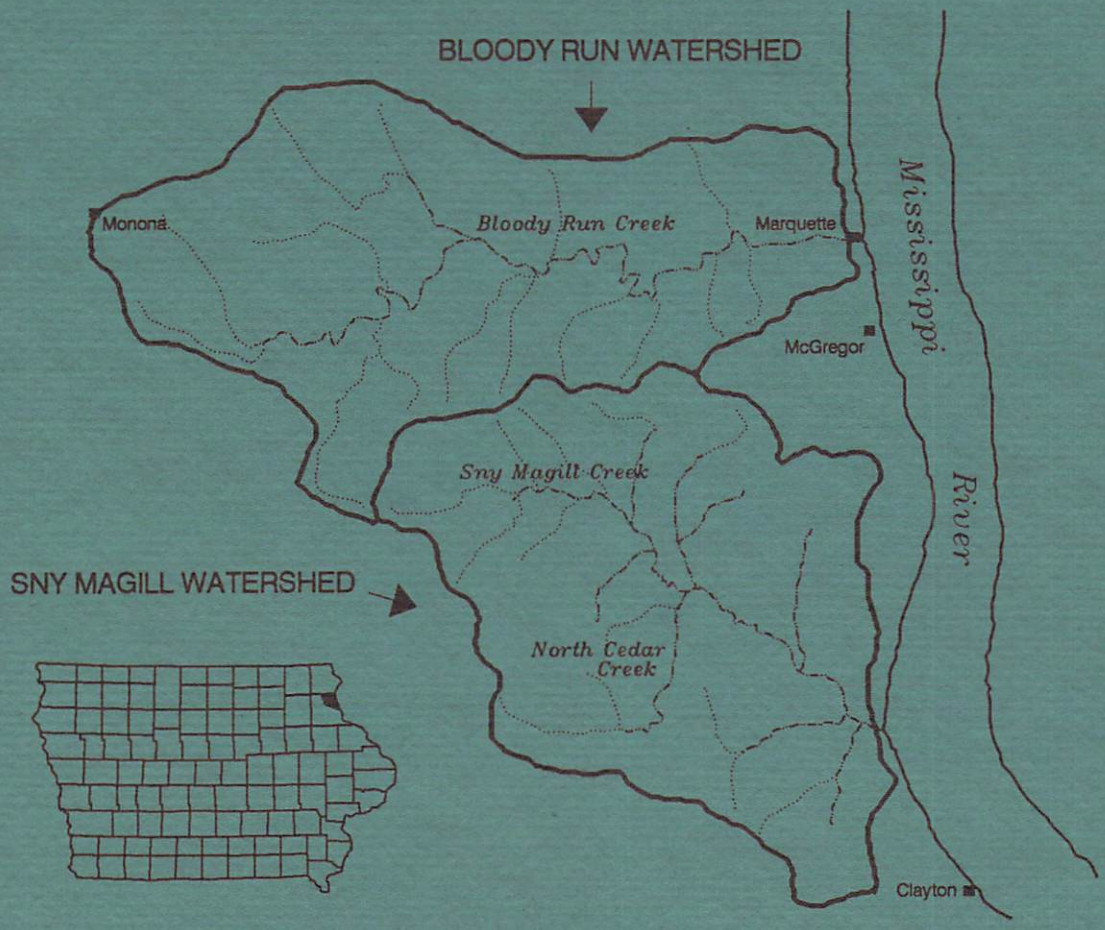
SNY MAGILL WATERSHED NONPOINT SOURCE POLLUTION MONITORING PROJECT WORKPLAN

Open File Report 92-1



Iowa Department of Natural Resources
Larry J. Wilson, Director
August 1992

SNY MAGILL WATERSHED
NONPOINT SOURCE POLLUTION
MONITORING PROJECT WORKPLAN

Open File Report 92-1

Prepared by:

L.S. Seigley[1], G.R. Hallberg[1], T. Wilton[1], M.D. Schueller[2], M.C. Hausler[2], J.O. Kennedy[2], G. Wunder[1], R.V. Link[3], and S.S. Brown[4]

[1] Iowa Department of Natural Resources
[2] University Hygienic Laboratory, University of Iowa
[3] U.S. Department of Agriculture, Soil Conservation Service
[4] Iowa State University Extension

August 1992

Iowa Department of Natural Resources
Larry J. Wilson, Director

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENTS

The Sny Magill Watershed Nonpoint Source Pollution Monitoring Project is supported, in part, by Region VII of the U.S. Environmental Protection Agency through a 319-Nonpoint Source Program Grant to the Iowa Department of Natural Resources. Analytical support is provided by the University Hygienic Laboratory in Iowa City and Des Moines.

Steve Kalkhoff, Jim Wellman, and Delmer O'Connell from the U.S. Geological Survey also made significant contributions to the development of this workplan as well as the installation of surface water stream gages on Sny Magill and Bloody Run creeks.

SNY MAGILL WATERSHED NONPOINT SOURCE POLLUTION MONITORING PROJECT WORKPLAN

L.S. Seigley, G.R. Hallberg, T. Wilton, M.D. Schueller, M.C. Hausler, J.O. Kennedy, G. Wunder, R.V. Link, and S.S. Brown, 1992.
Iowa Department of Natural Resources, Geological Survey Bureau,
Open File Report 92-1, 31 p.

ABSTRACT

A Nonpoint Source Monitoring Project (USEPA 319 Nonpoint Source Program) has been developed for the Sny Magill Watershed located in northeastern Clayton County, Iowa. The Sny Magill Watershed Nonpoint Source Pollution Monitoring Project, an interagency effort, is designed to monitor and assess improvements in water-quality resulting from implementation of two water-quality special projects in the watershed: the Sny Magill Hydrologic Unit Area project and the North Cedar Creek Agricultural Conservation Program-Special Water Quality Project. North Cedar Creek is a tributary to Sny Magill Creek. The project is supported, in part, by a Nonpoint Source Program (Section 319, Clean Water Act) grant from the USEPA, Region VII.

Both Sny Magill and North Cedar creeks are Class "B" coldwater streams managed for "put and take" trout fishing. The Sny Magill Watershed drains a 35.6 square mile area and is affected by water pollutants related to agricultural landuse and management, primarily sediment, animal waste, nutrients, and pesticides. A paired watershed approach is being used, with the Bloody Run Watershed (adjacent watershed to the north) serving as the control watershed. The watersheds are well suited to a paired approach; the Sny Magill Watershed drains 35.6 mi^2 and the Bloody Run Watershed drains 37.6 mi^2. The groundwater hydrogeology and known surface water characteristics are similar; both receive groundwater baseflow from the Ordovician Galena aquifer. The watersheds share surface water and groundwater divides and their proximity to one another minimizes rainfall variation. Subbasins within the Sny Magill Watershed will also be compared, using the paired approach as well as upstream/downstream comparisons.

A primary monitoring site was established on both Sny Magill and Bloody Run and equipped with U.S. Geological Survey stream gages to measure discharge and suspended sediment. In addition, other sites on both Sny Magill and Bloody Run will be sampled for chemical and physical water-quality parameters on a weekly to monthly basis, an annual habitat assessment will be conducted along stretches of stream corridor, biomonitoring of macroinvertebrates will occur on a bi-monthly basis, and an annual fisheries survey included.

INTRODUCTION

Nonpoint Source Pollution (NPS) is considered to be the major cause of remaining impairment to water quality in the United States. In an agricultural state such as Iowa this is particularly true; recent assessments show that agricultural landuse is the source of diffuse, nonpoint source pollution affecting approximately 96% of Iowa's stream miles and the majority of impaired lakes and wetlands (Agena, Bryant, and Oswald, 1991). Numerous programs are being implemented in Iowa, by many agencies, to work to mitigate NPS pollution from agriculture. These programs provide evidence of considerable pollution prevention and source reduction benefits that will, over time, reduce NPS pollution. The ultimate test of the success of such efforts must be improved water quality, however. Hence, there is a clear need for programs that can monitor water quality and begin to document the improvements that should accrue over time from the implementation of NPS control projects.

Monitoring NPS water-quality impacts and improvements is not an easy task. Monitoring the changes in point-source pollution was comparatively easy. Such discharges came from discrete entities, often the end of a discharge pipe from municipal and industrial sources. Monitoring the changes in effluent from such discharge pipes, and quantifying the observed improvements, is a relatively straight-forward task. With NPS pollution there are no such discrete entities to monitor; the pollution results from runoff and infiltration across the landscape, in relation to varied land-management practices. The resultant impacts that can be measured in perennial streams or groundwater are typically a mix of effects from many different parcels of land, many different components of management, integrated over many time scales. Even with these inherent complexities, monitoring programs must be developed to provide necessary measures of the effects and/or improvements in water quality related to nonpoint sources. This report outlines the design and initial workplan for a nonpoint-source, water-quality monitoring program for the Sny Magill Watershed, and related areas, in Clayton County, northeastern Iowa.

The U.S. Environmental Protection Agency (USEPA) has authority and responsibility to control NPS pollution, under Section 319 of the Clean Water Act. USEPA has issued grants to the states to implement NPS control projects and related activities. A grant from USEPA, Region VII, to the State of Iowa, Department of Natural Resources (IDNR), will provide partial support for the development and implementation of this monitoring program. The workplan described in this report is a joint product of the participating agencies and institutions. It is a *plan*, and as such, it is subject to change as changing conditions dictate.

WATER-QUALITY MONITORING PROJECT OBJECTIVES

The general goal of this project is: to institute a comprehensive, long-term, 319-NPS protocol monitoring project in the Sny Magill Watershed, Clayton County, Iowa; to quantitatively document the significance of water-quality improvements resulting from the implementation of the Sny Magill Hydrologic Unit Area (HUA) project and North Cedar Creek Agricultural Conservation Program (ACP) Water-Quality Special Project (WQSP). Several other component objectives can be expressed: 1. to develop the protocols and procedures for a collaborative inter-agency program to fulfill the USEPA standards for "Nonpoint Source Monitoring and Reporting Requirements for Watershed Implementation Projects" (USEPA, 1991); 2. to refine monitoring protocols to define water-quality impacts and the effectiveness of particular management practices; 3. to develop Iowa's capacity for utilization of rapid habitat and biologic monitoring; 4. to use the water-quality and habitat monitoring data interactively; a. with implementation programs, to aid targeting, and b. for public education to expand awareness of the need for nonpoint source pollution-prevention implementation by farmers; and 5. to provide Iowa and the USEPA with needed water-quality documentation for measures of success of nonpoint source implementation.

The project will be a coordinated inter-agency effort, with a planned time frame of approximately 10 years. This workplan outlines

the initial development year of the project and its first two years of implementation for which initial funding has been provided. Pending review and refinement of the project additional funding will be requested for the next three-year period.

Link to Iowa's NPS Management Program

Sny Magill and North Cedar creeks are two of 25 coldwater streams identified as a priority for project action to improve water quality in Iowa's State Nonpoint Source Management Report (NPSMR) (Iowa Department of Natural Resources, 1989). In addition, this project addresses the following objectives of Iowa's NPSMR Work Element #3, "Establish Additional Nonpoint Control Projects": "To develop, obtain funding for, and initiate additional nonpoint pollution control projects. Individual projects may be designed to accomplish one or more of the following: evaluate effectiveness of individual Best Management Practices (BMPs) or BMP combinations; assess feasibility and effectiveness of alternative approaches to accomplishing nonpoint control; establish demonstration projects throughout the state to inform and educate landowners and the general public on the use of various BMPs and to demonstrate their effectiveness in improving water quality."

Through the U.S. Department of Agriculture's (USDA) Water-Quality Initiative two special nonpoint source, water-quality mitigation projects have been implemented in the Sny Magill Watershed (Fig. 1), by the USDA-Soil Conservation Service (SCS), USDA-Agricultural Stabilization and Conservation Service (ASCS), and the Iowa State University Extension (ISUE), in conjunction with state and local agencies. The Sny Magill HUA project began in 1991 and is a five-year project. Also underway, in the North Cedar Creek Watershed, a tributary sub-basin within the Sny Magill Watershed, is the North Cedar Creek WQSP. This was initiated in 1988. The purpose of these projects is to provide technical and cost-sharing assistance, and educational programs to assist agricultural producers in the watershed to implement voluntary changes in farm management practices that result in improved water quality in Sny Magill Creek. Further, additional resources for technical assistance and education programs will be provided in the area through the Northeast Iowa Demonstration Project (NEIDP), directed by ISUE, and the Big Spring Basin Demonstration Project, directed by IDNR.

WATER RESOURCE DESCRIPTION

Sny Magill and North Cedar creeks are Class "B" coldwater streams in northeastern Iowa which are managed for "put and take" trout fishing by the IDNR. These creeks are two of the more widely used streams for recreational fishing; Sny Magill ranks ninth in the state for angler usage. Sny Magill and North Cedar are two of 25 coldwater streams identified as a priority for project action to improve water quality in Iowa's State Nonpoint Source Management Report (Iowa Department of Natural Resources, 1989). The creeks are further designated as "high-quality waters" and are to be protected against degradation of water quality. Only 17 streams in the state have this special designation. The Iowa State Nonpoint Source Assessment Report indicates that their present classification ("B") as protected for wildlife, fish, and semi-aquatic life and secondary aquatic usage is only partially supported (Iowa Department of Natural Resources, 1988). The report cites impairment of the creeks' water quality primarily by nonpoint source agricultural pollutants, particularly sediment followed by nutrients and pesticides. There are no significant point sources within the Sny Magill Watershed (Fig. 1). (In the remainder of this plan, descriptions of the Sny Magill Watershed refer to the entire area, i.e., including the North Cedar Creek basin, except where otherwise indicated.)

Average yearly rainfall in the area is 33 inches. The creeks are marked by high proportions of groundwater baseflow, which provides their coldwater nature. Groundwater constitutes an estimated 60-70% or more of annual flow. Hence, groundwater quality is also an important consideration in the overall water-resource management considerations for the streams in this area.

Watershed

Sny Magill Creek drains a 35.6 square mile watershed and outlets directly into the Upper

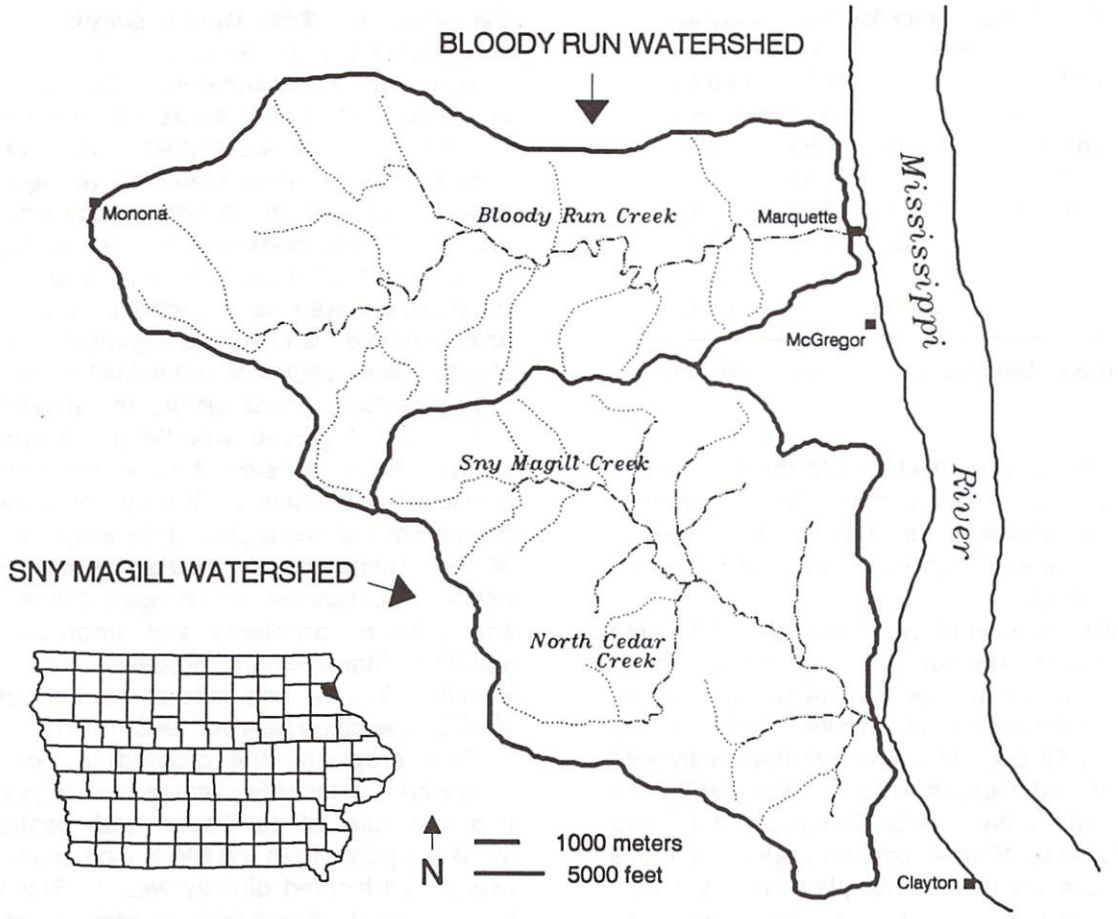


Figure 1. Location map of Sny Magill Creek, North Cedar Creek, and the paired watershed of Bloody Run Creek.

Mississippi River Wildlife and Fish Refuge which consists of islands, backwaters and wetlands of the Mississippi River. The creek also outlets into part of Effigy Mounds National Monument. These backwaters are heavily used for fishing and also serve as an important nursery area for juvenile and young largemouth bass. The entire Sny Magill Watershed is agricultural, with no industry or urban areas. The drainage area of Sny Magill is 22,780 acres, of which 19,560 acres are included in the Sny Magill HUA project. The remaining area is included in the North Cedar Creek Watershed where the WQSP began in 1988. The land use in the Sny Magill Watershed (including the North Cedar Creek sub-basin) is shown in Table 1 (Soil Conservation Service, 1986; 1991). In any given year approximately half of the cropland acreage is in corn, with the remainder dominated by oats and alfalfa in rotation with corn. Approximately 140 producers have land wholly or partially in the watershed, with an average farm size of about 275 acres.

The Sny Magill Watershed is marked by narrow, gently sloping uplands that break into steep slopes with abundant rock outcrops. Up to 550 feet of relief occurs across the watershed. The landscape is mantled with approximately 10-20 feet of loess, overlying thin remnants of glacial till on upland interfluves, which in turn overlie Paleozoic age bedrock formations. The bedrock over much of the area is the Ordovician Galena Group rocks, which comprise the Galena aquifer, an important source of groundwater and drinking water in the area. Some sinkholes and

Table 1. Landuse in the Sny Magill Watershed.

Land Use	acres	mi^2	Percent
Cropland	9,555	14.93	42%
Pasture	7,295	11.40	32%
Forestland	5,305	8.29	23%
Other land	625	0.98	3%
Total	22,780	35.60	100%

(Sources: Soil Conservation Service, 1986; 1991)

small springs are developed in the Ordovician-age limestone and dolomite. Also exposed at lower elevations in the watershed are the St. Peter Sandstone Formation and the Prairie du Chien Group.

Upland soils in cropland portions of the area are primarily the loess-derived series Tama, Downs, and Fayette on 3 to 14 percent slopes. Permanent pasture and wildlife areas dominate on 10 to 18 percent slopes predominantly with Fayette and Dubuque soils. Woodlands are found mainly on Fayette, Dubuque, and Steep Rock Land on 10 to 45 percent slopes. Land use is variable on the alluvial plain of Sny Magill Creek; ranging from row cropped areas, to pasture and forest, to areas with an improved riparian right-of-way where the IDNR owns and manages the land in the immediate stream corridor. The IDNR owns approximately 1,800 acres of stream corridor, along approximately eight miles of the length of Sny Magill-North Cedar creeks (Fig. 2). Some of the land within the corridor is used for pasture and cropping through management contracts with the DNR.

The stream bottom of Sny Magill and its tributaries is primarily rock and gravel with riffle areas frequently found. Along the lower reach of the creek where the gradient is less steep, the stream bottom is generally silty. The upstream areas have been degraded by sediment deposition, however.

Water Quality Problems

The Sny Magill Creek Watershed is affected by several agriculturally related water pollutants. The primary pollutants are sediment, animal waste, nutrients, and pesticides. Sediment delivered to Sny Magill Creek includes contributions from excessive sheet and rill erosion on approximately 4,700 acres of cropland and 1,600 acres of pasture and forestland in the watershed. Gully erosion problems have been identified at nearly 60 locations, as well. In addition to sediment, there are over 30 locations where livestock facilities need improved runoff control and manure management systems to control solid and liquid animal wastes. Grazing management is needed also to control sediment and animal waste runoff from over 750 acres of pasture and an additional 880 acres of grazed woodland. In addition, stream bank erosion has contributed to significant sedimentation locally and improved stream corridor management (to keep cattle out of the stream, repair riparian vegetation) is needed in critical areas to mitigate animal waste and nutrient problems and improve bank stability. Management problems have been identified in over one mile of stream corridor (Soil Conservation Service, 1986; 1991).

Row crop acreage planted to corn has increased substantially over the past 20 years, as has the use of fertilizers and pesticides. Monitoring data from the Big Spring basin study (watershed located directly west of Sny Magill Creek Watershed) and regional sampling of wells by IDNR has shown that nitrate concentrations in groundwater and surface waters have increased over this time as well. These studies have also shown that pesticides are now detected commonly in streams and groundwater in the region, particularly the herbicide atrazine.

Past Water Quality Evaluations

The University Hygienic Laboratory (UHL) conducted water quality surveys of Sny Magill and Bloody Run creeks in August of 1976 and 1978, during summer low-flow periods (University of Iowa, State Hygienic Laboratory 1977; 1978). An inventory of the benthic macroinvertebrate communities was included from several reaches of the streams. Figure 3 shows the water sampling locations. For both creeks the water quality was considered generally "good" during these brief sampling periods. Elevated water temperatures and fecal coliform contamination from animal wastes were noted in Sny Magill Creek. Downstream

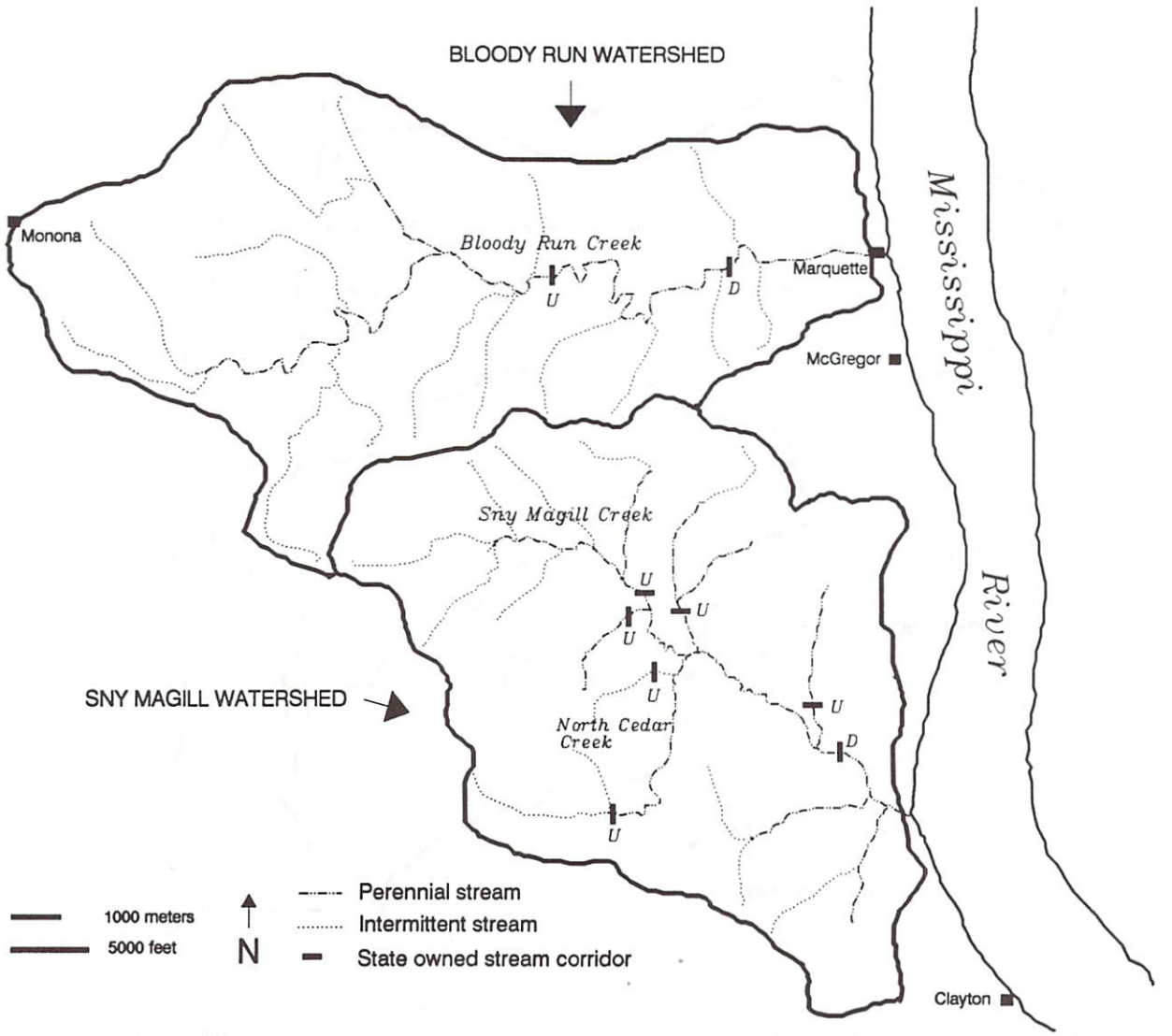


Figure 2. Stream corridor between "U" (upstream) and "D" (downstream) represents stretches of state-owned stream corridor on Sny Magill and Bloody Run creeks.

declines in nutrient concentrations were related to algal growth and in-stream consumption. (These past studies will be summarized in more detail in project background reports to be developed during 1992.)

Studies in the region have shown declining water quality since this time. In the adjacent Big Spring basin, nitrate concentrations in groundwater have increased 3-fold from about 1970 until the mid-1980s. Pesticides have been commonly detected as well. Nitrate concentrations in groundwater in the Galena aquifer, which supplies Big Spring, have increased from levels of 2-3 mg/L, NO_3-N, in the late 1960s to 9-10 mg/L in the 1980s. Atrazine has been widely detected in water wells also. Contaminants are delivered into the aquifer by leaching through the soil under routine practices and also through surface water runoff that discharges into sinkholes that may be open into the aquifer. Such sinkhole recharge can also deliver microbial pathogens from animal wastes

such a project. The area is amenable to various comparative water-quality approaches, including paired-watershed design. The coldwater stream has a high groundwater base-flow component which provides year-around discharge, minimizing potential missing data problems. This also affords analysis of both runoff and groundwater contributions to the water quality conditions. Because of the intimate linkage of groundwater and surface water in the region, the watershed has a very responsive hydrologic system and should be relatively sensitive to the changes induced through the implementation programs. The implementation programs are well-designed, targeted toward critical needs and areas: the two special programs (the HUA and the WQSP) will focus considerable resources to the area, and substantial improvements in land, nutrient, and chemical management will be implemented.

The HUA began in 1991 but implementation of conservation measures has not begun; 1991 was primarily for planning purposes. The implementation of the WQSP for North Cedar Creek was begun in 1988 and implementation of conservation measures is estimated to be 75% complete.

Background/Pre-Implementation Data

Water-quality and biomonitoring data is available from UHL surveys in 1976 and 1978 for both Sny Magill and Bloody Run. Groundwater and surface-water quality data were collected by IDNR-Geological Survey Bureau (IDNR-GSB) in the early 1980s. Stream habitat assessments, using the Habitat Evaluation Procedure (HEP) were conducted on North Cedar Creek in 1984. Further biomonitoring data were collected from Bloody Run in 1986 for a Department of Transportation environmental review. These data will be compiled as part of database organization during 1992. Pre-implementation water-quality data will be collected during 1991 and 1992. Except for the North Cedar Creek Watershed, no significant project land treatment was implemented in the Sny Magill Watershed during 1991. The earliest scheduled implementation associated with the Sny Magill Hydrologic Unit Area is 1992. In addition, ISUE will conduct well-water sampling in the area in 1992. Even though implementation efforts will phase in, beginning in 1992, there will likely be little immediate impact on the watershed hydrology. The monitoring during these first two water-years, coupled with the background data, will provide an adequate pre-implementation baseline. IDNR-GSB, along with the U.S. National Park Service personnel, initiated sampling in the watersheds in early 1991. The extensive temporal record of water quality in the region from the Big Spring basin study and related efforts provide background information for comparison, as well.

Several sources will provide information on landuse and management. IDNR is mapping 1990 landuse for the state, as part of the state's natural-resources GIS development. The IDNR-GSB GIS will be used to set up a tracking system for this project and the landuse assessment will be part of the baseline information. Further, IDNR-GSB acquired aerial photography of the Sny Magill and Bloody Run watersheds in 1991 to refine this base of information. The US Geological Survey (USGS) GIS-based system will provide basic morphometric and hydrologic comparisons of the basins. The ISUE is conducting farm management inventories which will provide base information on farm management, including nutrient and chemical practices, livestock enterprises, and other items. These data will provide basic information as a baseline for measuring changes, but will also provide the data needed to compute nutrient balances for the watershed.

Monitoring Plan Design

The project will monitor water-quality parameters at nine sites (Fig. 4) and will utilize multiple paired-watershed and upstream/downstream comparisons for analysis and tracking of trends. The Sny Magill Watershed will be paired with the Bloody Run Watershed, which shares a common basin divide with Sny Magill (Fig. 4). The pairing of these two adjacent watersheds will allow minimization of precipitation variation. The watersheds are ideally suited to such a design; the Sny Magill Watershed, including North Cedar Creek, is 35.6 mi^2 in area; the Bloody Run Watershed has an area of 37.6 mi^2. Their groundwater hydrogeology and known surface hydrologic

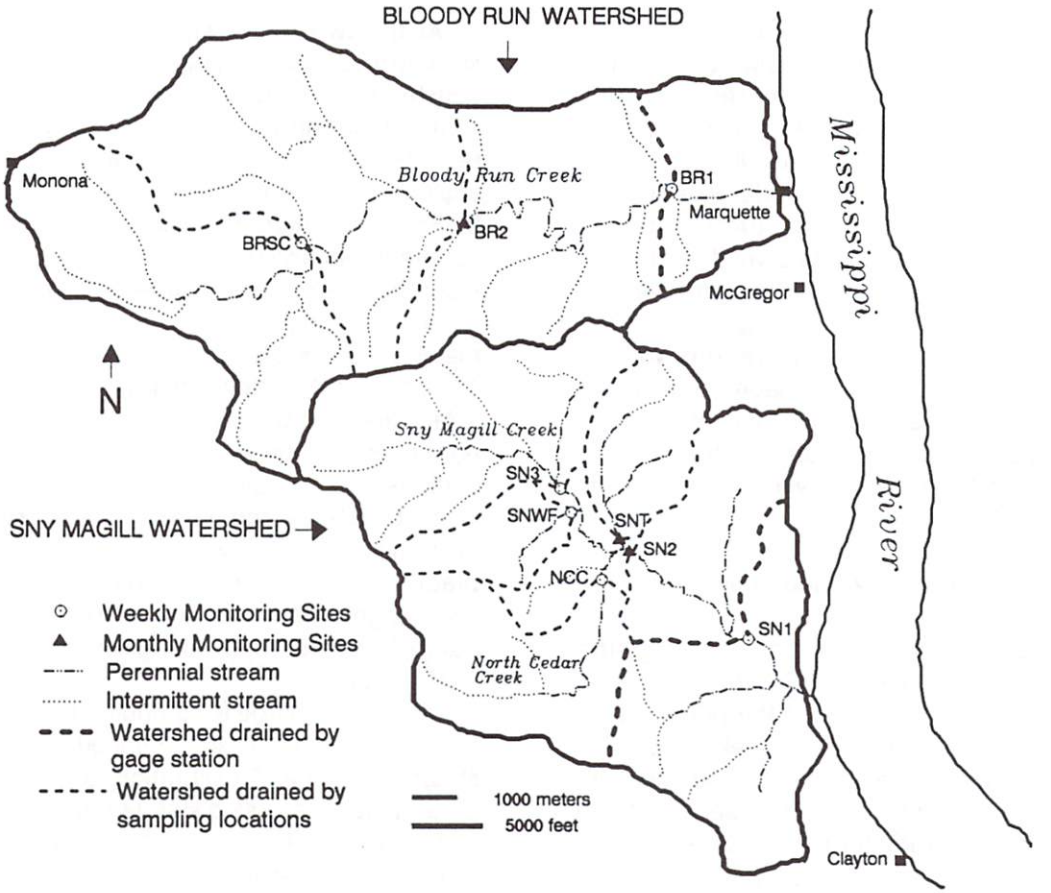


Figure 4. Monitoring sites for Sny Magill and Bloody Run creeks. The USGS gage stations are SN1 and BR1. Supplemental discharge is being measured monthly at all other monitoring sites.

characteristics are very similar. Both receive groundwater baseflow from the Galena aquifer and share a groundwater flow system divide, as well. Complete gaging and monitoring stations, including precipitation measurement, will be established near the mouths of these watersheds. These will form the two principle sites for paired watershed statistical comparisons.

A primary site on Sny Magill and Bloody Run creeks was established in 1991 (SN1, BR1; Fig. 4). In addition to the primary site on each creek, five additional sites were established on Sny Magill and two on Bloody Run (Fig. 4). These sites were chosen based on preliminary water chemistry sampling conducted by IDNR-GSB from February 1991 to September 1991, the evaluation of sites for fisheries survey, benthic macroinvertebrate sampling locations, and for habitat assessments, the site's relation to planned implementation, and feasibility for routine access. The goal was to coordinate the monitoring sites among the various monitoring groups to maximize the use of the water quality information being collected.

These smaller watersheds within Sny Magill will also be used for paired analyses. This will allow comparisons of differential implementation over time, and for analyzing their incremental contributions to the overall basin response. These smaller watersheds will have supplemental gaging measurements made and will be sampled for a subset of the water-quality parameters and covariates that are included at the principle sites. Field parameters will be monitored on a weekly basis at these additional sites as field assessments of the watershed warrant. These sites will also afford upstream/downstream

Table 3. Monitoring parameters and frequency of sampling for Sny Magill and Bloody Run.

Sampling Location	Parameters	Frequency
Sny Magill		
SN1	Stage/Discharge, Suspended Sediment	Daily
	Temperature, Conductivity, Dissolved Oxygen, Turbidity Fecal Coliform, N-Series, Anions, Total Phosphorus, BOD, IMA-triazines	Weekly
	Biomonitoring	Bi-monthly
SN2	Temperature, Conductivity, Dissolved Oxygen, Turbidity Fecal Coliform, Partial N-Series, Anions, Discharge	Monthly
	Biomonitoring	Bi-monthly
SNT	Temperature, Conductivity, Dissolved Oxygen, Turbidity Fecal Coliform, Partial N-Series, Anions, Discharge	Monthly
	Biomonitoring	Bi-monthly
SNWF	Temperature, Conductivity, Dissolved Oxygen, Turbidity Fecal Coliform, Partial N-Series, Anions	Weekly
	Discharge	Monthly
	Biomonitoring	Bi-monthly
NCC	Temperature, Conductivity, Dissolved Oxygen, Turbidity Fecal Coliform, Partial N-Series, Anions	Weekly
	Discharge	Monthly
	Biomonitoring	Bi-monthly
SN3	Temperature, Conductivity, Dissolved Oxygen, Turbidity Fecal Coliform, Partial N-Series, Anions	Weekly
	Discharge	Monthly
	Biomonitoring	Bi-monthly
Bloody Run		
BR1	Stage/Discharge, Suspended Sediment	Daily
	Temperature, Conductivity, Dissolved Oxygen, Turbidity Fecal Coliform, N-Series, Anions, Total Phosphorus, BOD, IMA-triazines	Weekly
	Biomonitoring	Bi-monthly
BR2	Temperature, Conductivity, Dissolved Oxygen, Turbidity Fecal Coliform, Partial N-Series, Anions, Discharge	Monthly
	Biomonitoring	Bi-monthly
BRSC	Temperature, Conductivity, Dissolved Oxygen, Turbidity Fecal Coliform, Partial N-Series, Anions	Weekly
	Discharge	Monthly

Table 4. Summary and references for laboratory methods used for analyzing Sny Magill water-quality analytes.

Analyte	Method Description and Reference

1) fecal coliform bacteria: Based on Standard Methods for Water and Wastewater, Method 9222D (APHA, 1985) using media fecal coliform at 44.5° C.

2) nitrate and nitrite-nitrogen: automated, copper-cadmium reduction and colorimetric quantitationusing a Technicon auto-analyzer system. The method is based on U.S. EPA Method 353.2 (USEPA, 1983).

3) ammonium-nitrogen: automated phenate reaction, and colorimetric quantitation, using Technicon auto-analyzer IM 780-86T. Based on U.S. EPA Method 350.1 and 350.2 (USEPA, 1983).

4) organic-nitrogen: total Kjedahl procedure with sulfuric acid, K_2SO_4, and $HgSO_4$ pre-treatment using Technicon IM 780-86T; semi-automated block digester, AAII, colorimetric quantitation. Organic-nitrogen is defined as the sum of free-ammonia and organic nitrogen compounds which are converted to ammonium sulfate, less the ammonium-N determined in procedure for ammonium-nitrogen (see above). Based on U.S. EPA Method 415.1 (USEPA, 1983).

5) anions: ion chromatography using a Waters Ion Chromatograph with either an IC-Pak A or IC-Pak HR using a borate/gluconate mobile phase, nitrite detected with UV absorbence and other anions with conductivity detector (Waters Ion Chromatography Cookbook, 1989).

6) total P: colorimetric, automated, block digestor, EPA Method 365.4 (USEPA, 1983).

7) 5 Day BOD: samples incubated in dark for 5 days at 20 ° C, Standard Method 507 (APHA, 1985).

8) IMA-triazines: immuno assay using spectrophotometric measurement and analysis; Millipore triazine kit.

9) suspended sediment: standard filtration and evaporation methods (Guy, 1969).

10) common herbicides, multi-residues: methylene chloride extraction; extract partitioned, using silica gel, into two fractions for gas chromatograph-nitrogen-phosphorous capture detector and/or GC-NPD analysis, employing two-column confirmation. Based on U.S. EPA methods, EPA-600/8-80-038, Section 10, A (USEPA, 1980, p. 431-456).

11) organophosphate insecticides: extraction with methylene chloride as a solvent at a neutral pH, using a separatory funnel or a continuous liquid-liquid extractor. GC with a flame photometric (FP) or nitrogen-phosphorous detector (NPD) is used for this multiresidue procedure. Based on U.S. EPA, Method 81.40 (USEPA, 1986).

Table 5. Summary of chemical parameters and method detection limits analyzed in Sny Magill samples.

Analyte	Lab	Method Detection	Sample Holding Time
Fecal bacteria	UHL-IC	count	8 hours
Nitrate & nitrite-N	UHL-DM	0.10 mg/L	28 days
Ammonia-N	UHL-DM	0.10 mg/L	28 days
Organic-N	UHL-DM	0.10 mg/L	28 days
Anions	GDL		
Bromide		0.06 mg/L	14 days
Chloride		0.02 mg/L	14 days
Fluoride		0.04 mg/L	14 days
Nitrate		0.10 mg/L	14 days
Nitrite		0.04 mg/L	14 days
Phosphate		0.15 mg/L	14 days
Sulfate		0.10 mg/L	14 days
Total P	UHL-DM	0.10 mg/L	28 days
5-Day BOD	UHL-DM	1.00 mg/L	48 hours
IMA triazines	UHL-IC	0.10 ug/L	14 days
Nitrate	UHL-IC	1.00 mg/L	48 hours
Suspended sediment	USGS-IC	0.50 mg/L	----
Common herbicides	UHL-IC	0.10 ug/L	7 days
Organophosphate insecticides	UHL-IC	0.10 ug/L	7 days

UHL-DM: University Hygienic Laboratory, Des Moines
UHL-IC: University Hygienic Laboratory, Iowa City
USGS-IC: United States Geological Survey, Iowa City
GDL: University of Iowa Geology Department Laboratory

Table 6. Summary of field measurements and equipment measuring water quality.

Analyte	Method	Units
1) Temperature	Mercury thermometer	degrees C
2) Specific conductance	Conductivity meter	uS/cm @25° C
3) Dissolved oxygen	Hach DO kit	mg/L
4) Turbidity	turbidimeter	NTU

instructed in proper field measurement and sampling techniques. Samples periodically will need to be mailed to meet laboratory holding time quality assurance/quality control (QA/QC) criteria. Appropriate QA/QC protocols for shipping water-quality samples have also been implemented.

Habitat Assessment

An inter-agency work group is coordinating the development of the physical habitat assessment protocols to be used in the project. The two primary goals for the aquatic habitat monitoring are 1) to qualitatively characterize and assess the variability of aquatic habitat at the biological water-quality monitoring sites, and 2) to provide quantitative data that can be used to measure project implementation effects. A number of sources and methods were reviewed to develop the habitat assessment procedures (Platts et al., 1983; Hamilton and Bergersen, 1984; Pajak, 1987; Ohio EPA, 1989; Rankin, 1989; Lyons, 1990; Simonson and Kaminski, 1991).

A pilot project was conducted by the habitat monitoring group in the fall of 1991. Data were analyzed using the U.S. EPA Rapid Bioassessment Protocols (USEPA, 1989) to assess habitat quality and comparability among sites and reviewed by the habitat monitoring group. Quantitative habitat indices for measuring project implementation effects will be evaluated to determine applicability to the project. Variables from the U.S. Fish and Wildlife Service's Habitat Suitability Index Models for brook trout (Raleigh, 1982), rainbow trout (Raleigh et al., 1984), and brown trout (Raleigh et al., 1986) will be among those evaluated. A QA/QC plan for the habitat monitoring is being developed. An intent of the group is to customize a habitat assessment for Iowa based on EPA's Rapid Bioassessment Protocols, and other available methods.

Annual habitat monitoring will be completed at each biomonitoring site along Sny Magill and Bloody Run creeks (Fig. 4). Inter-agency teams will be used to implement the habitat assessment to test for consistency and repeatability, and also to develop Iowa's capabilities to use the habitat assessment for other projects. By standardizing the semi-quantitative reporting of habitat quality, it will afford Iowa another tool for evaluating the effectiveness of NPS implementation projects and documenting improvements in water quality and habitat.

Biomonitoring

The purpose of the benthic macroinvertebrate monitoring is to determine if there are any significant measurable changes in the benthic macroinvertebrate community of Sny Magill Creek as a result of implementing nonpoint source pollution control measures. During the summer and fall of 1991 field visits of the streams and their environs were performed to assess sampling sites. A pilot study was conducted during September and October of 1991 to determine the appropriate sampling protocols and appropriate sites. For each subsequent year, sampling will occur bi-monthly during the period from April through October. From the pilot study, six locations in the Sny Magill Watershed and two locations in the Bloody Run Watershed were selected for monitoring. These sites correspond with the following sampling locations for water quality: SN1, SN2, SN3, SNT, SNWF, NCC on Sny Magill and BR1, BRSC on Bloody Run (Fig. 4). The biomonitoring involves sampling through a reach of the stream, which in part coincides with the point used for chemical and physical parameter water-quality sampling.

During the Fall 1991 pilot study, three Hester-Dendy artificial substrates were deployed at the eight sampling locations. After a six week colonization period the artificial substrates were collected and returned to the laboratory for sorting and identification: at the same time, riffle/run samples were also collected at each site with the use of a Modified Hess or Surber sampler. Three samples were collected from each site and returned to the laboratory.

In the laboratory a 100 organism, random sub-sample was taken from each sample for identification to the lowest taxonomic level (usually genus or species), as time and expertise permit. The remaining organisms and pickate were preserved in 70% ethyl alcohol. At a later date, if quantitative analysis is deemed necessary, the remainder of the sample will be identified and enumerated.

Data collected from this pilot study and data collected in subsequent years, will be analyzed

using appropriate metric indices outlined in the EPA Rapid Bioassessment Protocol III (USEPA, 1989). Other metrics may also be evaluated as results dictate.

The biomonitoring will be conducted using the UHL Limnology Section, Standard Operating Procedures for Quality Assurance for Aquatic Biological Sampling. Three replicates will be collected at each station to ascertain community or population variability and provide statistical validity. From 10% of the samples collected an additional 100 organism sub-sample will be taken and analyzed. An audit of 15% of the sub-samples will also be performed by another analyst. Each organism will have a recorded verification from an outside consultant. A reference collection will be maintained in which all organisms have been identified and the identification confirmed by experts.

At this time, data collected during the Fall pilot study is being analyzed to determine the best sampling method. The Fall monitoring period included a significant runoff event which covered several of the artificial substrates, while others were lost. The results will be summarized in baseline reports generated during 1992.

Fisheries Survey

The fisheries portion of the Sny Magill monitoring program will be limited to establishing baseline population information on the resident fish species; salmonids (family of fish including trout) will not be collected. Efforts will be concentrated at four sample sites on Sny Magill in the state-owned portion of the stream (Fig. 5). Data collected will include a species list and relative abundance. All collections will be scheduled for late September each year to minimize water and population fluctuations.

Sites will consist of approximately 100-yard stream segments located near an old oxbow (site A), a small parking "area" for fishery access (site B), a small spring run (site C), and the mouth of the West Fork (site D). All sampling will be done using back-pack, variable-voltage stream electrofishing equipment set at or near 150 VDC. Upper and lower block nets will be used to reduce intrastream movement of fish. All fish species will be identified, enumerated, and released downstream. Salmonids will be released and not considered part of the survey results. A summary of the survey will be compiled for annual reports.

Analytical Methods and Quality Assurance/Quality Control

The IDNR and UHL have USEPA approved QA/QC plans in place. The methods for the basic water analyses are further outlined in Hallberg and others (1990). The biomonitoring will use procedures outlined in EPA's Rapid Bioassessment Protocols for Use in Streams and Rivers (1989). The biomonitoring group will be using the UHL Limnology Section, Standard Operating Procedures for Quality Assurance for Aquatic Biological Sampling. The USGS follows their national standards for methods and procedures.

Project Coordination

This workplan, and the work elements to be carried out, are a coordinated inter-agency effort. The participating agencies will meet in work groups as needed, but typically quarterly, to review coordination needs and problems. The monitoring results and plan will be reviewed annually by an inter-agency coordinating committee to assess needed changes.

Weekly sampling of sites is coordinated between IDNR-GSB and the U.S. National Park Service (NPS) personnel. The NPS staff is handling Weeks 1 and 3 and the IDNR-GSB is in charge of Weeks 2 and 4, and the miscellaneous Week 5 that occurs. Weeks 1, 2, and 3 are the routine weekly sampling and the last week of the month is the routine weekly sampling, special supplemental monthly sampling, QA/QC, and maintenance work.

Data transfer procedures are already established between USGS, UHL and IDNR-GSB. Coordination will also be established with SCS and ISUE for reporting on implementation program progress. A process for tracking implementation progress is being coordinated among IDNR-GSB and SCS to transfer information into the project GIS.

Partnerships

This project will be an inter-agency, collaborative effort. The agencies noted below

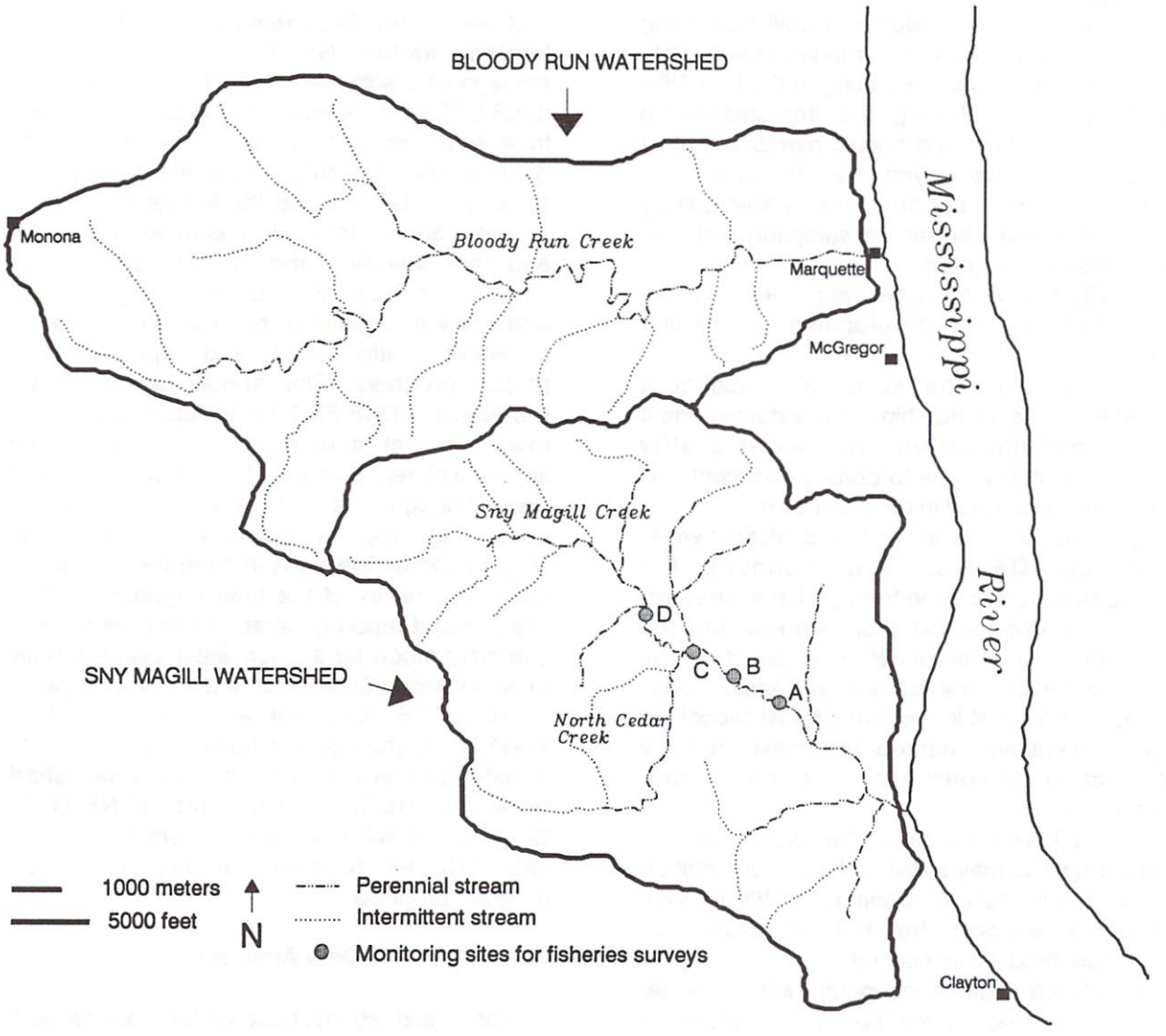


Figure 5. Monitoring sites for the fisheries survey on Sny Magill Creek.

have participated in the development of this project design. Their continued roles in the development and operations of the monitoring program are briefly outlined below:

ASCS will provide ACP cost-sharing for various approved, land-management practices; the cost-share program will be administered by the Clayton County ASCS Committee.

ISUE will survey and evaluate current farm practices and attitudes regarding water quality and provide intensive ICM assistance services to producers in the watershed. ISUE will coordinate implementation of the Farmstead Assessment System and coordinate the farm well-water quality sampling program.

IDALS will participate in program reviews and coordination with other state programs.

IDNR-EPD provides overall coordination and oversight for 319 programs. EPD will also coordinate an inter-agency group to develop quantitative habitat monitoring protocols and develop training for inter-agency staff to conduct the yearly habitat monitoring.

IDNR-FB will conduct the annual fisheries survey and assist in conducting the annual habitat monitoring.

IDNR-GSB will provide the overall monitoring project coordination and management, data management and data reporting to the EPA-NPS data system, including the implementation program reporting, and annual narrative project reporting and data synthesis. Personnel will coordinate and conduct the water-quality monitoring and coordinate sampling with the biomonitoring program.

PMED-ATL will participate in program reviews and planning and development of habitat protocols.

SCS will provide accelerated technical assistance and leadership for the development and implementation of water-quality improvement practices to control sediment and animal manure runoff in the watershed.

UHL will provide laboratory analytical work, and lab QA/QC, and conduct the macroinvertebrate monitoring of the streams. UHL will provide annual reports on the biomonitoring. Personnel may assist in the implementation of the yearly habitat assessment.

USFS will assist in improving forest/woodland management and markets for forest products and aid in demonstrations on buffer strip establishment.

USFWS will support the water quality monitoring and may assist in the implementation of the annual habitat monitoring. Will provide technical support for habitat evaluation procedure models, as needed.

USGS will install and operate surface water gage sites, precipitation collectors, parameter monitors, and suspended solids measurements. The USGS will provide cooperative expertise for interpretation and analysis of monitoring data and provide annual reports on streamflow, suspended solids loading, and other parameters as appropriate.

USNPS will assist in the water quality monitoring.

Budget needs and contributions were also coordinated among the agencies. The budget assumptions and agreements are outlined in Appendix I.

Data Management and Reporting

Project data management and reporting will be handled by the IDNR-GSB and will follow the requirements in the Nonpoint Source Monitoring and Reporting Requirements for Watershed Implementation Grants. EPA NPS data management software will be brought on-line at IDNR-GSB to track and report data to EPA using their four information "files": the Waterbody System File, the NPS Management File, the Monitoring Plan File, and the Annual Report File. All water quality data will be entered in STORET and the biological monitoring data will be entered into BIOS. Per the EPA guidance these systems will be used to provide annual reports on water quality results and implementation project progress. This annual report will be provided to IDNR-EPD for inclusion as part of Iowa's annual state section 319 report. The annual 319 report is due September 1 of each year; although draft EPA guidance suggests that monitoring program reports would be due in May, to afford data analysis from the prior water year. The reality of the time required for data analysis and report generation suggests that the summary report for a given water year will likely be submitted in September of the following year.

All USGS data will also be entered in WATSTORE, the USGS national data base. Data transfer procedures are already established between USGS, UHL and IDNR-GSB. Coordination will also be established with SCS and ISUE for reporting on implementation program progress.

Data Analysis

For annual reports, data will be evaluated and summarized on a water-year basis; monthly and seasonal summaries will be presented as well. Statistical analysis and comparisons will be performed as warranted using recommended SAS packages and other methods for statistical significance and time series analysis. Paired-watershed analysis will begin after sufficient data is collected; in addition to the pairing between Sny Magill and Bloody Run, and the intra-basin watersheds, data can be compared with the long-term watershed records from the Big Spring basin. This will provide a temporal perspective on monitoring and provide a valuable frame of reference for annual variations.

Implementation Project Tracking

IDNR-GSB is establishing a coordinated process for tracking the implementation of land treatment measures with SCS, ASCS, and ISUE. Procedures are already in place to track progress and considerable data will be available. SCS is utilizing the "CAMPS" data base to record annual progress for land-treatment and may link this to a GIS system, as well. ISUE will conduct baseline farm management surveys and attitude surveys among watershed farmers and will also have implementation data from ICM-Crop Enterprise records and Farmstead Assessment System records. IDNR-GSB will transfer the annual implementation records to the project GIS to provide the necessary spatial comparisons with the water-quality monitoring stations.

To the extent practicable the agencies will coordinate land treatment application with the water-quality monitoring to focus implementation, in particular sub-basins and, hence, maintain other sub-basins in an unaltered state for a longer period for comparison. Ideally paired watershed studies compare treated and untreated watersheds. This is not realistic, particularly at the current time. Within the Sny Magill area, implementation scheduling will have to fit within the financial planning and farm management scheme (e.g., crop rotation sequence) of individual farms. Further, nearly all farmers are under conservation compliance obligations, and hence some stepwise implementation of conservation practices must take place throughout the area, even in the Bloody Run watershed. No where in the midwestern grain belt is a true treated-untreated comparison a practical reality with producers' obligations under conservation compliance schedules.

Outputs/Reporting

Comprehensive narrative and interpretive reports will be issued by IDNR-GSB on an annual basis. UHL will issue annual reports on biomonitoring. USGS monitoring and gaging will be summarized in their annual review of water-resources records for the state; these data will be included and summarized in the annual project report. These data are typically not available until late spring following the water year. Hence, water-year summary reports will be scheduled for completion by September of the following year. All data will be reported to EPA through their NPS Management System software. The annual report will include progress of the implementation project and statistical summaries of the water quality, as described above and an evaluation of improvements in water quality resulting from implemented management projects. Data summaries will also be provided to cooperating agencies for public education programs to expand awareness of the need for nonpoint source pollution prevention implementation by farmers.

Measures of success will be the documentation of statistically significant improvements in water quality and aquatic habitat over time. These improvements will be determined through habitat monitoring, water chemistry monitoring, and biological monitoring. Other measures may include photographs of stream corridor improvements and qualitative observations on habitat improvement. Another measure will be the successful development of standard methods for rapid habitat and biologic monitoring for use by Iowa agencies.

REFERENCES

Agena, U., Bryant, B., and Oswald, T., 1991, Agriculture: environmental problems and directions: IN Proceedings of the 1990 Crop Production and Protection Conference, Iowa State University, p. 219-229.

APHA, 1985, Standard methods for the examination of water and wastewater (16th ed.): Washington, D.C., American Public Health Association, Water Works Association, and Water Pollution Control Federation, 1268 p.

Guy, H.P., 1969, Laboratory theory and methods for sediment analysis: U.S. Geological Survey Techniques of Water-Resources Investigations. Book 5, Chapter C1, 58 p.

Guy, H.P., and Norman, V.W., 1970, Field methods for measurement of fluvial sediment: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chapter C2, 59 p.

Hallberg, G.R., Kross, B.C., Libra, R.D., Burmeister, L.F., Weih, L.M.B., Lynch, C.F., Bruner, D.R., Lewis, M.Q., Cherryholmes, K.L., Johnson, J.K., and Culp, M.A., 1990, The Iowa State-Wide Rural Well-Water Survey Design Report, Technical Information Series 17, 135 p.

Hamilton , K., and Bergersen, E.P., 1984, Methods to estimate aquatic habitat variables: Colorado Cooperative Fishery Research Unit for Bureau of Reclamation Engineering and Research Center.

Iowa Department of Natural Resources, 1988, State Nonpoint Source Assessment Report - Iowa 1988, 73 p.

Iowa Department of Natural Resources, 1989, State Nonpoint Source Management Report - Iowa, 68 p.

Kennedy, D.J., 1983, Computation of continuous records of streamflow: U.S. Geolgical Survey Techniques of Water-Resources Investigations, Book 3, Chapter A13, 53 p.

Lyons, J., 1990, Appraisal-phase stream habitat sampling protocol - WDNR priority watershed projects: draft report, June 1990, Fisheries Section, Bureau of Research, Wisconsin Department of Natural Resources, Madison, Wisconsin.

Ohio Environmental Protection Agency, 1989, Biological criteria for the protection of aquatic life: Volume III, Standardized biological field sampling and laboratory methods for assessing fish and macroinvertebrate communities, Division of Water Quality Planning and Assessment, Columbus, Ohio.

Pajak, P., 1987, Stream habitat surveys: unpublished methods documentation, Wisconsin Department of Natural Resources, Madison, Wisconsin.

Platts, W.S., Megahan, W.F., and Minshall, G.W., 1983, Methods for evaluating stream, riparian, and biotic conditions: USDA Forest Service, General Technical Report INT-138, 70 p.

Raleigh, R.F., 1982, Habitat suitability index models: brook trout: U.S. Fish and Wildlife Service, FWS/OBS-82/10.24, 42 p.

Raleigh, R.F., Hickman, T., Soloman, R.C., Nelson, P.C., 1984, Habitat suitability information: rainbow trout: U.S. Fish and Wildlife Service, FWS/OBS-82/10.60, 64 p.

Raleigh, R.F., Zuckerman, L.D., and Nelson, P.C., 1986, Habitat suitability index models and instream flow suitability curves: brown trout, revised: U.S. Fish and Wildlife Service, Biological Report 82(10.124), 65 p.

Rankin, E.T., 1989, The qualitative habitat evaluation index (QHEI): rationale, methods, and application, Division of Water Quality Planning and Assessment, Columbus, Ohio.

Rantz, S.E., and others, 1982, Measurement and computation of streamflow: Volume 1. Measurement of stage and discharge: U.S. Geological Survey Water-Supply Paper 2175, p. 1-284.

Simonson, T.D., and Kaminski, M.T., 1991, Priority watershed evaluation - fish and fish habitat transect analysis - sample size determination: draft report, July 1991, Fisheries Section, Bureau of Research, Wisconsin Department of Natural Resources.

Soil Conservation Service, 1986, North Cedar Creek Critical Area Treatment and Water Quality Improvement: Clayton County Soil Conservation District, Iowa Department of Natural Resources, and the Upper Exploreland Resource Conservation and Development Area, 31 p.

Soil Conservation Service, 1991, Sny Magill Creek Cold Water Stream Water Quality Improvement Agricultural Non-Point Source Hydrologic Unit Area: Iowa Soil Conservation Service, Iowa State University Extension, Iowa Agricultural Stabilization and Conservation Service, 15 p.

University of Iowa, State Hygienic Laboratory, 1977, Summer Water Quality of the Upper Mississippi River Tributaries, 77-20, 9 p.

University of Iowa, State Hygienic Laboratory, 1978, Summer Water Quality Survey of the Bloody Run Creek and Sny Magill Creek Basins, 79-14, 24 p.

USEPA, 1980, Manual of Analytical Methods for the Analysis of Pesticides in Humans and Environmental Samples, Washington, D.C., U.S., Environmental Protection Agency, EPA-600/8-80-038, 557 p.

USEPA, 1983 (revised), Methods for chemical analysis of water and wastes: Cincinnati, OH, Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, EPA-600/4-79-020.

USEPA, 1986, Methods for the Evaluation of Solid Waste: Cincinnati, OH, Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, 8140-Organophosphate pesticides, p. 1-16.

USEPA, 1989, Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish, EPA/444/4-89-001.

USEPA, 1991, Watershed Monitoring and Reporting for Section 319 National Monitoring Program Projects, Washington, D.C.

Waters Ion Chromatography Cookbook, 1989: Millipore Corp. Waters Chromatography Division - Ion Chromatography Group, Manual no. 20195, rev. 1.0, Waters publications, Milford, MA.

APPENDICES

APPENDIX I

Project Costs/Funding Sources

Projected costs are itemized in relation to the analysis plan on the accompanying pages. The Analysis Outline and Budget are followed by an outline of the Budget Assumptions. These provide a summary of the plan of the monitoring effort, the costs for various components, contributed services by various agencies, and an overview of the entire budget. While the comprehensive monitoring programs will require a commitment of 8 to 10 years, this proposal and budget cover the first 3 years of the program. For planning purposes, the proposed budget for year 4 is also shown on the Analysis outline; at this time, if this plan is followed, a similar budget (i.e., approximately $95,000/year) might be projected for years 5 and beyond. In summary, this proposal would request funding for the first three-year period, FFY 91 through FFY 93:

319 Program Funds Requested:	$175,000 for 3 years;
FFY 91 --	$ 10,500
FFY 92 --	$ 73,500
FFY 93 --	$ 91,000

As noted in the Budget Assumptions, various contributions could be considered for match, as needed by the 319 program. Estimated contributed efforts by state agencies would total approximately $137,500 over this time period.

BUDGET ASSUMPTIONS

Gaging, Daily Streamflow, Sediment, and WQ Record

The costs for gaging station installation, daily streamflow records, daily suspended sediment records, and the electronic recording water-quality monitors are based on the standard cooperative pricing structure that IDNR has established over many years with the USGS; included within these costs are field maintenance and operations, annual reports, data management, and project coordination.

Costs for particular activities, and their projected total costs to the project are:

	Per Site	Total Annual
Construction and installation of stream gage	$17,000.00	$34,000.00
Daily streamflow record	$7,000.00	$14,000.00
Daily suspended solids record, WQ mini-monitor (yr-1)	$9,900.00	$19,800.00
319-Project Subtotal:		**$33,900.00 (yr-1)**
USGS Contributed:		**$33,900.00**

After initial one-time installation costs, the annual project operational costs will be $35,000, $17,500 from 319-funds and $17,500 contributed by USGS.

The recording mini-monitor will only be used at the Sny Magill site. A recording thermograph will be installed at the Bloody Run, paired watershed site. This equipment will be supplied by IDNR-GSB, cost approximately $2,000 contributed.

Water-Quality Analyses

The costs for various water-quality analyses are based on the standard cooperative pricing structure that IDNR has arranged for many projects with the UHL; included within these costs are added QA/QC sampling and lab protocols, UHL special assistance with analytical work and problem samples, UHL cooperative data management and analysis, and data reporting.

Costs for particular analytes and their annual projected totals (as shown on the project summary analysis outline) are:

	Per Sample	Total Annual
Nitrogen series; $NO_3 + NO_2$-N, NH_4-N, Organic-N	$30.00	$3,120.00
Partial N-Series; $NO_3 + NO_2$-N, NH_4-N,	$20.00	$3,600.00
Total phosphorus;	$10.00	$1,040.00
Fecal coliform bacteria	$10.00	$4,220.00
Biological oxygen demand (BOD)	$20.00	$3,860.00
Triazine Immunoassays (IMA)	$15.00	$2,460.00
Herbicide or insecticide GC scan	$100.00	$1,200.00
Biomonitoring, macroinvertebrate analysis and reports ($131.25/site/month)	$131.25	$12,600.00
UHL Subtotal:		**$32,100.00/year**
Estimated Additional UHL Contributed:	**$12,500.00**	

Analytical, Management and Field Effort

The IDNR-GSB will also provide some analyses, particularly field measurements and equipment for field analyses, and other ions (cations using ion-chromatography). For the field analyses, one suite of field equipment will be purchased for use by U.S. NPS and other agency staff for routine weekly sampling. These one-time costs are $2,000; in addition, IDNR-GSB will contribute other equipment as needed, valued at approximately $4,000.

Costs for the other ion analyses are:

	$5.00	$2,780.00

The IDNR-GSB will also provide project management and coordination, data management and GIS support, field work and sampling, 1991 aerial photography, project data synthesis and statistical analysis and interpretation, reporting through EPA NPS data management system, and annual narrative and interpretive reports, and other special reports as needed. IDNR-GSB will request support for a partial FTE beginning in FY 93 and beyond. The additional estimated annual GSB contributed effort, that could be tracked as match, is estimated below.

Estimated DNR-GSB Contribution: $30,000.00

The IDNR-Environmental Protection Division will provide coordination support, overall 319 management, and will coordinate and oversee the development and implementation of habitat monitoring and quantitative habitat assessment and modeling. Many agencies will contribute effort for the habitat assessment. The IDNR-Fisheries Bureau will provide the annual fisheries surveys, data analysis, and annual management data on the state-owned lands at no cost to the project.

The US Fish and Wildlife Service will provide logistical support, staff coordination time, Habitat Evaluation Procedure modeling and analysis as appropriate, and hopes to contribute $2-3,000/year for water-quality analytical work. The US National Park Service will contribute field support and staff to conduct weekly sampling during 2 weeks per month, and occasional special event sampling, at no charge to the project.

The Department of Preventive Medicine and Environmental Health, Analytical Toxicology Lab, will participate in project review and planning, and provide support services as called upon. The ISUE, in addition to their implementation activities (below), will coordinate farm well-water sampling for groundwater quality

assessment, farmstead assessment, and assist with occasional field sampling, as possible.

Implementation Programs

The implementation programs of the USDA agencies are an inherent part of this program. Federal funding levels have been in flux, but FY '91 allocations have been made. These are planned as 5-year programs. The 5-year funding levels estimated for these projects are:

SCS for the Sny Magill HUA	$400,000.00	
(plus technical assistance support for the North Cedar ACP-WQSP implementation)		
ASCS for ACP cost-share funding:		
For the North Cedar ACP-WQSP	$173,500.00*	
For the Sny Magill HUA	$500,000.00*	
ISUE for educational programs, ICM, and FAS implementation:	$410,000.00	
plus ISUE contributed	$210,000.00	
(adjusted for reduced FY '91 funding levels)		
Five-year implementation project totals:		**$1,693,500.00**

* These dollars do not include the landowners contribution to their share of the cost of these practices.

Budget Summary

The accompanying budget sheet details annual project costs for FY 91 through FY 94. This proposal suggests initial funding be allocated for the first 3 years of the project to insure a stable planning framework for initiation. The cost for the first 3 years of the approximately 10-year time frame that may be dedicated to the project is $172,900. Estimated contributed costs and Implementation Project costs for this 3-year period are summarized below. Not all the contributed costs can be considered as match, because some come from other federal agencies. Some even from state agencies may not be readily tracked, as well.

FY 91-93 Project Costs; FROM 319 funds:			$172,900.00
Agency contributed efforts:	IDNR-GSB	$90,000.00	
	IDNR-EPD/FB	$10,000.00	
	UHL/UI	$37,500.00	
	USGS	$55,720.00	
	USFWS/PS	$12,000.00	
	Contributed effort:	$205,220.00	
Implementation Program Costs, FY 91-93:			$930,000.00

APPENDIX II

SCHEDULE:

Activity:	Completion Date:
Initiate background water quality sampling (IDNR-GSB)	February 91
Complete background water quality surveys (Supported by IDNR-GSB, UHL, & USFWS)	September 91
Coordinate monitoring activities and plans with implementation project team	Ongoing
Develop working project design plan (IDNR-GSB)	May 91
Conduct initial stream surveys and macroinvertebrate sampling (UHL)	September 91
Conduct annual fisheries survey (IDNR-FB)	September 91
Develop quantitative habitat monitoring protocols (IDNR-EPD)	June 91
Train inter-agency staff to use habitat monitoring procedures	July 91
Conduct stream habitat monitoring	September 91
Procure needed equipment and supplies for monitoring teams (IDNR-GSB)	July 91
Train inter-agency staff for field water-quality sampling (IDNR-GSB)	October 91
Finalize water quality sampling locations for subsequent water years	September 91
Begin project design water quality monitoring for Water-Year '92	October 91
Conduct surveys and plans for gage installations (USGS)	August 91
Install stream gages on Sny Magill and Bloody Run (USGS)	September 91
Install sediment samplers, monitors, and thermographs (USGS, IDNR-GSB)	November 91
Put EPA NPS data management software on-line (IDNR-GSB)	November 91
Develop GIS and implementation tracking system for project (IDNR-GSB)	September 91
Procure aerial photography for basins for GIS/landuse (IDNR-GSB)	October 91
Develop 1990 satellite landuse from imagery (IDNR-GSB)	September 92
Develop data management and transfer plan with SCS/ISUE (IDNR-GSB)	January 92
Conduct geologic and hydrogeologic mapping of basins (IDNR-GSB)	August 91
Enter geologic mapping, sinkhole basins to GIS (IDNR-GSB)	August 91
Coordinate voluntary farm well-water quality sampling (ISUE/IDNR-GSB)	January 92
Finalize design workplan for publication and distribution	March 92

Ongoing activities:

- Coordinate monitoring activities and plans with implementation project team
- Carry out weekly, monthly water-quality sampling
- Conduct bi-monthly biomonitoring for macroinvertebrates, April through October
- Conduct annual fisheries survey
- Conduct annual habitat assessment
- Conduct annual bioassays