NWQEP NOTES

The NCSU Water Quality Group Newsletter

Number 138 | August 2013 | ISSN 1062-9149

NC STATE UNIVERSITY

NC State University A&T State University COOPERATIVE EXTENSION
Empowering People · Providing Solutions

IN THIS ISSUE

NWQEP NOTES is available on the World Wide Web at http://www.ncsu.edu/waterquality/issues/Default.htm. To subscribe or unsubscribe to the NWQEP NOTES listserv: Send e-mail to: mj2@lists.ncsu.edu (leave subject field blank). In the body of the e-mail, type **subscribe nwqep_notes** or **unsubscribe nwqep_notes**.

Note: *NWQEP NOTES* is only provided electronically effective June 2007.

PROJECT SPOTLIGHT

Totten and Eld Inlet Section 319 National Nonpoint Source Monitoring Program (NNPSMP) Project

Jean Spooner, Biological & Agricultural Engineering, NC State University

Based upon: Batts, D. and K. Seiders. 2003. Totten and Eld Inlets Clean Water Projects: Final Report

Project Overview

Totten and Eld Inlets are marine inlets separated by peninsulas in southern Puget Sound in Washington (Figure 1). Six subbasins draining to the inlets were selected for this monitoring project. The total drainage basin for the six monitored subbasins is 29,063 acres. These adjacent inlets are exceptional shellfish production areas. The rural nature of the area makes it an attractive place in which to live. Consequently, stream corridors and shoreline areas have experienced considerable urban, suburban, and rural growth in the past decade. Many recreational, noncommercial livestock farms are located in the area. Both upland and lowland areas have highly productive forest lands.

The most significant nonpoint source (NPS) pollution problem in these inlets is bacterial contamination affecting shellfish production (Seiders, 1999). Contamination of shellfish harvest areas by fecal coliform (FC) bacteria has restricted harvesting in more than 40% of Puget Sound's previously certified areas (Seiders and Cusimano, 1996). As of 2000, there were restrictions of one kind or another on about 25% of Puget Sound's commercial shellfish harvest areas (PSWQAT, 2001). The major sources of fecal coliform bacteria are failing on-site sewage (septic) systems (OSSSs) and poor livestock-keeping practices along stream corridors and marine shorelines. Saturated soil conditions in the wet season (November-April) reduce the ability of many OSSSs to adequately treat sewage. Saturated soils during the wet season also results in increased stormwater runoff, exacerbating water quality problems from livestock-keeping practices such as overgrazing pastures and poor maintenance of livestock holding areas. Direct livestock access to streams and poorly maintained near-shore on-site systems are year-round problems.

At the end of the NNPSMP monitoring project (early 2000's), Totten Inlet was classified by the Washington Department of Health (DOH) as an 'approved' shellfish harvest area but was considered threatened due to bacterial NPS pollution. Eld Inlet was classified by DOH as 'approved' for shellfish harvest, except for the extreme southern-most portion which was reclassified from 'conditionally approved' to 'unclassified' in 1998. A designation of 'unclassified' means shellfish may not be commercially harvested, although this may not be an issue if an area is not otherwise (independent of pollution concerns) suitable for shellfish growing or harvest. The southern DOH 'approved' portion of Eld Inlet had been classified 'conditional' (shellfish could not be harvested for 3 days following rain events greater than 1.25 inches in 24 hours) until early 1998. Eld Inlet is still threatened due to bacterial NPS pollution sources.

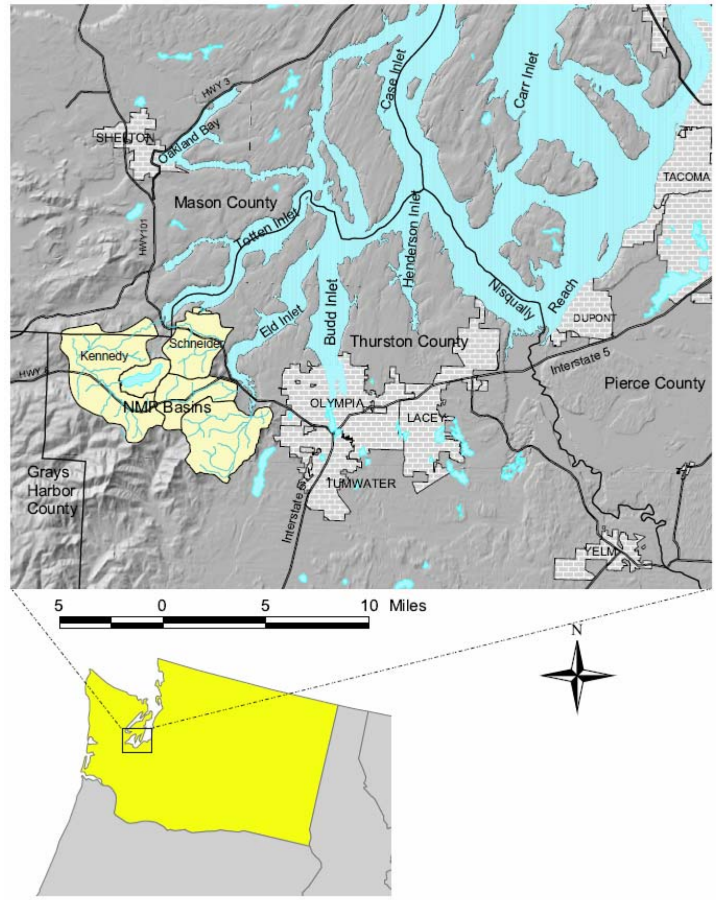

Figure 1. Location of study basins.

Land treatment within the Totten and Eld Inlets watersheds evolved from the combined efforts and resources of local and state government. Watershed action plans were completed in 1989 for both Totten and Eld Inlets. While a significant level of public involvement and planning occurred, material resources for implementing on-the-ground best management practices (BMPs) were scarce. In 1993, revenue from property assessments and grants provided funds for local government to implement remedial actions in targeted areas within these watersheds. The goal of the remedial efforts was to minimize the impacts of NPS pollution by implementing farm plans on priority farm sites and identifying and repairing failing on-site wastewater treatment systems. Priority farm sites were those farms that potentially threatened the quality of receiving wa-

EDITOR'S NOTE

This issue of *NWQEP NOTES* features two watershed studies. We continue our highlights of the EPA's National Nonpoint Source Monitoring Program (NNPSMP) projects with the water quality findings and recommendations from the Totten and Eld Inlets project in the southern Puget Sound, Washington State. The project's goal was to evaluate the effectiveness of agricultural BMPs (e.g., pasture management, riparian area protection, and management of livestock holding areas) and upgrading failing near-shore on-site sewage systems in reducing fecal coliform (FC).

The Totten and Eld Inlets project highlighted the importance of good experimental design in watershed studies. For the single watershed monitoring stations, FC fluctuations were high and land use/BMP tracking inadequate, making it difficult to link water quality to BMPS. However, in the paired watersheds, seasonal and transient weather effects could be factored out and a rapid decrease in FC was observed from the BMPS. This design also quantified how quickly the treatment watershed responded to decreases and then increases in animal numbers, with a corresponding decrease and increase in FC.

We also highlight the water quality system at the University of Wisconsin-Platteville Pioneer Farm, which was established in 2001 with initial efforts devoted to surface water monitoring and development of a baseline dataset that will be used to evaluate water quality benefits from agricultural BMPs including: grazing management, streambank stabilization, filter strips, manure management, and dairy cow dietary phosphorus management. Low-cost and innovative water quality monitoring approaches and devices have been developed, including a prototype low cost, edge-of-field monitoring gauge that can be deployed even in Wisconsin winters.

Jean Spooner

Jean Spooner
Editor, *NWQEP NOTES*

ters due to their physical location or known management problems such as animal access to a stream, large numbers of animals, and lack of adequate pollution controls. In part, these efforts have been hampered by a shift in political climate from regulatory/mandatory compliance to voluntary efforts. For example, a dramatic drop in participation occurred with on-site sewage upgrades when inspections changed from mandatory to voluntary (Holfstad and Tipton, 1998). Grant funded BMP efforts lasted into 1999 for the four Totten-Inlet subbasins, and into 2000 for the two Eld-Inlet subbasins.

In 1992, the Washington State Department of Ecology (WDOE) initiated a water quality monitoring program to evaluate the effectiveness of remedial land treatment practices on water quality. The monitoring effort was formalized in 1995 into a U.S. Environmental Protection Agency (USEPA) Section 319 NNPSMP project. The monitoring effort targeted six subbasins within the larger Totten and Eld Inlets watersheds. The goal of the monitoring program was to document water quality over time to evaluate the effectiveness of watershed-based land management programs. A paired watershed design was used for two subbasins (Kennedy and Schneider) while a single site approach was used for four subbasins. Water quality monitoring was conducted from mid-November to mid-April on a weekly basis for at least 22 consecutive weeks each year. Fecal coliform bacteria, suspended solids, turbidity, flow, and precipitation were the main parameters of interest. Farm-plan BMP implementation was tracked via information provided by the Conservation Districts. WDOE staff did not have control over any aspect of BMP design, BMP implementation, or BMP monitoring.

In the following sections, we highlight the paired watershed study, give a summary of the water quality findings from the single watershed monitoring results, and share some of the recommendations offered by the project personnel based upon their lessons learned.

Paired Watershed

A paired watershed approach was used for the Kennedy/Schneider subbasins to document the change in water quality resulting from BMP implementation. The paired watershed method comprises two watersheds of similar location and land use (control and treatment) and two periods of study (calibration and treatment) (Clausen and Spooner, 1993). The advantage of this method is that it factors out some non-BMP variables that can affect pollutant levels. Typically, one sampling station is positioned at the outlet of each watershed. During the calibration period (typically at least two years), land use at both control and treatment sites should remain the same. The goal is to establish a quantifiable relationship (e.g., a linear regression) between observations of water quality concentration and/or load in the two watersheds. At the end of the calibration period, BMPs are implemented at the treatment site. The project then proceeds into the treatment period (usually at least two years). Again, the goal is to establish a relationship between control and treatment watersheds. The relationships are compared statistically to see if a change has occurred due to BMP implementation.

In this project, Kennedy was a background (control) subbasin, while Schneider was the treatment subbasin (Figure 1). The calibration period was 1988-1993. The treatment period was 1994-2002. Land treatment included: animal waste storage, fencing and streambank protection, fish stream improvement, pasture management, nutrient management, and forest stand improvement.

The Kennedy/Schneider design differs from the classic paired watershed method described above, in that Kennedy was a relatively unpolluted stream during the rainy season, and Schneider was polluted. Instead of measuring percent change as a divergence (one stream getting cleaner than the other), the project sought to document a convergence of pollution levels in the two watersheds (i.e., Schneider becoming as unpolluted as Kennedy). The analytical mechanics of the paired watershed analysis were:

- Multiple regression was used for percent change and significance of change.
- The dependent variable was Schneider log10(FC).
- The independent variables were Kennedy log10(FC), Pre-Post (0-1), and interactive (Kennedy log10(FC)·Pre-Post).
- Plots of residuals against predicted values were examined for linearity, homogeneity of variance, and normality. These assumptions appeared to be met in all cases.

Percent change is obtained from the regression coefficients, and significance is determined by regression *P*-values; significance is set at a=0.05. When percent change differs depending on pollutant concentration, the slopes of the regression lines differ. This is called a concentration dependent or interactive effect. Regardless of whether there is a concentration-dependent effect or not, percent change is calculated as average percent change between the calibration period and each post-calibration period. When concentration-dependent effects are significant, they are retained as part of the regression equation. When they are not significant, they are removed, and the regression is run again. This lowers the *P*-value for the pre/post factor in the regression, increasing the significance of the percent change.

Boxplots describing the annual variability in weekly FC counts at the Kennedy and Schneider subbasin outlets are shown in Figure 2. The horizontal line or narrowest box width near the center of the box corresponds to the median of the distribution. The top and bottom edges of the box correspond to the 25th percentile (first quartile) and 75th percentile (third quartile) of the data. The interquartile range (IQR) is the distance between the third and first quartiles. Stars are used to

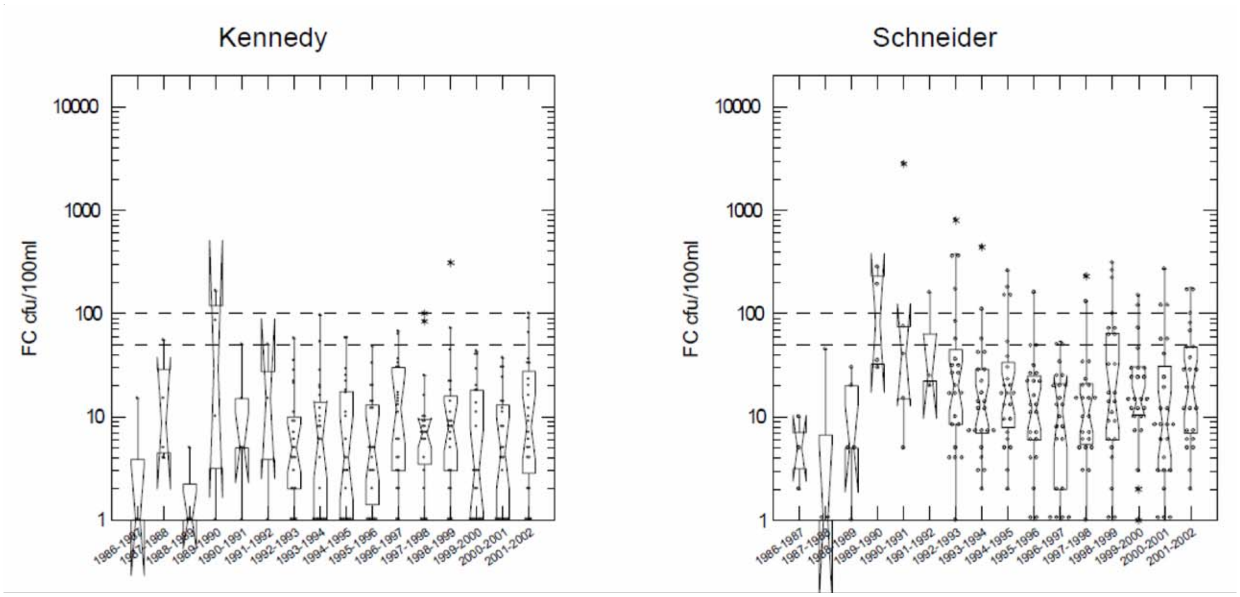

Figure 2. Box plots for weekly FC counts sampled at the Kennedy (control) and Schneider (treatment) subbasins.

mark observations beyond 1.5·IQR from either side of the box. The lines, or whiskers, drawn from the top and bottom of the box extend to the most outlying value within 1.5·IQR from the ends.

Weekly FC counts and a trend line show an indication of a decreasing trend in the treatment watershed (Schneider), but no change at the control watershed (Kennedy) (Figure 3).

The paired regressions of the pre- and post-BMP, $\log_{10}$-transformed FC data are shown in Figure 4. Annual fluctuations due to non-BMP factors such as changes in animal numbers, weather, and land use were large. As such, the project found comparisons between the pre-BMP period of 1988-1993 to the entire post-BMP period difficult to interpret. In response, the project regressed calibration period data (1988-1993) against overlapping two-year post-calibration period data rather than against a single post-BMP period dataset. This resulted in eight paired regressions instead of one (Figure 4).

The solid (red) line is the relationship between Schneider (treatment) and Kennedy (control) during the calibration period. The dashed line in each graph is the relationship between Schneider and Kennedy during a designated two-year period following the calibration period. Improvement is indicated by the dashed line dropping further below the solid line; degradation is indicated by the dashed line reapproaching or rising above the solid line.

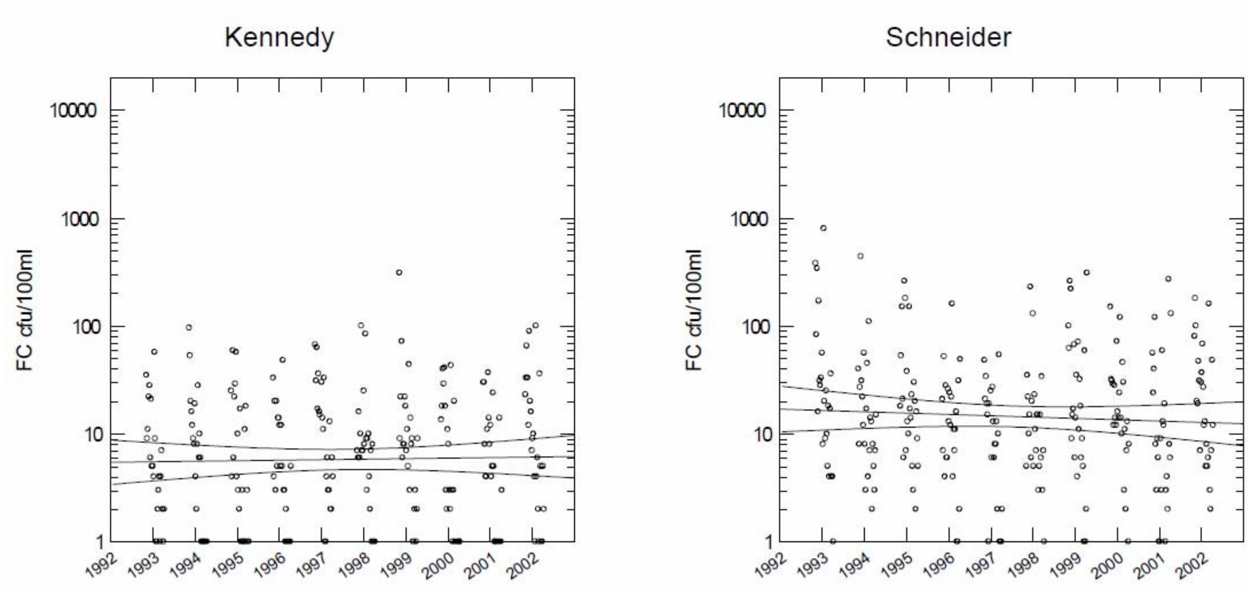

Figure 3. Fecal coliform counts sampled at the Kennedy (control) and Schneider (treatment) subbasins with a trend line and a 95% confidence interval for the period of 1992-2002.

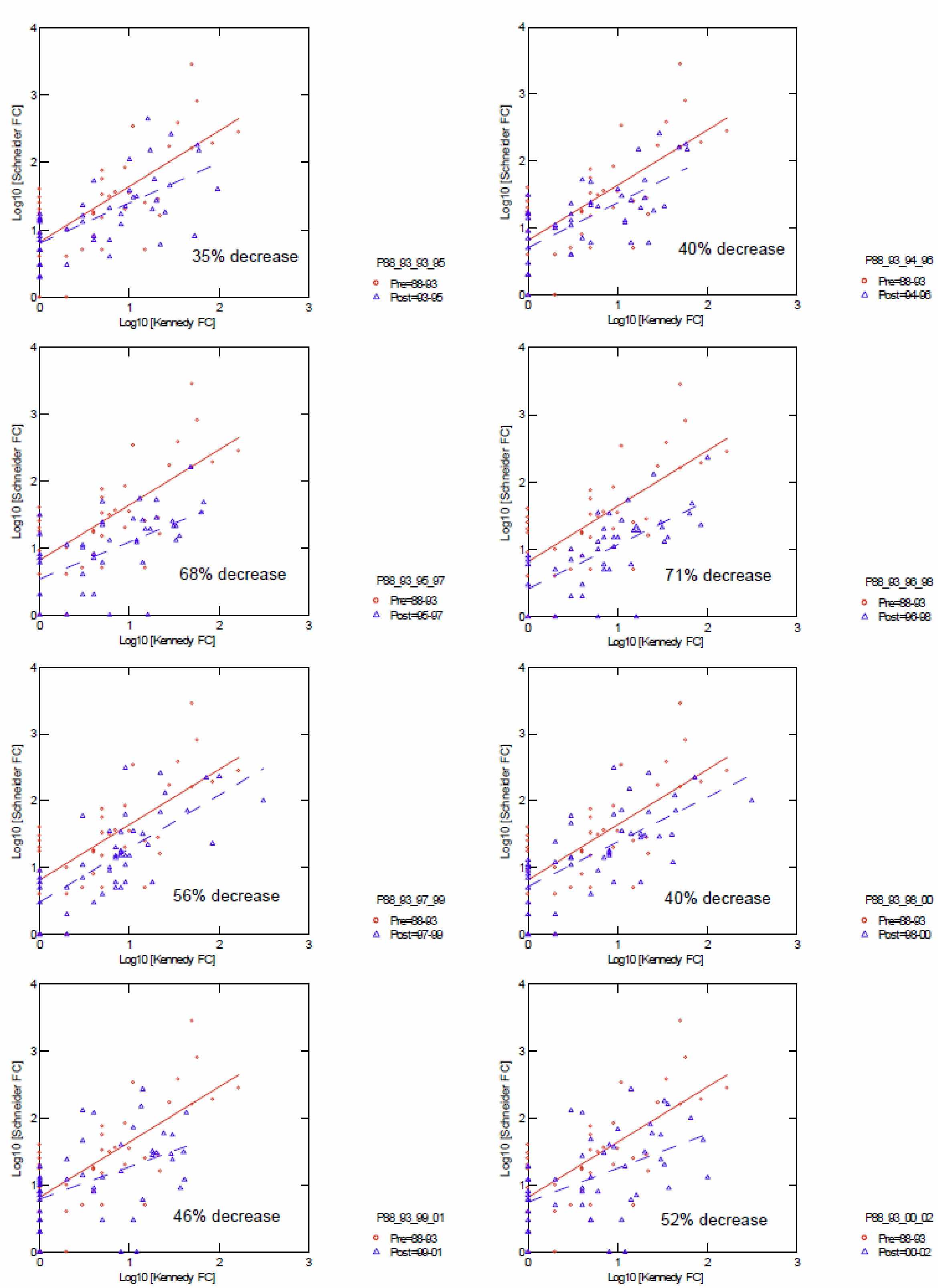

Figure 4. Paired watershed regressions of pre- and post-BMP log10(FC) data. Solid line is the calibration period; dashed line is the post- period. Schneider is the treatment watershed.

Percent change from the calibration period to each post-treatment period regression was calculated by the project and also shown on Figure 4.

Schneider FC decreased by 35% during the first post-calibration period (1993-1995), but this was not statistically significant. A further decrease to 71% from 1996-1998 was significant.

While Schneider FC decreased to below the calibration period level early during the watershed grant period and stayed below that level during the entire grant period, some of the decrease may be attributed to changes in farm ownership resulting in a non-BMP-related farm management change. One farm, just upstream of the sample site, changed ownership after the original farm plan was developed. Fewer horses were observed at this farm since 1996 than in previous years; no horses were observed from late winter 1997 until fall of 2000. The historical data show that FC levels increased about the same time (1990) that the original owners began keeping horses on the farm (Seiders, 1999). Paired watershed regression incorporating horses present/not present as a factor showed that horses were significant for FC concentration ($p=0.044$) and for FC loading ($p=0.033$) during the 1995-1997 period, a period of significant reduction in loading for Schneider. The horse factor was also significant for FC loading during the 1999-2001 period.

Simple before/after analysis for Schneider showed a similar pattern, although the results are generally not as pronounced or significant as with the paired watershed analysis. As with all other streams, FC levels were higher at Kennedy during the last period (2000-2002) than during the prior minimum FC period (1999-2001).

Water Quality Change in Single Monitoring Station Basins

The project post-BMP monitoring period ended in spring, 2002. Results from the 10-year monitoring effort were mixed, with some basins having decreases and some basins having increases in fecal coliform. During the post-BMP period, FC concentrations and loadings fluctuated considerably from year to year. In all cases where significant improvement occurred for at least one two-year average period, the average of the last monitoring period (2000-2002) was higher than the prior low value for the site. All streams violated state water quality standards for FC at some time during the study after best management practices were implemented.

A number of factors, including re-prioritization, reorganization, and staff turnover, as well as complex interagency relationships, reduced the agencies' abilities to meet original pollution control goals, including improving land management and water quality. These factors also affected the ability to monitor land-use and land-management practices. The project was not able to accurately track annual BMP implementation, but did make a good attempt at compiling records and performing windshield surveys. Batts and Sneiders (2003) shares details on BMP implementation and challenges with tabulating those data. Due in part to inadequate BMP implementation and accurate tracking, it was difficult to link water quality changes to land management programs.

Recommendations from Project Final Report

The final report included detailed recommendations, several of which are summarized and expanded upon here (Batts and Sneiders 2003).

- To be useful in establishing a pre-BMP baseline for watershed projects, the frequency and coverage of ambient monitoring need to be great enough to support subsequent statistical analysis in combination with post-BMP monitoring data. This can be of particular concern when baseline data are derived from shellfish sanitation monitoring efforts that may collect as few as 6 to 12 samples per year at targeted sites.
- Absent knowledge of seasonal patterns, baseline monitoring should be conducted throughout the year until such seasonality or critical periods are documented. For example, whereas impacts to shell fishing may be observed more on a seasonal basis, bacterial sources such as OSSSs and direct access of livestock to streams may be polluting year-round.
- Project water quality monitoring should commence as far in advance of any planned BMP work as possible, and should continue for a minimum of two years after BMP completion.
- Sample replication should be increased from the practice of 10% replication. Precision can be inferred but not determined for any sample that is not collected at least in duplicate. This is especially important for samples of known high variability like bacteria, for which both field and lab split sample replication should be increased. The number of laboratory dilutions should be increased to reduce the incidence of counts that are "at or above the reported value". Statistical power analysis should be undertaken in all cases to determine the minimum sampling frequency required for meaningful results.
- The influence of seasonal climatic patterns and weather events need to be factored out when determining effectiveness of watershed pollution-control efforts. Paired watershed and upstream/downstream monitoring can do this if all assumptions are met, but the real world often differs from the ideal condition. Statistical analysis methods should be applied to account for seasonal climatic and transient weather factors.
- Upstream/downstream monitoring should be employed, in all monitoring projects, even in paired watershed

studies. The upstream/downstream method maintains an internal control for isolating the effects of BMP implementation, which can be particularly useful when there is a lack of ability to restrict BMPs in the control watersheds.

- Stream flows should be measured synoptically with pollutant sampling whenever possible in order to have the ability to estimate covariate effects and continuously for loading calculations.
- States should engage in concerted efforts to obtain and consolidate statewide demographic and land-use data with both geo-spatial and ownership information. The data need to be updated annually, and the historical data should be as accessible as current data, so changes can be measured over time.
- Where water quality problems have been associated with failing OSSSs, counties need to track operation and maintenance at all systems in the watershed to help target problem areas and interpret water quality results. Requirements should include periodic leakage inspection, repair when leakage occurs, solids buildup inspection, pumping when indicated by inspection, and reporting.
- NPS pollution grants and loans for agriculture and OSSSs need to have unambiguous language with regard to performance expectations and measures, as well as data collection, storage, and reporting requirements. Land-use and management practices, livestock populations, and measurements of pollution-control installations and operations and maintenance need to be documented (at minimum by year and subbasin) and reported for all projects.
- NPS pollution efforts need stable long-term funding bases. The State water quality agency should consider encouraging the state, local agencies, or land trusts to purchase riparian properties in cases where watershed cleanup efforts have failed to be achieved or failed to be lasting. Environmental agencies should review their programs for conflicting mandates and implementations. Specific roles, reporting requirements, and priorities should be consistent

The material above was edited from the project final report (Batts and Seiders, July 2003) and is available at **http://www.ecy.wa.gov/biblio/0303010.html**.

Literature Sited

Batts, D. and K. Seiders. 2003. Totten and Eld Inlets Clean Water Projects: Final Report. Washington State Department of Ecology, Publication No. 03-03-010. **http://www.ecy.wa.gov/biblio/0303010.html** *(accessed June 1, 2013)*

Clausen, J.C., and Spooner, J. 1993. Paired Watershed Study Design. 841-F-93-009. U.S. Environmental Protection Agency. 8 pp.

Hofstad, L. and Tipton, D. 1998. *Shellfish Protection Initiative - Totten / Little Skookum Watershed: 1992-1998*. Thurston County Environmental Health Division, Olympia, WA.

PSWQAT. 2001. 2001-2003 Puget Sound Water Quality Work Plan. **http://www.psat.wa.gov/Publications/workplan_01/WORKPLAN.pdf**. Puget Sound Water Quality Action Team, Olympia, WA.

Seiders, K.R. 1999. *Totten and Eld Inlet Clean Water Projects: Annual Report*. Environmental Investigations and Laboratory Services Program. Pub. No. 99-316. Washington State Department of Ecology, Olympia, WA.

Seiders, K.R., and Cusimano, R.F. 1996. *Totten and Eld Inlet Clean Water Projects: Annual Report*. Environmental Investigations and Laboratory Services Program. Pub. No. 96- 342. Washington State Department of Ecology, Olympia, WA.

■

University of Wisconsin – Platteville's Pioneer Farm Water Quality and Flow Monitoring

University of Wisconsin-Platteville Pioneer Farm (**http://www.uwplatt.edu/pioneerfarm/research/about.html**) is located in southeast Wisconsin. Pioneer Farm is a 430-acre working laboratory of production agriculture with a mission to provide on-farm experiences with students, to evaluate management practices, to conduct systems and applied research, and to communicate education and research to students, agencies, producers, and the public. The Pioneer Farm Research department was established in 2001 with initial efforts devoted to surface water monitoring and development of a baseline dataset. Research projects have addressed grazing, stream bank erosion, odor, groundwater, filter strip runoff, manure management, dairy cow dietary phosphorus, and agroecology. The current emphasis is on hypothesis-driven research to evaluate specific farming practices consistent with the research mission to demonstrate and evaluate management practices and technologies to help farmers operate profitably.

The related Discovery Farms (**http://www.uwdiscoveryfarms.org/**) program is an effort by University of Wisconsin (UW) Extension and UW Madison that develops on-farm and related research to determine the economic and environmental effects of agricultural practices on a diverse group of

Wisconsin farms and educates and improves communications among the agricultural community, consumers, researchers, and policy-makers to better identify and implement effective environmental management practices that are compatible with profitable agriculture. In contrast to Pioneer Farm, Discovery Farms are real working farms throughout Wisconsin's diverse agricultural landscape. These programs are governed by a joint Steering Committee representing different farm and environmental organizations.

A key aspect of the current research conducted by UW and the U.S. Geological Survey (USGS) is water quantity and quality monitoring to evaluate management practices including tile drainage, cropping systems management, and manure management. A report released in 2011 (Stuntebeck et al., 2011) summarizes hydrologic and water-quality data collected year-round at 23 edge-of-field monitoring stations on five privately owned Discovery Farms and on Pioneer Farm during water years 2003–2008, totaling 84 site-years of data. This report establishes the relationship of precipitation and runoff in different physical settings and varying farming systems. This document also identifies typical ranges and magnitudes of sediment and nutrients in runoff from agricultural fields. In addition, field conditions and the timing of field-management activities are correlated to variances in concentration and yield of sediment and nutrients at an edge-of-field scale. The studied farms represented different geographic regions and farming systems in southern and eastern Wisconsin. Analysis of runoff timing, quantity, and quality, compared to environmental factors and on-farm field activities, identified conditions in which runoff, sediment loss, and nutrient loss were most likely to occur. This information can be used to better understand the mechanisms for sediment and nutrient loss to aid agricultural producers on making more informed management decisions.

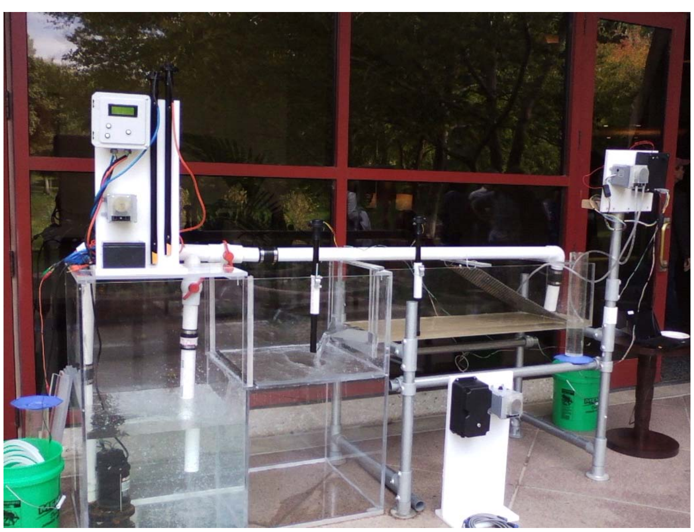

Figure 1. Recirculating flume set-up to demonstrate components of the prototype edge-of-field monitoring gauge.

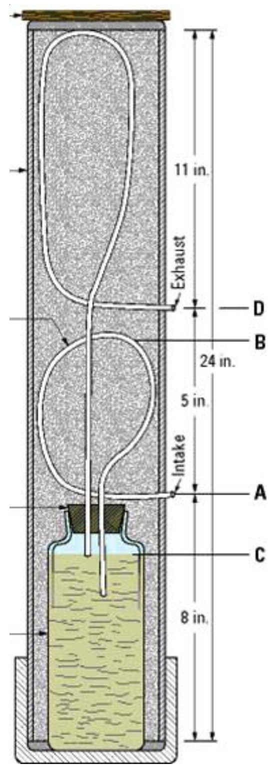

Figure 2. Construction of a single-stage siphon sampler (Credit: USGS Fact Sheet FS-067-00, May 2000)

Low-cost and innovative monitoring approaches and devices have been developed and tested as part of the UW-Platteville Pioneer Farm research effort. For example, researchers have been evaluating and developing a prototype low cost, edge of-field monitoring gauge that can be deployed even in Wisconsin winters. Busch and Mentz (2012) highlight their findings on this prototype which was demonstrated at the 2012 National Nonpoint Source Monitoring Workshop in Tulsa, OK (Figure 1).

With funding support from the MN Department of Agriculture researchers have also evaluated alternative low-cost passive sampling devices for monitoring runoff events at the edges of fields at Pioneer Farm (Busch and Haggard undated). A passive, single-stage syphon sampler is one of the devices tested versus more expensive samplers (Figure 2). With this device, the sample begins to collect when surface-water height in the flume exceeds the maximum height of the intake tube, initiating a siphon and filling the sample bottle rapidly. The device was originally developed for monitoring suspended sediment on flashy or intermittent streams (Federal Interagency Committee on Water Resources: Report No. 13 The Single-Stage Sampler-Stage Sampler for Suspended Sediment, St. Anthony Falls Hydraulic Laboratory, Minneapolis, MN) by the Interagency Committee on Water Resources. However, USGS has used the single-stage sampler to monitor additional water quality parameters (ammonia nitrogen and total phosphorus) in perennial streams and their results indicated that nutrient and sediment concentrations in samples collected by the siphon sampler were similar to concentrations collected by automated ISCO samplers. Similar results were obtained when siphon samplers were compared to automated samplers monitoring intermittent edge-of-field runoff at UW-Platteville's Pioneer Farm. Preliminary data indicated no significant (p=0.05) difference in concentration for suspended sediment, total nitrogen, or total phosphorus due to sampler. However, siphon samplers did over-estimate suspended sediment load which may be due to the fact that the sampler collects samples only on the rising limb of the hydrograph and not on the falling limb where concentrations are typically lower.

Figure 3. The enclosures installed at Pioneer Farm protect equipment (H-flumes, electronic samplers, data loggers) and help retain heat from propane heaters to keep gauges ice-free for improved data and sample collection.

Surface water monitoring during harsh winter conditions has been particularly challenging to the research team, and several innovative techniques have been developed to address the many problems associated with freezing and thawing cycles. For example, runoff monitoring stations used in a paired-station design use white plastic calf hutches to enclose the entire station, providing protection for equipment, sensors, and staff from the elements (Busch et al. undated). The hutches also provide enough heat retention to reduce the incidence of freezing during winter runoff events, using only a small propane heater (Figure 3).

Researchers at UW-Platteville have also applied photo-point monitoring to farm-scale research. Photographs are used to identify areas of concern, record field conditions within research project areas, monitor the locations of grazing cattle, record unusual or atypical events, and support QA/QC efforts in the surface-water runoff monitoring program. Time-lapse photos are taken on a 24-hour interval at surface-water gauging stations to create a record of field conditions within monitored areas. These photographs are useful in determining soil cover, plant canopy, snow cover, and crop growth throughout the year and especially at times when runoff events occur. Moreover, photographs of surface-water runoff sample bottles are taken after collection and prior to lab analysis (Figure 4). While bottle photos provide only qualitative information, such as relative sample color, this information, along with time-lapse photos can help confirm results when laboratory test results are in question. Photos of the bottle tops are used as part of the chain of custody record and project QA/QC, providing an accurate record of samples shipped for analysis.

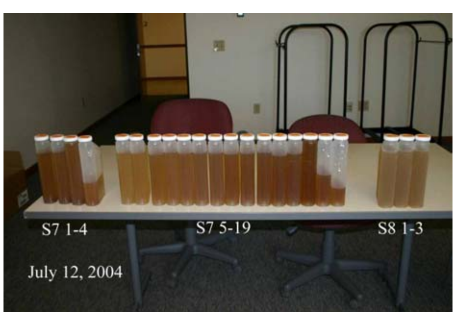

Figure 4. Photograph of sample bottles from sites 7 and 8 at Pioneer Farm.

References

Busch, D. and B. Haggard. Undated. Alternative Surface-Water Sampling Methods, University of Wisconsin-Platteville Pioneer Farm. http://www.uwplatt.edu/pioneerfarm/research/Current_Projects/Alternative_Surface-Water_Sampling_Methods.pdf

Busch, D. and R. Mentz. 2012. Lessons Learned: Edge-of-Field Runoff Monitoring. Presented at the 20th National Nonpoint Source Monitoring Workshop, Tulsa OK October 14-17, 2012. http://www.bae.ncsu.edu/programs/extension/wqg/nmp_conf/2012_tulsa/41uwplatteville.pdf

Busch, D., R. Mentz, and R. Crubel. Undated. Surface-Water Runoff Monitoring Sites 21-26. University of Wisconsin-Platteville Pioneer Farm. http://www.uwplatt.edu/pioneerfarm/research/Current_Projects/Surface-Water_Runoff_Monitoring_Sites%2021-26.pdf

Stuntebeck, T.D., M.J. Komiskey, M.C. Peppler, D.W. Owens, and D.R. Frame. 2011. Precipitation-Runoff and Water-Quality Characteristics at Edge-of-Field Stations, Discovery Farms and Pioneer Farm, Wisconsin, 2003-08. USGS Scientific Investigations Report. http://pubs.usgs.gov/sir/2011/5008/

Contacts

Dennis Busch, University of Wisconsin, Platteville Pioneer Farm, buschd@uwplatt.edu

Randy Mentz, University of Wisconsin, Platteville Pioneer Farm, mentzr@uwplatt.edu

University of Wisconsin-Platteville Pioneer Farm web site: http://www.uwplatt.edu/pioneerfarm/

Discovery Farms web site: http://www.uwdiscoveryfarms.org/

■

CONFERENCE REPORT

The 20th National Nonpoint Source Monitoring Program (NNPSMP) Workshop: The Secrets of Success: Making the Most of Available Resources was held on October 14-17, 2012 in Tulsa, Oklahoma. Plenary, technical, and workshop sessions included:

- The NIFA–CEAP Synthesis and Lessons Learned for Conservation—Water Quality Project
- Targeting Water Quality Monitoring
- Targeting Land Treatment
- Watershed Management
- Cost-Effective Water Quality Monitoring
- Cost-Effective Land Treatment
- Streambank Restoration
- Project Evaluation
- Maximizing the Effectiveness of Conservation Programs for Water Quality Improvement in Small Watersheds
- TBET Workshop: Texas BMP Evaluation Tool
- Stream Stability Assessment & BEHI Surveys workshop
- Monitoring Flow and Quality for Stormwater Control Measures Workshop
- Monitoring Edge-of-Field Runoff from Agricultural Land at UW–Platteville's Pioneer Farm

The PowerPoint presentations for the papers and workshops are accessible from **http://ncsu.edu/waterquality/nmp_conf/tulsa_oct2012.html**.

At the workshop, we were treated to a rainfall simulator demonstration by the Oklahoma NRCS. The relative quality and quantity of runoff and infiltration water from five different treatments were clearly illustrated by the use of clear collection bottles. The setup included bottles capturing both surface runoff and infiltration, providing a very effective means of demonstrating, for example, the increased infiltration achieved with native rangeland and no-till corn. You can see this demonstration in action at **http://www.youtube.com/watch?v=gdNBsZV-Y1w**. The OK NRCS website is **http://www.nrcs.usda.gov/wps/portal/nrcs/site/ok/home/**.

Rainfall Simulator Demonstration, Oklahoma USDA-NRCS. Greg Scott (white hat) is an Oklahoma State Soil Scientist. He has recently retired from NRCS and is now working for the Water Quality Division of the Oklahoma Conservation Commission. Steve Alspach (black hat) is a soil scientist with NRCS. The soils in this demo are (left to right): native rangeland, forested land, no-till (corn, wheat, soybean rotation, approx. 15 years in no-till), conventional tillage, and conventional tillage with straw mulch residue application. (Note that the runoff and infiltration jars for the native rangeland treatment have been placed on the ground.)

■

WEBCASTS ON NPS

EPA's Watershed Academy

The Watershed Academy is a focal point in EPA's Office of Water for providing training and information on implementing watershed approaches. The Academy's self-paced training modules, webcast seminars, and live training courses provide current information from national experts across a broad range of watershed topics. Information Transfer pdf documents related to watershed management are also available for download at **http://water.epa.gov/learn/training/wacademy/**

EPA's Watershed Academy Web (**http://cfpub.epa.gov/watertrain**) includes about 50 online modules on a variety of watershed management topics. Users can simply peruse the modules that interest them and a Watershed Management Training Certificate is available to trainees who complete 15 modules and pass the module self-tests. The module themes include: principles of watershed management, ecosystem services, watershed ecology, effects of natural and human-induced changes, watershed analysis and planning, management practices, communications and social issues, and water law. More than 3,500 trainees have received certificates to date. A complete listing with links is available at **http://cfpub.epa.gov/watertrain**.

EPA also offers Watershed Academy Webcast seminars approximately once a month. Webinars can be attended when given live, and afterwards via downloads of the MP4 and PowerPoint presentations at **http://water.epa.gov/learn/training/wacademy/webcasts_index.cfm**. Below, we've highlighted a few of the webcasts:

- **USDA's National Water Quality Initiative** (presented July 10, 2012) with EPA and USDA administrators
- **Section 319 Agricultural Nonpoint Source Success Stories** (June 14, 2012) with Lynda Hall, Chief NPS Branch, USEPA and various project/state practitioners
- **USDA's NIFA - CEAP Watershed Synthesis: Lessons Learned** (May 15, 2012) with USEPA, USDA, and university speakers
- **Monitoring and Assessment Under the Clean Water Act** (April 7, 2010) with scientists from EPA's Monitoring and Watershed Branches
- **National Lakes Assessment: Reporting on the Condition of the Nation's Lakes** (January 5, 2010) with USEPA and Vermont Dept. of Environmental Conservation
- **Low Impact Development: Designing LID to Work: Lessons Learned from North Carolina** (December 9, 2010) with university and private section experiences
- **Managing Nutrients in the National Estuary Program** (March 1, 2010) with Tampa Bay Estuary, Peconic Estuary, and Delaware Inland Bays programs
- **Conducting Effective Stormwater Outreach** (October 27, 2011) with EPA and Maine Dept. of Environmental Protection
- **Draft National Rivers and Streams Assessment 2008-2009: A Collaborative Survey** (April 3, 2013) with USEPA Monitoring Branch
- **Water Quality Exchange: A Tool for Tribes, Volunteer Monitors and Others to Share WQ Data** (March 14, 2013) with USEPA Monitoring Branch
- **Using Social Indicators in Watershed Management Projects** (May 1, 2013) with Purdue Univ. and Univ. of Wisconsin
- **How's my Waterway? And Other Water Quality Apps for Mobile Devices (**November 28, 2012) with USEPA and Citizen Groups
- **Monitoring Watershed Program Effectiveness** (April 10, 2010) with scientists from Tetra Tech, Inc.

State Nutrient Reduction Strategies Web Series

A series of webcasts initiated by NRCS and USEPA on State Level Nutrient Reduction Strategies started in 2011 and is continuing in 2013 (**http://www.epa.gov/region5/agriculture/nutrient.html**).

Case Studies in Integrated Water Resources Management (IWRM): From Local Stewardship to National Vision (report and webinar series).

American Water Resources Association (AWRA) produced a report and a webinar series — *Case Studies in Integrated Water Resources Management (IWRM): From Local Stewardship to National Vision* (**http://www.awra.org/committees/AWRA-Case-Studies-IWRM.pdf**) – which explore state, multi-state, and regional efforts to implement IWRM and highlighting its effectiveness at all levels of water management. Citing programs from Oregon, California, Washington, Delaware, Minnesota, Florida, and New Mexico, the case studies dispel the mystery behind IWRM by discussing the process of shifting to an IWRM approach and the resulting costs and benefits.

Using the collective experiences represented in the seven case studies, the report finds opportunities to improve our national stewardship of water resources and concludes with a recommendation that the United States move toward integrated water management at all levels of governance.

The following case studies are highlighted in the report and are the basis of the webinar series:

- Oregon's Integrated Water Resources Strategy: Implementing IWRM at the State Level
- California's Integrated Regional Water Management: Setting the Foundation for Regional Integrated Planning
- The Delaware River Basin Commission: A Classic Example of IWRM
- The Yakima River Basin Integrated Water Resource Management Plan
- The Middle Rio Grande Regional Water Management Plan: Regional Planning Using an IWRM Approach
- Developing a Plan and Decision Support System for Integrated Water Resources Management in the Minnesota River Basin
- The St Johns River Water Supply Impact Study: Creating Tools for Integrated Water Resources Management

The 62-page report with recommendations is available at **http://www.awra.org/committees/AWRA-Case-Studies-IWRM.pdf**.

A webinar series which highlights the case studies and lessons learned is available free to AWRA members and a small fee for non-members at **http://www.awra.org/webinars/**.

Urban BMPs and the Bay TMDL Webcast

On April 3, 2013 Chesapeake Stormwater Network (CSN) hosted a half day of webcast training on "**Urban BMPs and the Bay TMDL: A Users Guide**". This was an opportunity for users to learn about the Chesapeake Bay Program's Expert Panel recommendations for each of the newly approved Urban BMPs that can be used to achieve nutrient and sediment reductions toward the Bay TMDL. The webcast focuses on the CBP Expert Panel Recommendations regarding:

- Complying with State Stormwater Performance Standards
- Retrofits
- Stream Restoration
- Urban Nutrient Management

Webcasts of these presentations are available at **http://chesapeakestormwater.net/2013/03/urban-bmps-and-the-bay-tmdl-webcast/**.

■

INFORMATION

New Clean Water Act Section 319 Guidelines Released

In April 2013, the U.S. Environmental Protection Agency (EPA) released new guidelines that apply to recipients of grants made with congressionally appropriated Clean Water Act (CWA) section 319 funds which are used to help implement nonpoint source management programs. These guidelines apply to states, territories, and the District of Columbia; EPA issues separate guide-lines that apply to tribal recipients of section 319 funds. The newly revised guidelines provide updated program direction, an increased emphasis on project implementation in watersheds with impaired waters, and increased accountability measures. States and EPA regions will implement these guidelines beginning in fiscal year 2014. The new guidelines replace the *Nonpoint Source Program and Grants Guidelines for States and Territorie*s that have been in effect since fiscal year 2004.

Complete information is available at **http://water.epa.gov/polwaste/nps/cwact.cfm**.

How Green Infrastructure Saves Municipalities Money

"Banking on Green: How Green Infrastructure Saves Municipalities Money and Provides Economic Benefits Community-wide" was published in May 2012 by the American Society of Landscape Architects, American Rivers, the Water Environment Federation, and ECONorthwest. It examines hundreds of case studies that show that green infrastructure practices often offer more cost-effective solutions relative to traditional infrastructure approaches. The report details potential benefits of green infrastructure such as lower energy expenses, reduced flood damage, and improved public health. The report is available at **http://www.asla.org/ContentDetail.aspx?id=31301**.

Guide and Online Module for Developing Effective Watershed Plans

In June 2013 EPA released a new document called "A Quick Guide to Developing Watershed Plans to Restore and Protect Our Waters" that provides a streamlined summary of the 2008 Handbook for Developing Watershed Plans to Restore and Protect our Waters (the Handbook). EPA also recently released a companion product which is an online Web module called "An Introduction to Watershed Planning." Both of these new products summarize the Handbook and provide helpful technical training information for states, watershed groups, and others on how to develop more effective watershed plans to help restore and protect water resources.

The Handbook (and the Quick Guide and module) also provide information on how to incorporate the nine minimum elements from the Clean Water Act section 319 Nonpoint Source Program's funding guidelines into the watershed plan development process.

The Quick Guide is available at **http://water.epa.gov/polwaste/nps/upload/watershed_mgmnt_quick_guide.pdf**.

The new online module on "An Introduction to Watershed Planning" is available at **http://cfpub.epa.gov/watertrain/moduleFrame.cfm?module_id=70&parent_object_id=2867&object_id=2867**.

EPA Survey Finds More Than Half of the Nation's River and Stream Miles in Poor Condition

In February 2013, the U.S. Environmental Protection Agency released the results of the first comprehensive survey looking at the health of thousands of stream and river miles across the country: "The National Rivers and Streams Assessment 2008-2009: A Collaborative Study" (**http://water.epa.gov/type/watersheds/monitoring/aquaticsurvey_index.cfm**).

EPA partners, including states and tribes, collected data from approximately 2,000 sites across the country. EPA, state, and university scientists analyzed the data to determine the extent to which rivers and streams support aquatic life, how major stressors may be affecting them, and how conditions are changing over time.

Findings of the assessment include:

- 55% of the nation's river and stream miles do not support healthy populations of aquatic life, with phosphorus and nitrogen pollution and poor habitat the most widespread problems.
- 23% of river and stream miles are in fair condition.
- 21% are in good condition and support healthy biological communities.
- 40% of the nation's river and streams miles have high levels of phosphorus. 27% have high levels of nitrogen.
- Biological communities are at increased risk for poor condition when phosphorus and nitrogen pollution levels are high.
- Phosphorus and nitrogen pollution comes from excess fertilizers, wastewater, and other sources, and can cause algal blooms, low oxygen levels, and more.
- Poor vegetative cover and high levels of human disturbance near river and stream banks are also widespread, reported in 24% and 20% of the nation's river and stream miles, respectively.
- These habitat conditions make rivers and streams more vulnerable to flooding, contribute to erosion, and allow more pollutants to enter waterways.
- Excessive levels of streambed sediments, which can smother the habitat where many aquatic organisms live or breed, are reported in 15% of river and stream miles. Excess sediments are found to have a significant impact on biological condition.
- Over 13,000 miles of rivers are found to have mercury in fish tissue at levels that exceed thresholds protective of human health.

More information: **http://www.epa.gov/aquaticsurveys**

i-Tree Tool for Assessment and Managing Community Forests

i-Tree is a peer-reviewed software suite from the USDA Forest Service that provides urban forestry analysis and beneficial assessment tools. The *i-Tree* Tools help communities of all sizes strengthen their urban forest management and advocacy efforts by quantifying the structure of community trees and the environmental services that trees provide. For example, the *i-Tree Hydro* (beta) tool is designed for watershed-scale analysis of vegetation and impervious cover effects on hydrology.

By understanding the local, tangible ecosystem services that trees provide, *i-Tree* users can link urban forest management activities with environmental quality and community livability. Whether your interest is a single tree or an entire forest, i-Tree provides baseline data that you can use to demonstrate value and set priorities for more effective decision-making.

i-Tree tools can be found online at **http://www.itreetools.org/**.

USGS Phone APP for Stream Gages - WaterNow

Current conditions on thousands of rivers and streams across the country are now available by phone via text or email, using USGS' latest system WaterNow at **http://water.usgs.gov/waternow/**.

Like its predecessor and companion program, WaterAlert (**http://water.usgs.gov/wateralert/**), WaterNow seeks to make USGS gage information for streamflow, groundwater levels, springs, water quality, and lake levels more readily available to the general public. These data have been available for over 10 years at USGS Water Data for the Nation (**http://waterdata.usgs.gov/**), but this option requires a web browser for access.

WaterNow expands on the service provided by the USGS WaterAlert service. WaterAlert provides a notification only when conditions exceed a threshold set by a user, whereas

WaterNow provides data anytime on demand. These data are collected typically at 15 to 60-minute intervals, stored onsite, and then transmitted to USGS offices every hour.

To take advantage of this new feature, first find the gage you are interested in by following the instructions found on the WaterNow page (http://water.usgs.gov/waternow/), and then send a message to WaterNow@usgs.gov with the site number of the gage from which you would like to receive updates. If data are available for your site, you will receive a reply within a few minutes that includes the most recent values of stream depth and flow.

For complete instructions and guidance on how to tailor the types of data received or which stream gages might be of interest to you, visit the USGS WaterNow site (http://water.usgs.gov/waternow/).

■

CALENDAR

Meeting Announcements — 2013-2014

August-September 2013

5th National Conference on Ecosystem Restoration (NCER). Chicago, IL. July 29-Aug. 2, 3013. http://www.conference.ifas.ufl.edu/ncer2013/

13th Community Involvement Training Conference: The Next Generation of Community Involvement. Boston, MA. July 30-Aug. 1, 2013. http://www.epa.gov/ciconference/

98th Annual Meeting of the Ecological Society of America (ESA) - Sustainable Pathways: Learning from the Past and Shaping the Future. Minneapolis, MN. Aug. 4-9, 2013. http://www.esa.org/minneapolis/

2013 National Environmental Monitoring Conference (NEMC). San Antonio, TX. Aug. 5-9, 2013. http://www.nemc.us/

2013 North American Surface Water Conference and Exposition (StormCon 2013). Myrtle Beach, NC. Aug. 18-22, 2013. http://www.stormcon.com/

International Low Impact Development Symposium. Saint Paul, MN. Aug. 18–21, 2013. http://www.cce.umn.edu/2013-International-Low-Impact-Development-Symposium/

2013 California Stormwater Quality Association (CASQA) Annual Conference: Taking Stormwater Quality Management to New Heights. Squaw Valley, Lake Tahoe, CA. Sept. 9-11, 2013. http://www.stormwaterconference.com

National Ground Water Association (NGWA) Conference on Groundwater in Fractured Rock and Sediments. Burlington, VT. Sept. 10-14, 2013. http://www.ngwa.org/Events-Education/conferences/5017/Pages/5017sep13.aspx

8th Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES). Dubrovnik, Croatia. Sept. 22-27, 2013. http://www.dubrovnik2013.sdewes.org

2013 Water Education Summit: Making a Difference in Your Community. Chattanooga, TN. Sept. 24-26, 2013. http://www.h2osummit.org/

October-December 2013

86th Annual Water Environment Federation Technical Exhibition and Conference (WEFTEC 2013). Chicago, IL. Oct. 5-9, 2013. http://www.weftec.org/

5th World Conference on Ecological Restoration. Madison, WI. Oct. 6-11, 2013. http://www.ser2013.org/about/ser-25th-anniversary/

Promoting Excellence in Environmental Education: 42nd Annual North American Association for Environmental Education Conference. Baltimore, MD. Oct. 9-12, 2013. http://www.naaee.net/conference

9th Stormwater Management Symposium: Stormwater from the Ground Up. Villanova University, PA. Oct. 17-18, 2014. http://www.villanova.edu/vusp/

21st National Nonpoint Source Monitoring Conference and Workshops: Working Together to Protect and Restore Our Water Resources. Wyndham Cleveland at Playhouse Square, Cleveland, OH. Oct. 28-30, 2013. https://npsmonitoring.tetratech-ffx.com/

State of the San Francisco Estuary Conference - 20/20 Vision: Past Reflections, Future Directions. Oakland, CA. Oct. 29-30, 2013. http://www.sfestuary.org/soe/

The 33nrd International Symposium of the North American Lake Management Society. San Diego, CA. Oct. 30-Nov. 1, 2013. http://www.nalms.org/

Mid-Atlantic Stream Restoration Conference. Baltimore, MD. Oct. 30-Nov. 1, 2013. http://midatlanticstream.org/

Coastal and Estuarine Research Federation (CERF 2013): Toward Resilient Coasts and Estuaries, Science for Sustainable Solutions. San Diego, CA. Nov. 3-7, 2013. http://www.erf.org/cerf2013

AWRA Annual Conference. Red Lion Hotel on the River-Jantzen Beach, Portland, OR. Nov. 4-7, 2013. http://awra.org/

January-March 2014

National Association of Conservation Districts (NACD) Annual Meeting. Anaheim, CA. Feb. 2-5, 2014. http://www.nacdnet.org/events/annualmeeting/

13th River Restoration Northwest. Stevenson, WA. Feb. 4-6, 2014. http://www.pnamp.org/announcement/4287 (Abstracts due September 14, 2013)

Environmental Connection: International Erosion Control Association (IECA) 2014 Annual Conference. Nashville, TN. Feb. 25-28, 2014. http://www.ieca.org/conference/annual/

Annual International Stormwater and Urban Water Systems Modeling Conference. Toronto, Canada. Feb. 26-27, 2014 (and the 47th Annual SWMM Users' Group Meeting!). http://www.chi-conferences.com/

April-June 2014

9th National Monitoring Conference: Working Together for Clean Water (National Water Quality Monitoring Council, NWQMC) April 28 - May 2, 2014 in Cincinnati, OH. http://acwi.gov/monitoring/conference/2014/ (Abstracts due September 30)

AWRA Spring Specialty Conference on GIS & Water Resources VIII. May 12-14, 2014, Snowbird Resort - Salt Lake City, UT. http://awra.org

AWRA Summer Specialty Conference (IWRM). June 27-July 2, 2014 - John Ascuaga's Nugget Casino Resort, Reno, NV. http://awra.org

July-December 2014

CEER Ecological and Ecosystem Restoration Conference. July 28-Aug. 1, 2014. New Orleans, LA. http://www.conference.ifas.ufl.edu/CEER2014

50th AWRA Annual Water Resources Conference. Nov. 3-6, 2014, Sheraton Premier at Tysons Corner Hotel, Vienna, VA. http://awra.org

Southeast Regional Stream Restoration Conference. The Blake Hotel, Charlotte, NC. Nov. 17-20, 2014. http://www.ncsu.edu/srp/conference

2014 IAHS/ICCE International Symposium on Sediment Dynamics: From the Summit to the Sea. New Orleans, LA. Dec. 11-14, 2014. http://www.rnr.lsu.edu/icce2014/ (abstacts being accepted)

■

Production of NWQEP NOTES is funded through U.S. Environmental Protection Agency (USEPA) contract #GS-10F-0268K. Task Order Manager: Paul Thomas, Water Division, EPA Region 5. 77 W. Jackson St., Chicago, IL 60604.

21st Annual Nonpoint Source Monitoring Conference and Workshops

Working Together to Protect and Restore Our Water Resources

Cleveland, Ohio | October 28–30, 2013

The Annual Nonpoint Source (NPS) Monitoring Workshop is an important forum for sharing information and improving communication on ways to control and track NPS pollution at its source and in receiving waterbodies.

The focus of the 21st National Workshop is integration of resources and skills from the private and public sectors with a number of sessions devoted to bringing together individuals from a wide range of backgrounds including science, engineering, business, public policy, education, and community groups. Project examples from the Great Lakes Region will be coupled with specific technical and programmatic sessions to help individuals better understand the full range of resources and skills that can be pooled together to solve our Nation's water quality problems at the local and watershed levels.

This event will bring together NPS monitoring and management personnel from state, federal, Tribal and municipal governments, the private sector, academia, environmental groups and local watershed organizations to provide examples of lessons learned from completed NPS projects, demonstrations of new technologies and monitoring approaches, and documentation of successful application of NPS control practices, measures, programs and policies.

A number of technical workshops and interactive learning sessions will be offered to build knowledge and skills, transfer technology, and promote innovative monitoring and evaluation techniques. Field tours will be offered in both agricultural and urban settings.

Technical Sessions Include:

- Urban BMP Implementation in the Great Lakes Region
- Urban BMP Monitoring Innovations and Results
- Monitoring and Evaluating Sediment Transport Process
- Urban BMP Implementation
- Agricultural Nutrient Reduction Issues and Innovations
- Monitoring Innovations for Tracking Bacteria
- Harmful Algae Issues and Innovations
- Section 319 and Nonpoint Source Monitoring Projects

- Innovations in Volunteer Monitoring
- Stream Restoration Issues and Innovations
- National Water Quality Initiative

Workshops:

- Introducing Alternative Designs and Tools for Drainage Ditches
- Fundamentals of Green Infrastructure – Lessons from the 319 Monitoring Program
- Making Connections: How Stewardship and Partnership Lead to Stormwater Success

Tours:

- Chagrin River Watershed Stormwater Retrofits and Monitoring
- Euclid Creek Watershed Program—The Opportunities and Challenges of Restoring an Urban Watershed
- Middle Cuyahoga River Restoration
- Municipal Stormwater Programs in Action—Lessons Learned
- West Creek Neighborhood Stormwater Stewardship Initiative
- Stream Quality Monitoring (SQM) Project coordinated by the Ohio Department of Natural Resources' Division of Watercraft's Scenic Rivers Program—Workshop/Field Trip

https://npsmonitoring.tetratech-ffx.com/index.htm

NC STATE UNIVERSITY

NCSU Water Quality Group
Campus Box 7625
North Carolina State University
Raleigh, NC 27695-7625
Telephone: (919) 515-8240
Fax: (919) 515-6772
Website: http://www.ncsu.edu/waterquality/

Personnel

Jean Spooner
Robert O. Evans
Kristopher Bass
Jamie Blackwell
Michael R. Burchell II
Barbara A. Doll
Garry L. Grabow
Karen R. Hall
William F. Hunt
Catherine S. Smith
Daniel E. Line