Nonpoint Source
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The Condition of the Water-Related Environment
The Control of Nonpoint Sources of Water Pollution
The Ecological Management & Restoration of Watersheds

United States Environmental Protection Agency

Special Focus Issue: Controlling Nutrients through State-Based Authorities

Introduction: Controlling Nutrients through State Regulatory and Non-Regulatory Approaches

Nonpoint Source News-Notes returns after a nearly two year hiatus with the first of a two-part special focus on state approaches to controlling excess nutrients from nonpoint sources. This first special focus issue explores state regulatory approaches for controlling excess nutrients; the next issue will survey state non-regulatory programs and initiatives. Importantly, both regulatory and non-regulatory approaches were envisioned by Congress when it amended the Clean Water Act (CWA) in 1987 to address nonpoint sources of pollution through the CWA section 319 program. Under section 319(b)(2), Congress expected states to establish their own nonpoint source management

A mix of regulatory requirements and voluntary efforts helped restore coastal watersheds in Washington. See article on page 14.

Inside this Issue

programs by implementing "non-regulatory or regulatory programs for enforcement, technical assistance, financial assistance, education, training, technology transfer and demonstration projects," as appropriate. In other words, grant funds made available through CWA section 319 have been provided to support both state regulatory and non-regulatory approaches, as states see fit, for reducing nonpoint source pollution. State nonpoint source management programs are tailored to the specific needs and circumstances of each state, and their effectiveness has matured since Congress passed the 1987 CWA amendments. This issue of *News-Notes* presents examples of some of the valuable regulatory approaches that states have chosen to adopt.

State nonpoint source programs are vibrant and evolving mixes of regulatory and non-regulatory efforts. The purpose of these special focus issues is not to tout a preferred approach to controlling nutrients, but to share a round-up of some of the more useful and creative regulatory and non-regulatory approaches that states are choosing to implement. This issue of *News-Notes* discusses how states use regulatory means to control both agricultural and non-agricultural nutrient sources.

Nutrients – What's the Problem?

All living organisms need nutrients such as nitrogen and phosphorus to survive and grow. These nutrients are present naturally in our air and water. However, when too much nitrogen and phosphorus enter the environment—usually from a wide range of human activities—the air and water can become polluted. Since the rise of synthetic fertilizers, modern agriculture and suburbia, nutrient pollution has become all-too-common.

Excess nitrogen in the air can impair our ability to breathe, limit visibility and alter plant growth. Too much nitrogen and phosphorus in the water causes algae to grow faster than ecosystems can handle. Significant increases in algae can harm water quality, damage food resources and habitats, and decrease the water's oxygen levels. Very large growths of algae (algal blooms) can severely reduce or eliminate oxygen in the water, leading to illness or death of fish and other aquatic life. Some algal blooms are harmful to humans because they produce elevated toxins and bacterial growth that can sicken people who contact the polluted water, consume tainted fish or shellfish, or drink contaminated water.

Excess nitrogen and phosphorus can travel thousands of miles to coastal areas where the effects of the pollution are felt in the form of massive hypoxic zones with scarce oxygen and little life, such as those in the Gulf of Mexico and Chesapeake Bay. More than 100,000 miles of rivers and streams, close to 2.5 million acres of lakes, reservoirs and ponds, and more than 800 square miles of bays and estuaries in the United States have poor water quality because of nitrogen and phosphorus pollution. Visit EPA's Nutrient Pollution website (www.epa.gov/nutrientpollution) for more information.

High nutrient levels can fuel algae blooms, such as the one seen in this Iowa lake. *(Photo by USDA NRCS)*

State Restrictions on Non-Agricultural Fertilizer Use on the Rise

In sprawling urban and suburban settings across the country, non-agricultural fertilizer use is contributing increasingly significant amounts of nutrients to surface waters. Unlike agricultural crop farmers who manage nutrient delivery rates and timing, suburban lawn owners are not always aware of appropriate application rates, soil testing or how weather considerations can affect uptake and runoff. Plus, lawn care services typically fertilize four to five times per year in an ongoing pursuit of the greenest (colored) lawns. To address this problem, at least 10 states in recent years have passed fertilizer restrictions and regulations to reduce harm to the aquatic environment (Figure 1). By requiring that people, lawn care companies, golf courses and fertilizer manufacturers comply with the regulations, the states hope to better control fertilizer use and reduce nutrient delivery to local streams, rivers, lakes and estuaries. Examples of the new laws include:

State Restrictions on Non-Agricultural Fertilizer Use on the Rise (continued)

Minnesota updated its Phosphorus Turf Fertilizer Restrictions in 2006 (see www.mda.state.mn.us/phoslaw), and was the first to pass a statewide law of its kind. Restriction on phosphorus fertilizer use on lawns and turf started in 2004 in the seven-county Twin Cities metro area and in Minnesota's other 80 counties in 2005. The law was enacted to reduce over-enrichment of lakes and other water bodies with phosphorus. The 2006 update specifies that fertilizers containing phosphorus cannot be used on lawns and turf, except for establishing new lawns or when a soil test or plant tissue test shows a need for phosphorus. Golf courses are also exempted, provided that fertilizer is applied by trained staff. The law further requires that educational materials be posted at retail points of sale to help guide consumers (Figure 2).

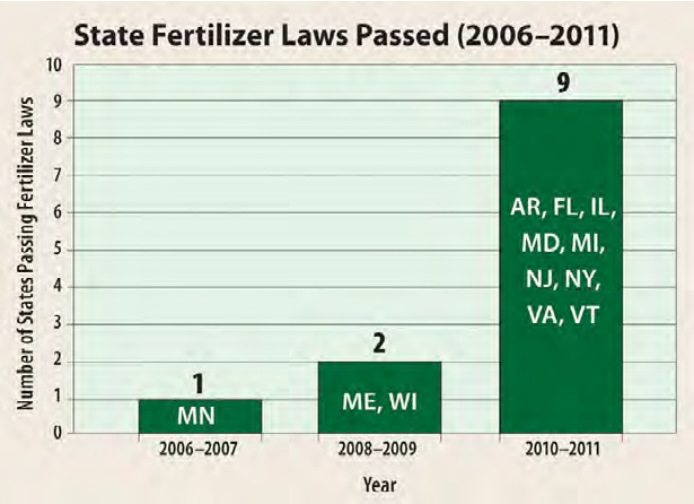

Figure 1. The number of states passing non-agricultural use fertilizer laws has increased dramatically in recent years.

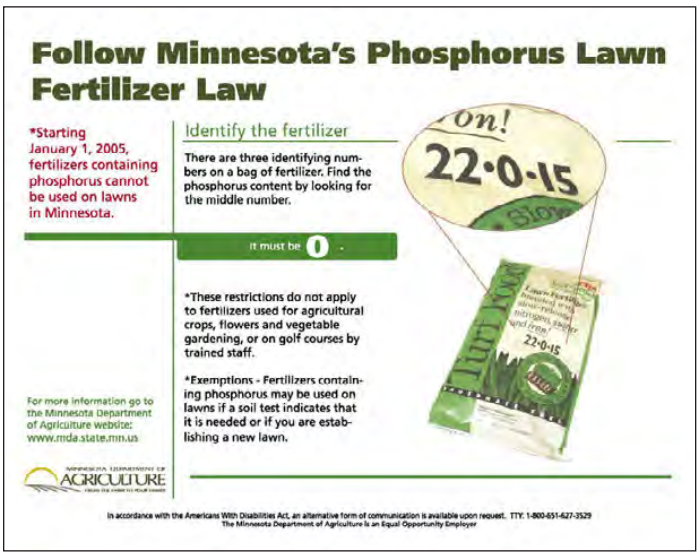

Figure 2. The Minnesota Department of Agriculture encourages consumers to check the middle number on a fertilizer bag to confirm that the phosphorus content is "0" before purchase.

New Jersey's new fertilizer law (Fertilizer Statute [Chapter 112]) took effect in 2011 (see http://ocean.njaes.rutgers.edu/documents/NJFertilizerLaw2011.pdf). Proudly billed as the toughest in the nation by New Jersey's state government, the law has the most restrictive fertilizer content standards for nitrogen and phosphorus, and is aimed at protecting water quality. The law bans phosphorus in fertilizer for all non-agricultural uses unless a soil test confirms that phosphorus is needed or unless new vegetation is being established. Golf courses are exempt from the law; however, a certified professional fertilizer applicator must apply or oversee any fertilizer application. The law also restricts application of fertilizer within 10 feet of streams and prohibits application of fertilizer to frozen ground or when heavy rain is forecasted. Professional landscapers must be trained and landscape companies must be licensed to apply fertilizers. Fertilizer must include at least 20 percent slow-release nitrogen.

Wisconsin passed its Turf Fertilizer Restrictions Law in 2009 (see http://datcp.wi.gov/Environment/Fertilizer/Turf_Fertilizer). The law restricts the use of lawn fertilizers with phosphorus on lawns, golf courses and turf, unless used to establish grass or to correct a soil phosphorus deficiency identified by a soil test. Fertilizer spread or spilled on impervious surfaces must be cleaned up. Fertilizer is prohibited from being applied on frozen ground. Stores may not display phosphorus lawn fertilizer, but can post signs saying that it is available upon request for permitted uses.

Arkansas' *Title 22 Rules Governing the Arkansas Soil Nutrient and Poultry Litter Application and Management* (see www.anrc.arkansas.gov/Rules%20and%20Regulations/title_22.pdf) restrict phosphorus in fertilizers for residential areas. Effective as of 2010, these rules apply to eight watersheds in northwest Arkansas (about 10 percent of the state).

Florida has seen numerous local governments pass fertilizer ordinances over the past decade to reduce nutrient pollution of surface waters. Building on the success of these ordinances, Florida passed a statewide law in June 2009 that requires all local governments to adopt a model fertilizer use ordinance as a minimum standard (see http://fyn.ifas.ufl.edu/fert_ordinances.html). In 2010, Florida passed fertilizer statutes that require every county and municipal government in a watershed containing a nutrient-impaired water body to adopt a model ordinance for Florida-Friendly Fertilizer Use on urban landscapes (Figure 3). The statutes also require trainings for all commercial fertilizer applicators.

State Restrictions on Non-Agricultural Fertilizer Use on the Rise (continued)

Maryland's Fertilizer Use Act of 2011 (see www.mda.state.md.us/pdf/FertilizerLaw_Facts_final.pdf) restricts phosphorus in lawn fertilizer, with exceptions for specially labeled starter fertilizer and organic fertilizer products. The law also decreases the total amount of nitrogen that may be applied to turf and specifies that at least 20 percent must be in a slow-release form. The law prohibits labeling fertilizer product as de-icers and requires them to include the following statement on the label: "Do not apply near water, storm drains or drainage ditches. Do not apply if heavy rain is expected. Apply this product only to your lawn and sweep any product that lands on the driveway, sidewalk, or street, back into your lawn." The law also prohibits people from applying lawn fertilizer to impervious surfaces, between November 15 and March 1 (when the ground is frozen), and within 10-15 feet of waterways. The law contains substantial penalties ($1000-$2000 per violation).

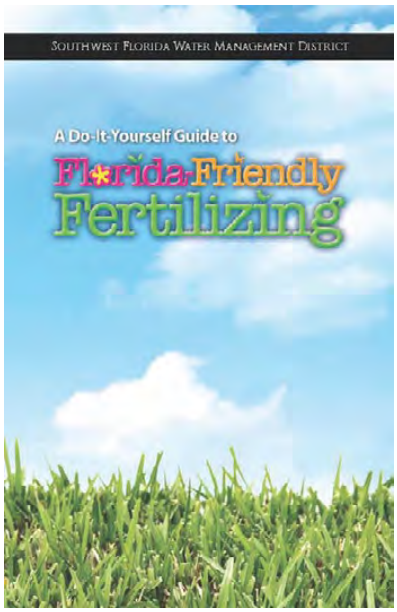

Figure 3. Southwest Florida Water Management District released a *Do-It-Yourself Guide to Florida Friendly Fertilizing* document to help its citizens learn how and when to apply fertilizer.

Maine passed a statewide law in 2008 to reduce the use of fertilizer that contains phosphorus by raising people's awareness and encouraging behavior change (www.maine legislature.org/legis/statutes/38/title38sec419.html). The law requires all fertilizer retailers to post an educational sign. The sign (Figure 4), approved by the Maine Department of Environment, explains the link between phosphorus use and algae growth and discourages people from using phosphorus-containing fertilizer except on new or reseeded lawns.

Figure 4. Maine fertilizer retailers are required by law to post this educational sign near fertilizer displays.

Many other states have recently passed laws that include similar restrictions as those stated above, including the following:

- **Illinois.** Statute 415 ILCS 65/5a; passed in 2010: www.ilga.gov/legislation/publicacts/fulltext.asp?Name=096-1005.
- **Michigan.** Public Act 299 of 2010 (Statute 324.8512b): www.michigan.gov/mda-fertilizer.
- **New York.** Dishwater Detergent and Nutrient Runoff Law; passed in 2010: www.dec.ny.gov/chemical/67239.html.
- **Vermont.** Turf Fertilizer Law; passed in 2011: www.leg.state.vt.us/docs/2012/Acts/ACT037.pdf.
- **Virginia.** Fertilizer Act; passed in 2011 and scheduled to take effect in 2014: www.vdacs.virginia.gov/plant&pest/agcomm.shtml#fertilizer.

Need more information? On September 21, 2011, the U.S. Environmental Protection Agency's Watershed Academy conducted a webcast seminar: "Nitrogen and Phosphorus Pollution Series: State and Local Policies to Restrict the Use of Lawn Fertilizers." This webcast highlighted legislation passed by Minnesota, Michigan and the Chesapeake Bay states to restrict the use of lawn fertilizers. Experts shared state- and region-specific case studies and the lessons learned along the way. To experience the archived version of the webcast or to see the slides, see http://water.epa.gov/learn/training/wacademy/archives.cfm and click on the link for "Nutrient Management."

State Regulations Take Aim at Nutrients from Agricultural Nonpoint Sources

As noted in the introduction to this special focus issue, state nonpoint source management programs established under the authority of section 319 of the Clean Water Act (CWA) amendments of 1987 may include a mix of state regulatory and non-regulatory programs. While about half of

state nonpoint source management programs are primarily non-regulatory, the other half include regulatory programs in the mix to help control excess nutrients from nonpoint sources on either a statewide or basin scale. A few of these states have authority to control nonpoint sources across multiple categories of nonpoint sources (e.g., both agriculture and urban). Other states rely on regulatory approaches to enhance certain portions (e.g., only agriculture) of their nonpoint source programs. Many of these state programs consider reducing nutrient pollution to be a high priority alongside other types of nonpoint source pollutants, such as sediment, bacteria and pesticides. The first part of this article provides an overview of those few states that rely on regulatory authorities to reduce nutrient pollution across multiple categories of nonpoint sources, while the second part summarizes state regulations to reduce nutrients primarily from agricultural nonpoint sources. For details on state regulations related to urban and suburban (non-agricultural) fertilizer use, see "State Restrictions on Non-Agricultural Fertilizer Use On the Rise" on page 2 of this newsletter.

Cross-Cutting State Regulatory Programs to Reduce Nutrients and other Nonpoint Source Pollution

While many states have broad "bad actor" laws that authorize enforcement actions against activities that generate nonpoint source pollution regardless of its source category (typically on a reactive complaint-driven basis), a few states proactively control activities across multiple nonpoint source categories through a single law or connected series of regulations. The broadest of these nonpoint source authorities include the following:

California's *Porter-Cologne Water Quality Control Act* (Porter-Cologne Act) provides broad authorities to regulate nonpoint source pollution statewide as needed. It requires the State Water Resources Control Board and the nine Regional Water Quality Control Boards to control all discharges that either generate or have the potential to generate pollution. For more information, see "California's Porter-Cologne Act Offers Broad Regulatory Authority" on page 10 of this newsletter.

Wisconsin's *"NR 151" Runoff Management Rules* (2002, updated 2011) establish runoff performance standards. The rules establish specific performance standards and prohibitions for agricultural and non-agricultural sources. For non-agricultural sources, the law requires that developments of one acre or greater must have stormwater management plans in place to control runoff and protect water quality. Agricultural sources are also required to implement practices to control runoff. For example, farmers must establish a tillage setback of at least 5 feet and up to 20 feet from a water body or top of a stream bank, install clean water diversions, restrict livestock access to waters where vegetative ground cover cannot be sustained, and implement nutrient management plans, among other requirements. To avoid undue economic burden, agricultural performance standards and prohibitions for existing facilities and practices cannot be required unless at least 70 percent cost sharing is made available (90 percent in cases of economic hardship). Wisconsin has provided generous funding support to help reach this cost share goal broadly across the state.

Figure 1. Filter strips in North Carolina's Neuse River basin help decrease nitrogen loads to the river.

North Carolina relies on two significant regulatory authorities for systematically controlling nonpoint source pollution. First, its *State Nutrient Strategy Rules* are state-level regulations designed to restore impaired waters. These comprehensive water quality restoration regulations have been developed for four large water bodies that collectively comprise about a third of the state (Neuse River, Tar-Pamlico Sound, Falls Lake and Jordan Lake basins) and address agriculture, new development, nutrient management, protection of riparian buffers and wastewater dischargers. In 1997, the North Carolina Environmental Management Commission adopted the state's first mandatory plan to control both point and nonpoint source pollution in the Neuse River basin. The plan, backed by figures in the Neuse River total maximum daily load (TMDL), called for a mandatory 30 percent reduction in nitrogen from point, urban and rural sources by 2003 (Figure 1). The agricultural community implemented best management practices (BMPs) that resulted in a 42 percent decrease in nitrogen loading to the

estuary by 2003 (see the Neuse River Basin nonpoint source Success Story for more details: http://water.epa.gov/polwaste/nps/success319/nc_neu.cfm). Non-agricultural sources must also meet the 30 percent nitrogen reduction goal by adopting stormwater management plans and implementing BMPs such as constructed wetlands in new developments. North Carolina's second broad regulatory authority is its Drinking Water Reservoir Protection Act (2005), which requires the development of water supply reservoir protections and further authorizes nonpoint source-related rule development.

Virginia established its *Chesapeake Bay Tributary Strategies* to comply with the multi-state Chesapeake 2000 Agreement (with the U.S. Environmental Protection Agency) and Virginia Statute by establishing nutrient and sediment reduction goals for watersheds that drain to the Chesapeake Bay. These "trib strategies" are integrated with the state's nonpoint source program to reduce nutrient and sediment loads for each of Virginia's large river basins within the Chesapeake Bay, with load reductions tracked annually. Additionally, in 1997 Virginia passed its *Water Quality Monitoring, Information and Restoration Act*, which requires the state to develop TMDL Implementation Plans.

State Regulatory Approaches for Reducing Nutrient Pollution from Agricultural Sources

At least 23 states (AR, CA, DE, IA, ID, KS, KY, MD, ME, MN, NC, NE, NJ, NY, OH, OK, OR, PA, TX, VA, VT, WA, WI) have authorities that regulate agricultural activities beyond what is required under federal regulations for concentrated animal feeding operations (CAFOs). These state laws and regulations typically address impacts from row crops, animal operations (beyond CAFOs), or both. For most of these states, nutrient management is a major focus. A few examples of these state authorities are highlighted below.

Vermont law requires that all farms implement a set of Accepted Agricultural Practices (AAPs). AAPs are statewide restrictions designed to reduce nonpoint source pollutant discharges by implementing improved farming techniques rather than investing in structures and equipment. The law requires that these AAPs (such as adding vegetated buffers, restricting livestock access to streams and implementing animal waste management) must be technically feasible as well as cost-effective for farmers to implement without governmental financial assistance. State law also established the Medium Farm Operation (MFO) permitting program, whereby all medium-sized animal feeding operations are required to obtain coverage under a state general permit. Common MFOs range from dairies with 200 to 699 mature animals to turkey operations with 16,500 to 54,999 birds. The state general permit prohibits discharges of wastes from a farm's production area to waters of the state and requires manure, compost and other wastes to be land applied according to a nutrient management plan.

Pennsylvania has several agricultural regulations designed to minimize nonpoint source pollution, including its *Nutrient Management Act* (1993, updated 2005). Under this law, farmers must develop and implement nutrient management plans for high density animal feeding operations (2,000 pounds of animals per acre or more) with eight or more animal units (8,000 pounds or more). Requirements for these operations include developing agricultural erosion sediment control plans and establishing either a 100-foot setback or a 35-foot-wide vegetated buffer to comply with restrictions on land application of manure near water bodies.

Kentucky's *Agriculture Water Quality Act* (1994) requires all landowners with 10 or more acres that are being used for agricultural operations to develop and implement a water quality plan based upon guidance from the Kentucky Agriculture Water Quality Plan, a document that provide BMP manuals in six different areas: silviculture, pesticides and fertilizers, farmstead, crops, livestock, and streams and other waters.

Delaware's *Nutrient Management Law* (1999, updated 2001) requires a nutrient management plan or animal waste management plan for anyone managing more than 10 acres of land on which nutrients are applied (including golf course operators and lawn care providers) and/or operates an animal operation in excess of 8,000 pounds of live animals. These plans must be developed

by a state-certified nutrient management specialist and address the amount, placement, timing and application method of nutrients. The law is overseen by Delaware's Nutrient Management Commission.

Ohio addresses nonpoint source impacts from agricultural activities in two sets of rules. First, its *Agricultural Pollution Abatement Rules* mandate that overflow and discharge to state waters from animal feeding operations shall be prevented by implementing BMPs. Second, in 2010, Ohio passed a Distressed Watershed Rule that allows the Ohio Department of Natural Resources to designate one or more watersheds-in-distress, and thus establish "requirements for the storage, handling and land application of manure; and/or the control of the erosion of sediment…; and associated nutrient management plans for land and operations within the designated watershed boundaries." Within designated watersheds, all livestock operations that generate 350 tons of manure/year or more (roughly equal to facilities housing 15 dairy cows or 25 steers and larger) or 100,000 gallons of manure/year or more are required to implement nutrient management plans. The law also generally prohibits land application of manure on croplands or elsewhere between December 15 and March 1. Outside this time frame, land application of manure on frozen ground is prohibited unless it is incorporated or injected. Currently, only the Grand Lake Saint Mary's watershed, which has been heavily impacted by livestock agriculture, has been designated as a distressed watershed (see Figures 2 and 3).

Figure 2. Nutrient inputs from Ohio's Grand Lake St. Mary's watershed caused persistent algae blooms in the lake such as this one in June 2010. *(Photo by Ohio EPA)*

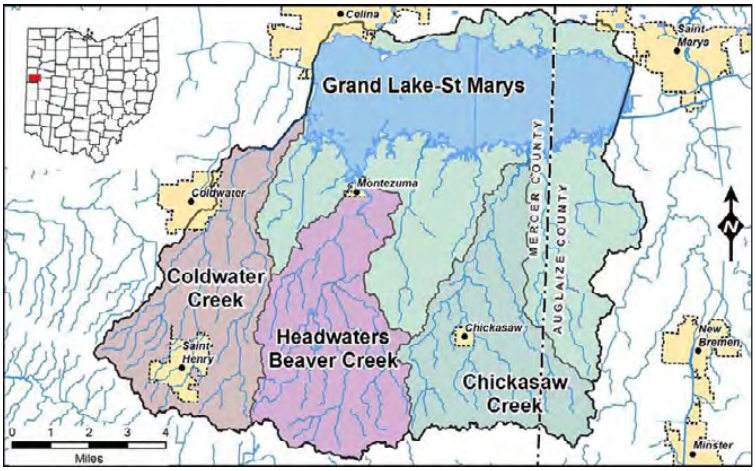

Figure 3. Ohio designated the Grand Lake-St. Mary's watershed as the state's first "distressed watershed," thus allowing tough state regulations to take effect.

Washington's *Dairy Nutrient Management Act* (DNMA) requires all licensed cow dairies to develop and implement nutrient management plans and participate in a routine inspection of the cow dairy at least every 22 months. This law has been very effective in reducing nutrient, sediment and bacteria pollution throughout the state, and played a significant role in the restoration of at least 84 bacteria-impaired segments (a total of 136 miles) in the Chehalis and Willapa watersheds. For more information on Washington's DNMA and its impact on restoration, see "Dairy Regulations and Coordinated Approach Help Restore Record Number of Washington Water Bodies" on page 14 of this newsletter.

Maryland's Water Quality Improvement Act, passed in 1998, provided landmark legislation designed to protect the health of Maryland's citizens and its waterways by establishing both short- and long-term strategies for reducing nutrient levels in streams, rivers and Chesapeake Bay. For more information about Maryland's law, see the next article ("Maryland Laws Help Manage Agriculture Nonpoint Source Pollution").

Additional Examples

The above regulations are just a sample of how many states are establishing legislative authority structures to ensure nonpoint source control. For a more comprehensive rundown of state authorities designed to reduce nutrient and other nonpoint source pollution sources, see EPA's report on *A National Evaluation of the Clean Water Act Section 319 Program* (November 2011), available at www.epa.gov/nps/pdf/319evaluation.pdf.

Maryland Laws Help Manage Agriculture Nonpoint Source Pollution

For more than a decade, Maryland has had significant legislation in place for controlling nonpoint source nutrient pollution. In 1998 the Maryland General Assembly passed the Water Quality Improvement Act, landmark legislation designed to protect the health of Maryland's citizens and its waterways by establishing both short and long-term strategies for reducing nutrient levels in streams, rivers and Chesapeake Bay.

The most significant feature of the Water Quality Improvement Act is a provision requiring all Maryland farmers grossing $2,500 or more annually or raising 8,000 pounds or more of live animal weight to run their operations using a nutrient management plan that addresses both nitrogen and phosphorus inputs (see box). This comprehensive legislation also affects other interests, including those who apply nutrients, poultry growers and companies, and Maryland-certified nutrient management consultants, who must write nutrient management plans based on both soil nitrogen and phosphorus. Updated nutrient management plans are required every three years.

Implementing Nutrient Management Improves Water Quality in Bens Branch

Runoff from agricultural activities and urbanization contribute to sediment and nutrient impairments in the lower Monocacy River and Lake Linganore. As a result, Maryland Department of the Environment (MDE) added the water bodies to the 1996 Clean Water Act (CWA) section 303(d) list, and they have remained there ever since. In 2006 a landowner developed a nutrient management plan and installed agricultural best management practices (BMPs), including cattle fencing, alternative watering facilities and riparian planting on a small, unnamed tributary of Bens Branch in the Lake Linganore basin (Figure 1). The BMPs resulted in phosphorus reductions in the first year (Figure 2). Data collected since 2008 indicate that water quality continues to improve. MDE will continue monitoring progress toward meeting the total maximum daily load and water quality standards. For more information, see http://water.epa.gov/polwaste/nps/success319/md_bens.cfm.

Figure1. Before the 2006 fence installation (left), uncontrolled cattle access to an unnamed tributary of Bens Branch caused visible erosion. By late 2007 (right), one year after the 2006 fence installation, the riparian area was recovering.

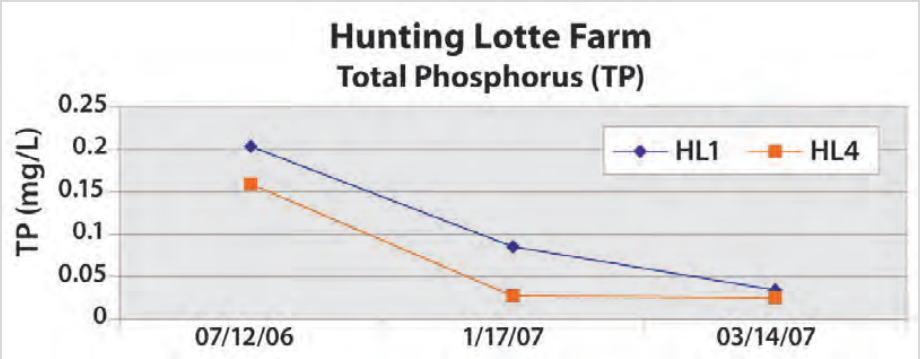

Figure 2. Implementing a nutrient management plan and installing fences to keep cattle away from streams helped reduce phosphorus levels. Data from the first year show steady phosphorus declines.

The law also applies to commercial lawn care companies, landscapers, golf courses and certain others. Annual implementation reports must be filed with the state. The state Nutrient Management Program oversees a licensing and certification program for consultants, compliance activities, and education and training programs necessary to implement the law. The Act includes a number of deadlines and requirements, such as filing of annual implementation reports, but it also offers many new incentives aimed at helping farmers comply. To learn more about Maryland's nutrient management regulations, see www.mda.state.md.us/resource_conservation/nutrient_management.

Additional Regulatory Authorities

In addition to requirements and programs established under the Water Quality Improvement Act, Maryland has supplemental authorities for regulating agricultural activities. Maryland's General Discharge Permit for Animal Feeding Operations, 2009-2014, goes somewhat beyond the federal Combined Animal Feeding Operation (CAFO) regulations. The state designates Maryland Animal Feeding Operations (AFOs) as distinctly regulated AFOs that fall under the threshold for CAFO regulations. Maryland AFOs are non-CAFOs that are designated as "large AFOs" and may also include "medium AFOs," as defined by the regulations. AFOs of a certain size not otherwise categorized as a CAFO or Maryland AFO must submit a Certificate of Conformance. Every Maryland AFO is required to obtain a state discharge permit under state permitting authority even if they are not expected to discharge directly to state waters. Maryland AFOs must develop and implement nutrient management plans, as well as soil conservation and water quality plans with very specific requirements to implement a suite of standard practices, and are regulated to minimize their impacts to groundwater.

Maryland's Agricultural Sediment Pollution Control Act (ASPCA) prohibits agricultural operations from adding, introducing, leaking, spilling or otherwise emitting soil or sediment into waters of the state, or placing soil or sediment in a condition or location where it is likely to be washed into waters of the state. The Maryland Department of Environment is responsible for regulating the ASPCA. Enforcement is complaint-driven and violators are not subject to penalties if they are using an approved soil conservation and water quality plan or comply with an order for a corrective action water quality plan.

Finally, Maryland's Critical Areas Law of 1984 (updated 2008) mandates that local governments pass ordinances approved by the state's Critical Areas Commission to minimize water quality impacts from conveyances or nonpoint source runoff from activities and development within 1000 feet of mean high tide. Soil conservation plans are required for agricultural lands to minimize impacts to water quality, protect habitat and provide protection from shoreline erosion.

Measuring Success

The success of any regulatory approach lies in how well it meets its intended goal. For the WQIA, success is measured in decreased delivery of nutrients to water bodies, and ultimately in improved water quality. This, in turn, hinges on compliance. In 2001, the first year annual implementation reports from agricultural operations were due back to the state, only 20 percent of the farmers filed nutrient management plans, another 44 percent filed delay forms, and 36 percent ignored the reporting requirement. The state responded in 2002 by increasing state funding to develop nutrient management plans and delaying deadlines for developing these plans. By 2005, nutrient management plans covered 80 percent of state agricultural lands and enforcement actions began on the remaining 20 percent. In 2006, the Maryland Department of Agriculture (MDA) began on-farm compliance inspections. According to MDA's Nutrient Management Program 2011 Annual Report, 99.9 percent of all Maryland farmers now have nutrient management plans and 98 percent have filed annual implementation reports. More importantly, 70 percent of farmers passed on-farm inspection audits, up 10 percent over the previous year, and enforcement has been ratcheted up. Over time, Maryland is building on this success and sees the water quality improvements envisioned by the Water Quality Improvement Act as a key ingredient in Maryland's recipe for a cleaner Chesapeake Bay.

California's Porter-Cologne Act Offers Broad Regulatory Authority

For more than forty years, California has had a legislative structure in place that requires the regulation of both point source and nonpoint source pollution. The Porter-Cologne Water Quality Control Act (Porter-Cologne Act), enacted in 1969, serves as the cornerstone of California's water protection efforts. In fact, many consider it to be a precursor to, and model for, the federal Clean Water Act (CWA) enacted by Congress just three years later.

Figure 1. California is divided into nine hydrologic regions for water quality management purposes.

The Porter-Cologne Act requires that the State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCBs) control all discharges that either generate, or have the potential to generate, pollution. The SWRCB adopts statewide policy for water quality control and water quality control plans, in addition to regulations that are binding on the RWQCBs. The RWQCBs each govern one of the nine hydrologic regions into which California is divided (Figure 1). Each RWQCB adopts regional water quality control plans (Basin Plans) for their respective regions.

In February 2000, California submitted its *Plan for California's Nonpoint Source Pollution Control Program* (CA NPS Program Plan) and full federal approval was granted in July 2000. The CA NPS Program Plan was the first significant upgrade of California's Nonpoint Source Pollution Control Program (CA NPS Program) since its inception in 1988. The purpose of the CA NPS Program Plan is to improve the state's ability to effectively manage nonpoint source pollution and conform to the requirements of the federal CWA and the Federal Coastal Zone Act Reauthorization Amendments of 1990.

The CA NPS Program Plan focuses on implementing 61 management measures for nonpoint source pollution by the year 2013 (see www.waterboards.ca.gov/water_issues/programs/nps/protecting.shtml). While the CA NPS Program originally emphasized using voluntary and incentive measures to protect water quality, the Porter-Cologne Act was amended in 1999 to require the SWRCB to develop guidance to enforce the NPS program. The SWRCB complied by adopting the NPS Implementation and Enforcement Policy (see www.waterboards.ca.gov/water_issues/programs/nps/docs/npsfactsheet.pdf) in 2004.

The amended Porter-Cologne Act requires that the RWQCBs regulate all nonpoint sources of pollution, using the administrative permitting authority within the statute. The permitting authorities include, but are not limited to Basin Plan prohibitions, Waste Discharge Requirements (WDRs) (i.e., permits), and/or waivers of WDRs (waivers). Prohibitions for agriculture may only be included as part of a WDR and/or waiver. In addition, the Porter-Cologne Act requires that waivers must be conditional and may be terminated at any time, must be consistent with the public interest and any applicable state or regional water quality control plans, may not exceed five years, may be renewed following consideration of the necessity for issuing WDRs, and must be enforced. Dischargers must comply with the administrative permits issued by the RWQCBs by developing and implementing nonpoint source pollution control programs, either individually or collectively as participants in third-party coalitions. The SWRCB and RWQCBs can, and have, used these administrative tools to regulate nonpoint source discharges from various land use categories (e.g., agriculture, urban, and marinas and recreational boating).

Porter-Cologne Act Regulates Agriculture-Related Nonpoint Source Pollution

California has significant agricultural programs (e.g., irrigation, grazing and animal waste management) that operate under the general authority of the Porter-Cologne Act. For example, the State Water Resources Control Board's Irrigated Lands Regulatory Program (ILRP) regulates discharges from irrigated agricultural lands to prevent these discharges from impairing receiving waters (Figure 2). Discharges include irrigation return flow, flows from tile drains and stormwater runoff (generally up to the 25-year storm event) that might carry pesticides, sediment, nutrients

California's Porter-Cologne Act Offers Broad Regulatory Authority (continued)

or other pollutants to the state's surface or ground water. To ensure protection of receiving waters, Regional Water Boards issue WDRs and conditional waivers of WDRs to growers. These waivers require growers to monitor the water quality of receiving waters (cooperatively or individually) and take corrective actions when impairments are found. In some regions, growers are required to adopt best management practices (BMPs) to prevent pollutants from entering water bodies. More than 25,000 agricultural producers are regulated under the state's ILRP. Each RWQCB implements the ILRP using the various regulatory options available under the Porter-Cologne Act. For more information, see www.swrcb.ca.gov/water_issues/programs/agriculture.

The Porter-Cologne Act also provides general authority for grazing operation management on California's 40 million acres of rangeland (half of which are publicly owned). Well-managed grazing operations can serve as a tool for fire management, help control invasive species and provide areas for groundwater recharge. Poorly managed grazing operations, however, may contribute to water quality problems. Approximately 100 water quality impairments identified on the 2010 CWA section 303(d) list for California are on lands with active grazing operations. In these cases, recreational and aquatic life beneficial uses are not being protected. Implementing grazing management practices can help to minimize sediment, pathogens and nutrients loads to surface water. RWQCBs have utilized various tools to address water quality impacts from grazing operations. Some RWQCBs have adopted and implemented WDRs, or waivers of WDRs (which still come with requirements for BMPs and monitoring), while others have implemented prohibitions (see box, next page). For more information, see www.waterboards.ca.gov/water_issues/programs/nps/encyclopedia/1e_graz.shtml.

Figure 2. This irrigated California lettuce farm is subject to the ILRP. *(Photo by USDA NRCS)*

Waste from animal operations other than grazing operations is also regulated under the Porter Cologne Act. California designates Confined Animal Facilities (CAFs), which are places where animals are held and fed but not defined with any particular size thresholds. Under the law, California requires that EPA's Coastal Zone Act Reauthorization Amendments management measures be met as minimum statewide standards. Specifically, facility wastewater, including stormwater runoff, must be contained on site. However, facilities with an NPDES permit can discharge excess runoff generated by a 25-year, 24-hour frequency storm. Most dairies use impoundments that comply both with the California Code of Regulations (Title 27) and the RWQCB requirements to retain wastewater until it can be applied to cropland at an appropriate rate. CAFs and other agricultural operations must develop, implement and update nutrient management plans. The nine RWQCBs may adopt more stringent standards than the state minimum standards, and several have, particularly for dairy operations.

Act Provides TMDL Implementation Authority

The SWRCB has also interpreted the Porter-Cologne Act to require that total maximum daily loads (TMDLs) be incorporated into Basin Plans. The Porter-Cologne Act requires that each RWQCB formulate and adopt Basin Plans for all basins within its region. It also requires that Basin Plans outline water quality objectives for the reasonable protection of beneficial uses and include an implementation program to help achieve those objectives. California uses TMDLs as another tool to help foster implementation of appropriate nonpoint source management measures. By providing watershed-specific information, TMDLs help target specific sources and corresponding corrective measures and provide a framework for using more stringent approaches that may be necessary to achieve water quality goals and maintain beneficial uses. More information is available through the SWRCB's TMDL website (www.swrcb.ca.gov/water_issues/programs/tmdl).

Water Recreation Use Restored in Alpine Water Bodies

Livestock grazing on high wet meadows on public lands in the Lake Tahoe Basin contributed bacteria to Big Meadow Creek and the Upper Truckee River in California. Water quality monitoring showed that bacteria levels violated water quality standards and prevented the water bodies from supporting their beneficial use, prompting the Lahontan RWQCB to add both water bodies to California's 2002 CWA section 303(d) list of impaired waters.

Under the state's Porter-Cologne Act, the U.S. Forest Service (USFS) manages grazing allotments in accordance with a SWRCB-certified water quality management plan. In the 1990s, the USFS Lake Tahoe Basin Management Unit (LTBMU) tried to mitigate the impacts on water quality from cattle grazing by installing BMPs such as cattle stream crossings and cattle exclusion fencing upstream of the crossings. Within the protected stream areas, the LTBMU planted vegetation and stabilized streambanks using cobbles and erosion control cloth. The LTBMU conducted its own water quality monitoring to assess the effectiveness of the various BMPs.

In the areas where cattle weren't excluded, the USFS implemented off-stream water sources, rest rotation, reduced herd size and shortened grazing season. Despite these efforts, water quality continued to violate California's bacteria objective. In 1999, the LTBMU informed the permittees who grazed the Meiss Meadows area that "a viable grazing strategy cannot be developed that would likely meet the state-mandated water quality standards..." As a result, the USFS permanently ceased all grazing on the Meiss Meadows area, which includes the Big Meadow Creek and Upper Truckee River basins.

Removing livestock from the area allowed the water bodies to recover. Between 2000 and 2008 the USFS collected and analyzed approximately 43 samples for bacteria levels; the samples showed that both water bodies met the water quality objective by 2004. As a result, the Lahontan RWQCB removed 4.5 river miles of Upper Truckee River and 1.4 river miles of Big Meadow Creek from the 2010 CWA section 303(d) list of impaired waters. For more information, see http://water.epa.gov/polwaste/nps/success319/ca_bigmeadow.cfm.

The Upper Truckee River, after restoration. ***(Photo courtesy of USFS Lake Tahoe Basin, Meiss/Dardanelles Backcountry Flickr site)***

[For more information contact Steve Fagundes, Chief, NPS Program Plan Implementation Unit, State Water Resources Control Board, 1001 I Street, 15th Floor, Sacramento, CA 95814. Phone: 916-341-5487; Email: sfagundes@waterboards.ca.gov]

Notes on the National Scene

New Recovery Potential Screening Website Assists Restoration Planners

States, tribes and territories now have another powerful tool in their water quality management toolbox. EPA recently released a new technical assistance tool that will help watershed managers protect and restore surface water quality: the Recovery Potential Screening website (www.epa.gov/recoverypotential). Recovery Potential Screening is a user-driven, flexible approach for comparing relative differences in restorability among impaired waters. The website offers step-by-step screening directions (Figure 1); summaries of more than 120 recovery potential indicators; a recovery literature database; case studies; and time-saving tools for calculating and displaying ecological, stressor and social indices.

How Does the Screening Method Work?

Watersheds vary in the complexity and difficulty of restoration–but how can these differences be systematically and usefully compared? Recovery Potential Screening is a method that measures several ecological, stressor and social context indicators for water bodies that are associated with the likelihood that a restoration effort may achieve good results. The user selects the indicators based on what is most appropriate to the waters being compared, the availability of suitable data

New Recovery Potential Screening Website Assists Restoration Planners (continued)

and the goals of the restoration effort. Measuring the same indicators on all evaluated waters allows for systematic, consistent and information-based comparisons.

The tool calculates a value for all the selected indicators on each watershed. These values are combined into three index scores per watershed, representing ecological, stressor and social context indices. The three separate scores enable the user to consider each of these three classes of factors, individually or in combination. The ecological index score reflects overall condition and the capacity of the watershed to regain functionality, based on metrics related to natural watershed processes and structure. The stressor score reflects the pressures on watershed condition from several primary sources of pollutants, water quality impairments and land use. The social context score includes many factors, such as community involvement, incentives, economics, governance, regulation and planning status, which do not constitute watershed condition but often strongly influence the level of effort and complexity of accomplishing restoration. A Recovery Potential Integrated (RPI) score is calculated by combining these three indices (Figure 2). The user then has the opportunity to see a gradient of different scores across all their watersheds, based on any of the indices or even an individual indicator. All watersheds in a given basin or study area are typically screened and compared. The results may show differences in complexity and relative difficulty of restoration, but the tool is not used to call any watershed "unrestorable."

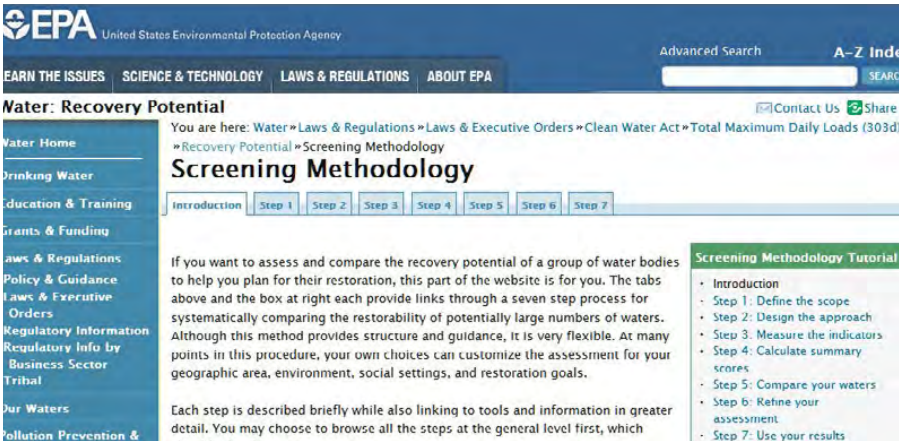

Figure 1. The Recovery Potential Screening website walks users through each of the seven steps in the assessment process, and also provides indicator descriptions and an assortment of downloadable tools.

How Can the Screening Tool Be Applied?

EPA originally developed the Recovery Potential Screening approach as a technical aid to help states meet their Clean Water Act obligation to develop a prioritized schedule for creating total maximum daily loads (TMDLs) to reduce pollution in impaired waters. However, Recovery Potential Screening can also be applied in a wide range of other watershed activities. Rather than a "one-size-fits-all" procedure, this flexible framework can be customized for a specific impaired waters restoration program purpose in a specific geographic area. Some users apply screening results to identify the better prospects for successful restoration and target these watersheds as a priority. Others use the screening method to increase awareness of the relative difficulty of restoration across all their watersheds, and apply these insights to planning and implementing a best course of action. Examples of practical applications of the screening tool include:

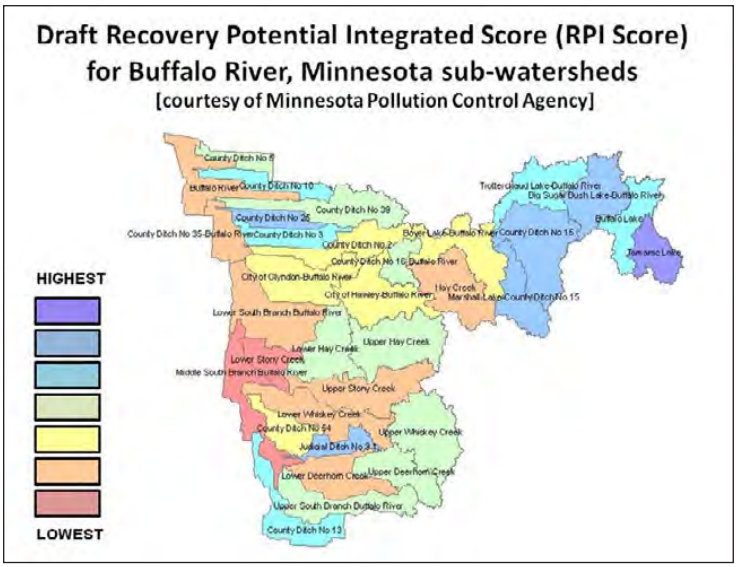

Figure 2. A summary map resulting from a Recovery Potential Screening completed by Minnesota.

- Assisting watershed-level programs that need to focus on priority areas because of limited resources.
- Developing a prioritized schedule for waters on the Clean Water Act section 303(d) impaired waters list.
- Prioritizing implementation among many TMDLs.
- Planning statewide nonpoint source control projects and restoration initiatives.
- Helping to develop strategies to meet performance tracking measures.

New Recovery Potential Screening Website Assists Restoration Planners (continued)

- Identifying opportunities for synergy between healthy watersheds protection and impaired watersheds restoration.
- Revealing underlying factors that influence restoration success to improve programs.

EPA developed this technical method and website to assist states and others in complex planning and prioritizing activities, to provide a systematic and transparent comparison approach, and to help improve watershed management program results.

What Does the Website Provide?

The Recovery Potential Screening website provides all the directions and tools needed to conduct a screening assessment. It provides step-by-step instructions showing a user how to complete each of seven steps. The website provides access to a wide variety of onsite tools, resources and other information as the user moves through the process. Users may download the restoration and recovery literature database, which houses more than 1,700 citations of technical papers that describe recovery-relevant characteristics of waters or watersheds. These papers provided the basis for developing recovery potential indicators.

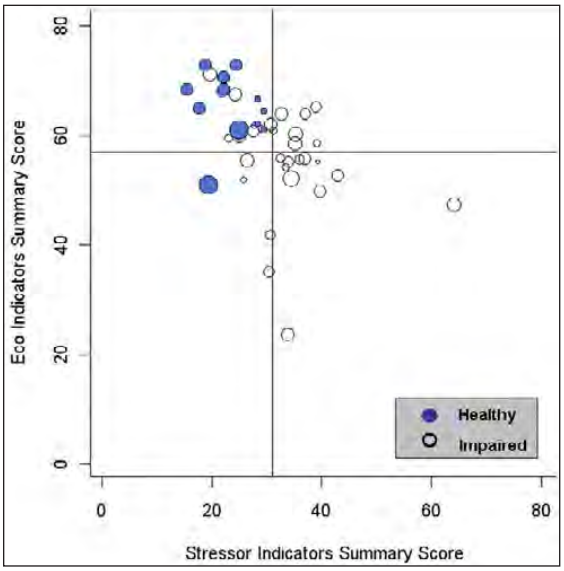

Figure 3. Bubble plots simultaneously show ecological, stressor and social indices of each watershed. Healthy watersheds identified from field data (in solid blue) and scored with the same RPS indicators enable users to compare their impaired and healthy watersheds. Bubble size reflects social score.

The website also provides links to many common data sources, guidance for scoring and offers tools that help users assign values and weights to each indicator, normalize the values and generate spreadsheets of summary scores. Users may download a software script that will display results as 3-D bubble plots, which provides a way to simultaneously consider the ecological, stressor and social indicator scores for each water body assessed (Figure 3).

The website also offers links to other Web-based resources that address restoration planning, including publications and presentations that provide further information and summaries of example projects. Recovery Potential Screening training course materials (in a 13.5 MB zipped file) are available by email upon request by following the link to "Publications and Training Materials" at the bottom of the home page. These materials were used in a one-day training course about Recovery Potential Screening and include six slide presentations, three exercises, and numerous supplementary technical materials. EPA's Watershed Academy recently held a Webcast titled "Recovery Potential Screening: A Tool for Comparing Impaired Waters Restorability," now archived for viewing online at www.epa.gov/watershedwebcasts.

[For more information, contact Doug Norton, USEPA Office of Water, 1200 Pennsylvania Avenue, N.W., Mail Code 4503T, Washington DC 20460. Phone: 202-566-1221; Email: norton.douglas@epa.gov]

Notes from the States, Tribes and Localities

Dairy Regulations and Coordinated Approach Help Restore Record Number of Washington Water Bodies

In 2011 the state of Washington reported that 84 impaired water bodies in the Chehalis and Willapa watersheds had been restored or partially restored, thanks in large part to widespread nonpoint source pollution control efforts. Highlighted on the U.S. Environmental Protection Agency's (EPA's) Nonpoint Source Success Stories website (www.epa.gov/nps/success), this remarkable achievement brings Washington's total number of restored water bodies up to 91—making up approximately 25 percent of the 366 restored (or partially restored) water bodies reported to date nationwide. Washington's recipe for success appears to be a combination of regulatory requirements, stakeholder collaboration, targeted implementation and voluntary efforts. Importantly, the success is documented by watershed-wide monitoring.

Watersheds Up-Close

The Chehalis and Willapa rivers drain to coastal bays that support important shellfish areas (Figure 1). About 80 percent of each watershed is forested and about 10 percent is dedicated to agriculture. Because of the hilly topography, most of the urban development and agricultural land uses (primarily dairy and livestock operations) are concentrated in areas close to waterways.

Elevated levels of fecal coliform bacteria from agricultural runoff and leaking septic systems restricted shellfish harvesting and recreation uses in both watersheds. As a result, the Washington Department of Ecology (DOE) added numerous segments to the state's list of impaired waters (for bacteria impairments) between 1996 and 2004. Listings included 93 segments in the 2,600-square-mile Chehalis River watershed and 15 segments in the 260-square-mile Willapa River watershed. Many of these segments were also listed as impaired for temperature (attributed to a lack of riparian cover and natural factors) and dissolved oxygen (attributed to elevated nutrients from nonpoint source pollution and warm water temperatures).

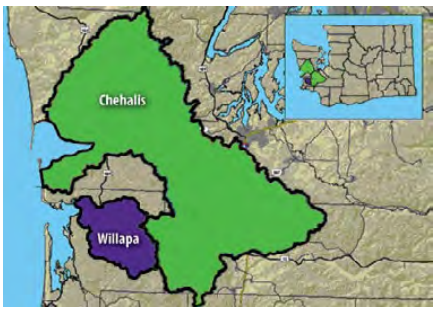

Figure 1. Both the Chehalis River and the Willapa River basins empty into coastal bays (Gray's Harbor and Willapa Bay, respectively).

Between 2000 and 2008, DOE developed bacteria total maximum daily loads (TMDLs) and TMDL implementation plans for both watersheds. The TMDLs identified the main bacteria sources as animal waste from livestock operations and livestock stream access, agricultural and stormwater runoff, untreated human sewage from failing and inadequate residential and commercial septic systems, and wildlife. Existing bacteria permit limits for sewage treatment plant discharges complied with the TMDL waste load allocations. Separate TMDLs developed for dissolved oxygen and temperature are also being implemented.

Targeting Pollution Control Practices

Livestock nutrient management-related actions played a key role in the removal of bacteria impairments in both basins. In 1998 Washington passed its Dairy Nutrient Management Act, which requires that all licensed cow dairies develop and implement nutrient management plans, register these plans with the Washington State Department of Agriculture (WSDA), and participate in a routine inspection (conducted by WSDA nutrient management inspectors) at least every 22 months. The WSDA and DOE have worked closely with dairy operators to help them comply with the requirements. Nutrient management plans helped reduce the amount of bacteria and other nonpoint source pollutants reaching waterways by reducing livestock access to waterways and better controlling the storage and application of manure. Although non-dairy livestock owners are not subject to the Act, they work with DOE and local conservation districts to implement BMPs voluntarily to ensure that their operations do not degrade water quality.

In both the Willapa and Chehalis River basins, DOE's nonpoint source program staff worked with local conservation groups to produce and implement TMDLs that helped dairy operators and other agricultural landowners target best management practices (BMPs) and other management actions required to eliminate pollution from their properties. Watershed stakeholders responded. In both watersheds, all dairies developed and implemented nutrient management plans. (Currently, a total of 40 dairies are operating with approved and certified nutrient management plans in these two basins—seven in the Willapa and 33 in the Chehalis.)

Coordinated efforts by watershed stakeholders also led to widespread implementation of other BMPs designed to reduce bacterial discharges, such as planting riparian buffers, adding livestock exclusion fencing and alternative water sources, replacing and repairing septic systems, adopting nutrient management plans, building manure containment structures, treating stormwater runoff, and educating landowners and the general public about how they can contribute to water quality protection. The Chehalis Confederated Tribes installed numerous riparian planting and fencing projects on reservation land and in partnership with many nontribal public and private landowners. These BMPs reduced the amount of bacteria and other nonpoint source pollutants reaching surface waters.

Stakeholders also implemented a number of wetland restoration and protection projects to improve and preserve the filtering capacity of the wetlands. In the Willapa Basin, for example, multiple landowners and agencies partnered on an eight-year effort (2000 to 2008) to restore 300 acres of estuary wetlands at Potter Slough in the lower Willapa River and remove livestock from the area (Figure 2). For this project, six adjacent private landowners applied for Wetland Reserve Program funds and were granted conservation easements. In the Chehalis Basin, stakeholders improved wetland habitat by installing more than two miles of fencing to exclude livestock, restoring more than 1,100 acres of wetlands and implementing 600 acres of wetland wildlife habitat management.

"The success achieved in these watersheds is thanks to many different people—farmers, homeowners, local governments and stakeholder groups," explains DOE's Dave Rountry. "We've seen big improvements in the handling and storage of dairy farm manure, notably from the 1998 Dairy Nutrient Management Act. Farmers are keeping their livestock out of the streams. More landowners are planting trees on shorelines to block and filter pasture runoff. We've also seen more homeowners taking care to fix and correctly operate and maintain their septic systems. This has truly been a watershed-wide restoration effort, where neighbors helping neighbors have turned ordinary work into extraordinary results."

Diverse Funding Support Encourages Implementation

The availability of local, state and federal funding sources was critical for the success of landowners' restoration and TMDL implementation efforts in both the Chehalis and Willapa basins. Between 1996 and 2008 in the Chehalis River basin, nonpoint source project funding included $675,000 in Clean Water Act (CWA) section 319 grants; $2.2 million in state Centennial Clean Water Fund (CCWF) grants to conservation districts; $500,000 in Local Toxics Control Account grants for stormwater improvements; $400,000 in Aquatic Lands Enhancement Account grants for habitat improvement and vegetation control; and $502,000 in special appropriations administered by the state's Shoreland Environmental Assistance Program. Landowners and project sponsors contributed an additional $1 million toward those projects in cost-share funds.

Figure 2. Numerous Willapa River watershed stakeholders partnered on the Potter Slough Estuary restoration project, shown here after completion.

In the Willapa River basin, the Pacific Conservation District (PCD) received approximately $300,000 from the CCWF and other Washington state funding sources to help plan and implement efforts to reduce nonpoint source bacteria levels. More than $68,000 in CWA section 319 funds supported septic system assessment and growth planning in the watershed. The PCD and the Natural Resources Conservation Service continue to work with landowners to implement agricultural and riparian BMPs using funds from the Environmental Quality Incentives Program, the Conservation Reserve Program, the Wetland Reserve Program and the Wildlife Habitat Incentive Program.

Like other counties in the state, those in the Chehalis and Willapa basins relied on the Washington State Water Pollution Control Revolving Fund low-interest loan program to create local loan programs to help residents and small businesses pay for needed repairs and upgrades of faulty on-site sewage treatment systems. Some basin homeowners living near shorelines have also received financial assistance to repair or replace their septic systems from a dedicated fund established by the Washington State Legislature in 2001. The fund is supported by a portion of revenues from oyster sales on state-owned tidelands.

Water Quality Monitoring

In both basins, active monitoring programs have helped DOE identify water quality improvements. The Chehalis Basin Partnership, which includes representatives from cities, tribes, counties, state government and local citizens, began a study in 2006 to collect and analyze water samples from 83 sites on a monthly basis. During 2008, the number of sites was expanded to 94. These

Dairy Regulations and a Coordinated Approach Help Restore a Record Number of Washington Water Bodies (continued)

data show that 76 impaired Chehalis Basin segments (covering 128.8 miles) now meet the applicable primary contact recreation use water quality standard for fecal coliform bacteria. Similarly, DOE maintained a comprehensive monitoring network (25 sites) in the Willapa Basin through the late 2000s. Data collected in 2006 show that at least eight impaired Willapa Basin segments (covering 7.2 miles) met water quality standards for bacteria. Thanks to the monitoring efforts, DOE has the data necessary to propose removing a total of 82 Chehalis and Willapa segments from the impaired waters list for bacteria in 2012. (Two additional segments within the Chehalis Basin were already removed in 2008.) Most shellfish beds are now open for harvesting (Figure 3), although harvests in some areas close to sewage treatment plants will remain prohibited as a routine precaution.

Partnerships Count!

In the Chehalis River and Willapa River basins, cooperative efforts between landowners, nonprofit groups and local, state, tribal and federal governments have facilitated implementation of targeted BMPs and yielded water quality improvements. Janet Strong, President of Chehalis Basin Land Trust, and Trustee of the Chehalis River Council, is optimistic about the future. "These improvements in water quality are most impressive. Even more inspiring are the strong partnerships formed by so many groups and individuals." Pacific County Commissioner Lisa Ayers (District #3, within the Willapa River basin), shared similar thoughts: "This successful local effort will serve as a model for cooperative water quality investigation and restoration efforts throughout the state." The remarkable restoration success seen in these two basins will surely have watershed managers across the country taking a closer look.

Figure 3. An oyster barge sails in Willapa Bay.

More details about restoration efforts in the Chehalis and Willapa basins are available on EPA's Success Stories website at http://water.epa.gov/polwaste/nps/success319/wa_chehalis.cfm and http://water.epa.gov/polwaste/nps/success319/wa_willapa.cfm.

[For more information, contact David Rountry, Washington Department of Ecology, Southwest Region, P.O. Box 47600, Olympia, WA 98504-7600. Phone: 360-407-6276; Email: drou461@ecy.wa.gov]

Software Spotlight

NPDAT Helps States to Reduce Nutrient Pollution

In March 2011, the U.S. Environmental Protection Agency released a memorandum outlining its intention to work more closely with states and others to reduce nutrient pollution. The memorandum, titled "Working Effectively in Partnership with States to Address Phosphorus and Nitrogen Pollution through Use of a Framework for State Nutrient Reductions," included a recommended framework that is intended to initiate conversation with states, tribes, other partners and stakeholders on how best to achieve near-and long-term reductions in nitrogen and phosphorus pollution.

The first elements in EPA's recommended framework are to (1) prioritize watersheds on a statewide basis for nitrogen and phosphorus loading reductions and (2) set watershed load reduction goals based upon best available information. To support states, other partners and stakeholders in this important work, EPA has developed a data access tool known as the Nitrogen and Phosphorus Pollution Data Access Tool (NPDAT).

NPDAT Helps States to Reduce Nutrient Pollution (continued)

NPDAT boasts a geospatial viewer and a multitude of publicly available datasets for download in a single location. Having all of these data available in this integrated format allows states and others to develop the most effective nitrogen and phosphorus source reduction strategies possible (Figure 1).

NPDAT Elements

The tool provides downloadable data layers and key information describing (1) the extent and magnitude of nitrogen and phosphorus pollution in U.S. waters, (2) water quality problems or potential problems related to this pollution, and (3) potential sources of these pollutants. Specific data layers accessible through NPDAT include:

- **Nitrogen and phosphorus loadings.** Data layers include total nitrogen and phosphorus yields for the Mississippi River (1992) and other major river basins (2002), as developed by the USGS' SPAtially Referenced Regressions On Watershed attributes (SPARROW) program. (For more information on SPARROW, see the article "New Decision Support System from USGS Widens Access to Nutrient Transport Information," on the next page).
- **Water quality data and information.** Data layers include nutrient information from EPA's National Aquatic Resource Surveys, EPA's STORage and RETrieval database (STORET) and the USGS' National Water Information System (NWIS).
- **Resources to help set watershed load reduction goals or source control priorities.** Data layers include those that display (1) the facilities that are likely to discharge nitrogen and phosphorus to water, (2) locations of operations with National Pollutant Discharge Elimination System Concentrated Animal Feeding Operations permits, (3) the National Land Cover Dataset, (4) waters listed for nitrogen/phosphorus or related impairments, (5) waters with total maximum daily loads in place for nitrogen/phosphorus or related impairments, and (6) drinking water sources. A data layer showing recent, nutrient-related Clean Water Act section 319 projects is expected to be added soon.
- **Hydrologic and political boundaries.** Data layers include states, eight-digit hydrologic unit code watersheds, and the Mississippi/Atchafalaya River basin.

User Support for NPDAT

EPA offers several resources on its NPDAT website (www.epa.gov/nutrientpollution/npdat) to help new users learn how to operate the tool. Resources include a fact sheet that provides a brief overview of the tool and a tutorial document, which uses narrative text and screenshots to walk a user through a NPDAT case study and provides guidance for downloading data. EPA also offers a link to the Watershed Academy's archived version of its November 30, 2011 webcast titled "Tools for Developing State Nitrogen and Phosphorus Pollution Reduction Strategies," which demonstrates both NPDAT and SPARROW. Users can also visit the "Recent Additions" page (http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/npdat_recent.cfm) to see an overview of updates to NPDAT and dates on which the updates occurred. To receive update notifications by email (no more than a few per year) on new data added to NPDAT, please send an email to npdat-hq@epa.gov with the word "subscribe" in the subject line. Users with additional questions may contact the NPDAT resource center by emailing npdat-hq@epa.gov or by clicking the "Contact Us" link at the bottom of the NPDAT webpage.

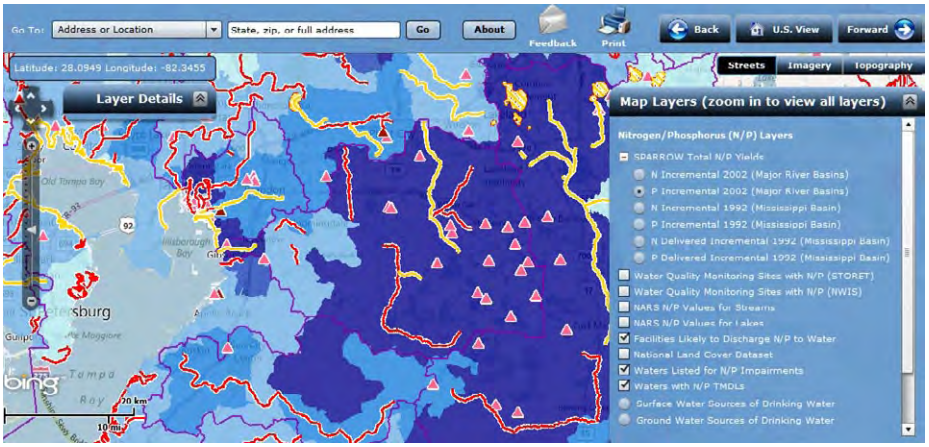

Figure 1. This NPDAT screenshot features a look at Florida's Tampa Bay area. Data layers shown include phosphorus yields (blue: darker shade equal higher yields), waters listed for nutrient impairments (red lines), waters with a nutrient-related TMDL in place (yellow lines), and the location of facilities with the potential to discharge nutrients (triangles). States can use information like this to help them develop nutrient reduction strategies.

SPARROW: New Decision Support System from USGS Widens Access to Nutrient Transport Information

The U.S. Geological Survey (USGS) has released an online, interactive decision support system that provides easy access to six newly developed regional models which describe how rivers receive and transport nutrients from natural and human sources to downstream waters. High levels of nutrients in the nation's rivers, streams and coastal areas can be toxic to both humans and wildlife and can cause algal blooms that increase drinking water treatment costs, limit recreational activities and threaten valuable fisheries.

Developed using the SPARROW (SPAtially Referenced Regressions On Watershed attributes) modeling framework, the new USGS decision support system allows water managers, researchers and the general public to map predictions of long-term average water quality conditions, track nutrient transport to downstream receiving waters and evaluate different pollution control scenarios.

SPARROW

The USGS developed the SPARROW water-quality model in the late 1990s to help interpret national-scale water resource data and predict water quality in unmonitored streams. Since then, the USGS National Water Quality Assessment (NAWQA) Program has worked to develop regional models that can focus on the factors that influence water quality locally. The regional SPARROW models incorporate geospatial data on geology, soils, land use, fertilizer (including manure), wastewater treatment facilities, temperature, precipitation and other watershed characteristics gathered from the USGS, the National Oceanic and Atmospheric Administration, the U.S. Department of Agriculture, and the U.S. Environmental Protection Agency. The geospatial data are linked to measurements of stream flow from USGS stream gages and water quality monitoring data from approximately 2,700 sites operated by 73 monitoring agencies. To date, the NAWQA Program has developed six regional models covering much of the nation (Figure 1).

Benefits of the Decision Support System

USGS recently released its SPARROW model as a Web-based, interactive decision support system (see http://cida.usgs.gov/sparrow). The decision support system's map-based displays make navigation easy. The USGS provides video tutorials that walk users step-by-step through different types of analyses. Users may also access numerous pre-defined example scenarios that show how nutrient loads to rivers and lakes vary with changes in pollutant inputs.

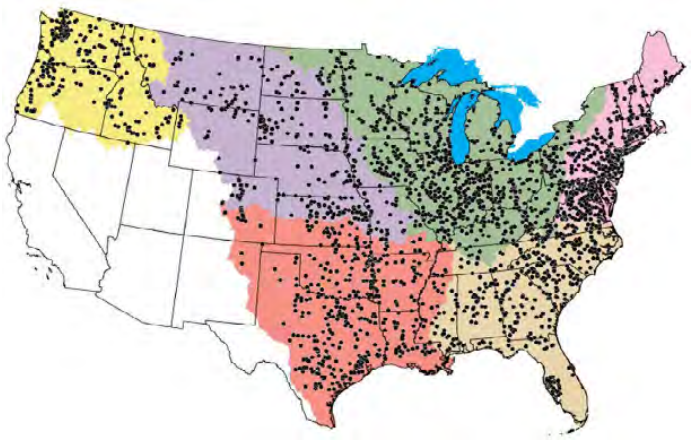

Figure 1. SPARROW regional models are available for each of the shaded areas. Dots represent the 2,700 monitoring sites that USGS used to calibrate the models.

Each region and locality has a unique set of nutrient sources and characteristics that determine how those nutrients are transported to streams. Stephen Preston, USGS hydrologist and coordinator for these regional models, noted, "Using the decision support system, users can evaluate combinations of source reduction scenarios that target one or multiple sources of nutrients and see the change in the amount of nutrients transported to downstream waters–a capability that has not been widely available in the past."

As an example, the decision support system indicates that reducing wastewater discharges throughout the Neuse River Basin in North Carolina by 25 percent will reduce the amount of nitrogen transported to the Pamlico Sound from the Neuse River Basin by three percent; whereas a 25 percent reduction in agricultural sources, such as fertilizer and manure, is anticipated to reduce the amount of nitrogen by 12 percent.

SPARROW: New Decision Support System from USGS Widens Access to Nutrient Transport Information (continued)

The six regional model results indicate that the primary sources of nutrients vary widely by location (Figure 2). Wastewater effluent and urban runoff are significant sources of nutrients in the Northeast and mid-Atlantic, whereas agricultural sources such as farm fertilizers and animal manure contribute heavily to nutrient concentrations in the Midwest and Great Plains regions of the nation. Atmospheric deposition is the largest contributor of nitrogen in many streams in the eastern United States, and naturally occurring geologic sources are a major source of phosphorus in many areas.

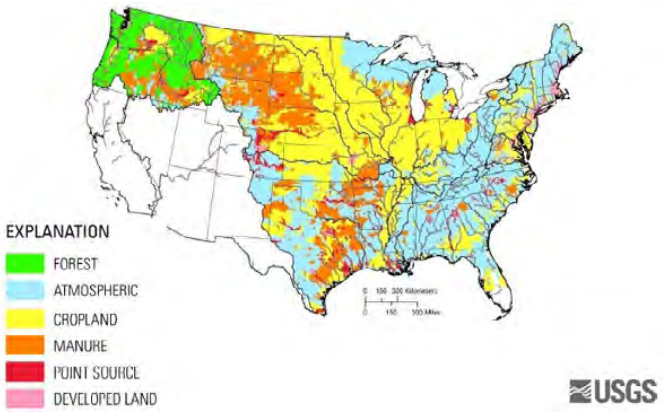

Figure 2. The regional models reveal that the sources of nitrogen most responsible for nutrient loading vary by location. Colors indicate primary nitrogen sources.

Additionally, the six models used in the decision support system show that the amounts of nutrients transported varies greatly among the regions, partly because nutrients can be removed in reservoirs or used by plants before they reach downstream waters. Temperature and precipitation variation across the country also affect the rates of nutrient movement and loss on the land and in streams and reservoirs.

"Protecting ecosystems like the Great Lakes and Gulf of Mexico is critical to ensuring that those areas continue to be important economic engines for our nation," said Lori Caramanian, Deputy Assistant Secretary, Water and Science, U.S. Department of Interior and a member of the Mississippi River Gulf of Mexico Watershed Nutrient Task Force. "These new models and the decision support system are excellent tools that will help states, water managers and federal agencies target sources and areas in order to design effective nutrient reduction strategies to improve water quality."

[For more information, contact Steve Preston, U.S. Geological Survey, Office of Communications and Publishing, 12201 Sunrise Valley Dr, MS 119, Reston, VA 20192. Phone: 302-734-2506 x230; Email: spreston@usgs.gov]

Reviews and Announcements

Agricultural Systems Report from USDA on Nitrogen Management

In September 2011 the U.S. Department of Agriculture's (USDA's) Economic Research Service released *Nitrogen in Agricultural Systems: Implications for Conservation Policy* (www.ers.usda.gov/Publications/ERR127). This report explores the use of nitrogen in U.S. agriculture and assesses how potential changes in nutrient management by farmers can improve nitrogen use efficiency. The report suggests that several potential policy approaches could induce farmers to improve their nitrogen management strategies and reduce nitrogen losses to the environment. These changes include financial incentives, nitrogen management as a condition of farm program eligibility, and regulation.

Case Studies Highlight Cities with Successful Green Infrastructure Strategies

In 2011 the Natural Resources Defense Council released *Rooftops to Rivers II: Green Strategies for Controlling Stormwater and Combined Sewer Overflows*, which offers case studies for 14 geographically diverse cities that are all leaders in employing green infrastructure solutions to address stormwater challenges. The report, available at www.nrdc.org/water/pollution/rooftopsii, highlights ways that these cities find beneficial uses for stormwater, reduce pollution, save money and beautify cityscapes. The report identifies six key actions that cities can take to maximize green infrastructure investment.

Climate Change Handbook for Regional Watershed Planning Released

EPA, U.S. Army Corps of Engineers, California Department of Water Resources and the Resources Legacy Fund recently released the *Climate Change Handbook for Regional Watershed Planning* (www.water.ca.gov/climatechange/CCHandbook.cfm). This document provides a framework for considering climate change in water management planning. Key decision considerations, resources and tools are presented to guide resource managers and planners as they develop means of adapting their programs to a changing climate. The handbook uses the California Department of Water Resources' Integrated Regional Water Management planning framework as a model into which analyses of climate change impacts and planning for adaptation and mitigation can be integrated. In addition, the handbook provides a checklist for identifying and prioritizing the vulnerability of local watersheds. The checklist includes questions about water demand and supply, wildlife and habitat, sea level rise, critical infrastructure and hydropower.

Climate-Ready Water Utilities Toolbox Revised

EPA has recently updated its Climate-Ready Water Utilities Toolbox (www.epa.gov/safewater/watersecurity/climate/toolbox.html). The Toolbox provides access to more than 500 resources that support climate adaptation planning at water utilities, including reports and publications, information about funding programs that could support climate-related actions by utilities and municipalities, upcoming workshops and training sessions, models and tools, and climate response materials that focus on mitigation and adaptive strategies. The Toolbox is organized into two sections: (1) a highlighted resources section that provides a selection of resources from each category and a map that helps users select resources by geographic region; and (2) a section that features a search function to helps users select resources based on their location, the size and type of their utility, and resources of interest.

EPA's Nonpoint Source Outreach Toolbox Updated

EPA recently updated its Nonpoint Source Outreach Toolbox (http://cfpub.epa.gov/npstbx). The Toolbox serves as a one-stop-shop for state and local agencies and other organizations interested in educating the public on nonpoint source pollution or stormwater runoff. The Toolbox houses a variety of resources to help develop an effective and targeted outreach campaign. Features of the Toolbox include EPA's Getting in Step Outreach Series, a searchable catalog of outreach materials developed at the state and local level, and surveys and evaluations of effective outreach campaigns. The updated version includes two important new features, along with other improvements: (1) A robust new search feature to help users find the most applicable TV, radio or print materials in the Toolbox's product catalog to meet their specific nonpoint source/stormwater outreach needs; and (2) new TV, radio and print ads covering various nonpoint source and stormwater topics.

EPA Releases PCB TMDL Handbook

EPA has issued a technical document titled *Polychlorinated Biphenyl (PCB) Total Maximum Daily Load (TMDL) Handbook* (http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/upload/pcb_tmdl_handbook.pdf), which provides EPA regions, states and other stakeholders with updated information for addressing waters impaired by PCBs. PCBs rank sixth among the national causes of water quality impairment in the country; of the 71,000 water body pollutant combinations listed nationally, more than 5,000 are PCB-related. This handbook identifies various approaches to developing PCB TMDLs and provides examples of TMDLs from around the country, complete with online references. It aims to help states develop meaningful PCB TMDLs and ultimately restore waters impaired by PCBs.

Fact Sheet Examines Phosphorus Transport in Agricultural Watersheds

In January 2012 the U.S. Geological Survey's National Water Quality Assessment (NAWQA) Program released a fact sheet titled *Phosphorus and Groundwater: Establishing Links Between*

Agricultural Use and Transport to Streams (see http://pubs.usgs.gov/fs/2012/3004). This fact sheet highlights findings from an examination of phosphorus occurrence and transport in groundwater of five of the seven agricultural watersheds currently being studied as part of NAWQA's ongoing Agricultural Chemicals Transport (ACT) study. For more information on ACT, see http://in.water.usgs.gov/NAWQA_ACT.

International Coastal Cleanup Marks 25-Year Milestone

Over the past 25 years, the Ocean Conservancy's International Coastal Cleanup has become the world's largest volunteer effort for ocean health. Thanks to a concerted cleanup effort taking place on just one day each year for 25 years, nearly nine million volunteers from 152 countries and locations have cleaned 145 million pounds of trash from the shores of lakes, streams, rivers and oceans. In late 2011 the Ocean Conservancy released a report highlighting the successes and lessons learned from the past 25 years, including a summary of the types and amount of trash collected (e.g., 52.9 million cigarette butts, 1.2 million latex balloons, and 7.8 million plastic bags). For more information, see www.oceanconservancy.org/our-work/marine-debris/international-coastal-cleanup-11.html.

International Report Highlights Water and Ecosystem Connectivity

Releasing the Pressure: Water Resource Efficiencies and Gains for Ecosystem Services, a new report from the United Nations Environment Program (UNEP), discusses the need to balance short-term water productivity gains, particularly in agriculture, with water flows' long-term role in maintaining sustainable landscape ecosystem services and human health. Produced by researchers at the Stockholm Environment Institute, the UNEP report recognizes the valuable services provided by ecosystems—such as wetlands and forests—and how they can improve livelihoods and help meet the rising demands on the world's water resources in a sustainable manner. This report outlines 10 key messages highlighting ways that water productivity, water flows and ecosystem services are interconnected. It gives examples (through case studies) on the trade-offs and opportunities between water productivity improvements and the water-related services provided by other ecosystems. The report is geared to land use planners and managers. For more information, see www.sei-international.org/publications?pid=2050.

National Water Monitoring Newsletter Available

The National Water Quality Monitoring Council's 4th Edition of *National Water Monitoring News* (http://acwi.gov/monitoring/newsletter/National_Monitoring_News_fall2011.pdf) is available. This newsletter provides a forum for communication among water practitioners across the United States. In support of the national council's mission, this newsletter is geared to foster partnerships and collaboration; advance water science; improve monitoring strategies; and enhance data integration, comparability and reporting. Topics in the newsletter include the upcoming 8th National Monitoring Conference, EPA's National Wetlands Condition Assessment and National Lakes Assessment, bivalve monitoring in the Great Lakes and new online tools.

New EPA Compilation DVD Offers Videos on Reducing Runoff from Urban Areas

EPA recently released a four-video DVD compilation that provides an introduction to controlling runoff in urban areas. Called *Reduce Runoff: Slow it Down, Spread it Out, Soak it In!*, the DVD's videos can help fulfill the outreach requirements for EPA's Stormwater MS4 program as well as helping with outreach for other purposes. EPA has full rights to the videos and is encouraging the airing of these programs on local cable TV stations. This DVD video compilation features: (1) *Reduce Runoff: Slow it Down, Spread it Out, Soak it In!*, an introductory video on reducing stormwater runoff and its harmful effects on the environment (8:43 minutes); (2) *RiverSmart Homes: Getting Smart about Runoff in Washington, DC*, a video about a District of Columbia program that provides assistance to citizens to install various practices such as trees, rain barrels

and rain gardens (12:00 minutes); (3) *Building Green: A Success Story in Philadelphia*, a video tour of an environmentally friendly housing complex in Philadelphia (11:00 minutes); and (4) *After the Storm*, a popular video co-produced by EPA and The Weather Channel in 2004 to educate the public about watersheds and stormwater (21:39 minutes). Copies of this DVD suitable for airing on local cable TV stations may be ordered from the National Service Center for Environmental Publications by emailing nscep@bps-lmit.com or calling 800-490-9198 (refer to document number EPA 842-11-001). The videos are posted in small-screen format at http://water.epa.gov/polwaste/green/video.cfm.

New Method for Detecting Bacteria at Beaches Described

The article "Autonomous, Wireless In-Situ Sensor (AWISS) for Rapid Warning of *Escherichia coli* Outbreaks in Recreational and Source Waters" is now available online (http://online.liebertpub.com/doi/abs/10.1089/ees.2011.0148) for free. The article describes a new, economical, sensor-based device capable of measuring *E. coli* bacteria levels in water samples. The device contains a prototype optical sensor that measures changes in fluorescence intensity in a water sample. In the presence of *E. coli* bacteria, an enzymatic reaction will cause an increase in fluorescence. The AWISS, which can detect high concentrations of bacteria in less than one hour and lower concentrations in less than eight hours, could serve as a valuable early warning tool for recreational beaches.

Newsletter Highlights Water Quality Trend Analysis

The November 2011 issue of the North Carolina State University Water Quality Group's *NWQEP Notes* includes a detailed article describing how to evaluate water quality data to identify steadily increasing or decreasing trends over a long period of time. "Statistical Analysis for Monotonic Trends" is targeted toward persons involved in watershed nonpoint source monitoring and evaluation projects where documentation of water quality response to the implementation of management measures is the objective. The relatively simple trend analysis techniques discussed are applicable to water quality monitoring data collected at fixed stations over time. For more information, see www.bae.ncsu.edu/programs/extension/wqg/issues/notes135_monotonic_trends.pdf.

Nutrient Reduction Decision Support Toolbox Available

The Gulf of Mexico Alliance Nutrient Reduction Priority Issue Team has released the Nutrient Reduction Decision Support Toolbox (www.gulfofmexicoalliance.org/toolbox/toolbox.html). Targeted at state and local agencies and other organizations interested in reducing nutrients (nitrogen and phosphorus) and other pollutants, the toolbox aims to improve efforts to reduce the size of the hypoxic zone in the Gulf of Mexico as well as occurrences of hypoxic events across Gulf of Mexico coastal and estuarine waters. The toolbox was developed through the collaborative interaction of non-governmental organizations; agricultural producers; private businesses; academic institutions; and local, state and federal agencies.

Presentation Describes Stormwater Education Campaign

A new online presentation features the Knoxville, Tennessee-based Water Quality Forum's annual Rainy Day Brush Off campaign. This artistic rain barrel competition, created in 2007, engages the regional visual arts community, schools, businesses and local citizens in both art and stormwater education. Initially developed as an EPA-funded webcast, the presentation is now available as an online PDF at http://waterqualityforum.org/wordpress/wp-content/uploads/RDBO-EPA_Webcast_WNotes.pdf.

Report Details Benefits of Building Water Infrastructure

The national organization Green For All, in partnership with American Rivers, Pacific Institute, and the Economic Policy Institute, recently released *Water Works: Rebuilding Infrastructure, Creating Jobs, Greening the Environment* (see www.greenforall.org/about-us/resources/water-works).

This report details the impact of hypothetical increases in federal spending on water and wastewater infrastructure projects. According to the report, a roughly $200 billion investment in water infrastructure could improve the United States' ability to manage stormwater and wastewater, create 1.9 million jobs and add $265 billion to the economy. In particular, the report examines a $188.4 billion investment spread equally over the next five years. *Water Works* emphasizes the importance of green infrastructure projects that restore, preserve or mimic natural hydrological systems. The report argues that more widespread use of these technologies will significantly decrease the amount of polluted runoff being directed into rivers, lakes and streams.

Resources Available for New Stormwater Construction General Permit

On February 16, 2012, EPA issued its final 2012 Construction General Permit (CGP), which provides permit coverage to operators of construction sites disturbing one or more acres of land. In March 2012, EPA held a webinar to review new permit requirements and answer questions. A copy of the webinar is available at http://cfpub2.epa.gov/npdes/outreach.cfm?program_id=0&otype=1. Additionally, EPA has posted a new template for construction operators to use in developing stormwater pollution prevention plans, which are site-specific documents required as part of EPA's new 2012 Construction General Permit. The template is designed to help construction operators develop a stormwater pollution prevention plan that complies with the new permit's minimum requirements. The template allows operators to customize the document to the needs of the site, and includes tables and other fields that are easy to complete. For more information on EPA's 2012 CGP see http://cfpub.epa.gov/npdes/stormwater/cgp.cfm.

Student Guide Links Food Choices and Water Quality

What's On Your Fork? is a free downloadable action guide and collection of supplementary educational tools from EarthEcho International. The information is designed to help educators and students explore how our water supply is impacted by daily food choices as well as the fertilizers, pesticides and irrigation water needed to grow that food. This new resource is part of EarthEcho's Water Planet Challenge, a Web-based interactive program exploring topics that engage and empower middle and high school-aged youth to design, create and implement service-learning projects in their communities. Rich in academic connections, the *What's On Your Fork?* step-by-step action guide includes stimulating content, student organizers for discussions and planning, and examples of youth taking action. See www.WaterPlanetChallenge.org for details.

Webinar Features Regulations and Agriculture in New Zealand

An April 20, 2012 Ohio State University (OSU) seminar featured New Zealand's unique approach to regulating water quality through nutrient trading between farmers within a watershed. The seminar ("Environmental Regulation and Agriculture in New Zealand: Lessons for the U.S.") will be available online at http://aede.osu.edu/programs-and-research/environmental-policy-initiative/events. OSU offers several additional water quality management-related webinars including "Managing Nutrients in Agricultural Watersheds," available at http://ohiowatersheds.osu.edu/news/archive/2011/managing-nutrients-in-agricultural-watersheds.

Winter Maintenance Videos Available

The Mississippi Watershed Management Organization developed two educational videos about winter maintenance, with a focus on using best management practices to reduce environmental impacts from deicers and sand. The first, *Improved Winter Maintenance: Good Choices for Clean Water*, is targeted at homeowners and focuses on the impacts of salt on water quality (search for "mwmovideo" on www.youtube.com). The second video, *Winter Maintenance for Small Sites*, was completed in 2010 and is targeted at contractors, maintenance staff and others who maintain small sites such as building entrances and sidewalks (see www.pca.state.mn.us/roadsalt).

Recent and Relevant Periodical Articles

Cry Me a River: Following a Watershed's Winding Path to Sustainability

By Cheryl Dybas, National Science Foundation, March 9, 2012
(www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=123431&org=NSF)

This article is a part of a series developed by the National Science Foundation (NSF) describing projects that won its Water, Sustainability and Climate grant awards. This article features a project that investigates how Wisconsin's Yahara River watershed is affected by changes in climate, land cover, urban areas and human demands on the environment.

Excess Nitrogen in the U.S. Environment: Trends, Risks, and Solutions

By Davidson et al, *Issues in Ecology*, Winter 2012
(www.esa.org/science_resources/issues/FileEnglish/issuesinecology15.pdf)

This issue of *Issues in Ecology* presents new research showing how excess nitrogen can influence ecosystems, biodiversity, human health and climate. The publication also explores options for reducing nitrogen oxide emissions from energy, transportation and farm and livestock operations.

Fertilizer Use Responsible for Increase in Nitrous Oxide in Atmosphere

By Robert Sanders, University of California-Berkley, April 2, 2012
(http://newscenter.berkeley.edu/2012/04/02/fertilizer-use-responsible-for-increase-in-nitrous-oxide-in-atmosphere/)

This press release describes a new nitrogen isotope study completed by Dr. Kristi Boering, a University of California-Berkley professor of chemistry and earth and planetary science. Boering and her colleagues analyzed nitrogen isotopes in Antarctic ice and found a link between nitrogen used in fertilizer and a rise in atmospheric nitrous oxide over the past 50 years. Boering was able to trace the source of nitrous oxide because bacteria in a nitrogen-rich environment, such as a freshly fertilized field, prefer to use nitrogen-14 (the most common isotope), instead of nitrogen-15. The study suggests that a change in the way people use fertilizer could influence the amount of nitrous oxide present in the atmosphere.

Measuring Farm Pollution: By the River or by the Farm?

By Jennifer Vogel, Minnesota Public Radio, September 13, 2011
(http://minnesota.publicradio.org/display/web/2011/09/13/ground-level-water-science)

This report from Minnesota Public Radio discusses a "Discovery Farms" monitoring project taking place on a working farm near Lake Wakanda, Minnesota. The report describes the ongoing struggle to identify whether agricultural or urban areas are the largest source of nonpoint source pollution for a given water body. In this case, the data indicate that a nearby city is putting more sediment, phosphorus and other pollutants per acre into Lake Wakanda than is the farm. The data also show that the farm is adding six times more nitrate than the city. The project is one of six led by a Minnesota farm coalition that wants to collect more data on the relative pollutant contribution from agriculture.

Ohio Farmers Battle Sedimentation, Nutrient Runoff in Creative Ways

By Chris Kick, *Farm and Dairy*, November 16, 2011
(www.farmanddairy.com/news/ohio-farmers-battle-sedimentation-nutrient-runoff-in-creative-ways/31685.html)

This article, printed in the online edition of *Farm and Dairy*, discusses efforts by Ohio farmers to reduce their impact on Lake Erie by using voluntary conservation measures.

Websites Worth a Bookmark

Geospatial Platform (www.geoplatform.gov)

Federal agencies and their partners collect and manage large amounts of geospatial data; however, these data are often not easily found when needed or accessible in useful forms. The Geospatial Platform provides ready access to federally maintained geospatial data, services and applications, as well as access to data from non-governmental organizations and state, tribal, regional and local government partners. The Web site allows users to create customized maps, or to integrate their own data into the maps, and share the maps through Web browsers and mobile applications. The Geospatial Platform was developed by an interagency committee composed of representatives from the Executive Office of the President, the EPA, the U.S. Department of the Interior and the National Oceanic and Atmospheric Administration.

Green Infrastructure (www.epa.gov/greeninfrastructure)

EPA's Office of Water recently released its new Green Infrastructure website designed to better communicate the "what, why and how" of green infrastructure to municipalities, developers and the general public. The new Green Infrastructure website, which features improved navigability and up-to-date content, serves as a one-stop-shop for resources on green infrastructure and low impact development. The site offers a wealth of publications and tools developed by EPA, state and local governments, the private sector, nonprofit organizations and academic institutions. The new site also provides access to the latest research developed by EPA's Office of Research and Development.

Farm Program Atlas (www.ers.usda.gov/Data/FarmProgramAtlas)

The USDA's Economic Research Service now offers an online interactive mapping tool that displays payment and participation data by county for seven key federal farm programs, including the Conservation Reserve Program. Users may choose from an array of maps displaying county-level data for nearly 100 variables to see maps showing levels of participation and benefits from key farm programs, maps comparing participation and benefits from selected programs, and data for any county on a selected farm program. Users may also print maps or save them in a graphics-file format for use in other documents or presentations. Atlas data is available for download in spreadsheet format.

Nutrient Pollution Policy and Data (www.epa.gov/nandppolicy)

EPA recently unveiled a new website featuring nutrient pollution policy information and data to help people access information on EPA actions to reduce nutrient pollution. The site will support state efforts to develop numeric nutrient criteria and provide access to EPA tools, data, research and reports related to nutrient pollution. To facilitate state and local efforts to reduce nutrient pollution, EPA also released a new Web-based Nitrogen and Phosphorus Pollution Data Access Tool (www.epa.gov/nutrientpollution/npdat; see "NPDAT Helps States to Reduce Nutrient Pollution" on page 17 for more information).

Nutrient Pollution (www.epa.gov/nutrientpollution)

EPA also developed a new nutrient pollution website targeted at homeowners, students and educators. The site features information explaining the problem of nutrient pollution; the sources of the pollution; how it affects the environment, economy and public health; and what people can do to reduce the problem. The site features an interactive map of case studies showing example of efforts to reduce nutrient pollution across the United States.

Calendar

For an updated events calendar, see www.epa.gov/newsnotes/calendar.htm.

May 2012

5/20–24 *2012 Land Grant and Sea Grant National Water Conference*, Portland, OR (www.usawaterquality.org/conferences/2012/default.html)

5/21–23 *Global Conference on Oceans, Climate and Security*, Boston, MA (www.gcocs.org/)

5/22–24 *2012 Tahoe Science Conference: Environmental Restoration in a Changing Climate* , Incline Village, NV (www.nvwra.org/)

5/29–31 *2012 International Conference on Climate Adaptation: Adaptation Futures*, Tucson, AZ (www.adaptation.arizona.edu/adaptation2012)

June 2012

6/3–8 *International Association for Ecology (INTECOL) International Wetlands Conference: Wetlands in a Complex World*, Orlando, FL (www.conference.ifas.ufl.edu/INTECOL/index.html)

6/10–13 *2nd International Conference on Algal Biomass, Biofuels and Bioproducts*, San Diego, CA (www.algalbbb.com/)

6/21–24 *Association for Environmental Studies and Sciences Annual Meeting: Preparing for our Environmental Future*, Santa Clara, CA (www.aess.info/content.aspx?page_id=22&club_id=939971&module_id=105521)

6/25–27 *American Water Resources Association Specialty Conference; Contaminants of Emerging Concern in Water Resources II: Research, Engineering, and Community Action*, Denver, CO (www.awra.org/meetings/Summer2012/contaminants.html)

6/25–27 *2012 State of the Coast: Preparing for a Changing Future*, New Orleans, LA (www.stateofthecoast.org)

6/25–27 *The Mediterranean City 2012: A Conference on Climate Change Adaptation*, Los Angeles, CA (www.watershedhealth.org)

6/26–27 *National Ground Water Association Focus Conference on Midwestern Groundwater Issues*, Columbus, OH (www.ngwa.org/Events-Education/conferences/5085/Pages/5085jun12.aspx)

6/27–29 *American Water Resources Association Specialty Conference; Riparian Ecosystems IV: Advancing Science, Economics and Policy*, Denver, CO (www.awra.org/meetings/Summer2012/riparian.html)

6/28–29 *8th International Conference on Data Integration in the Life Sciences*, College Park, MD (https://sites.google.com/site/webdils2012)

6/30–7/3 *18th International Interdisciplinary Conference on the Environment*, Portland, ME (http://ieaonline.org/?page_id=68)

July 2012

7/12–13 *4th International Conference on Climate Change,* Seattle, WA (http://on-climate.com/conference-2012)

7/18–20 *Stormwater Symposium 2012*, Baltimore, MD (http://wef.org/Stormwater2012/)

7/22–25 *67th Annual Soil and Water Conservation Society International Conference; Choosing Conservation: Considering Ecology, Economics and Ethics*, Fort Worth, TX (www.swcs.org/index.cfm?nodeID=34487&audienceID=1)

7/29–8/1 *2012 American Society of Agricultural and Biological Engineers' Annual International Meeting*, Dallas, TX (www.asabemeetings.org)

August 2012

8/26–30 *38th International Aquatic and Marine Science Libraries and Information Centers Annual Conference: Exploring New Frontiers in Aquatic Sciences Information Management*, Anchorage, AK (www.iamslic.org/conf2012)

Contribute to *Nonpoint Source News-Notes*

Do you have an article or idea to share? Want to ask a question or need more information? Please contact *NPS News-Notes*, c/o Don Waye, by mail at U.S. EPA, Mail Code 4503-T, 1200 Pennsylvania Ave., NW, Washington, DC 20460, or by email at waye.don@epa.gov.

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