have students mark streams or rivers on their papers, and also have them mark where they think the water will collect as it runs downhill. (This could represent a lake.)
 - Using a black water-based marker, have students outline the ridges that separate one stream or river from another.
 - Using brown water-based markers, have students draw exposed soil that could erode or wash away into the lake as the water flows through the watershed.
 - Using red water-based markers, have students draw in some pollutants that may be found in their watershed, such as soap from washing cars, pesticides from lawns, and animal waste from a nearby farm.
Keeping the model on the desks, have students spray (or you go around with a sprayer and spray) a very light mist of water over it.
 - Observe where water runs down and collects.

Questions to consider:

1. What do you think the paper represents?

2. What do you think the spray represents?
 3. Why does water flow down into the creases?
 4. What would you call the water that runs down in the creases
 5. And the water that collects in “pools”?
 6. What happened to the ink from the markers as the water flowed? Where did it end up?
 7. How is this a problem if the inks represent pollutants?”
- Ask learners to consider how this is similar to and/or different from local areas. Where in the community would there be the most pollutants?
 - Ask learners to identify where the rain, snow, etc. in their area drains. They may name local rivers streams, lakes, or bays, etc.
 - Provide them with a county or state map which indicates the streams and rivers flowing through their watershed. Indicate the lowest point in the watershed – the point to which all water flows - and have them trace the path they believe the water would flow to get there.
 - Use an overhead projector to demonstrate the process, frequently asking for student input. You could have the rivers already listed on the map.
 - Start by marking their town with a red dot, and then find the river nearest to their school or town and draw a blue line from there to the lowest point in the watershed - indicating any rivers it may flow through along the way. Be sure they include arrows showing the direction the water flows. Teacher Note: Maps can be found at the EPA Surf Your Watershed site <http://cfpub.epa.gov/surf/locate/index.cfm> background info on your watershed can be found at the Know Your Watershed site <http://www2.ctic.purdue.edu/kyw/>

Day Two

Anticipatory Set:

Think/Pair/Share: (Think about your answer, pair with a partner and discuss and then share with the

class.) Tell the learners: "Yesterday, we discovered what our watershed is. Think of at least one way you use our watershed and one way our watershed could be harmed."

- Look at yesterday's maps and continue the discussion of pollution.

- As you look at this map, discuss how the health of a watershed is determined by many factors, including the use of land throughout the watershed, and what pollutants each uses that may be put into the watershed.

- Discuss what types of land use are present within your community and your overall watershed. Ask: "Are there factories that produce heavy metals such as mercury and cadmium and organic chemicals like PCBs (Polychlorinated Biphenyls) and PAHs (Polyhydroxyalkanoates)? Are there farms that use nitrates from fertilizers and livestock waste? Are there small businesses using things that might pollute the watershed?" Teacher Note: You may need to do some advance research about your individual community, and share the information with the learners.

- Discuss how each of these uses could lead to pollution, not only by being directly put into the drainage area, but also indirectly through other streams, rivers, lakes, and even through groundwater. Define ground water as water that soaks into the ground.

- Discuss ways in which pollution could occur: run-off from crop and forest land, failing septic systems, construction sites, irrigation drainage systems, automobile exhaust, etc. How can waste materials like old motor oil, pesticides, and raw sewage (from overflowing septic tanks and sewage systems) get into the watershed?

- Do a water pollution demonstration at this point to show how easily contaminants can get into the water source.
 - Using two clear two liter bottles, create a model of the water table. Using a utility knife cut off the bottom two inches of a two liter bottle, recycle the top.
 - Drill six holes in the bottom of the remaining piece. This can be done with a low speed drill or a hot nail.

- Cut off the top two inches (five cm) of the other bottle. Insert the bottom of the first bottle into the second bottle with the holes pointing up.
 - Cut a coffee filter to fit into the second bottle. Cover the coffee filter and the bottle bottom with two inches (five cm) of sand. You may tape the top of the second bottle back on, but it is not necessary. You now have a working model of ground water and pollution.
 - To demonstrate how water pollution seeps into ground pour one cup of water on the sand. The water will filter through the sand and collect at the bottom of the bottle.
 - To demonstrate pollution, place five drops of red food coloring on the sand to simulate a pollutant. Slowly pour one cup of water on top of the food coloring. It will filter through the sand and appear in the bottom of the bottle. The ground water has been polluted.
- Generate a list of why it is important to protect the local watershed.
 - Explain to learners that it is important to know that the responsible use of watershed is an example of stewardship. We live on Mother Earth and we need to take care of her for ourselves and for those who come after us.

Assessment:

Draw a picture of your local watershed and include some of the fish, plant life, or animals that use it. (Provide pictures of flora and fauna from your watershed area and also include maps of the watershed. Maps can be located at <http://cfpub.epa.gov/surf/locate/index.cfm>)

Have learners write a short story detailing at least one way their watershed could become polluted, and three reasons why it is important to protect their watershed.

School/Home Connection:

- **Interactive Parent / Student Homework:**
The learners will write a letter to the family members at home, explaining their study of the watershed and asking them to help devise a plan to reduce water usage in their household. Learners should share information from their family's plan with the class. The entire class can

brainstorm a list of ideas for saving water, which can be sent home with the letters as a springboard for discussion. If families have other ideas, they can be shared with the class.

Extension:

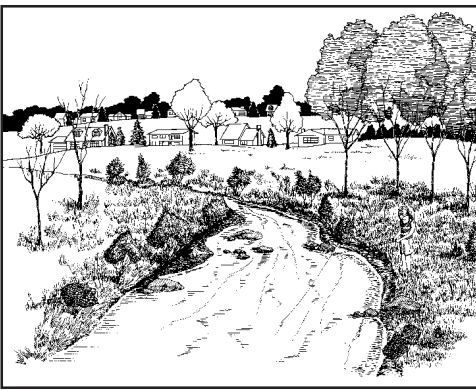
For additional activities go to <http://www.epa.gov/safewater/kids/gamesandactivities.html>

Bibliographical References:

- Bay Area Community Foundation and Others, Saginaw Bay Watershed Middle School Curriculum Guide
- The Little Mermaid: Original Motion Picture Soundtrack. Disney Studio, 1997. ASIN: B000001M3Z.
- Know Your Watershed
www.ctic.purdue.edu/KYW/brochures/GetToKnow.html
- Surf Your Watershed:
<http://www.epa.gov/surf/>

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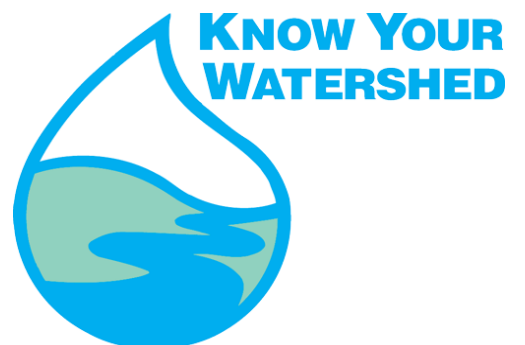


GETTING TO KNOW YOUR LOCAL WATERSHED

A GUIDE FOR WATERSHED PARTNERSHIPS



RECYCLED PAPER



GETTING TO KNOW YOUR LOCAL WATERSHED.

LET'S START BASIC:

WHAT IS A WATERSHED?

A watershed is an area of land that drains into a lake or river. As rainwater and melting snow run downhill, they carry sediment and other materials into our streams, lakes, wetlands* and ground water*.

WHY IS YOUR WATERSHED IMPORTANT?

We all live in a watershed. Watersheds are the places we call home, where we work and where we play. Everyone relies on water and other natural resources to exist. What you and others do on the land impacts the quality and quantity of water and our other natural resources.

Healthy watersheds are vital for a healthy environment and economy. Our watersheds provide water for drinking, irrigation and industry. Many people also enjoy lakes and streams for their beauty and for boating, fishing and swimming. Wildlife also need healthy watersheds for food and shelter.

Managing the water and other natural resources is an effective and efficient way to sustain the local economy and environmental health.

Scientists and leaders now recognize the best way to protect the vital natural resources is to understand and manage them on a watershed basis. Everything that is done in a watershed affects the watershed's system.

POLLUTANTS AND WATER QUALITY.

In the past, most water quality problems were traced to the most obvious cause ... point-source pollution.* This means the problem can be traced to a specific location such as a pipe or disposal site.

Technical and regulatory methods have been used to detect and control these problems. Much progress has been made in preventing further water quality problems from point sources.

However, water quality problems from nonpoint-source pollution* are more difficult to isolate and control. These sources are often hard to identify and difficult to measure. This type of pollution results from a wide variety of activities over a wide area.

Nonpoint-source pollutants are in the water that runs off crop or forest land. Others include failing septic systems,

**Wetlands*: Areas that are covered with water during at least part of the year. They have certain distinctive types of soils, plants, and drainage. They provide habitat for fish and wildlife, help filter pollutants, and control floods.

**Ground water*: Water that is trapped underground in an area of porous material. Most wells tap ground water. This water recharges slowly and is difficult to clean if it becomes contaminated.

**Point-source pollution*: This originates from the discharge of pollutants from a single, readily identifiable source such as an industrial or sewage discharge pipe.

**Nonpoint-source pollution*: This occurs from widely dispersed land areas and is carried in runoff water from a field, forest, or urban area into a stream, lake, or groundwater.



parking lots, construction sites, irrigation systems and drainage systems. It can even result from automobile exhaust getting in the atmosphere and falling back to earth in the rain.

A partnership among all who live, work or play in the watershed can help identify concerns, educate those involved and

encourage them to take action. Watershed management plans focus on prevention of pollution. This is easier and cheaper than trying to cleanup a watershed after the fact.

Understanding your watershed is the first step in protecting the water and other natural resources.



UNDERSTANDING YOUR WATERSHED.

The watershed where you live is a dynamic and unique place. It is a complex web of natural resources — soil, water, air, plants and animals. Yet, everyday activities can impact these resources, ultimately impacting our well-being and economic livelihood.

To DO...

- Determine size and boundaries
- Show terrain
- Overlay soils
- Identify and map critical areas
- Map land uses and identify trends
- Identify uses of natural resources
- Determine employment trends
- Study economic trends
- List stakeholders
- Define attitude trends

FEATURES.

Your watershed has many features that make it unique.

Size.

One important feature is the size of the watershed. Some (like the Mississippi River basin) are very large and include many smaller river basins or watersheds. These smaller watersheds can be subdivided into even smaller areas. The ideal size for a voluntary partnership to work with is 50,000 acres or less. At this size your group will likely see water quality improvements sooner than in larger areas. Of course, in regions of the United States where ranchers, foresters and others manage large tracts of land, you may be working with a much larger watershed.

Boundary.

Another important feature is the geographic boundary of the watershed. The boundary is formed by a ridge or high area from which water drains either toward or away from your watershed.

Terrain.

The topography (terrain) is another important feature. How flat or steep the

land is impacts how fast water drains. The faster the drainage, the more potential for flooding and increased soil erosion.

Soil type.

Soil type is also important. For example, sandy soils allow the ground to soak up water faster. This reduces surface runoff, but can affect ground water. Clay soils, on the other hand, are tighter and do not allow as much water infiltration. This can lead to more runoff and soil erosion.

Other features.

Whether your watershed drains into a stream or lake, the area nearest the water greatly affects water quality. This is why filter/buffer strips*, wildlife habitat*, wetlands and riparian areas* are important aspects of your watershed.

Both filter/buffer strips and wetlands utilize nutrients and tie up sediment to help improve water quality. Wetlands also act as natural sponges to absorb peak flows of water and reduce flooding. Many fish and wildlife species rely on wetlands for rearing their young, and for food and shelter.

USES.

To fully understand your watershed, you'll also need to consider how it is used.

Land uses and trends.

All activities within the watershed have an impact on its natural resources. Cities, homes, roads and factories modify the watershed and affect its natural resources. Farming, recreation, mining, construction

**Filter/buffer strips*: Grassy areas located at the borders of fields. They are particularly important on the edge of lakes or streams since they remove sediment and other types of pollution as well as provide a home for wildlife.

**Wildlife habitat*: The area in which animals live. Includes woodland, cropland, rangeland, wetlands etc.

**Riparian area*: Land and vegetation adjacent or near the banks of water (stream, river, bayou, lake, etc.)

**Stakeholders*: Any individuals or groups who have an interest in or will in some way be affected by your watershed management efforts. They include those who will benefit from improved water quality, as well as those who will pay for land management or other changes. Farmers, environmental organizations, government agencies, businesses, developers, and recreational users are examples of stakeholders.

and forestry can also significantly affect a watershed.

One trend you may want to note is whether or not more homes are being built in rural areas. This can lead to conflicts over watershed issues such as livestock odor, pesticide use or septic systems. It can also lead to significant changes in land use which can affect water quality and property values.

Natural resource uses.

You may also find natural resources are used in many different ways in your watershed.

Water can be used by municipalities and local industries. Farms also rely on water for irrigation and livestock. Many people enjoy water for recreational uses like fishing, swimming and boating. So the water quality and quantity are important to the watershed's stakeholders.*

Air quality, wildlife, soil quality and the other natural resources can also be important aspects of watershed management.

Stakeholder uses.

To fully understand your watershed you'll also need to understand how it's used by the people who live, work and play there. These are the stakeholders who need to be involved in the planning and implementing process. For this reason, they'll need to be a part of the watershed partnership.

WATERSHED PARTNERS

- ◆ Landowners
- ◆ Homeowners
- ◆ Local businesses
- ◆ Developers
- ◆ Recreational users
- ◆ Government agencies
- ◆ Elected officials
- ◆ Media
- ◆ Teachers
- ◆ Civic groups
- ◆ Conservation groups
- ◆ Environmentalists
- ◆ Church groups
- ◆ Youth groups
- ◆ Others _____

SOCIAL TRENDS.

Social trends also influence watershed management efforts.

Economic trends.

A sound local economy is also important to everyone with a stake in the watershed. That's why it's important to consider the local economy and ways to sustain or improve it through successful watershed management. Ask your group how the natural resources within the watershed can affect the local economy.

Employment trends.

These trends can be critical. For instance, are people living in one watershed and working in a different one? Are jobs and family incomes dependent on the watershed? Do people understand how various jobs depend on it? Is employment stable? Are jobs transient?

Attitude trends.

Most people rely on their beliefs and experiences, rather than on scientific data, to shape their attitudes. This means that when their perceptions don't match reality, people react to their perceptions, not reality.

Although experts disagree, most people perceive there is more risk today than in the past. In addition, more people are striving for a risk-free world. These people often resist making trade-offs, particularly those between the economy and the environment.

Many people are more concerned about some perceived risks than others (regardless of the potential). For instance, involuntary risks (like secondhand smoke) often bring a higher level of concern than voluntary risks (like smoking).

"Most people rely on their beliefs and experiences, rather than on scientific data, to shape their attitudes."

SUCCESSFUL WATERSHED MANAGEMENT.

A study of watershed management efforts highlights some of the keys to successful watershed management. They are:

- ◆ Include all stakeholders in the local partnership
- ◆ Use sound technical information
- ◆ Set clear objectives and priorities
- ◆ Select effective management alternatives
- ◆ Develop innovative educational and assistance programs
- ◆ Use strong local leadership
- ◆ Use a systems approach that integrates all concerns and challenges.

when you ask.

By using a partnership approach you'll find greater local initiative, responsiveness, and control. Partnerships can build a climate of cooperation and focus on solutions. A plan developed by a local partnership is often more effective and efficient than other methods such as broad-sweeping regulations. The result is the improved environmental and economic health of your watershed.

WATERSHED PARTNERS.

Effective watershed management planning relies on an effective partnership that includes representatives of all stakeholders and works cooperatively toward a common goal.

As you look around your community, you'll find many people who will want to be involved in developing a plan to protect your watershed. The guide *Building Local Partnerships* describes how partners can contribute and outlines strategies for building local watershed partnerships.

Successful partnerships start with partners understanding each others' current beliefs about the issues. What people believe to be real is real in its consequences. Understanding each others' beliefs will help your efforts.

Conflicts among partners can also influence the effectiveness and fairness of the management plan. The *Managing Conflict* guide describes how you can effectively manage conflicts and work toward consensus.

THE WATERSHED PLANNING PROCESS.

GET TO KNOW YOUR WATERSHED

- Determine size, boundaries, soils, terrain and other features
- Understand the people, interests, and institutions
- Determine how the watershed is used

BUILD LOCAL PARTNERSHIPS

- Identify and contact partners/stakeholders
- Divide work and responsibility
- Identify and manage conflicts
- Obtain local funding and other resources

DETERMINE PRIORITIES FOR ACTION

- Assemble maps and data
- Identify and document problems
- Determine goals and objectives
- Evaluate water quality
- Assess land use
- Select critical areas for attention

CONDUCT EDUCATIONAL PROGRAMS

- Identify and understand target audiences
- Develop specific messages
- Combine communication approaches, channels and media

PROVIDE LANDOWNERS WITH ASSISTANCE

- Target technical assistance
- Provide financial assistance
- Build social support and recognition

ENSURE IMPLEMENTATION AND FOLLOW-UP

- Continue with monitoring and evaluation
- Provide continued local funding
- Continue to inform and involve everyone

YOU'RE NOT ALONE.

The good news is that you are not alone in your concern for watershed protection.

Many partnerships have been formed and are successfully managing their watersheds. In your area, you'll find many partners ready to help

SOURCES OF INFORMATION.

To start down the road toward an effective local watershed partnership, you may want to read some of these other guides available through the Conservation Technology Information Center. To order, please call 765-494-9555. A \$2.00 fee is charged to cover postage and handling.

Building Local Partnerships

Leading & Communicating

Managing Conflict

Putting Together a Watershed Management Plan

Reflecting on Lakes

Groundwater & Surface Water: Understanding the Interaction

State and Regional Watershed Contacts

The author acknowledges the following sources of information that were used in developing this guide. You may also find these publications helpful. There may be fees for these publications.

Clean Water in Your Watershed: A Citizen's Guide to Watershed Protection.

Terrene Institute Tel: 202-833-8317

Evaluation of the Experimental Rural Clean Water Program — Project Report.

North Carolina State University. Tel: 919-515-3723.

Managing Nonpoint Pollution: An Action Plan for Puget Sound Watersheds.

Puget Sound Water Quality Authority Tel: 206-464-7320

Public Perception and Communication of Risk.

North Carolina Cooperative Extension Service Tel: 919-515-1676

ABOUT THIS GUIDE....

This guide is one of a series for people who want to organize a local partnership to protect their watershed. This series will not solve all your problems. They were designed to provide guidance for going through the process of building a voluntary partnership, developing a watershed management plan and implementing that plan. Because the characteristics of each watershed are unique; you may wish to select and use the portions of this guide that are applicable to your particular situation.

Although the series is written for watershed-based planning areas, the ideas and process can be used for developing other types of plans (such as wildlife areas) to match the concerns of the partnership. Regardless of the area, remember a long-term, integrated perspective—based on a systematic, scientific assessment—can be used to address more than one concern at a time.

SPECIAL THANKS...

Special thanks to Dr. Thomas J. Hoban, Associate Professor, North Carolina State University, who dedicated long hours to writing this guide. Without his help this guide would not be possible.

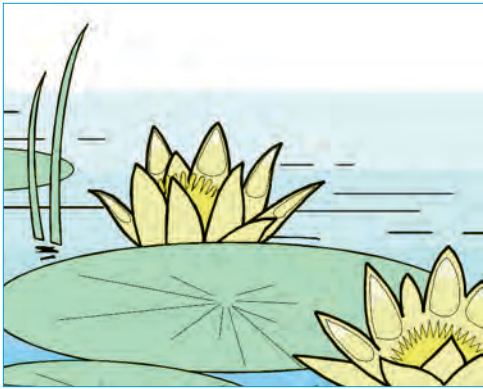
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The Know Your Watershed campaign is coordinated by the Conservation Technology Information Center (CTIC), a nonprofit public/private partnership dedicated to the advancement of environmentally beneficial and economically viable natural resource systems. It provides information and data about agricultural and natural resource management systems, practices and technologies. The center was established in 1982 under the charter of the National Association of Conservation Districts.

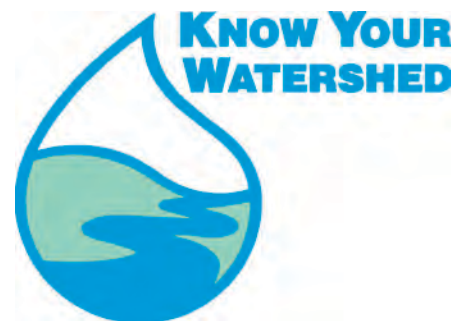


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WETLANDS: A KEY LINK IN WATERSHED MANAGEMENT

A GUIDE FOR WATERSHED PARTNERSHIPS



HOW YOUR WATERSHED CAN BENEFIT WITH WETLANDS.

Wetlands are a key link in watershed management. The role that they play in our watersheds is critical to protecting water quality and moderating water quantity.

Wetland habitat serves as home for many plants and animals. Even the national—and in many areas the local—economy has a significant connection to wetlands.

Essentially wetlands are the transition between dry land and water (streams, rivers, lakes, and coastlines), wetlands take many forms including the familiar marshes, swamps and bogs. Yet, not all wetlands are “wet” year round. These “drier end” wetlands also perform significant wetland functions. Yet, these are often the target for many uses including agricultural and urban/suburban uses.

WHY CONSIDER WETLANDS IN YOUR WATERSHED?

Without wetlands, we can expect an increase in flooding, decrease of animal, plant and bird species, increase in

erosion, decrease in water quality, and lost revenue.

Vegetated riparian wetlands in agricultural areas have proven to remove high percentages of phosphorus and nitrogen from runoff water. Without these wetlands,

increased nutrient loading to rivers, streams and lakes could result in algal blooms and over-abundant aquatic plant growth. When these algae and plants die, oxygen in the water is used during the decomposition process. This can result in oxygen deprivation which may lead to fish kills.

When agriculture and development practices impact wetlands, the water storage and flood control capacity of the land decreases, increasing the likelihood of costly flood damage downstream.

WETLAND BENEFITS.

Wetlands are valuable systems that provide many benefits to your watershed including:

Reduced water treatment costs

Wetlands can help improve water quality by removing or retaining nutrients, organics, and sediment carried by runoff. The flow of water slows as it enters a wetland, which causes sediment in the water to settle out. Many chemicals — fertilizers, human and household wastes, toxic compounds — are tied to sediment and trapped in wetlands. Plants and the biological processes present in a wetland breakdown and convert these pollutants into less harmful substances. By restoring and utilizing wetland functions, we can reduce the costs of constructing, operating and maintaining drinking water treatment plants.

Increased groundwater availability

Wetlands “soak up” water during and after a rainy spell. While wetlands “hold” most of the water, some water makes its way to the groundwater supply. Thus wetlands often fill the vital job of recharging groundwater so it’s available for use at a later date.

7 WAYS YOUR WATERSHED CAN BENEFIT

1. Improve water quality by breaking down, removing, using or retaining nutrients, organic waste and sediment carried to the wetland with runoff from the watershed.
2. Reduce severity of floods downstream by retaining water and releasing it during drier periods.
3. Protect stream banks and shore lines from erosion.
4. Recharge groundwater, potentially reducing water shortages during dry spells.
5. Provide food and other products—such as commercial fish and shellfish—for human use.
6. Provide fish and wildlife—including numerous rare and endangered species—food habitat, breeding grounds, and resting areas.
7. Increase opportunities for recreation—bird watching, waterfowl hunting, photography—and outdoor education.

Reduced flood damage

Another way wetlands are valuable to humans is their influence on the flow and quality of water. Wetlands often act like giant sponges, soaking up water that runs off the land. This feature can help slow floodwaters, lower flood heights and reduce shoreline and stream bank erosion. Preserving natural wetlands can reduce or eliminate the need for expensive flood control structures.

Food and related industries

The vast majority of our nation's fishing and shellfishing industries harvest wetland-dependent species. This catch is valued at \$15 billion a year. Commercial fishermen harvested nearly ten billion pounds of fish in 1996.

EPA estimates suggest that 98% of the Gulf of Mexico fishing industry harvest comes from fish and shellfish that are dependent on in-shore wetlands. The US Department of Commerce reports that 438 million pounds of brown, white and pink shrimp were harvested in 1995 and 1996 (combined). This was worth more than \$838 million dockside.

Other wetland-reliant products include cranberries, blueberries, wild rice, medicines, pelts and timber.

Diverse plants & animals

Wetlands contribute to diversity by providing food and habitat that supports a wide variety of plants and animals. Detritus—enriched organic material formed by the decay of plant and animal material in water—is food for insects, shellfish and forage fish. In turn, fish (such as striped bass and bluefish), mammals, reptiles and amphibians feed off of the insects and forage fish. The growth of wetland plants and algae is also nourished by nutrients the provided in the detritus.

Wetland plants provide food and shelter for fish and animals. Wetland-dependent mammals include: muskrat, beaver, moose, raccoon, bobcat, swamp rabbit, and white-tailed deer. Bald eagles, ospreys, hawks, egrets, herons and kingfishers are just a few of the birds that thrive in wetlands. The high biological productivity of wetlands makes them vital ecosystems not only to the plants and animals that directly depend on them for food and shelter, but to humans as well.

Recreation

Revenue is also generated from waterfowl hunters in search of wetland-dependent birds. The 1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation reported 3.1 million adult Americans hunt migratory birds. This includes hunting for geese, ducks, doves, and other game birds. They spend about \$1.3 billion on travel, equipment and other associated expenses.

Another recreational outlet is trapping. An EPA report puts the nation's harvest of muskrat pelts worth over \$70 million annually. This, of course, does not include the value of beaver, mink or reptiles such as alligators.

The natural beauty and solitude found in wetland areas provides opportunities for bird watching, wildlife photography, painters, hikers and simply relaxing while appreciating the wonders of nature. For many people, wetlands are a vital part of their lives providing a peaceful place to reflect while escaping from the everyday stress and strains.



UNDERSTANDING WETLANDS.

HOW WETLANDS FORM.

The formation and role of a wetland is driven by its location in the watershed, the presence of water during significant periods, soil quality and, ultimately, plants and animals. In fact, soils and plants act as “identifiers” for each wetland.

As sediment is deposited along river corridors, opportunistic plants and animals seek out the new habitat and flourish. As these areas mature, the soils change which impact the variety of plant and animal species. Thus new species may colonize. This process is called succession.

At the mouths of rivers (where a river meets the ocean) sediments are often deposited forming alluvial plains. Marsh grasses find these areas desirable. In addition, other plants and many animals are then attracted to these deltas.

Other wetlands are formed by aging lakes that fill-in with sediments. This area supports shrubs and trees adaptable to life in a wet environment.

TYPES OF WETLANDS.

The diversity of wetland habitat makes the identification and classification of wetlands challenging. Wetlands are identified and classified according to the types of plants, soils, hydrology or patterns of water, and fish and/or wildlife communities present.

Swamps, marshes and bogs are easily recognizable types of wetlands. Other types of wetlands may be less well known because the amount of water present will vary seasonally, with specific rainfall events or with snowmelt.

The plants that live in wetlands are particularly adapted to soils that are saturated with water and, at times, contain little oxygen. These plants, such as marsh grasses, are called hydrophytes (literally water plants) and the soils where they thrive are referred to as “hydric soils.” Some basic types of wetlands are:

Riverine Bottomlands/Hardwood Forests: Found along the river corridors, these provide water storage during times of peak precipitation, reducing flood water and then slowly releasing the stored water. Silver maple and cottonwood are common in northern regions. Bald cypress and tupelo dominate southern regions.

Northern Bogs: Saturated areas with mossy carpets and shrubs, grasses and stunted spruce trees. These cool wetland areas produce wild cranberries, harvested in autumn. Bogs effect the climate by storing carbon dioxide in decaying plant materials (peat), thereby reducing its release into the air.

Cypress Swamps: Also known as domes, these are characterized by tall cypress trees growing in the center of the swamp. The trees filter pollutants like nitrates and phosphates that reach the swamp via water runoff.

Coastal Marshes: Influenced by the tides, these highly productive ecosystems support the majority of fish and shellfish harvested. These wetlands provide feeding, spawning and nursing areas for a multitude of invertebrates, birds and fish.

Prairie Potholes: Formed by receding glaciers that produced shallow depressions which seasonally fill with water, these are a favorite breeding and feeding area for North American ducks. These wetlands also play an important role in recharging freshwater aquifers.

SUSTAINABLE WETLANDS DEPEND ON...

- ◆ Understanding how the parts integrate into the whole system.
- ◆ Treating the root of existing problems, not just manifestations.
- ◆ Understanding nature’s boundaries.
- ◆ Learning to live in balance with natural systems.
- ◆ You!!

RUNOFF THREATS.

While wetlands can reduce the impact of some pollutants, too much pollution will negatively impact the wetland. Thus, the quality of a wetland is dependent on the water flowing into them ... and the pollutants that the water carries with it from activities in the watershed.

Runoff, originating with rain fall or snow melt, that contains pollutants—oil, grease, fertilizers or pesticides—is called nonpoint source pollution. In addition to the potential of runoff polluting wetlands, it also can pollute other surface waters such as lakes, rivers, and oceans. Eventually it can reach groundwater, which is often used for drinking water.

The best way to protect the quality of wetlands is for every person in the watershed to prevent potential pollutants from being carried by runoff or infiltration.

OTHER WETLAND THREATS.

The loss of the values provided by wetlands impacts watershed residents, plants, and animals. Filling in one acre of wetland

may not seem devastating. Yet, the cumulative affect threatens the value of remaining wetlands and impacts the entire watershed...residents, plants, animals, water quality and quantity. Already more than half the wetlands in the lower 48 states have been destroyed. Some of the causes are listed below:

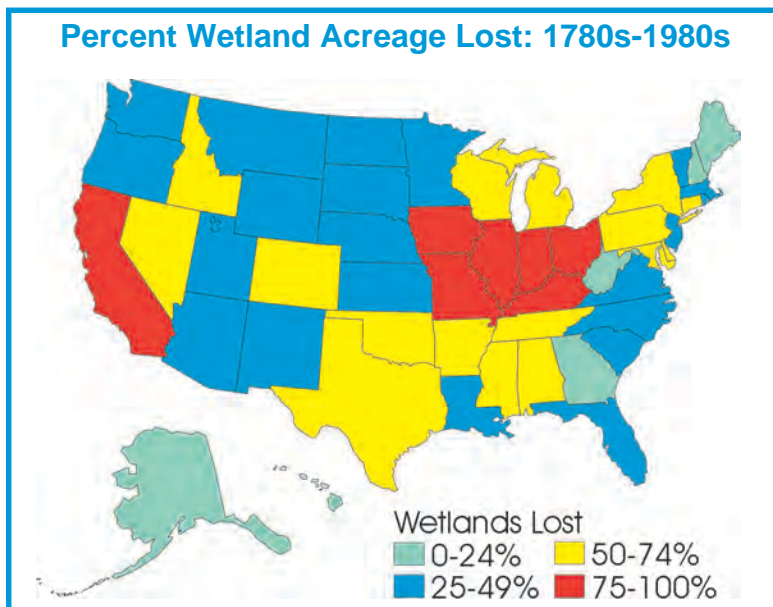
Naturally occurring events—hurricanes, droughts, erosion, drops in groundwater levels—destroyed or severely threatened some wetlands.

Agriculture production is responsible for many drained wetlands.

Marinas, housing, roads and other urban structures were built on filled wetlands.

Dams and dredging nearly always affect the flow of rivers and lakes, destroying some wetlands and threatening others.

There are numerous other threats, however those listed above are the most common.



Twenty-two states have lost at least 50% of their original wetlands since the 1780s. Seven states—Indiana, Illinois, Missouri, Kentucky, Iowa, California and Ohio—have lost over 80%. Since the 1970s states with the most losses are Louisiana, Mississippi, Arkansas, Florida, South Carolina and North Carolina. Wetlands drained for agricultural purposes has been reduced while development continues to account for a larger percent.

Source Mitch and Gosselink. Wetlands, 2nd Edition, Van Nostrand Reinhold, 1993

MANAGING & RESTORING WETLANDS.

Preservation and protection is the most economical way to “manage” wetlands. Of course, this isn’t an option for the millions of altered wetland acres. In these areas, restoration is often the best solution to meet a watershed partnership’s goals.

10 GOOD REASONS TO RESTORE WETLANDS.

1. Re-establish native vegetation...a sustainable food source for wildlife.
2. Provide breeding grounds for waterfowl.
3. Connect wildlife corridors for ease of movement and healthy interactions.
4. Reduce downstream flooding.
5. Reduce streambank and shoreline erosion.
6. Protect fish and shellfish harvests.
7. Restore natural biological diversity.
8. Improve water quality.
9. Enhance threatened and endangered species.
10. Provide recreational and educational sites.

WHAT IS RESTORATION?

“Restoration” is the process of returning the wetland system to an approximation of its predisturbed condition.

This does not mean returning all altered wetlands to their unaltered state. It simply means replacing the lost values with newly created or “restored” wetlands. In other words, the goal is to restore the value rather than restore a particular site with a self-sustaining system that requires little human “management.”

Considerable advances have been made in large-scale wetland restoration. Yet, restoring wetlands to their original condition—replicating the complex and diverse physical, chemical, and biological interactions—hasn’t been well-documented.

THE RESTORATION GOAL.

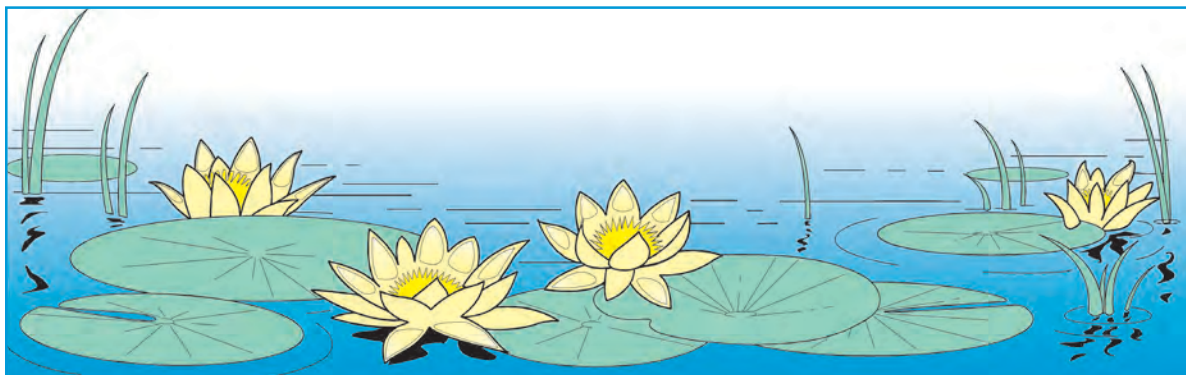
The major challenge of restoration is the replacement of the structural and functional aspects of a naturally formed wetland. A “restored” wetland should look naturally formed. It should also support values—the array of biological, chemical and physical processes and interactions—found in the naturally created wetland.

The intensity of restoration techniques will depend on the level of disturbance to the values of the original wetland.

Restore water flow. The first step in the process is to restore the hydrology (flow of water) to support conditions favorable for the return of wetland plant communities. The approach used is dependent on what caused the initial disturbance.

- ◆ Altered flow:
 - Re-establish flow of a river back into a wetland area.
 - Remove dams or other structures that cause flooding of a wetland.
- ◆ Filled or dredged:
 - Re-establish original landscape.

Re-establish plants. The next step is planting appropriate native plants. If the soil has been contaminated by toxic chemicals, it will likely need to be removed. If successful, a diverse and balanced plant community will establish itself. Then wildlife will colonize.



WHAT YOU CAN DO.

IF YOU OWN A WETLAND...

Before clearing, draining or manipulating wetland areas—including areas which you're unsure about—contact one of these government agencies. If the wetland area is used as cropland, contact your local USDA Natural Resources Conservation Service (NRCS) office. In non-cropland areas, check with your U.S. Army Corps of Engineers district. (Look under U.S. Government in the Yellow Pages.)

HOW TO GET STARTED.

Successful restoration of wetlands is possible by implementing comprehensive conservation plans along with watershed protection strategies developed by a partnership of public and private sectors. In addition to NRCS and the Army Corps of Engineers, the U.S. Environmental Protection Agency and the U.S. Dept. of Interior are also involved in protecting and restoring wetlands. Other agencies that often participate include state, tribal, regional, and local government agencies.

Government and watershed residents must work together to determine how wetlands fit into their watershed, the values (roles) of wetlands, and how to best protect and restore these values. Then each public and private partner needs to do their part in making it happen.

SOME ACTIVITIES.*

- ❑ Coordinate wetland protection plans at all levels: local, state, regional, and federal.
- ❑ Build nest structures to increase nesting of Canadian geese, mallards, wood ducks, and other birds.
- ❑ Plant food plots to increase survival of pheasants and other wildlife.
- ❑ Plant native wildflowers to add color and habitat for songbirds, mammals, butterflies, and other insects.
- ❑ “Adopt A Wetland.” Call 800-832-7828.
- ❑ Help local schools adopt a wetland, maintain it and learn about it.

*Source: League of Women Voters.

FOR MORE INFORMATION...

Wetlands Information Hotline
Contractor operated for EPA.
Tel: 800-832-7828 between
9:00 a.m. and 5:00 p.m. ET
Email: wetlands-hotline
@epamail.epa.gov

***America's Wetlands: Our Vital
Link Between Land and Water***
Tel: 800-832-7828
Email: wetlands-hotline
@epamail.epa.gov

***Better Wetlands: More than a
dozen ideas to improve restored
wetlands for wildlife and
personal enjoyment.***
Tel: 765-494-9555
Email: kyw@ctic.purdue.edu

ABOUT THIS GUIDE...

Because the characteristics of each watershed are unique; you may wish to select and use the portions of this guide that are applicable to your particular situation.

This guide is one of a series of guides for people who want to organize a local partnership to protect their watershed. The series is designed to provide guidance for going through the process of building a voluntary partnership, developing a watershed management plan and implementing that plan.

The series of guides will not solve all your problems and will not replace the collective

minds of partners who, together, represent of those with a stake in your watershed and the technical advice available through local government agencies.

Although this series is written for watershed-based planning, the ideas and process can be used for developing other types of plans (such as wildlife areas) to match the concerns of the partnership. Regardless of the area, remember a long-term, integrated perspective — based on a systematic, scientific assessment — can be used to address more than one concern at a time.

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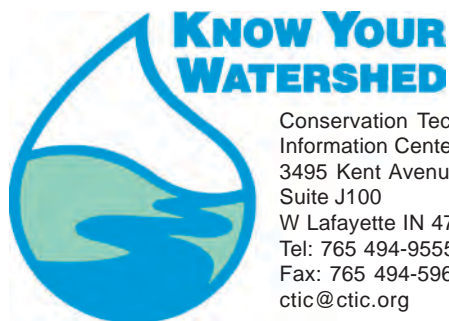
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The Know Your Watershed campaign is coordinated by the Conservation Technology Information Center (CTIC), a nonprofit public/private partnership dedicated to the advancement of environmentally beneficial and economically viable natural resource systems. It provides information and data about agricultural and natural resource management systems, practices and technologies. The center was established in 1982 under the charter of the National Association of Conservation Districts.



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