



**In the last issue of “Watershed Lab Connections”, we introduced you to the scientists and staff at the North Appalachian Experimental Watershed (NAEW) and provided some history of the facility. In this issue, we are highlighting some recent results related to applying manure on frozen soil using our experimental watersheds, and increasing awareness of our unique runoff and other data sets. In future updates, we will present other studies.**

### Inside this issue:

The Crown Jewels of Watershed Data	2
Facts About NAEW	3
NAEW Addresses National Priorities	3
NAEW Awards & Invitations	4

## Experimental Watershed Studies—Applying Manure to Frozen Soils

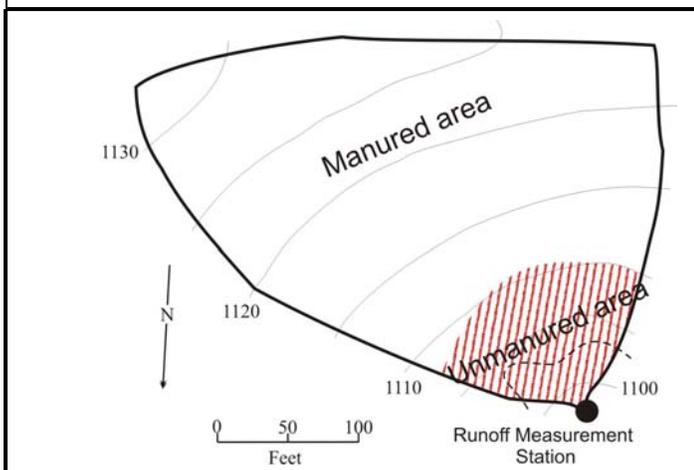
Applying manure during the winter months is a common practice, especially among small to medium-sized livestock operations with limited manure storage facilities. Manure applications during this time of year pose increased environmental risks. Soils that are saturated and/or frozen may have considerable surface runoff following rainfall or snowmelt. Such runoff can carry manure particles, pathogens and nutrients to ponds and streams.

Although winter manure application is not recommended, guidelines have been developed to minimize the detrimental aspects of this practice if it is necessary. Using the guidelines developed by the Ohio NRCS (Natural Resources Conservation Service), experiments were conducted at the North Appalachian Experimental Watershed near Coshocton, OH to evaluate the effectiveness of these recommendations.

In collaboration with the USEPA, a study was conducted using NAEW watersheds and plots. Liquid swine manure and turkey litter were applied at recommended rates to small watersheds (approximately 2 acres in area), which were in a no-till corn cropping practice. There was a 100 ft buffer area (no manure application) downslope from the area receiving manure. Beef slurry manure was also applied to grassed plots with either 100 or 200 ft grassed buffer.



Swine manure being applied to a NAEW experimental watershed when ground was frozen



NAEW experimental watershed showing manured and unmanured (hashed) areas.

The highest concentrations of nutrients in runoff were measured when runoff occurred soon after manure application. However, most events with high concentrations occurred with low flow volumes, and therefore transport was minimal. Because of manure composition, applying manure at the nitrogen (N) rate for crop needs resulted in phosphorus (P) being applied at rates in excess of crop needs. This contributed to elevated P losses, which in turn contributed to a greater potential of detrimental impacts with P than with N. Nevertheless, if prescribed guidelines are followed, detrimental aspects of winter manure application can be reduced. These findings are important to producers, conservation groups, and regulatory agencies such as EPA. For more information, contact Dr. Lloyd Owens or Dr. Jim Bonta using the contact information on the last page.

# Data Data Data

## The Crown Jewels in the Treasure of Watershed Data



In this issue of Watershed Lab Connections we will look at different aspects of the NAEW's **treasure** of runoff, precipitation, land-management, and other data collected over the last 70+ years. The NAEW has *one of the world's most extensive data bases* on the effects of land management on hydrology and water quality. The data set has been referred to as the "*crown jewels*" of watershed data today.

## Have You Ever Needed Data???

Did you ever use the "*curve number*" (CN) method for estimating runoff? If you are involved with soil and water projects, the answer is most likely "yes". Did you know that the original development of the CN method used NAEW data collected from the experimental watersheds at Coshocton, Ohio? The CN method is used worldwide today and often mandated by statute in engineering design. Developers of the method today still use Coshocton data.

Did you know that runoff studies at the NAEW were some of the first to document the conservation benefits of *no-till* farming using the small watershed monitoring infrastructure and data at Coshocton? The studies on *no-till* have led to many other studies on water and chemical movement in macropores (e.g., worm holes), and soil carbon studies under *no-till*. Today, the *no-till* practice is recommended by the Natural Resources Conservation Service for the national conservation programs that they manage.

Do you need data on how land management affects water quality and hydrology at the small watershed scale? We have evaluated many land-management practices on experimental watersheds on a range of soil types under many different weather experiences. We continue to address national watershed issues using our data base and monitoring infrastructure.

Have you ever needed weather information to investigate climate change, to comply with requirements of a conservation program, or need them for watershed modeling or other research? We have data that might help you.

## Data, Facilities, and Expertise to Address National Natural-Resource Problems and Emerging Issues

We have measured runoff under a wide variety of land-management practices. However, many uses of the data and watersheds were never originally envisioned when the facility was established. Today, NAEW scientists and others are using the experimental watershed facility and data to address *National natural-resource problems and emerging issues*. Examples are:

- Pathogen and hormone transport from watersheds
- Evapotranspiration-cover land fill caps
- Model development and validations
- Pesticide and nutrient control in waterways
- Effects of land disturbances due to mining and reclamation and urbanization
- Applying manure to frozen ground
- Use of industrial byproducts on mined lands
- Water-quality and runoff trading
- Soil carbon sequestration
- Climate change
- Macropore-flow investigations (e.g., worm holes)
- Biofuels



Runoff water quality improvement by using compost-filled mesh tubes at the NAEW

Often it is necessary to conduct our watershed research off the NAEW facility because implementation of management practices can be expensive, so collecting data off site is not uncommon for the NAEW.

It is obvious that experimental watersheds are important to solving national water-quality problems. Data are needed to minimize over- and under- design. Practitioners also know how well land-management practices will generally perform in areas where there are no data. If you need data that you think we might have, please give us a call at 740-545-6349 or email Dr. Jim Bonta at [jim.bonta@ars.uda.gov](mailto:jim.bonta@ars.uda.gov).

## Facts About the NAEW Monitoring Infrastructure and Data Sets

- NAEW located in East-Central Ohio and established in 1935
- Area of facility is 1050 ac
- 2066 station-years of runoff and 1089 station-years of precipitation data
- Data collected from 48 watersheds and 27 rain gauges
- Experimental watersheds range in size classes from ~1 to 7 ac, 40 to 300 ac, and others from 300 ac to 7 square miles
- Small watersheds comprise the test-bed infrastructure for determining land management effects for upland areas in which management decisions are made (see photo)
- Weather, soil moisture, soil temperature, land management, lysimeter, soil carbon, and other data are available
- NAEW strengths are its instrumented small watersheds and long data records
- Experiments are conducted on and off the NAEW site
- New watershed sites are available for research as funding allows



NAEW experimental watershed (1.65 ac) showing watershed boundary, concentrated-flow swale, and water-monitoring station. A land-management practice is applied to the watershed and the effects of the practice are evaluated by measuring runoff and water quality at the watershed outlet.

## The NAEW is Currently Using Our Monitoring Infrastructure and Historical Data to Address National Priorities Such As...

- Manure on frozen ground
- Grazing
- Precipitation simulation
- Transport of nutrients and pesticides
- Investigating simple methods for evaluating impacts of land management
- Filtering runoff through compost-filled tubes
- Urban hydrology and water quality
- Climate change
- Soil carbon
- Sustainability of agricultural production
- Environmental aspects of organic production



Effects of grazing on runoff and water quality is being studied under nonorganic and organic systems



## NAEW Awards and Invitations

The staff of the NAEW have been recognized for their contributions and expertise in 2010...

- Don Lightell and Phyllis Dieter, Biological Science Lab Technicians were selected by the USDA-ARS Midwest Area Office in Peoria, IL to receive the Midwest Area SHEM (Safety, Health, and Environmental Management) award for their efforts to increase safety on the NAEW.
- Drs. Martin Shipitalo and James Bonta received an award for outstanding scientific publication by the All-Ohio Chapter of the Soil and Water Conservation Society for a paper titled, "Impact of using paper mill sludge for surface-mine reclamation on runoff water quality and plant growth".
- Dr. James Bonta was selected the Outstanding Civil Engineer of the Year for 2010 by The Ohio State University Civil Engineering Alumni Association.
- Dr. Shipitalo gave an invited presentation and field demonstration at the annual meeting of the Association of Ohio Pedologists on earthworm and macropore research at the NAEW.
- Dr. Shipitalo gave an invited keynote address at Penn Extension Farming for Success Field Day and two field demonstrations.
- Dr. Bonta was invited to speak to the Ottawa County SWCD and Northwest Ohio Urban Technician Meeting regarding an overview of the NAEW, results from mining and reclamation watershed and rainfall simulator studies that are similar to urban runoff conditions, and preliminary results on curves numbers from urban hydrology studies using NAEW watersheds.
- Drs. Shipitalo and Bonta, and Dr. Deb Stinner, Research Scientist at The Ohio State University, Ohio Agricultural Research and Development Center, received a \$50,000 planning grant from USDA-NIFA to prepare a larger grant in 2011 addressing environmental aspects of organic production.
- Dr. Bonta was invited to speak to an Environmental Science class at The Ohio State University on the capabilities and opportunities for research at the NAEW.
- Dr. Bonta was invited to speak at the field day for the Organic Food and Farming Education and Research Program (OFFER) at Ohio State University at Wooster, Ohio. The three NAEW research opportunities related to environmental aspects of organic agriculture were presented (current organic grazing project, a planning grant, and a proposal for further research into environmental aspects of organic production).

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