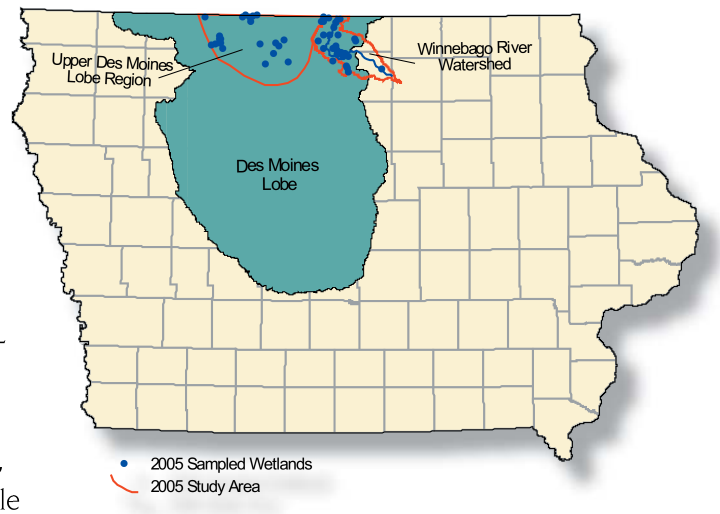
IOWA'S WATER
Ambient Monitoring Program

Iowa's Wetland Monitoring Program – 2005

Lakes, streams, and rivers have been monitored across the U.S. and in Iowa for several years. However, only recently have wetlands been monitored as their environmental and economic benefits have begun to be recognized. Iowa is one of only 17 states with organized statewide wetland monitoring programs, and most of these programs are less than 10 years old. Therefore, many of the wetland monitoring techniques are still being adapted and developed. Good monitoring programs should be designed to answer questions such as when, where, how, and to what degree do unacceptable wetland conditions occur.



Map showing the Des Moines Lobe and the location of 60 Iowa DNR wetland monitoring sites for 2005.

In 2005, the Iowa Department of Natural Resources (IDNR) began its wetland monitoring program in two areas of north-central Iowa: the Winnebago River watershed and the northern portion of the Des Moines Lobe (Algona Advance; see map above). The Des Moines Lobe represents the southernmost extent of a glacier that advanced into Iowa 15,000 years ago and occupied north-central Iowa until 12,000 years ago. It created the surface for what became a vast expanse of tall grass prairie and thousands of glaciated pothole wetlands. For conservation purposes, this unique land surface is also known as part of the Prairie Pothole Region, which occupies portions of roughly 35 counties in Iowa and extends north into central Canada.

Perhaps the most important tool for developing Iowa's wetland monitoring program is detailed maps. Since the 1800s, at least 90% of the wetlands in Iowa have been drained, therefore just knowing the location and extent of Iowa's remaining wetlands is critical. Geographic Information System (GIS) technology has improved surface mapping. These maps efficiently evaluate land use across Iowa including the location of existing wetlands. The National Wetlands Inventory (NWI) maps existing wetlands and classifies them by their hydrological regime. The NWI was developed by the United States Fish & Wildlife Service and was used in Iowa in the mid 1980s. Recently, the IDNR has been working with a business contractor to update the coverage of NWI for Iowa. The use of enhanced map interpretation techniques and color infrared photo imagery has resulted in a more accurate and concise wetland inventory. The updated NWI is now complete for nearly one third of the state (mostly northern Iowa), with plans to finish the rest of the state in the next few years. This is an extremely valuable tool in monitoring efforts because it provides information on the location, size, and types of existing wetlands.

A short, light canoe (upper left) worked well to access the open water zone of wetlands from which to collect samples of sediment (upper and lower right) and water (lower left) for analysis of several different types of pesticides, metals, and nutrients.

Wetlands provide many benefits for water quality and wildlife habitat. In order to help preserve these valuable wetlands, a statewide monitoring program is being developed to determine the ecological condition of Iowa's existing wetlands. Results from sampling will enable us to determine whether we have healthy functioning wetlands; or if not, be able to sort out the leading causes of degradation. These data will be helpful for making informed decisions affecting the future of Iowa's wetlands.

In 2005, the first wetland monitoring sites were randomly selected using the updated NWI. For consistency purposes, only upland depressional semi-permanent and permanent pothole wetlands located on public or private land were used. Permanent wetlands are those that have water in them all or most of the time, both annually and seasonally. Semi-permanent wetlands hold water a majority of the time, but go dry occasionally, either annually or seasonally. Site visits and evaluations enabled us to select 60 wetlands to monitor. Using color aerial photos from 2002, maps were developed for each site to determine the ownership of each wetland and access routes. Permission was then obtained from the public land managers and private landowners to sample these wetlands. Sampling began in early June and continued through August; all samples were collected from the middle of the open water zone of each wetland. A canoe was used to reach the open water regions to minimize disturbance to the area during sample collection (see above photo). Below is a description of the methods used to sample three components to the wetlands: chemical, physical, and biological.

Chemical Monitoring

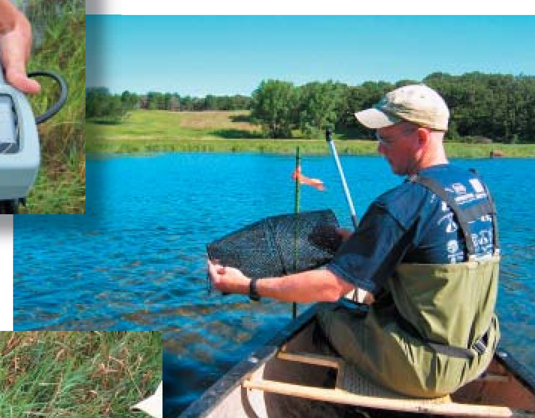
Sediment and water samples were collected and analyzed for an extensive number of chemical pollutants, which included herbicides, insecticides, PCBs, heavy metals, as well as nitrogen and phosphorus (photos above). This monitoring represents the most extensive chemical testing ever performed for Iowa's wetlands. Surface water grab samples were collected from the canoe in the open water zone of each wetland. This water was then transferred into specific containers for shipment to the laboratory for chemical analysis. Sediment samples were taken from three random locations within each wetland. These sediment cores were extracted by driving a 3-inch diameter PVC coring device approximately 30 cm into the sediment with a hammer. The corer was capped to create suction so that the sediment could be removed without sliding out into the water. Each sediment core was extruded into a glass pan and mixed for one composite sample. All cores from each wetland were placed into glass jars for shipment to the laboratory for analysis.

Physical Monitoring

Physical measurements were taken from the canoe with a hand-held YSI probe that measured water temperature, dissolved oxygen concentration, and conductivity (see photo below). Separate devices were used to measure pH and turbidity. These physical parameters may influence the plant and animal composition of a wetland as well as influence the toxicity of chemical contaminants in the system.

Biological Sampling

Biological samples were taken from 22 of the same 60 wetlands that were sampled for chemical pollutants. Sites were selected by categorizing the health of all 60 wetlands as "good," "fair," and "poor" based on best professional judgment and use of GIS. Each of these 22 wetlands was surveyed for fish, invertebrates, and plants to determine diversity and abundance (photos below). For fish sampling, two methods were used; minnow traps to catch minnow sized fish, and nets to catch larger fish such as carp and bullhead. Three Gee type minnow traps, which are basic swim-in funnel traps, were baited with dry dog food and placed in each wetland for a 48-hour period and checked daily. Two Fyke nets were also set for 48 hours to catch any larger fish that may have been present in the wetland. These large nets funnel fish into a hoop net, holding them until checked. Daily records were kept of species type and quantity of fish and turtles caught in the nets and traps. Invertebrate samples were also collected from two random locations within each of the 22 wetlands. One 5-gallon stovepipe type sampler, which resembles a bucket with no bottom, was placed into the wetland at a standard depth of 36 cm. All sediment (to a depth of 5 cm) and plant material was removed from within and sieved with a 500 μm mesh screen to remove excess mud. A subsample of 200 inverte-



Monitoring included measuring water temperature, dissolved oxygen, and conductivity with the use of a multi-parameter probe (upper left); fish surveys using funnel type traps for small fish (upper right) and fyke nets for larger fish (lower right); and invertebrate sampling (lower left).

Healthy wetlands such as this one at Union Hills Waterfowl Production Area in Cerro Gordo County provide many benefits to both people and wildlife.

was then picked from the sample and preserved for identification. A simplified plant survey was also conducted at each of these 22 wetlands. After walking the perimeter of each wetland, the surveyor recorded the estimated abundance and species type of each wetland plant.

Results and Future Plans

Nutrient concentrations in wetlands were variable, as nitrogen (represented as nitrate+nitrite) concentrations ranged from 0.05 to 27 mg/L (mean = 6.2), total phosphorus levels varied from 0.05 to 1.2 (mean = 0.27), and orthophosphorus levels ranged from 0.02 to 0.72 (mean = 0.16). No heavy metals were found in the water; heavy metal results for sediment samples are not yet available. One or more pesticides were detected in water from 58 of the 60 wetlands, with acetochlor, alachlor, atrazine, metolachlor, and their metabolites (breakdown products) being most frequently detected. Initial classification of wetlands based on biological health showed that wetlands categorized as "good" had, in general, plant communities of higher abundance and diversity while "poor" wetlands had less diversity and were generally dominated by one plant species, often reed canary grass or hybrid cattail. Fish and invertebrate data are still being evaluated, but will be analyzed for correlations with plants or contaminants.

Wetland monitoring results from 2005 will continue to be analyzed to determine their effects to aquatic life and water quality. For 2006, the wetland monitoring staff plan to continue sampling additional wetlands in the Des Moines Lobe region as well as other areas throughout the state.

Acknowledgements

The Iowa DNR would like to acknowledge the contributions of those involved with the Iowa Wetland Monitoring Program. Staff from the University of Iowa Hygienic Laboratory, Iowa DNR Wildlife Bureau's Rice Lake Unit, Ingham Unit, and Big Marsh Unit, Iowa DNR Watershed Monitoring and Assessment Section, Iowa DNR Clear Lake Fisheries and Wildlife Station, Iowa DNR Pilot Knob State Park, County Conservation Boards from Cerro Gordo, Kossuth, Winnebago, and Worth counties, The Nature Conservancy, Iowa State University, U.S. Fish & Wildlife Service, and the U.S. Environmental Protection Agency have graciously contributed their time toward the development and implementation of this program.

Photos by Vince and Andrea Evelsizer, and Matt Fisher.

Funding

Wetland Monitoring activities of the Iowa Department of Natural Resources are funded by Iowa Infrastructure – Environment First Fund appropriations, as well as wetland program development grants provided by the U.S. Environmental Protection Agency from Section 104 of the Clean Water Act.

Iowa Watershed Monitoring and Assessment Program Web Site – wqm.igsb.uiowa.edu

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