

Changing Landscapes

Land use planning curriculum for natural resource professionals

- P** rinciples, people, and policies
- L** and planning and pressures
- A** pproaches
- N** atural resource planning tools

N6: Planning Tools to Protect Water Quality



Protecting water quality is important because life depends on clean water to survive. (Photo: Joseph O'Brien, U.S. Forest Service)

Overview

As stormwater runoff increases, many communities face flooding, damage to infrastructure, degraded aquatic and terrestrial ecosystems, and greater numbers of invasive species. This factsheet provides an overview of the threats to water resources, water regulations, and the importance of healthy ecosystems—especially forest systems—to water quality. It also provides examples of planning tools that can help mitigate the threats and protect those natural resources that support water quality.

Importance of Protecting Water Quality

Protecting water quality is important because life depends on clean water to survive. The ability of freshwater systems to efficiently recycle and remain healthy determines the usability of water for people (Naiman and others 1995). The average American most likely thinks of water quality in terms of safe drinking water and “fishable” and “swimmable” streams and lakes. However, the public is increasingly aware of the impacts that changes in land use have on water resources.

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Land development decisions directly impact water quality because these decisions change the natural systems that support water systems. Development impacts are often the greatest on small headwater streams that make up 80 percent of the Nation’s stream network with 75 percent of these being first- and second-order streams.

In the past, water quantity (flooding) issues were often solved without regard for water quality. Today it is essential to consider both water quantity and quality, in part to be able to obtain necessary permits. Traditional stormwater practices, such as using pipes and concrete flumes, focus on solving water quantity issues on a given site by removing water as quickly as possible. Unfortunately, this strategy often has negative effects downstream,



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October 2014

<http://www.na.fs.fed.us>

NA-TP-01-14 N6

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including flash flooding in receiving waters and decreased water quality because of the runoff of oil and other contaminants.

Current trends in stormwater management are designed to solve water quantity issues on a given site while also improving water quality. These trends are commonly referred to as Stormwater Best Management Practices (BMPs). They include protecting existing streams and water bodies, constructing “green” infrastructure, and monitoring water quality.

Water Quality Protection Regulations

The United States has a long history of legislation to protect and improve water quality. The laws listed here have shaped water protection regulation and led to the water protection practices in place today.



Traditional stormwater practices often have negative effects downstream, including flash flooding and decreased water quality. (Photo: FEMA/David Fine)

Drinking Water Legislation

Almost any legislation directed at water has an impact on drinking water. The 1996 amendments to the Safe Drinking Water Act gave States greater flexibility and responsibility for administering drinking water programs.

Clean Water Act (1972)

The Clean Water Act is the primary water quality law today. It defines EPA’s responsibilities for restoring and maintaining the chemical, physical, and biological integrity of the waters of the United States so that they can support “the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water.” States carry out this law through a variety of programs designed to prevent point and nonpoint pollution sources, help with publicly owned water treatment works, and maintain the integrity of wetlands.

Secure Water Act (2009)

This act provides authority for Federal water and science agencies to work with State and local water managers to plan for climate change and other threats to United States water supplies as well as take action to secure water resources for the communities, economies, and ecosystems they support.

Water Quality Act (1987)

This act requires a National Pollutant Discharge Elimination System permit for sources of nonpoint pollution such as construction sites and industrial nonpoint discharges.

Safe Drinking Water Act (1974)

This act defines the Environmental Protection Agency’s responsibility for setting national health-based standards for drinking water quality and overseeing the States, localities, and private water suppliers who adhere to those standards.



My Clean Water Act

The My Clean Water Act national program was created in 2012 to celebrate the 40-year anniversary of the signing of the Clean Water Act. (Logo: My Clean Water Act Program)

Weeks Act (1911)

This act authorized the Federal purchase of forest lands in the headwaters of navigable streams, established the National Forest Reservation Commission, gave consent for States to enter into compacts to conserve forests and water supplies, and authorized Federal matching funds for approved State agencies to protect forested watersheds or navigable streams.

Forest Service Organic Administration Act (1897)

Although this law was established primarily for forest improvement and protection, this law explicitly states doing so "...to secure favorable conditions of water flows."

Planning Tools for Watershed Management

There are a variety of tools to help planners protect valuable water resources during the planning process.

Land Use Plan

Municipal governments can use a land use plan to guide development proposals in their communities. Planners evaluate available data regarding land and water sensitivity, economic conditions, and social environment to develop a land use plan. This tool's effectiveness varies among communities. Plans are updated routinely, typically every 5 to 10 years.

Natural Resource Inventory

This tool is a series of map overlays that delineate sensitive natural resource areas and less sensitive areas. It is typically developed by natural resource professionals using aerial photography analyses, remote sensing data, and field reconnaissance. This tool gives municipal decisionmakers information that helps them develop land use plans and review development plans under a simple premise: you need to know what you have before you can work to save it.

You need to know what you have before you can work to save it.

Aquatic buffers in the form of healthy forests provide critical protection for water resources while also providing habitats for wildlife and recreational opportunities for people.



The Weeks Act authorized Federal purchase of forest lands in the headwaters of navigable streams.



Land Conservation

State and local governments frequently manage conservation areas to protect their natural resources and for the recreational amenities they provide. Some municipalities require a conservation easement or parkland dedication from developers to set aside permanent open space as part of their development permit requirements. The Natural Resources Conservation Service manages land conservation incentive programs at the county level. Many States and municipalities also offer voluntary landowner assistance programs that promote natural resource conservation on private land.



Some municipalities require developers to set aside permanent open space as part of their development.

Groundwater Protection Requirements

Most of the environmental laws in place to protect natural resources also have the dual benefit of protecting groundwater from contamination. For example, the Resource Conservation and Recovery Act, which regulates the storage, transportation, and disposal of solid and hazardous wastes, also helps prevent contaminants from leaching into the groundwater from landfills, underground storage tanks, and other sources.

A provision within the Safe Drinking Water Act established the Wellhead Protection Program. This law requires that States develop a comprehensive program to protect public water supply wells from contaminants that could be harmful to human health. This is achieved partially through protecting all or part of the land surrounding a well from which groundwater is drawn.

Nonstormwater Discharge Regulations

Under the National Pollutant Discharge Elimination System (NPDES) program authorized under the Clean Water Act, all facilities that discharge pollutants from any point source into waters of the United States are required to obtain a permit. This includes introducing nonstormwater into storm drainage systems, such as wash water from laundry facilities.

Under Section 303 (d) of the Clean Water Act, communities are required to develop lists of impaired waters, establish priority rankings for these waters, and develop Total Maximum Daily Loads.

Watershed Protection and Restoration

Many recent efforts towards managing urban forests for watershed health have resulted in a variety of highly useful tools and training materials. The Center for Watershed Protection has developed an approach to watershed management that considers all stages in the land development process from land use planning through land development and post occupancy.

Watershed Stewardship

There are many nonprofit stewardship groups that work to monitor and improve the quality of streams and water bodies in their watershed. These organizations frequently form partnerships with local government to advance water quality education and cleanup efforts in their communities.



Many nonprofit groups work to improve the quality of streams in their watershed.

Aquatic Buffers

Aquatic buffers help municipalities restrict or prohibit development within a designated zone around wetlands, streams, and water bodies. In addition to protecting aquatic resources from disturbance, aquatic buffers (especially healthy forest buffers) provide areas for stormwater infiltration, wildlife habitat, and recreational amenities in the form of trails and greenways.

Better Site Design

Municipal codes and ordinances have a strong influence on site design. Requirements for building setbacks, the number of parking spaces, and landscape design ultimately impact the quality and quantity of water that the site generates. Many municipalities are amending their codes and ordinances to favor sustainable site development practices and, in some cases, to require their use.

Erosion and Sediment Control Requirements

This group of tools allows States to ensure that erosion and sediment are being controlled on development sites. EPA NPDES Construction General Permits are required when developers plan to disturb sites larger than one acre or plan to develop an area that will eventually disturb more than one acre through additional phases. As part of the permitting process, the developer is required to prepare a Stormwater Pollution Prevention Plan, which must be followed throughout the construction process.

Stormwater Best Management Practices (BMPs)

BMPs are site-specific improvements designed to catch and treat stormwater runoff at the source by either reusing it on site or having it infiltrate into the ground. Many States encourage this group of stormwater management techniques as part of the requirements to obtain an NPDES permit. In addition, many municipalities have ordinances that require the use of BMPs.



One type of stormwater BMP is constructing wetlands to store stormwater and remove pollutants.

(Photo: Wisconsin DNR/Pete Wood)

Water Quality Management

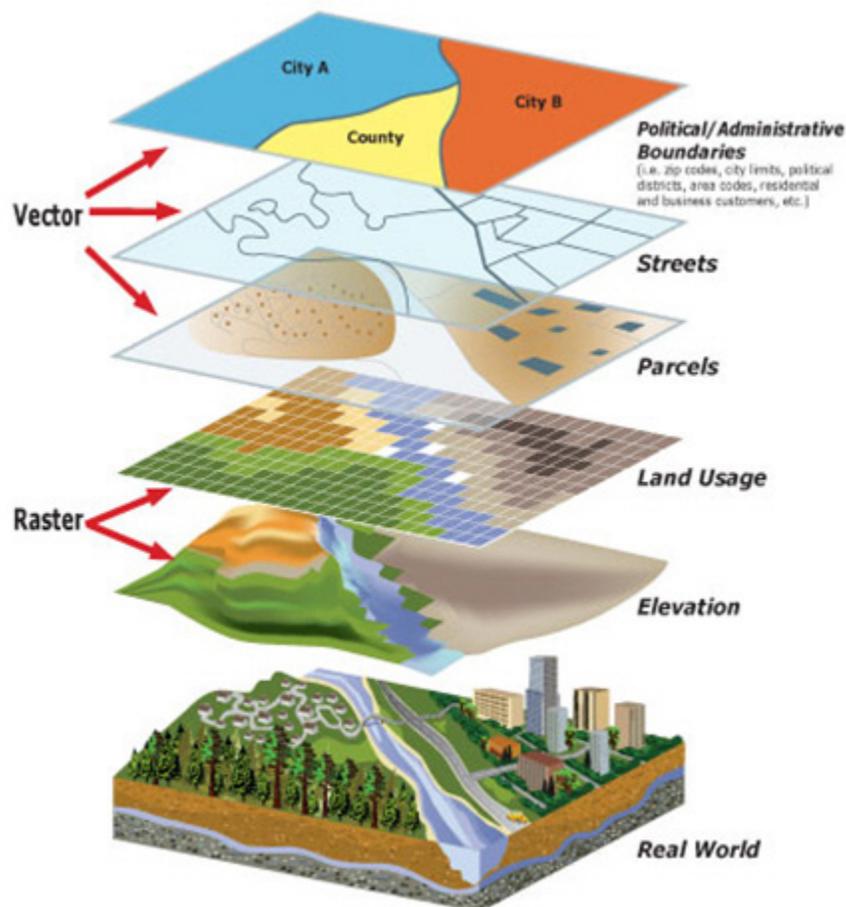
The goal of the WaterSMART program established under the Secure Water Act of 2009 is to achieve sustainable water conservation, recycling, and reuse strategies. The program includes numerous partnerships, incentives, assessments, grant programs, and best practices for carrying out water conservation and recycling efforts.

Technical Tools and Databases

There are a number of technical tools and databases that planners use to support planning decisions and activities. New technical tools are frequently being introduced that use emerging technology.

Geographic Information System (GIS) Mapping and Modeling

A GIS integrates hardware, software, and data to capture, manage, analyze, and display all forms of geographically referenced information. Digital map layers are available online at many scales from the national level to the local level, depending on the location. The U.S. Geological Survey (USGS) and the Natural Resources Conservation Service have multiple GIS maps and data layers available for use in planning.



Geographic information systems use overlapping digital map layers to help users analyze data. (Illustration: Birmingham, AL, National Weather Service GIS Data Page)

Water Budgeting

This method examines the impacts of land use on a given water body or watershed by measuring inputs and outputs of water to and from the soil profile. Water budget details are developed locally for a given water body or watershed. The Ecological Limits of Hydrologic Alteration tool integrates environmental water flows of individual watersheds into regional water resource planning and management, and estimates environmental water flows across large regions.

Databases

There are numerous databases that have been and are being developed to provide information about natural resources for multiple purposes. EPA's Watershed Assessment, Tracking and Environmental Results System (WATERS) is an integrated information system for the Nation's surface waters. The WATERS database connects the information from individual water programs into a framework that is a digital network of surface water features known as the National Hydrology Dataset, which effectively shares information across programs. The Forest Service developed another database that provides condition classifications for watersheds on National Forest System lands. For more information, go to <http://www.fs.fed.us/publications/watershed/>.

Resource Assessments

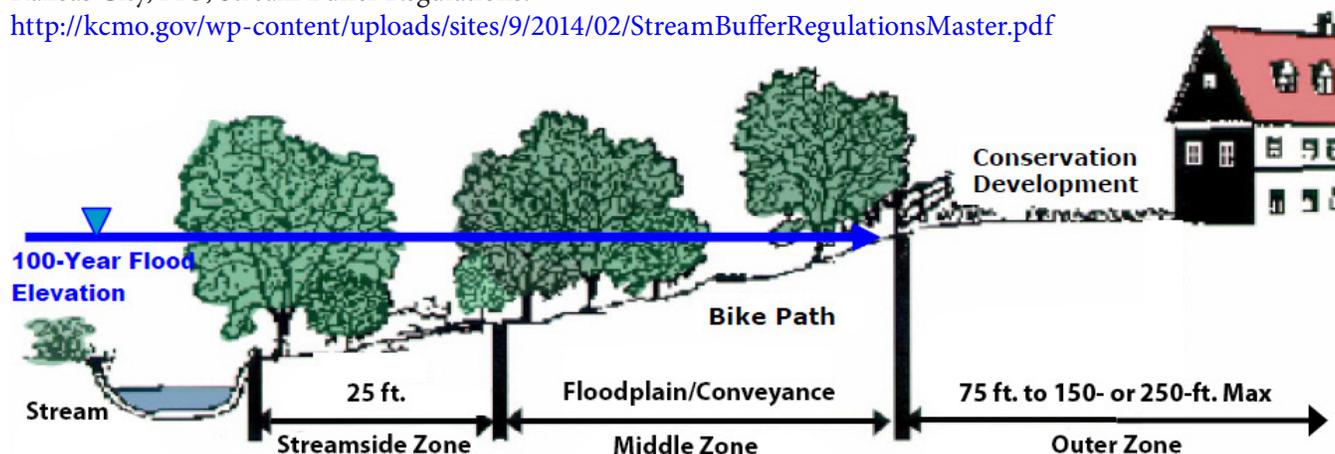
Water quality can be measured using a number of techniques that include surveying the flora and fauna present and chemical testing. The USGS National Water Quality Assessment (NAWQA) Program assesses regional and national water resources to provide an understanding of water quality conditions, and how natural features and human activities affect those conditions. Planners at a variety of levels use the NAWQA information to design and carry out strategies to manage, protect, and monitor water quality.

Case Study – Kansas City, Missouri (KCMO) Stream Setback Ordinance

This model ordinance illustrates the integration of humans and ecological processes to protect water quality. Developers of the ordinance used an ecosystem approach, which effectively balanced environmental, economic, and social factors. This ordinance provides multiple community benefits, from stormwater management to recreation and wildlife habitat, while minimizing the impact on developable land. Through this ordinance, KCMO will be able to conserve functional riparian forest buffers, improve water quality, and provide habitats for wildlife and recreational opportunities for people.

Kansas City, MO, Stream Buffer Regulations:

<http://kcmo.gov/wp-content/uploads/sites/9/2014/02/StreamBufferRegulationsMaster.pdf>



The Kansas City, MO, stream setback ordinance uses a three-tier riparian buffer system. (Illustration: Laurie Brown, Vireo)

Case Study – Chesapeake Bay Total Maximum Daily Load (TMDL)

On December 29, 2010, the U.S. Environmental Protection Agency established TMDLs for the Chesapeake Bay. This historic and comprehensive “pollution diet” calls for rigorous accountability in an effort to initiate sweeping actions to restore clean water in the Chesapeake Bay and the region’s streams, creeks, and rivers. Actions taken using the TMDL standard will also have significant benefits far beyond the Chesapeake itself—clean rivers and other waterways that not only support local economies and recreational pursuits such as fishing and swimming but serve as drinking water sources as well.

U.S. EPA Mid-Atlantic Water:

<http://www.epa.gov/chesapeakebaytmdl/>



Map of the Chesapeake Bay region.
(Web site: <http://www.epa.gov/chesapeakebaytmdl/>)

Relevant Factsheets

P2 – *Policies that Direct Natural Resource Planning* – Provides the foundation for regulations that direct water protection and use.

P5 – *Principles of Ecosystem Services* – Discusses the value of ecosystem services provided by natural resources such as water.

L3 – *How Planning is Put into Practice* – Proper planning can greatly minimize costs associated with protecting water quality.

A3 – *Managing Stormwater with Green Infrastructure* – How stormwater is managed directly impacts streams, lakes, and other water bodies, including their stability and water quality.

A4 – *Using Science to Substantiate Natural Resource Planning* – Provides the scientific resources for defining water quality and impacts.

N1 – *Developing a Natural Resource Assessment* – Provides tools for assessing water resources in the field.

Resources

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