

Overview of the North Appalachian Experimental Watershed Facility

Coshocton, Ohio

An outdoor laboratory for land and water management research

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North Appalachian Experimental Watershed (NAEW)

Overall mission:

Evaluate the effectiveness of land-management practices to control runoff and water quality

Facility:

- 1050-ac outdoor laboratory located near Coshocton, Ohio
- Rolling, unglaciated hill land in Ohio and surrounding states
- Operated by the USDA-Agricultural Research Service since ~1935

The NAEW Infrastructure Includes:

*Instrumented watershed for
runoff studies*



Networks of ...

- **Large lysimeters (11)**
- **Instrumented watersheds (20+)**
- **Rain gauges (15+)**
- **Springs (~5)**
- **Wells (~40)**
- **Meteorological stations (2)**

*H flume and Coshocton wheel for
surface water runoff measurement*



NAEW at Coshocton, Ohio

- ~1050 ac
- Infrastructure of small and large experimental watersheds
- Watersheds are instrumented with flow-measuring and sampling equipment



Strengths of the NAEW

- 70-yr data base from small agricultural watersheds
- Controlled, 1050-ac facility having an infrastructure of experimental watersheds, lysimeters, rain gauges
- Experienced personnel for monitoring and evaluating effects of land-management practices
- Research conducted off-site also

Water Quantity and Quality Issues Addressed by the NAEW

- Cropland
 - Nutrients
 - Pesticides
 - Sediment
- Pastures - same
- Weather inputs to watershed models
- Climate change
- Mined and reclaimed land
- Urbanization
- Landfill caps
- Ground water contamination
- Acid precipitation
- Best-management practices

Urbanization

- Changes in runoff production and rain water infiltration when agricultural areas are disturbed due to increasing imperviousness caused by urbanization.
- Initial studies in collaboration with USEPA

Urbanization increases surface runoff and sediment loads



Proposed Long-Term Layout of the Residential Development



Connected vs. Disconnected Impervious Surface

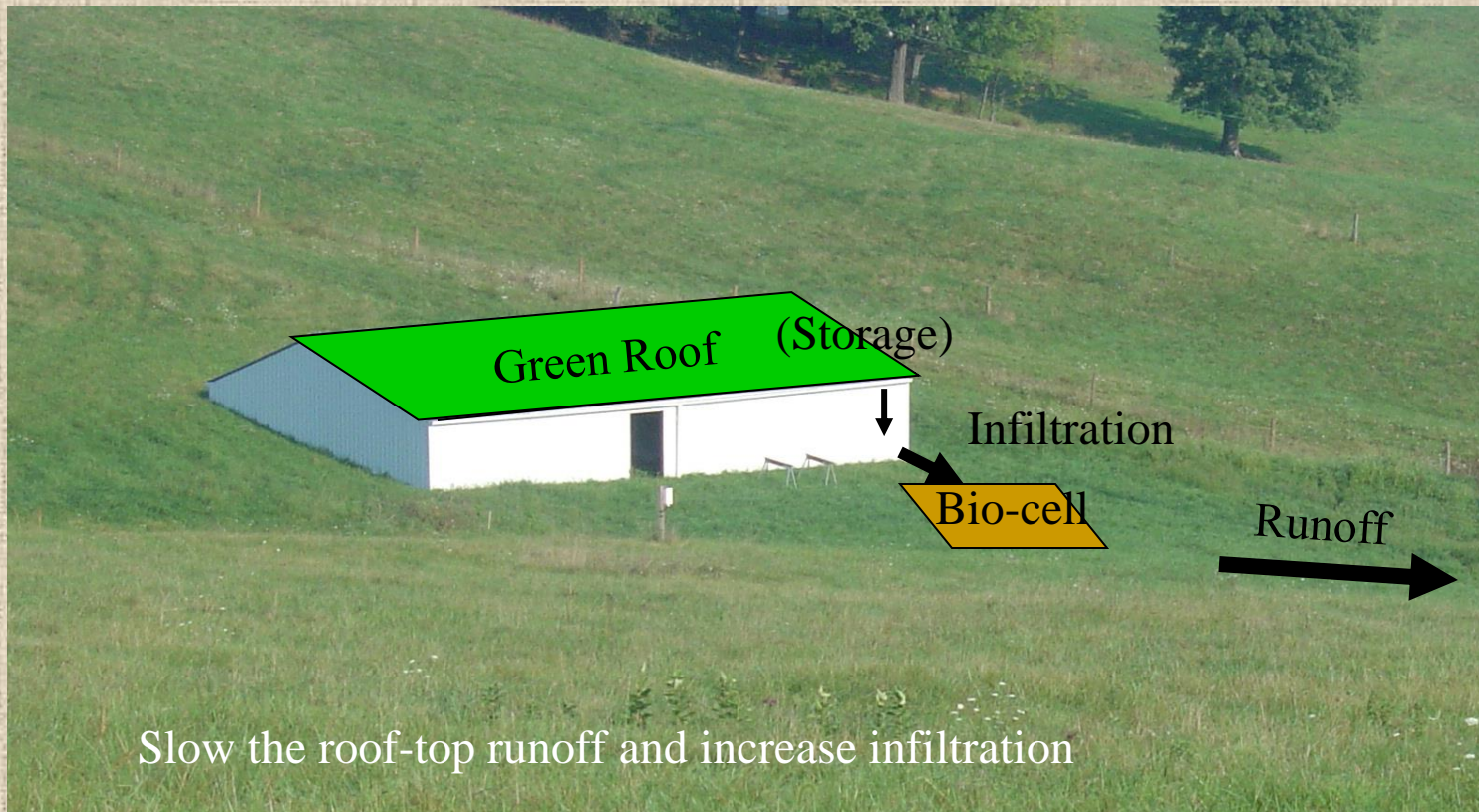
Building *near* stream
channel –
“connected”



Building *far* from
stream channel –
“disconnected”

Next Steps (cont'd)

- Evaluate effectiveness of bioretention cells and green roofs draining the roof structures



Removal of Pesticides in Grassed Waterways

- Quantify the effectiveness of using water-treatment residuals in filter socks for removal of pesticides from fields
 - Collaboration with industry
- Grassed waterway*



Filter sock filled with compost



Land Application of Paper-Mill By-products

- Determination of allowable rates of paper mill byproducts to control erosion on surface mine lands
- Collaboration with paper-mill industry, Ohio EPA, and a mining company



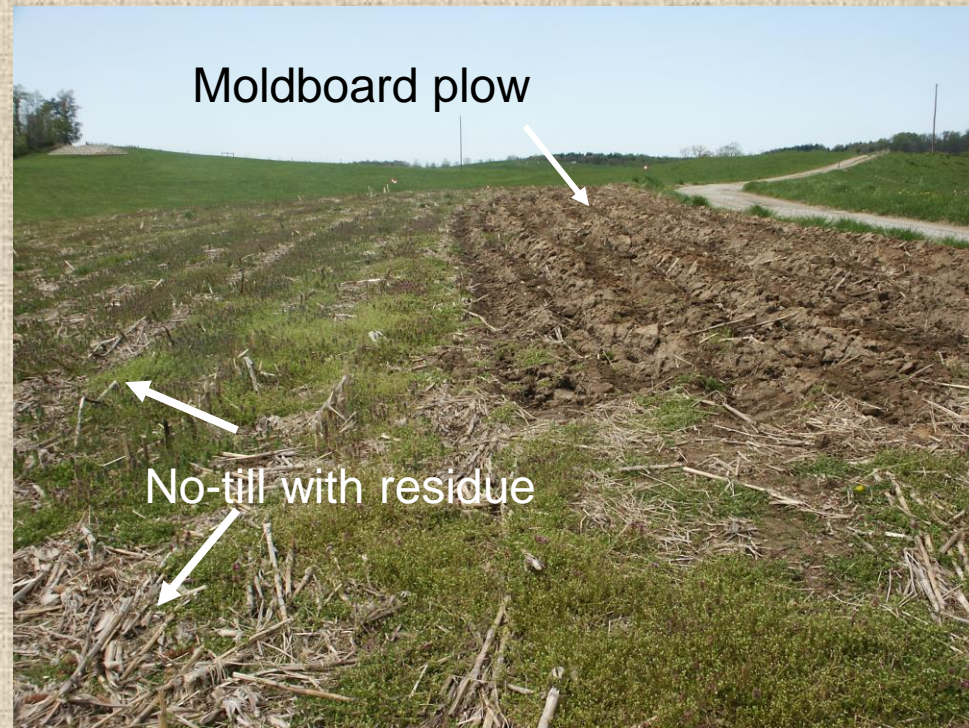
*Paper-mill byproduct spread
on reclaimed mined land*



Coshocton wheel sampler at base of runoff plot

Long-term no-till/conservation tillage research...

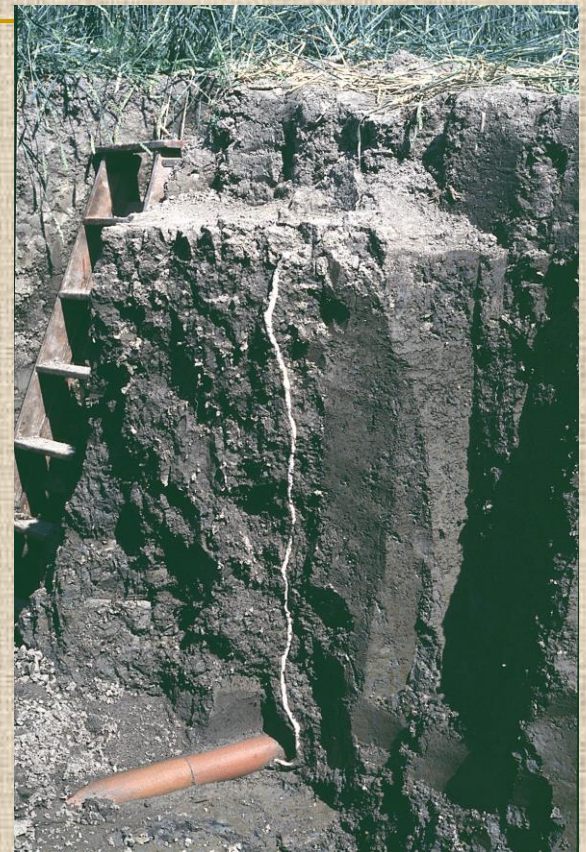
- Soil-carbon increases documented
- Effects of tillage practices on hydrology and water quality (herbicides)
- Earthworm burrows — preferential flow



Macropores – Conservation Tillage / Liquid Manure

- Identification of preferred pathways of rainwater and liquid manure movement into tile line drains
- Conservation tillage research
- Effect of macropores to transport contaminants, increase infiltration, and reduce runoff

*Smoke injected into a drain tile emitting
from worm burrows on the surface*



Carbon Sequestration

- Quantification of the effects of agricultural management practices on carbon sequestration
- Higher organic carbon levels increase water-holding capacity, and reduce runoff and erosion.
- Potential for farm revenue through carbon trading
- Collaboration with OSU

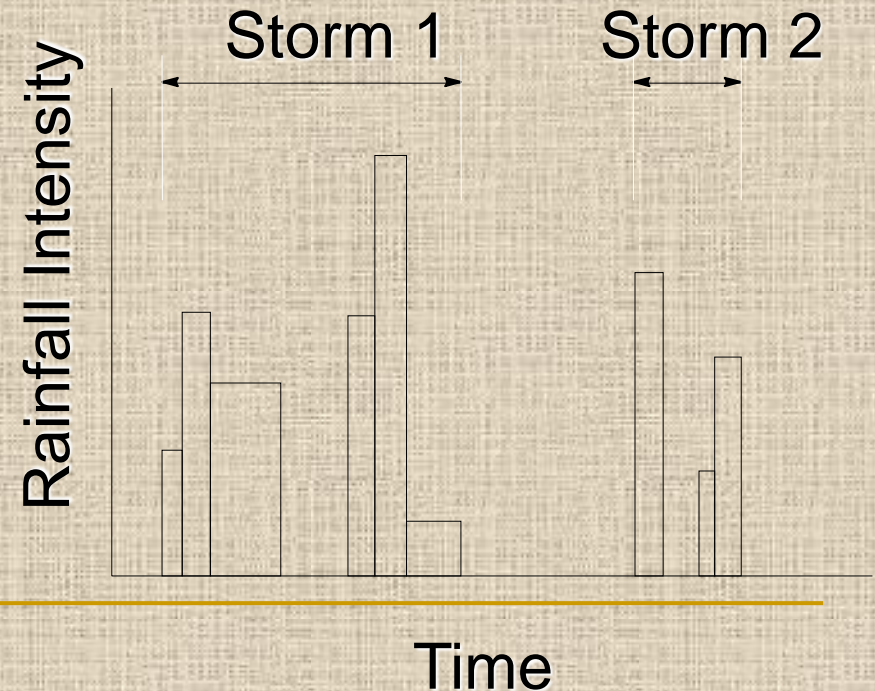


Comparison of dark no-till soil with lighter conventionally plowed soil

Storm Simulation

- Modeling and characterization of short-time increment intensities in “storms”
- Needed for watershed modeling where there are no precipitation data
- Requested by NRCS for national modeling efforts
- Requested by others for urbanization applications

*Modeling of storm intensities for
input to watershed models*

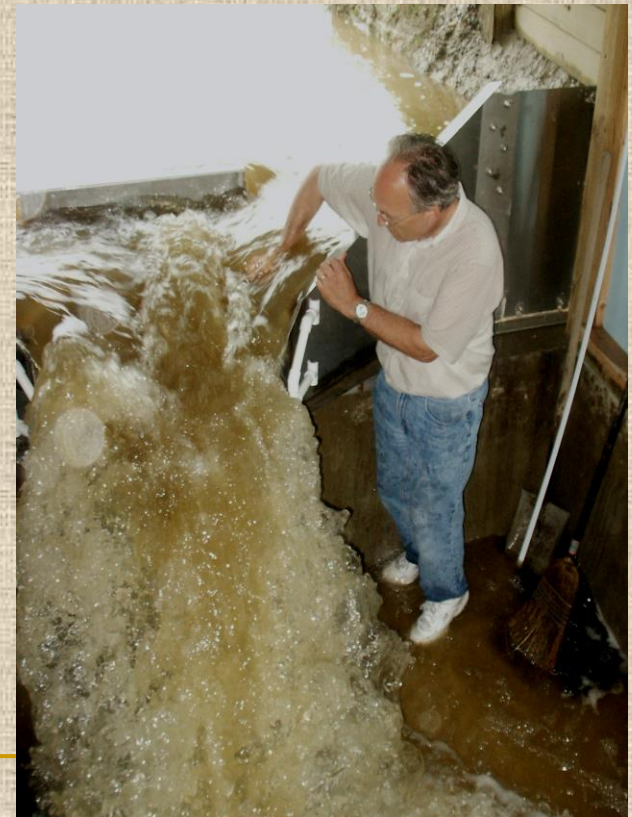


Hydrological Instrumentation

Development and adaptation of hydrological instruments:

- H flumes
- Coshocton wheels
- Discrete samplers
- Data loggers
- Drop-box weir for accurate sediment-laden flow measurement (e.g., urbanization, surface mines, etc.)
- Samplers for sampling agricultural runoff
- Consulted worldwide on hydrological instrumentation

Drop-box weir for measuring flows



Coshocton Wheel Water Sampler with H Flume



Drop-box Weir



Winter Application of Manure on Frozen Ground

- Development of guidelines for rate and placement of manure on frozen soils
- Collaboration with OSU, USEPA, Small Farm Institute



Manure applied on snow-covered ground



Manure runoff plot

Management Intensive Grazing

- Research into the environmental, animal, and forage components of intensive versus rotational grazing
- Collaborators include private producers, Small Farm Institute, OSU/OARDC
- 30 years of previous grazing research at the NAEW

*Livestock affects runoff and
chemical loads*



North Appalachian Experimental Watershed

Summary

- 70 years of water-quantity and 30 yrs water-quality data
- One of few experimental watershed facilities in the US
- NAEW is located in the Ohio River Basin near Coshocton, Ohio
- Addresses issues related to:
 - Physiography and watershed management found in the Ohio River Basin
 - Water quantity
 - Water quality
- NAEW addresses *high priority national* needs
- Part of the larger network of ARS experimental watersheds

Potential for the NAEW Watershed

- Biofuels research
 - How much residue can be removed before we see environmental degradation?
 - Impact on national farm programs
 - Are proposed crops suitable for preventing runoff and chemical and sediment transport?
 - Septic tank improvements in watersheds
 - Air quality
 - Geothermal heat
 - Windmill
-

Potential for the NAEW Watershed

■ Homeland Security

- ❑ Infrastructure already in place to look at transport of chemicals off fields and watersheds
- ❑ NAEW at the “local top of the world”
- ❑ We can incorporate animal production issues that may be linked with biosecurity and runoff issues
- ❑ Pathogens
- ❑ Land areas include pastures, cropland, urban areas, mines, etc.

North Appalachian Experimental Watershed

Coshocton, Ohio

- Additional Information

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