II. Chapter 2 Impacts of Nonpoint Source Pollution

Nonpoint source (NPS) pollution occurs when rainfall, snow melt or irrigation water runs over land or through the ground, picking up pollutants and depositing them into lakes, rivers and groundwater. Nonpoint pollutants and sources that threaten or impair designated uses in waterbodies include:

- Excess fertilizer (nutrients), herbicides and insecticides from agricultural, residential and urban areas.
- Sediment (siltation, suspended solids), pesticides, pathogens (animal waste), from agricultural, residential and urban areas.
- Oil, grease and toxic chemicals from urban runoff and energy production.
- Sediment from improperly managed construction sites, crop and forest lands and eroding streambanks.
- Bacteria and nutrients from livestock operations, pet wastes and faulty septic systems.
- Atmospheric deposition, hydromodification and habitat alteration.

Water quality, therefore, becomes a direct reflection of watersheds and Iowa is a classic example. The state offers a diversity of land uses creating a variety of nonpoint pollution sources. But more than 80 percent of Iowa's land mass is devoted to production agriculture and, as could be expected, most of Iowa's nonpoint pollution is generated from agricultural activities.

Due to its rich natural resources for production agriculture, Iowa has become perhaps the most intensively cropped state in the country. While agriculture is not the only source of nonpoint pollution, it is definitely the primary source and the source providing the biggest challenge to address due to the sheer magnitude of the industry. Addressing agricultural related nonpoint pollution represents not only the physical difficulty of trying to incorporate best management practices over so many acres, but also the challenge of trying to change landowner attitudes. The agri-industrial complex of today is built upon generations of farmers who have been encouraged to maximize efficiencies mainly in terms of agricultural output.

Other nonpoint sources are of lesser statewide significance but may be of major importance in determining local or regional water quality conditions. Water quality assessments conducted for Iowa's 305(b) report indicate that a number of nonpoint pollution sources are affecting the quality of Iowa's surface waters and groundwaters.

The most current 305(b) report completed in 1998 notes traditional point source pollution associated with heavy industrialization such as toxic metals has been low during the three-year period from October, 1994 through September, 1997 covered by the study. While the study also notes that the number of livestock-related fish kills increased during the period from 1994 through 1997, the number of instances has dropped off in the last two years due, at least in part, to new laws requiring manure management plans and training for manure applicators.

Iowa's current 303(d) list contains 157 waterbodies. Most of the causes of impairment to Iowa waterbodies — especially siltation, nutrients and habitat alterations — are primarily related to agricultural nonpoint source pollution. Other sources of impairments — including municipal and industrial point sources, urban runoff and combined sewer overflows — cause less widespread, but often more severe water quality impacts than do agricultural nonpoint sources, according to the 1998 305(b) report.

Nonpoint source control activities conducted in Iowa through Section 319 include animal waste management projects, groundwater monitoring to show effectiveness of animal waste controls, development of methods for disposal of dead livestock, development of informational and educational materials for the public and erosion control projects in watersheds of several publicly-owned lakes. Since 1990, more than 110 nonpoint source water quality projects have been completed or are ongoing using a variety of funding programs including EPA Section 319 funding administered by IDNR, state Water Protection Funds and other funding sources.

Listed below are the major nonpoint source issues needing to be addressed in Iowa:

A. Agriculture

The results of Iowa's 1988 nonpoint assessment clearly point out agriculture is the major nonpoint source impacting the state's surface waters. Of 8,235 stream miles assessed, agriculture was identified as the primary nonpoint source impacting 93 percent of this mileage, and all streams were assessed as being impacted to some degree by agriculture. Similarly, agriculture was assessed as the major source of impact for 156 of 236 assessed lakes, and for 68 of 96 assessed wetlands.

Sediment was most frequently identified as the agricultural pollutant causing the greatest water quality impact, with 84 percent of the stream miles reporting major sediment related impacts and the remaining 16 percent reporting lesser sediment related impacts. Sediment was also reported as the major pollutant for 137 of 236 lakes, for 55 of 65 wetlands, and for all four of Iowa's federal flood control reservoirs.

Likewise, the 1998 305(b) Report sites the fact that agricultural nonpoint pollution is the major source causing water quality impairment on Iowa's flood control reservoirs and wetlands. Nonpoint pollution is listed as the second biggest source of impairment for Iowa's rivers, streams and lakes.

Water quality assessments also show that agriculture is impacting much of the state's groundwater. Leaching of nitrogen through the soil has caused nitrate concentrations in Iowa groundwaters to increase significantly over the past 20 years, with many shallow aquifers now exceeding the nitrate drinking water standard of 10 mg/l (as nitrogen).

In recent years, a number of commonly-used agricultural pesticides have been detected at low concentrations in shallow groundwater aquifers. The pesticides found are generally quite soluble, and thus leach readily under favorable soil and geologic conditions. Leaching from

areas with high pesticide concentrations in the soil (due, for example, to container breakage, spills during mixing and handling, etc.) is an important source of groundwater contamination. The widespread use of pesticides on Iowa croplands is also an important source of groundwater contamination.

Agricultural drainage wells, sinkholes, and poorly-constructed or abandoned water supply wells allow agricultural pollutants to be discharged directly into groundwaters. Abandoned water supply wells are located throughout the state, while agricultural drainage wells and sinkholes are generally found only in areas of north central and northeastern Iowa, respectively. While nitrates and soluble pesticides are the major pollutants found if only tile drainage is involved, a variety of pollutants (including sediment, pathogens, and organic matter) may enter the groundwater if surface runoff enters agricultural drainage wells, sinkholes, and poorly constructed or abandoned wells.

A number of studies were conducted between 1975 and 1979 which better defined the nature and extent of Iowa's nonpoint problems, the factors influencing the types and amounts of pollution occurring, and the effectiveness of various control practices. These study results were used to develop an agricultural nonpoint control plan, which was adopted in 1979 as part of the Iowa statewide water quality management plan (DEQ-DSC 1979).

The rise of large-scale confined animal feeding operations in Iowa over the last decade presents significant threats--both short term and long term--to the quality of Iowa's surface waters and groundwater. Some of the most extensive fish kills in Iowa in the last decade have occurred since 1995, and many of these kills were caused by movement of animal waste from confined animal feeding operations to streams and rivers. Other, more subtle and long-term changes in water quality, such as increased levels of nutrients and bacteria in Iowa streams, may also result from the expansion of the confined livestock industry in Iowa, particularly in areas where large amounts of manure from these operations are applied to farm fields.

While sediments and nutrients from agricultural sources are known to be impacting Iowa's waters, the lack of specific water quality criteria for either sediments or nutrients in Iowa's water quality standards has made it difficult to accurately assess the extent to which Iowa's waters are impaired due to these pollutants. Generally, the assessments completed to date have been subjective and based upon the knowledge of IDNR staff and others familiar with specific water bodies. EPA is currently developing nutrient criteria for surface waters on a somewhat regionalized basis, with states being expected to subsequently adopt these criteria as part of their state water quality standards. Although the impacts of including nutrient criteria in Iowa's water quality standards are currently unclear, it is expected that doing so will greatly increase the number of surface waters in Iowa which are identified as being impaired by nutrients.

B. Atmospheric deposition

Additional attention is also being directed at nonpoint impacts on water quality from atmospheric deposition throughout the United States. Iowa currently has two monitoring sites as part of the National Atmospheric Deposition Program/National Trends Network (NAPD/NTN).

Through the NAPD/NTN research so far, it has been determined that higher ammonium ion concentrations are associated with agricultural lands in the Midwest and central plains which likely result from fertilizer applications and livestock. Nitrate ion concentrations at both Iowa sites are also higher than at many of the other sites in the southern and western regions of the United States. Excess nitrate or ammonia in rainfall on lakes and streams can stimulate algae growth, eventually depleting oxygen levels which can affect fish and other aquatic organisms.

C. On-site residential wastewater disposal

Between 300,000 and 400,000 Iowa households are using on-site systems for disposal of wastewater. While these systems do not pose a major threat to Iowa's surface or groundwaters, localized contamination problems may occur, due to improperly designed or maintained septic tanks, septic tank distribution fields, the direct discharge of septic tank effluents to surface waters, etc. Restrictions on swimming have been imposed in a southwestern Iowa lake due to excessively high levels of fecal coliform bacteria believed to be due to discharge of wastewater from lakeside residences. Information from IDNR field staff suggests similar problems may exist in other Iowa surface waters.

D. Waste disposal

Iowa's municipalities, industries, and agricultural operations produce large volumes of organic waste. Unless properly disposed of, these wastes can contaminate the state's surface and groundwaters. Another potential source of contamination is waste sludge produced by municipal sewage treatment plants, which in most cases is disposed of by land application. Virtually all of Iowa's solid waste is now disposed of in 64 municipal and 27 industrial permitted sanitary landfill sites. There are a total of 295 solid waste management facilities in the state, which includes permitted and permit-pending municipal and industrial landfills that are operational or closed, as well as facilities for waste transfer, recycling, composting, incineration, disposal of household hazardous materials, and land application and related waste management facilities. Before a 1975 Iowa law required that solid wastes be disposed in permitted landfills, Iowa had over 2,000 municipal open dumps, including many which were located in sites with considerable potential for groundwater contamination. Much of the contamination potential of these now-abandoned open dumps remains, even though they have been capped with soil and re-vegetated. In the past, industrial wastes were often disposed of on lands owned or leased by the generating companies. While this practice is no longer permitted, over 500 abandoned industrial disposal sites have been identified, and some are known to be sources of groundwater contamination. Problems at these sites are now being addressed through the state's contaminated sites program.

E. Urban runoff/stormwater discharges

Many recent studies have shown that runoff from industrial and urban areas contains many of the same pollutants found in municipal and industrial discharges. Rainfall picks up pollutants from parking lots and streets, building roofs, construction and industrial sites, and mining operations. Approximately 3,000 stormwater discharges in Iowa are covered by a general NPDES permit for stormwater discharge associated with industrial activity. Cedar Rapids, Des Moines and Davenport have completed applications for their separate storm sewer systems under a permit. Approximately 850 Iowa facilities are participating in the group application process.
Urban households account for approximately 2 percent of the pesticides used in Iowa. Urban use of pesticides is also a nonpoint source of pollution. State law and rules of the IDALS govern certain aspects of pesticide use in urban areas. Commercial applicators applying pesticides to public and/or residential areas are required to pass state examination to become certified. Continuing education credits are required annually, and retesting occurs every three years.
A number of construction-related activities in or near Iowa's waters may adversely impact water quality in terms of turbidity, sedimentation, or habitat modification. In addition, activities such as the withdrawal of water from streams and alluvial aquifers or the construction of dams can impact the hydrology of Iowa's waterbodies. Iowa carries out programs which regulate activities that can impact the hydrology and habitat of a waterbody. These programs are the floodplain management program, the water rights program, and the Section 401 water quality certification program.