Chester River Watershed Observatory

WASHINGTON COLLEGE

The Pulse of the Chester

This pioneer observatory, an initiative of Washington College's Center for Environment & Society, is designed to take the pulse of every aspect of the Chester River. The aim is to make the Chester the best understood watershed in the country. Water quality is measured by sensors in the Chester River, augmented by wells, sampling stations on land and autonomous vehicles "swimming" the river. Water flow, benthic habitat, and land use are investigated to better understand system dynamics and the interplay between people and the environment.

A system installed in the Foreman's Branch of the Chester River already tracks water temperature, conductivity, pH, turbidity, nitrates, phosphates (nutrients) and dissolved oxygen. Data generated has been used by Washington College students for classes and Senior Capstone Experiences. Five miniature observation buoys will make up the first deployment of a new class of lower cost sensors on the river. Every twenty minutes, they will send water quality data, including water temperature, conductivity, salinity, turbidity, pH, and dissolved oxygen, to a central, publicly accessible website. The water quality data will be augmented by the initial installation of five weather stations around the watershed. Ultimately, these sensors and many others will provide a dense network of monitors, collecting real-time information on a host of variables critical to the health of the river.

Results will be internet available to agencies, academics, resource managers and the public. Research programs incorporate hands-on experiential learning opportunities with student-built buoys and underwater robots, as well as analyzing data. Teacher training programs and the involvement of K-12 schools throughout the "schoolshed" are an integral part of the project, working alongside scientists, undergraduates, and volunteers.

Resources

The Center boasts two research vessels, the 46 ft R/V *Callinectes* and the 27 ft R/V *Lookdown*. *Callinectes* was built for Washington College in 2010 with funding from the U.S. Department of Education and is designed for teaching and research on the Chesapeake Bay and its tributaries. *Lookdown*, a former NOAA vessel, is dedicated to remote sensing for mapping habitat characteristics of the Bay and reconnaissance of submerged archaeological sites. Both vessels have an array of the latest electronics and environmental instrumentation for use in mapping and evaluating environmental features of the Bay and its tributaries, including:

- fish trawls, water & bottom sampling devices
- GPS positioning systems
- side scan sonar, sub bottom profiler, magnetometer, and single beam echosounders, underwater cameras
- acoustic seabed classification systems

These research platforms are joined by an array of sondes and other sensors for use in the water, while the Center for Environment & Society also deploys terrestrial magnetometers and related sensors, as well as RTK GPS (global positing systems) and total stations for mapping . A fully staffed and equipped Geographic Information Systems (GIS) Laboratory supports mapping and geospatial analysis. The 5,000 acres of Chino Farms provides an important land base for this effort, along with thousands of acres of riverfront and agricultural lands held by partners up and down the Chester River.

Washington College's faculty, staff, students, and science facilities, including a new, state-of-the-art, NSF-funded Geochemistry Laboratory, provide a core team for a collaborative partnership that now includes local and regional organizations such as the Chester River Association, the Chesapeake Conservancy, Sultana Projects, local K-12 schools, higher education (U.S. Naval Academy, Rutgers, University of Delaware, University of Maryland), state and federal agencies (MD DNR, NOAA, USGS, NASA), and corporate partners (Teledyne and the Hach Company).

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Observing System

- **Scale** – watershed small enough to be manageable, large enough to be meaningful
- **Coverage** – land, water, air
- **Collaborative** – higher education, federal & state agencies, local K-12 schools, non-profits such as riverkeepers, local government, NGOs
- **Innovative** – new ideas, experimentation, and implementation
- **Multidisciplinary Approach** – cutting edge science, primed by social context (sociocultural, political, economic dimensions)
- **Access** – Chino Farms (5,000 acres), Washington College, Eastern Neck National Wildlife Refuge, multiple landowners

Components

Remote sensing methods for assessing landscape variables, monitoring & assessing BMP effectiveness, implementation

Water-based sensors – observation buoys, fixed sondes, flow meters and other instruments, research vessel instrumentation, AUVs, ROVs, citizen and student volunteers

Land-based sensors – piezometers, flow meters, wells, weather stations

Education – "School-shed" approach, with student-teacher teams, school-based monitoring systems, Youth Watershed Council, teacher training, and STEM programming

Transparency – GIS data management, web-based access, analytical and visioning tools

Outcomes

Improved nutrient source identification and flow data

Measured assessment of BMP implementation and impacts

Controlled studies supporting new , more effective BMPs

Identification of motivators (economic, psycho-social, political, etc.), impediments, opportunities, challenges

Groundtruth and refine nutrient trading methods

Refine the Chesapeake Bay model, support higher resolution results and accurate management tools(TMDLs, WIPs)

Attributes

- Transferability
- Policy change
- Transparency
- Accountability

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