Researchers Work To Better Determine Contributors Of Nutrients

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Data Integrity

"The integrity of the data is there, and objectivity is there, number one because Penn State will be working with real data — no models, no assumptions.

"The other thing of interest is, to the best of my knowledge, nothing like this has ever been done on this large a scale," Fiestsa said.

According to Barry Evans, a senior research assistant at ERRI more closely in charge of this research project, raw data from a variety of actual research projects from a variety of disciplines will be gathered, and along with mapping through the use of Geographic Information System (GIS) technology and computers, it will be the first time that the state will get a "spacial" look at nutrient flows in the state.

What he means by "spacial" is that, on the face of it, lists of raw data are two dimensional at best. A spacial view is multi-dimensional and takes into account the overall picture of the different aspects of what is being studied and the relative relationships and interactions.

Comparing lists of data without considering how those pieces fit into the overall dynamics of an actual watershed can and has created much controversy and argument about responsibility.

The only way scientifically acceptable to determine sources of nutrients in a watershed is to monitor and collect data about what is really happening overall and what actual level of nutrient release is occuring.

To this end, the research has been proceeding by dividing the state into a number of smaller parts, according to watershed subbasins.

These subbasins were selected because the state can be divided that way, and because DEP through its Bureau of Water Quality field work has been conducting regular tests at established sites along flows of water within these subasins.

Evans also said that testing at the sites selected has been done on a monthly basis for about 10 years, providing a solid base of real field data.

From the collected data, the total concentration of nitrogen in the water at the test sites is gained.

The process of narrowing down and assigning levels of nutrient contibution to the total is to be done through a process of elimination — subtracting known levels from the total.

Ultimately, the mapping is an excercise in environmental accounting

Because no scientifically sound assessing or testing process is 100 percent accurate, it must be assumed there will be a level of error to take into account, but for the first time, there will be a solid base of data from which to continue to fine tune, and the expected level of error should be well within reason.

The first thing to be subtracted from the total nitrogen level will be an amount attributed to known point sources.

From that level, researchers are to subtract the levels of nitrogen assigned to the next best-known source of nitrogen, such as that derived from certain agricultural operations.

Ultimately, the percentages of nitrogen assigned to each source must add to 100 percent, which is the total nitrogen concentration collected from the test site.

DEP — PSU Contract

The DEP has entered an open-ended contract with Penn State to conduct research. Each new research request is assigned a task number.

Work to fulfill the research requirement of the Nutrient Management Act has been assigned as Task 9 and incorporates the complete assessment of all five suspected non-point sources of nutrients.

ERRI is a multi-disciplinary effort calling upon shared research data from existing or ongoing studies within the university and outside.

The state Department of Agriculture, as an example, is to provide data on the sales of commcerial fertilizer.

From this data, researchers expect to be able to assume a certain portion of sales of small bags of lawn fertilizer, for example, can be attributed to local residential use.

Other groups within Penn State are working on testing and tracking of airborne nutrients. From that data, researchers expect to make an accounting of the fallout of nitrogen onto a particular watershed.

Data from actual research on forest nutrient dynamics are to be used to determine expected flows from those areas.

Data, such as the fact that each person contributes about 13 pounds of nitrogen per year to the environment, is also to be used in conjunction with results of research from engineering disciplines, etc. to arrive at the total nutrient picutre for Pennsylvania.

"We have to look at everything," Evans said. "We're going to have to know the agricultural non-point source as well.

"One of the best estimates (of the amount of nutrient loss) is agricultural runoff. If we subtract that, we can get at the remaining five catagories."

Evans said that although there are to be many people within ERRI contributing to this project, there are about 15 people working on it directly, counting grad students and part-time help.

ERRI has been in operation for some time and has been using GIS technology for some time. "It's used all over the world," Evans said. "We've been using it for 10 or 15 years for many different types of environmental applications. It's quite preferable as a type of computer mapping technology."

However, "Of all the tasks we have done, it's one of the bigger ones we've done for DEP," Evans said.

He said that he expects the research, begun in September to be completed to the point of providing a report to DEP by late spring or early summer.

"Given what we have to do, and the time frame, it's one of the (ERRI's) biggest projects," Evans said.

After the report is submitted, DEP, in consultation with the researchers, is to determine the magnitude of the problem and possible solutions.