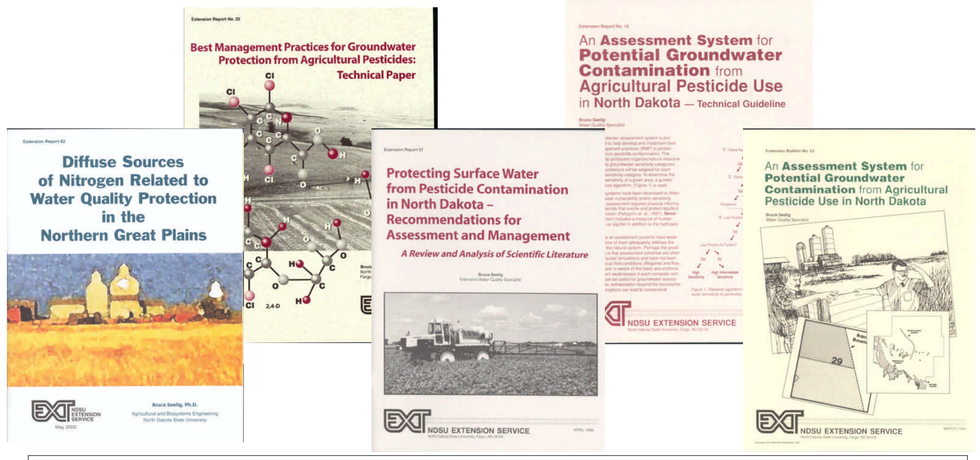
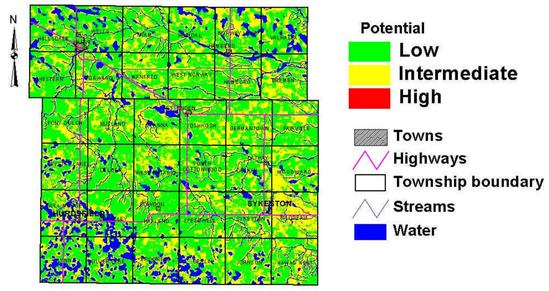
Geospatial Applications to Water Quality

Bruce Seelig, Sheri Fox, Dath Mita, Dennis Rindy, and John Nowatzki
Agricultural and Biosystems Engineering
North Dakota State University



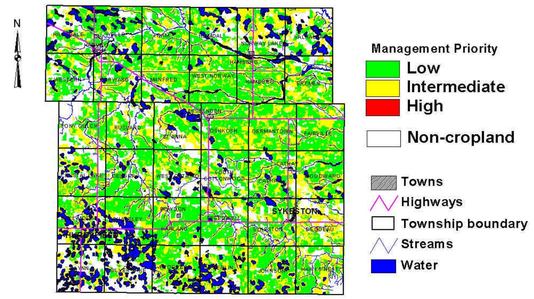
Geospatial applications to water quality rest on a foundation of scientific literature related to the investigation of factors and processes that explain the observed conditions of the environment. The water quality group at NDSU has published a series of technical documents designed to help resource managers identify important characteristics related to water resource contamination. EB 63 "An Assessment System for Potential Groundwater Contamination from Agricultural Pesticide Use in North Dakota" has become part of the package of materials provided to the thousands of participants in Pesticide Applicator Certification program. ER 62 "Diffuse Sources of Nitrogen Related to Water Quality Protection in the Northern Great Plains" has been included in the NRCS Technical Guide as a reference. These technical publications and others can be downloaded from the North Dakota Water Quality website at http://aeserver2.abeng.ndsu.nodak.edu/ndsqw/index.html.

Potential for Phosphorous Translocation to Surface Water in Wells County, North Dakota



Scale 1:436403
UTM 83 Zone 14

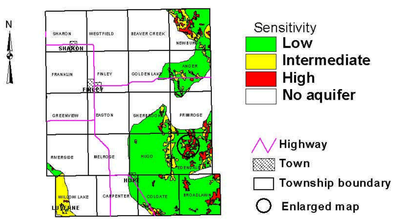
Cropland Phosphorus Management Priority Zones Wells County, North Dakota



Scale 1:406211
UTM 83 Zone 14

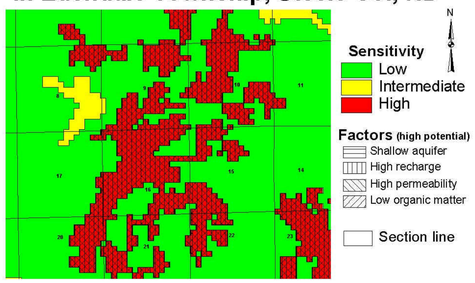
The NDSU water quality group has helped the James Headwater Watershed project in Wells County identify areas sensitive to surface water contamination with nutrients. ARC VIEW 3.2 GIS was used to process Natural Resources Conservation Service (NRCS) Soil Survey Geographic (SSURGO), North Dakota Dept. of Transportation (NDDOT) GIS, and North Dakota Agricultural Statistics Service 2001 landuse databases for surface water assessment. In addition to surface water sensitivity, management priority zones were also determined. Continued research in the watershed is planned to evaluate the accuracy and utility of modeled nutrient impacts as related to implemented management strategies.

Aquifer Sensitvity to Leachable Pesticides Steele County, North Dakota



Scale 1:432322
UTM 83 Zone 14

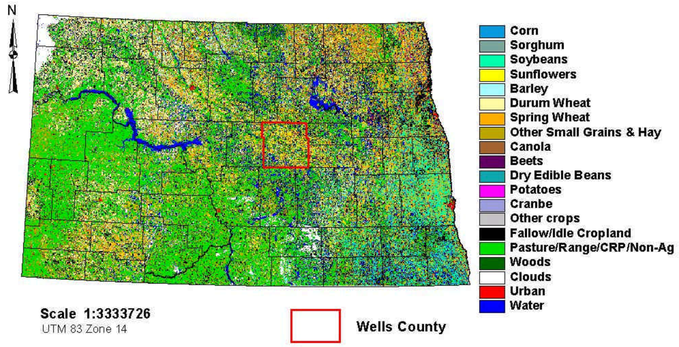
Aquifer Sensitivity to Leachable Pesticides in Edendale Township, Steele Co., ND



Scale 1:35017
UTM 83 Zone 14

Aquifer assessment for potential pesticide contamination is based on the publication ER 18 "An Assessment System for Potential Groundwater Contamination from Agricultural Pesticide Use in North Dakota - Technical Guideline". The protocol outlined in the guideline was adopted for use by the North Dakota Dept. of Agriculture (NDDA) in their Pesticide – Groundwater Protection Strategy. The NDSU water quality group has built a website to assist NDDA with disseminating aquifer sensitivity information for over 20 counties in North Dakota. The website was designed using ARC IMS so that the user can interactively determine, at any scale, aquifer sensitivity and the factors that contribute to it. The website address is http://www.ageng.ndsu.nodak.edu/pest. Training in the use of the aquifer sensitivity site is done annually in conjunction with the Pesticide Applicator Certification program.

North Dakota Landuse 2001 from NASS* LandSat Database

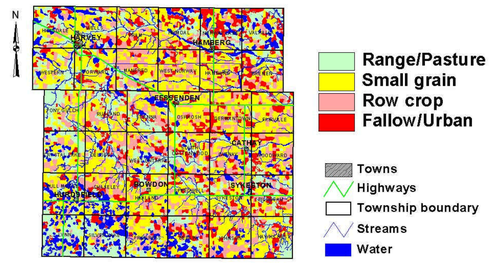


Scale 1:3333726
UTM 83 Zone 14

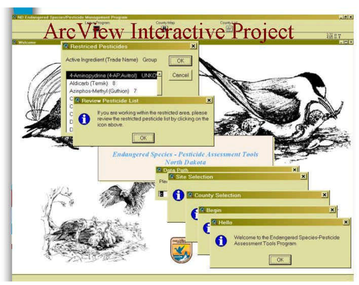
*National Agricultural Statistics Service

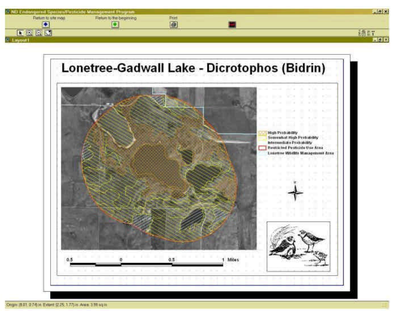
A cooperative program utilizing EPA 319 grant money was established between the NDSU water quality group and North Dakota Agricultural Statistics Service (NDASS) to deliver an annual landuse layer based on LandSat imagery. The landuse information collected is one of the data layers used with ARC VIEW 3.2 GIS to produce county assessments of both groundwater and surface water related to nitrogen. The NDSU water quality group continues to investigate the relationship between landuse categories and agricultural inputs. The landuse database has uses that are not directly related to water quality issues. In one instance the database was used to help estimate annual the loss of cropland acreage due to the inundation of Devils Lake flood-water. The landuse images with attributes attached are available from the NDSU water quality group in compact disk format. Landuse images are available at http://www.ageng.ndsu.nodak.edu/geodata/documents/.

Landuse Categories for Surface Water Assessment in Wells County, North Dakota



Scale 1:446378
UTM 83 Zone 14





The NDSU water quality group helped the US Fish and Wildlife Service (USF&WS) adapt the protocol outlined in ER 37 "Protecting Surface Water from Pesticide Contamination in North Dakota – Recommendations for Assessment and Management" to their Endangered Species Protection Program. Assessment of water resources for potential pesticide contamination in known areas of endangered species was utilized to design management zones. Pesticide use recommendations are designed for each management zone. The USF&WS has developed a GIS program that interactively provides information related to endangered species management zones. In the near future, landowners will be able to determine their responsibility with respect to the Endangered Species Protection Program through the WEB.

A geospatial education program has been developed to advance knowledge of GIS tools, geographic databases, and global positioning equipment. Program participants have the opportunity to learn how to apply basic and advanced geospatial concepts to enhance their work performance. Training workshops in ARC VIEW GIS, global positioning instruments (GPS), remote sensing databases, and hand-held computers have been delivered to a broad audience including Extension agents and specialists, Ag. Experiment Station faculty, State and Federal agency personnel, Ag. consultants, and producers. One of the most recent efforts has been funded through a NASA grant to train approximately 100 individuals in the use of geospatial data and hand-held computers. The participants are linked online through the Black Board computer classroom program at NDSU. In return for training and equipment, participants in the program are expected to design and implement local projects utilizing geospatial concepts.