

# ILLINOIS

## Conservation Reserve Enhancement Program 2004 Annual Report

A Partnership Between The USDA and the State of Illinois



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Illinois Conservation Reserve Enhancement Program  
(CREP)

Reporting Period: October 1, 2003 through September 30, 2004

The Illinois Conservation Reserve Enhancement Program (CREP) is a federal-state program that was created by a Memorandum of Agreement (MOA) between the U.S. Department of Agriculture, the Commodity Credit Corporation, and the State of Illinois in March 1998. Enrollments into this program began on May 1, 1998.

Since the beginning, the program has been extremely well received by the landowners in the targeted area. The MOA was re-authorized by all the parties on December 18, 2002 increasing the eligible acreage for enrollment to 232,000 acres. Since that time, the state's program re-opened for a brief period of time to provide landowners already enrolled in the federal program the opportunity to enroll on the state's side. A total of 6,657.12 acres were enrolled in that time period.

CREP is being implemented through a federal-state-local partnership in the eligible area. The Agencies that are implementing the program are USDA - Farm Service Agency (FSA), USDA - Natural Resource Conservation Service (NRCS), the Illinois Department of Agriculture (IDOA), the Illinois Environmental Protection Agency (IEPA), the Illinois Department of Natural Resources (IDNR), and the County Soil and Water Conservation Districts (SWCDs) along with the Association of Illinois Soil and Water Conservation Districts (AISWCD) in the eligible area. Other agencies and organizations provide guidance and assistance for the program through the CREP Advisory committee, which is a subcommittee of the State Technical Committee.

ENROLLMENT SUMMARY:

For the reporting period of October 1, 2003 through September 30, 2004, the Federal CREP Program in Illinois was closed.

During the same reporting period, the State approved 114 contracts enrolling 6,657.12 acres into State options. A total of 5,996.92 acres or 90.1% of the acres in State Options are enrolled in permanent easements. Another 345 acres or 5.2% are in 35-year contract extensions, and 315.2 acres or 4.7% are in 15-year contract extensions. The average state incentive payment per acre for these enrollments is \$483 per acre. The average cost to the State per acre is \$637 per acre, which includes the incentive payment, cost-share, administrative expenses, state technical assistance and legal expenses.

TECHNICAL ASSISTANCE AND PROGRAM STAFF:

Technical assistance in this program is made up of three types:

1. Assistance to the landowners during the enrollment process in determining eligibility, options, and selecting approved practices;
2. Assistance to landowners in implementing the approved CREP practice once the property is enrolled in the program; and
3. Assistance to the SWCD and landowners in the state requirements for execution of the state easement documents.

The Farm Service Agency, Natural Resource Conservation Service, Department of

Natural Resources, and the County Soil and Water Conservation Districts provide primary technical assistance.

**NON-FEDERAL CREP PROGRAM EXPENDITURES:**

The State obligated \$4,524,842 dollars for CREP expenditures to pay for the 114 State

contracts (6,685.3 acres), State cost-share expenses, monitoring costs, SWCD administrative fees and other associated enrollment and easement costs. In addition, the IDNR has provided another \$172,712.45 from its operational dollars to provide for CREP Administrative Expenses, bringing the total State dollars directly expended for CREP enrollments to \$4,697,554.63.

State CREP Expenses  
October 1, 2003 through September 30, 2004

State Bonus Payment for State Option	\$ 3,214,847.11
State Cost-Share Payments	\$ 649,204.72
Soil and Water Conservation District (SWCD) Administrative Fees	\$ 303,148.15
DNR Administrative Expenses - Contract and Data Management, Technical Assistance, Reports, Training	\$ 172,712.45
Additional Admin. Fees – Legal, Survey, filing costs	\$ 74,333.78
Monitoring	\$ 283,308.42
<b>TOTAL</b>	<b>\$ 4,697,554.63</b>

The federal CREP Program was not open for enrollment during this time period. However, 41 contracts were finalized by August 31, 2004. This was the most current federal funding information available at the time of this report. A summary of these enrollments follows: The total federal annual rent payment for the 41 CREP contracts (684.6 acres) is \$95,685. The total annual incentive payment is \$22,293. The total federal annual rent plus incentive and

maintenance over the life of the 15-year contracts is \$1,427,156. The estimated total federal cost-share is \$132,269. The Memorandum of Agreement (MOA) for the Illinois CREP, as amended on December 18, 2002, details the formula to determine the overall costs of the program and to determine if the State has fulfilled its obligation to provide 20% of the total program costs. To determine the overall costs of CREP, the following costs are to be

used: the total land retirement costs, which will include the CRP payments made by the Commodity Credit Corporation and the easement payments or the bonus payments made by Illinois; the total reimbursement for conservation practices paid by the CCC and Illinois; the total costs of the monitoring program; and the aggregate costs of technical assistance incurred by Illinois for

implementing contracts and easements, and a reasonable estimate of the cost incurred by the State to develop conservation plans. Since the CRP contract payments will be annual payments, an 8 percent per annum discount rate (per the MOA) will be used to compare the CRP Payments with the State Bonus payment.

Annual CRP Payments  
Discounted at 8% for 15 Years

Payment Year	Annual Payment	Payment Year	Annual Payment
Year 1	\$95,685	Year 9	\$49,107
Year 2	\$88,030	Year 10	\$45,179
Year 3	\$80,988	Year 11	\$41,564
Year 4	\$74,509	Year 12	\$38,329
Year 5	\$68,548	Year 13	\$35,180
Year 6	\$63,064	Year 14	\$32,366
Year 7	\$58,019	Year 15	\$29,776
Year 8	\$53,378	TOTAL 15 Years	\$852,722

Total Federal and State Expenditures  
October 1, 2003 through September 30, 2004

CRP Payments (Before Discount)	\$1,427,156	CRP Payment (Discounted 8%)	\$ 852,722
Federal Cost-Share	\$ 132,269	Federal Cost-Share	\$ 132,269
State Payments for CREP Enrollments	\$4,697,555	State Payments for CREP Enrollments	\$4,697,555
Total Program Costs	\$6,256,980	Total Program Costs	\$5,682,546

The total Federal and State costs of the CREP from October 1, 2003 through September 30, 2004 was \$6,256,980. The State's share of costs for the reporting period was \$4,697,555. Using the 8% per annum discount rate per the MOA, the Federal costs to be used for comparison to the state expenditures are \$852,722.

Per the December 18, 2002 Agreement, The State must contribute 20% from the Program inception in May 1998. Total Program discounted costs for this period are \$227,937,571. The State contributed \$50,453,655, or 22.13% of the total program costs after using the discount rate. The State has met the requirement for incurring 20% of the total Program costs.

**PROGRAM ACTIVITIES AND ACCOMPLISHMENTS**

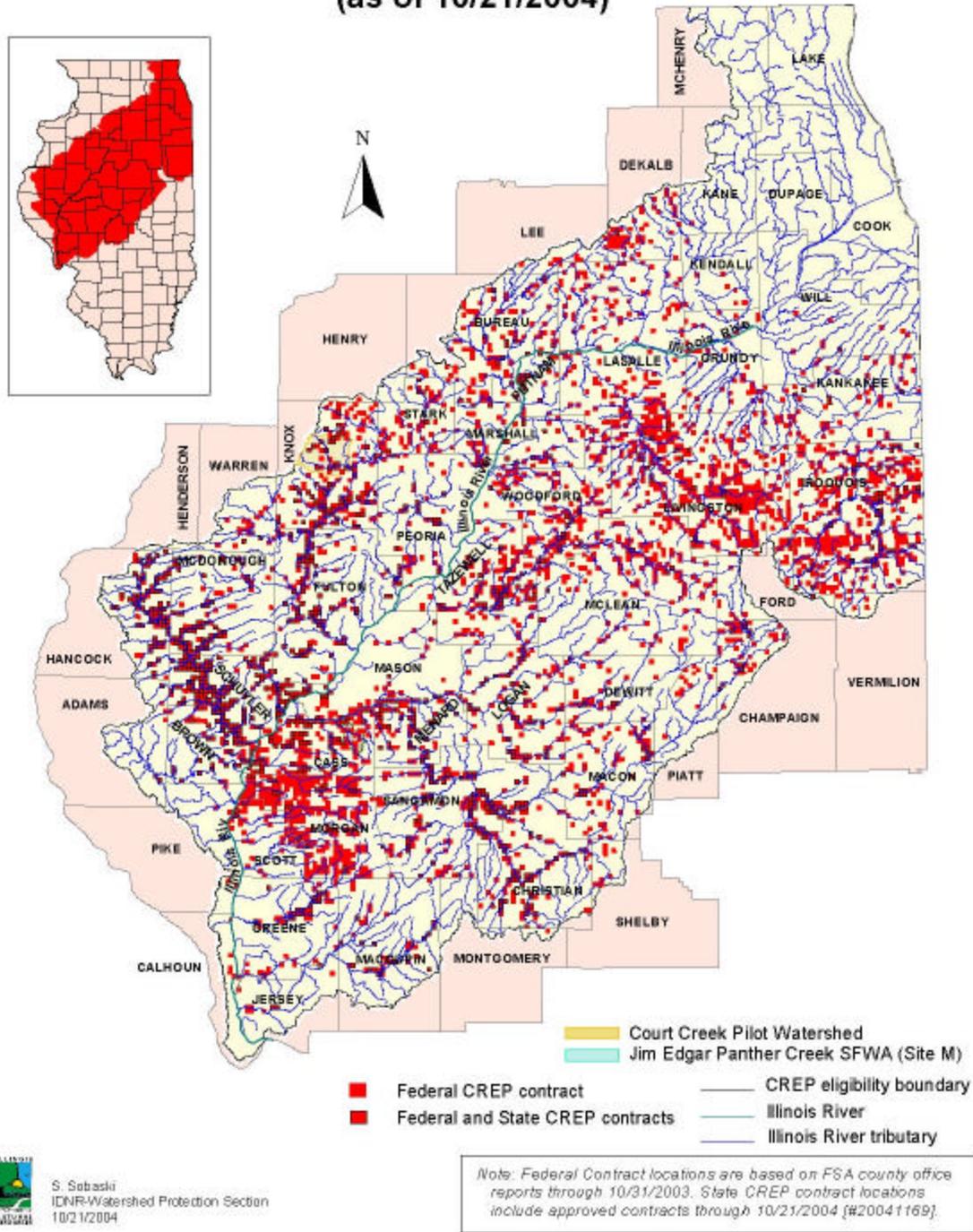
Since the beginning of the CREP program on May 1, 1998 through the end of the current reporting period (September 30, 2004), CREP has restored and/or protected 110,854.3 acres of land either in existing native vegetation or in a previous CRP sign-up (See Map 1).

During that same time period, 73,120.98 acres were enrolled in the CREP State Options. Of these acres, 92% or 67,121.71 acres were enrolled in permanent easements; 5% or 3633.67 acres were enrolled in

15-year contract extensions; and 3% or 2365.60 acres were enrolled in 35-year contract extensions.

The CREP program is restoring and protecting large stretches of floodplain corridors both on the main stem of the Illinois River and along the major tributaries. It is helping landowners, who have only been able to produce crops in the area once or twice in the last decade, to retire these lands from agricultural production.

# Location of Approved Illinois CREP contracts from the USDA and State of Illinois - All Years (as of 10/21/2004)



MAP 1

*Success Story: State CREP  
A Tremendous Success in Sangamon County!*

Although Sangamon County had just one year to enroll acres in the CREP program before it abruptly came to a close, we were successful in securing 2,548 acres in CREP permanent easements. This year we were fortunate to get another forty contracts approved for landowners who had been waiting since 2001 for this opportunity. When all of these contracts are completed, Sangamon County will have close to 4,500 State CREP acres. Ninety-nine percent of the acres will be in conservation permanent easements—protected forever!

As you look out over the floodplain bottomlands previously used for agricultural crop production, you now see acres and acres of trees and native grasses covering the area. Sedimentation reduction into the streams throughout the Sangamon River basin is improving significantly thanks to the conservation practices now in place on these CREP acres. And, last but not least, we hear from landowners how once disappearing wildlife is again flourishing in the habitat provided on these conservation acres.

A report, “Inventory of Sangamon County Natural Areas”, recently completed by members of The Friends of the Sangamon Valley, highlights natural resource areas with ecological significance that need to be protected. It was interesting to note that several of these natural areas are already enrolled in the State CREP program and will be kept in their natural state in perpetuity.

The Springfield Sangamon County Regional Planning Commission recently contacted our office requesting GIS data layer information depicting the CREP acres in Sangamon County. By adding this information to their other GIS data layers, they will have an excellent tool to assist officials in making informed decisions regarding land use planning and development for the county. Thanks to the information technology resources now available, we are able to build partnerships by sharing information with other agencies that also have a key role in determining how our natural resources will be preserved.

It feels really good to know that the CREP program is not only helping to protect our environment, water quality and wildlife today, but also part of our local natural heritage for generations to come.

#### OTHER PROGRAMS AND PARTNERSHIPS

There are other state, federal and organizational programs that are contributing to the accomplishment of the goals of the Illinois CREP. The following highlights some of the programs that contributed to achieving the goals the State has set for the Illinois River Basin. Any state or non-federal dollars that have been expended in these programs have not been included in the previous section that describe and list the direct state expenditures for CREP match.

## STATE SUPPORTING AGENCIES

### ILLINOIS DEPARTMENT OF CONSERVATION - C2000

The Conservation 2000 (C2000) Ecosystems Program currently has 20 Ecosystems Partnerships in counties that comprise of the Illinois River watershed, which consist of Big Rivers, Chicago Wilderness, DuPage River Coalition, Fox River, Headwaters, Heart of the Sangamon, Illinois River Bluffs, Kankakee River, Lake Calumet, LaMoine River, Lower Des Plaines, Lower Sangamon Valley, Mackinaw River, North Branch of the Chicago River, Prairie Parklands, Spoon River, Thorn Creek, Upper Des Plaines, Upper Salt Creek, and Vermillion Watershed Task Force. Since 1996, these partnerships have been awarded over \$10,000,000 for projects providing a variety of conservation practices.

Through the Ecosystems Program 22 projects in FY 04 were funded. These 22 projects restored a total of 2,134 acres. Projects consisted of 186 acres of wetland, 258 acres of prairie, 235 acres of riparian, and 1,455 acres of forest being restored. C2000 funds also helped in educating 258 teachers, 5,220 students, and numerous landowners and local officials on the importance of biodiversity in the Illinois River watershed.

The C2000 Ecosystems Program also awarded support and vision grants to partnerships in the CREP area. Support grants are available to partnerships to assist them in functioning effectively. Vision grants provide funds for vision plans used to guide future ecosystem planning and project implementation activities throughout the watershed. The Vermillion Watershed Task Force is currently working on their plan. In

the future, other CREP area partnerships may also receive vision grants.

### ILLINOIS DEPARTMENT OF AGRICULTURE

The Illinois Department of Agriculture administers numerous soil and water conservation programs that produce environmental benefits in the Illinois River Watershed.

As part of the Conservation 2000 Program for FY '04, \$1,464,682 has been spent on upland soil and water conservation practices in the 51 Soil and Water Conservation Districts (SWCD) that comprise the Illinois River watershed through November 1, 2004. An additional \$1,027,570 is earmarked for conservation practices now under construction.

The program, implemented by the Department and SWCDs, provides 60% of the cost of constructing eligible conservation practices that reduce soil erosion and protect water quality. Eligible conservation practices include such practices as terraces, grassed waterways, water and sediment control basins and grade stabilization structures, well-decommissioning, and nutrient management planning.

From July 2003 through November 1, 2004, approximately 1483 individual conservation projects were completed in the Illinois River watershed. Soil loss was reduced to T or tolerable levels, as well as control of gully erosion, on this land. In addition, about 100,000 tons of soil has been saved and will continue to be saved each year.

In FY 2004, the State of Illinois, through the Department of Agriculture, provided nearly \$3.3 million to the 51 SWCDs in the Illinois River Watershed. Funds are used to provide financial support for SWCD offices, programs and employees' salaries. Employees in turn, provide technical and educational assistance to both urban and rural residents of the Illinois River Watershed. Their efforts are instrumental in delivering programs that reduce soil erosion and sedimentation, and protect water quality.

In an effort to stabilize and restore severely eroding streambanks that would otherwise contribute sediment to the Illinois River and its tributaries, the Department is administering the Streambank Stabilization and Restoration Program (SSRP). The SSRP, funded under Conservation 2000, provides monies to construct low cost, vegetative or bio-engineered techniques to stabilize eroding streambanks.

In FY 2004, 63 individual streambank stabilization projects, totaling \$499,171 were constructed in 22 counties within the Illinois River watershed. In all, 34,304 linear feet of streambank, have been stabilized, thereby protecting adjacent water bodies.

The Department's Sustainable Agriculture Program provides research and educational grants to help protect our natural resources and improve the economic viability of farmers and rural communities. Improving water quality has been and continues to be an important aspect of the program. Grants are available to individuals, nonprofit organizations, agencies and universities to conduct on-farm research and demonstrations, outreach and education, and university research trials. In FY 2004, \$403,877 was awarded to 16 recipients within the Illinois River Watershed. Projects addressed such topics as alternative crops, stream buffers, composting livestock waste, soil quality/health, organic production, and

youth education. The research and education efforts will help to protect the Illinois River Watershed and the citizens who make a living from agriculture within its boundaries.

## ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

The Illinois Environmental Protection Agency (IEPA) continues to support the Conservation Reserve Enhancement Program (CREP) and participates on the State CREP Advisory Committee. In FY 2004, IEPA continued to provide financial assistance to half of the CREP Soil and Water Conservation Districts (SWCD) to help them maintain staff to assist with CREP enrollment efforts.

The benefits derived through this financial support is not only efficiency in the sign-up process to increase CREP enrollment, but it also allows the existing SWCD and NRCS staff to continue to implement the other conservation programs so desperately needed to improve water quality in the Illinois River watershed.

The CREP complements the IEPA's Nonpoint Source Pollution Control program and is a positive step to help the state to meet water quality goals throughout the Illinois River Watershed. The program and partnerships created and reinforced through the implementation of CREP have been influential to help additional programs and partnerships merge programs that have parallel but different goals. Illinois has seen additional benefits in the areas of environmental education, water quality and habitat improvements. IEPA continues to believe that this type of success demonstrates the need to provide assistance not only in counties with high landowner interest, but also in counties needing enhanced marketing of the program to improve sign-up.

## FEDERAL PROGRAMS CONTRIBUTING TO THE GOALS FOR THE ILLINOIS RIVER BASIN

### NATURAL RESOURCES CONSERVATION SERVICE

The EQIP program works to provide technical, financial, and educational assistance to farmers and private landowners who are faced with serious threats to soil, water and related natural Resources. Currently, the EQIP program has spent approximately \$12.3 million for financial and educational assistance in the Illinois River Basin to treat Natural Resource concerns on approximately 344,083 acres working with approximately 2,185 landowners.

The Wildlife Habitat Incentive Program (WHIP) provides assistance to people who want to develop and improve wildlife habitat primarily on private lands. Statewide the program has worked with approximately 580 producers to improve wildlife habitat on approximately 15,838 acres. Approximately, \$1,269,000 was spent to enhance or create wildlife habitat through this program. Approximately 25% of the WHIP financial assistance has been put in place in the Illinois River Basin.

The Wetland Reserve Program (WRP) increases wildlife habitat and improves water quality by providing increased wetland habitat, slowing overland flow and providing a natural pollution control. To date, approximately \$14.9 million have been spent in the Illinois River Basin on Wetland Restoration, covering 10,367 acres and working with 23 producers.

The Forestry Incentives Program (FIP) provides an avenue of assistance to private

landowners for planting trees, improving timber stands, as well as other non-industrial private forestland practices. In the Illinois River Basin, approximately \$21,000 has been spent to treat approximately 520 acres and working with 21 producers. Approximately \$15,800 will be spent on timber practices in the Illinois River Basin.

CRP enrollments beyond the CREP Program enrollments provide additional in-place conservation practices facilitating resource management in the Illinois River Basin.

The Grassland Reserve Program (GRP) is a new program available to agriculture producers to help them protect important grasslands. In the Illinois GRP has put approximately \$1,355,473 in the Illinois River Basin to help protect approximately 2000 acres of grassland through easements and 20 and 30 year rental agreements, with 20 producers.

### FISH AND WILDLIFE

As members of the Midwest Natural Resources Group seven federal agencies signed the Illinois River Focus Area Intergovernmental Partnership Agreement. The agencies agreed to cooperate and collaborate in the protection, restoration, and enhancement of wetlands and other habitat in the focus area; to reduce nutrient and sediment loading to the Illinois Mainstream and tributaries; and to explore and improve tools, methods and measures to accomplish the above goals.

The Fish and Wildlife Service approved Comprehensive Conservation Plans for the Illinois River Refuges and the Mark Twain Refuges setting the direction of these river refuges for the next 15 years.

The Illinois River Refuges' Partners for Wildlife and Fish helped to restore 6,000 acres of wetlands and other habitats in recent years.

Volunteers planted 120 acres of native mast trees on Emiquon Refuge. Ducks Unlimited, the Service, and the Illinois Conservation Foundation are partnering in developing a water distribution system for 1,000 acres of wetlands on Emiquon Refuge. The approved boundary for Emiquon Refuge is over 11,000 acres and includes all the land in The Nature Conservancy's Emiquon project. The Nature Conservancy's application to enroll 6,332 acres of their Emiquon project in WRP was approved.

The Corps of Engineers and Fish and Wildlife Service completed a \$19 million partnership restoration project on Chautauqua National Wildlife Refuge. The project restored refuge infrastructure to enhance management capability on 3,200 acres of wetlands. Chautauqua Refuge is a Western Hemisphere Shorebird Network Site and was recently named a Globally Important Bird Area by the American Bird Conservancy and identified as an Important Bird Area by the Illinois Audubon Society. Summer shorebird counts may exceed 10,000 individuals and waterfowl counts often exceed 100,000 ducks of a dozen species.

The Service partnered with Ducks Unlimited, the Rice Foundation, the Buchanan Family Foundation, NAWCA Joint Venture, and the Illinois Migratory Waterfowl Fund to restore the 328-acre Weis Lake on the Cameron Unit of Chautauqua Refuge in Marshall County.

THE FOLLOWING IS A SPECIAL SUPPLEMENT TO THE FWS COMMENTS EXPRESSING THE PERSONAL THOUGHTS OF ROSS ADAMS, FWS, AND CREP ADVISORY COMMITTEE MEMBER:

As manager of the Illinois River National Wildlife and Fish Refuges and leader of the Illinois River Focus Team of the Midwest Natural Resources Group for the past seven years, I have observed a transformation of the landscape in the Illinois River floodplain, and even more amazing, it all occurred on private lands. It is seldom that one can observe habitat restoration on such a grand scale in such a short span of years. From my vantage point, the Conservation Reserve Enhancement Program (CREP) appears to be the leader in restoration of wetland habitat along the Illinois River.

I attended the ceremony for the signature of the original CREP agreement in Peoria on March 30, 1998. Since that time approximately 120,000 acres of cropland were enrolled in CREP, most of which were signed up in the state side of the program with permanent easements.

One of the first projects that I watched undergo this incredible transformation was The Nature Conservancy's 1,100 acre Spunky Bottoms across the river from the Meredosia National Wildlife Refuge. Within a couple of years after the pumping stopped, aquatic and emergent plants colonized the clear waters from dormant seeds that remained in the soils. The birds and animals quickly followed. It was quite exciting working with TNC and IDNR biologists capturing wood ducks in lotus beds where just 3 years before corn and soybeans dominated the landscape.

Traveling north from Spunky Bottoms, wading birds and waterfowl can be seen foraging in the restored wetlands on the Gust Farm. Further north along Highway 100, the former Kelly Lake Drainage District is once again Kelly Lake. White pelicans were observed late into the summer on this restored lake raising the question of whether or not these birds may be nesting here in the near future.

Ducks Unlimited purchased 400 acres adjacent to IDNR's Spring Lake area and enrolled the property in CREP. The property is presently being restored to wetlands and will eventually be turned over to IDNR for management. One of the more exciting features of this project is the nearly unlimited source of water from Spring Lake for managing the wetlands.

Another exciting project worthy of praise is the Wetland Initiative's Hennepin-Hoper project. The first year after the pumps were turned off, muskrats were building feeding platforms among last years corn stubble. The IDNR killed the carp and stocked the waters with desirable fish, resulting in some of the clearest water in the river valley with abundant invertebrates and aquatic plants. The response of birds to this restoration has been awesome. The weekly aerial surveys of waterfowl by the Illinois Natural History Survey show that tens of thousands of waterfowl are using the restored wetlands. The November 8 survey listed 14,100 mallards, 11,750 pintail, 7,050 widgeon, 4,700 gadwall, 4,700 shovelers, 2,350 ring-neck ducks, and 500 ruddy ducks.

As a wildlife biologist and refuge manager observing conservation activities along the Illinois River, I can describe the success of Conservation Reserve Enhancement Program as incredible. Just absolutely incredible!

## NON-GOVERNMENTAL PARTICIPANTS

### ILLINOIS FARM BUREAU

Illinois Farm Bureau (IFB) continues to publicize and promote the Conservation Reserve Enhancement Program (CREP). In 2004, articles in FarmWeek provided information about aspects of the program. IFB also used our statewide radio network to highlight details of the program. Information on CREP was sent directly to county Farm Bureaus (CFB) via e-mail and through our county Farm Bureau mail system. An Illinois Farm Bureau statewide workshop in 2004 on voluntary programs for farmers included information about CREP and other conservation programs through various agencies. Details about CREP were also provided to a statewide committee comprised of both agricultural and non-agricultural organizations. Illinois Farm Bureau continues to provide input about the program through various groups and committees. IFB has also continued to voice support for future funding of the program. CREP is another tool producers can use that provides cost-share incentives and technical assistance for establishing long-term, resource-conserving covers and is a positive program in Illinois.

### UNIVERSITY OF ILLINOIS - EXTENSION

Two full-time Educator positions designed to address educational needs of landowners, watershed groups, and organizations regarding CREP and watershed management are funded through a grant. The grant is a partnership between Illinois Department of Natural Resources (IDNR), Illinois Environmental Protection Agency (IEPA), and the University of Illinois. Educators coordinate CREP and watershed management information, education and research activities among Illinois Department of Natural Resources, Illinois Environmental Protection Agency, University of Illinois - Extension and other natural resource agencies and groups.

### NATURE CONSERVANCY - RESEARCH UPDATE

(PLEASE SEE NEXT 4 PAGES)

## Mackinaw River Paired Watershed Study — Progress Report

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### Executive Summary

The Mackinaw River watershed in central Illinois contains some of the most productive agricultural land in the nation. The Nature Conservancy is in the final year of a five-year Paired Watershed study within the Mackinaw River watershed. The objective of the study is to:

- Determine whether or not focused outreach can persuade people to use suggested best management practices (BMPs);
- Determine whether or not the suggested BMPs are effective for improving hydrology, water quality and biological resources, such as fish and mussels; and,
- Determine the diversity and scale at which these efforts need to be implemented to show a positive impact on freshwater conservation at a broader level.

Preliminary results show that focused outreach has significantly increased acceptance and usage of BMPs, such as strip till agriculture and buffer strips, to protect water quality in adjacent streams. Increased BMP implementation in Bray Creek (the experimental watershed) has significantly reduced baseflow nitrate and suspended sediment concentrations compared to an adjacent watershed where no outreach was conducted.



The Mackinaw River

However, the study has also shown that surface BMPs alone will not be enough to improve the overall biological health of local streams and waterways. It will be necessary to build upon the findings of the study and focus efforts on achieving more comprehensive water quality improvements, especially reductions in sediment load.

Activities likely to aid in further improving the water quality and ecological health of these systems would include even broader use of traditional BMPs, establishment of additional types of BMPs known to improve water quality, such as wetlands, tile-biofilters, and streambank stabilization, and implementation of other farm conservation activities (such as nutrient management).

## Project Overview

The Mackinaw River watershed contains some of the most highly productive agricultural land in the country. Within this agricultural setting, the Mackinaw River contains diverse aquatic communities relative to other regional rivers. In the statewide Biological Stream Characterization, the Mackinaw River had the highest number of "A" and "B" rated streams in Illinois (Page et al. 1992). With over 90% of the watershed currently in agriculture, any attempts to maintain and improve the condition of the natural resources in the watershed must be approached through the context of the agricultural community.

There are a variety of agricultural best management practices (BMPs) that are available to improve soil conservation and water quality. However, the adoption of these practices has only been moderately successful in many areas. In the Mackinaw River watershed, there is evidence that farmers have not embraced these programs for a variety of reasons including: complex application and sign-up procedures, frustration over changes in rules that govern these programs, information that is inconsistent or unreliable, and an unwillingness to take cropland out of production.

While the positive impacts of specific conservation practices have been documented for a given farm or field, there is little evidence to demonstrate that watershed-level improvements in water quality can occur as a result of these practices. Consequently, the influence of BMPs in improving soil and water conservation at large scales has been questioned. There is growing concern that site-specific improvements in water quality can be overwhelmed at larger scales.

The objective of the Mackinaw River Paired-Watershed study is to demonstrate the cumulative effects of BMPs in a subwatershed on hydrology, water quality and biological

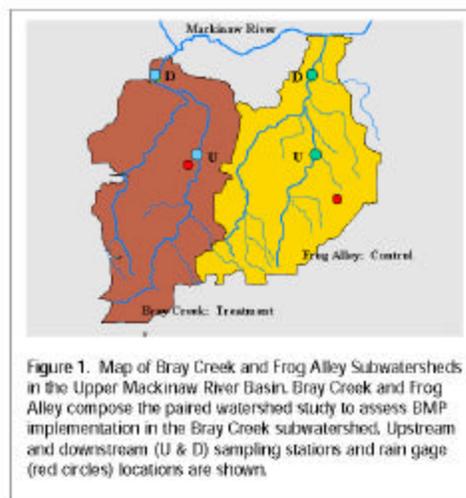


Figure 1. Map of Bray Creek and Frog Alley Subwatersheds in the Upper Mackinaw River Basin. Bray Creek and Frog Alley compose the paired watershed study to assess BMP implementation in the Bray Creek subwatershed. Upstream and downstream (U & D) sampling stations and rain gage (red circles) locations are shown.

resources. In turn, this information will be used to suggest the diversity and scale at which these efforts need to be implemented to show a positive impact on freshwater conservation at a watershed level. The project is also designed to determine whether a concentrated outreach program can successfully increase the amount and diversity of BMPs in the study area.

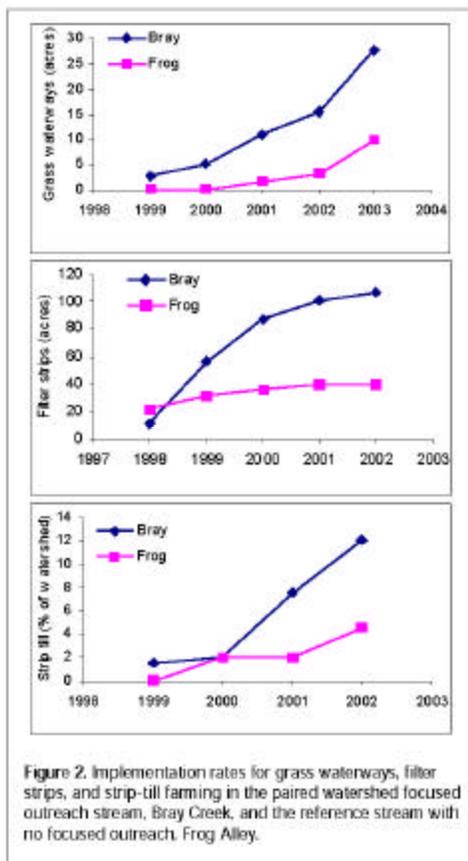
Two small tributaries in the upper Mackinaw River subwatershed were identified for intensive monitoring as part of an initial five-year project: Bray Creek and Frog Alley (Figure 1). Both subwatersheds are of similar size (around 10,000 acres), are exclusively agricultural, and have similar climates and geology. A paired watershed approach was chosen to carry out this project. Bray Creek was selected as our target watershed to receive intensive outreach designed to promote BMPs, and Frog Alley was selected as a reference stream to receive no outreach.

The development and implementation of the outreach program involved the participation of The Nature Conservancy, The Mackinaw River Watershed Council (a citizen-based conservation group), The McLean County Soil and Water Conservation District (SWCD), the Natural Resources Conservation Service

(NRCS), and an outreach group of resident owner/operators assembled for the project. Outreach has been conducted throughout the duration of the study and provides landowners and farm operators with information about available cost-share programs, technical assistance, and implementation on BMPs through one-on-one meetings, community workshops, field demonstrations, and tours. Participation in cost-share programs, and the number and type of BMPs implemented are tracked within both paired watersheds. A survey administered in year one will be repeated at the end of the study to determine changes in landowner/operator attitudes, knowledge, and conservation practices. Data from each

watershed will then be compared to determine the effectiveness of locally lead outreach initiatives.

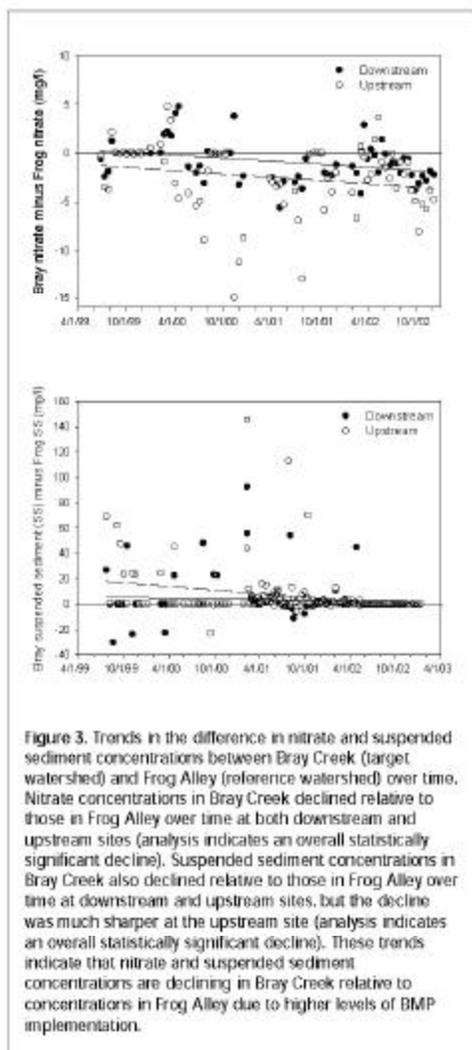
Changes in stream systems are being monitored in partnership with the Illinois Natural History Survey, Illinois State University, University of Illinois, Illinois Department of Natural Resources (INDR), and the Illinois State Geological Survey. Monitoring of instream hydrology, water quality, and biological resources are being conducted in the target and reference watersheds. Hydrologic conditions are monitored through the use of electronic rain gauges and stream water-level gauges at one location in each watershed. Nutrient (nitrate, nitrite, ammonia, and orthophosphorous) concentrations are measured weekly in upstream and downstream sampling locations. Suspended sediment is measured every two weeks at upstream and downstream sites. Habitat surveys are conducted three times annually to detect changes in the physical structure. Fish and macroinvertebrates are sampled twice annually and mussels are sampled annually in each stream.



## Results to Date

Analyses of BMP implementation rates for the two subwatersheds through 2003 clearly show that focused outreach has significantly increased acceptance and installation of BMPs. During four years of focused outreach, the Bray Creek subwatershed had significantly higher implementation rates for grass waterways, filter strips, and strip-till farming acreage than the reference watershed (Frog Alley), where no outreach was conducted (Figure 2).

In terms of water quality, initial analyses have now been completed for nutrients and suspended sediment under baseflow conditions. These analyses have shown that the increased BMP implementation in Bray Creek (the experimental watershed) has significantly reduced baseflow nitrate (Figure 3) and



suspended sediment (Figure 3) concentrations compared to Frog Alley (the control watershed). No differences have been detected for nitrite, ammonia or orthophosphorus. Analyses of improvements in stream hydrology, biotic communities, and nutrients and suspended sediment during storm events are in progress.

## Implications

Preliminary results indicate that (1) focused outreach can significantly increase acceptance and volunteer implementation of BMPs within highly productive agricultural landscapes, and (2) such efforts can result in significant improvements in water quality. While these results are very encouraging, nutrient concentrations in these subwatersheds still exceed levels set for maintaining ecological integrity (TNC 2002) and human health (EPA 2000). Thus while moving us toward ecological and human health goals, additional efforts will be required to achieve these targets. Activities likely to aid in further improving water quality and ecological health of these systems would include (1) implementation of even more traditional BMPs (grass waterways, filter strips, no-till, nutrient management plans), (2) establishment of additional types of BMPs well known to improve water quality, such as upland and riparian wetlands (Kovacik et al. 2000), tile-biofilters, and streambank stabilization, and (3) implementation of other farm conservation activities (such as nutrient management).

## Literature Cited

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## RECOMMENDATIONS AND FUTURE PLANS OF THE CREP ADVISORY COMMITTEE

Setbacks from reductions in CREP appropriations have had a significant impact on not only enrollment, but the loss of momentum that had been achieved with the State's successful achievement of its original goal, and the USDA approval of expanded acreage to 232,000 acres. This has resulted in the need to re-evaluate the future of the program and the development of new fiscal strategies.

### FUTURE PLANS

1. Taking into consideration the source of Illinois CREP Funding, establish a long-term staffing and monitoring strategy to assure adequate staff and support for the proper administration of the program.
2. Hold training and workshops, as needed, for all field staff and SWCD's as a means of updating new and existing staff on issues, and refinement of the enrollment process. Update and keep the training manual up-to-date for field use.
3. The University of Illinois Extension (Extension) maintains the web site for the Illinois CREP Program. This site assists SWCDs and landowners with information on the program. This site should be maintained and

updated either internally or through support from the Extension.

4. Continue to pursue long-term additional staff to assist all SWCDs in the administration of the CREP Program at the County level. Efforts to work with IEPA and other supporters need to continue and expand.

### OTHER RECOMMENDATIONS

- Additional funding should continue to be sought for dedicated full-time staff to provide technical assistance to landowners in the following agencies: NRCS, DNR, and SWCDs.
- Evaluation of practices and lands eligible under the current CREP Program should be re-visited for possible inclusion of additional lands and practices such as Highly Erodible Lands (HEL).
- Review of Administrative rules to assure correctness and comprehension should be performed to assure adequate enforcement of rules.

# MONITORING AND EVALUATION OF THE ILLINOIS RIVER

Assessment of Stream Remediation on the Aquatic Habitat and Fish Community of Cox Creek,  
Cass County, Illinois (Illinois River Basin)

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Illinois Conservation Practices Tracking System (ICPTS) and CREP Assessment

----  
Monitoring and Evaluation of Sediment and Nutrient Delivery to the Illinois River:  
Illinois River Conservation Enhancement Program (CREP)

----  
The Illinois River Basin Hydrology Observatory - A Center for Understanding the Hydrologic  
Cycle of Intensively Managed Landscapes

**ASSESSMENT OF STREAM REMEDIATION ON THE  
AQUATIC HABITAT AND FISH COMMUNITY OF  
COX CREEK, CASS COUNTY, ILLINOIS**

**Douglas A. Carney  
Streams Biologist  
Illinois Department of Natural Resources  
Brighton, IL**

**EXECUTIVE SUMMARY**

To address significant streambank erosion on Panther and Cox creeks in the Jim Edgar Panther Creek State Fish and Wildlife Area, the IDNR and USDA-NRCS, installed several instream or near-stream practices including riffle-weirs (i.e., Newbury weirs), lunker structures and dormant willow posts. These practices helped complement the ongoing implementation of numerous floodplain and upland conservation practices, including CREP and CRP.

The effects of these instream practices and their influence on instream habitat and fish were documented in pre- and post-implementation assessments. Habitat was evaluated by the Illinois EPA's Stream Habitat Assessment Procedure (SHAP), a 15-metric qualitative measure of habitat quality where higher values indicate better fish habitat. Practices were installed on Cox Creek allowing comparison with the adjacent Panther Creek. SHAP values were significantly higher in post-project Cox Creek in comparison to Panther Creek. In both Cox Creek and Panther Creek, post-project SHAP scores were higher than observed in pre-project assessments. After riffle installation, some general, but important changes in channel morphology included increased water depth and width.

With the physical changes resulting from these practices, a corresponding change in fish assemblages was observed. In Cox Creek, fish abundance decreased and species richness increased following installation of practices. Increased species richness is unlikely to be a result of differing sample methods (change from backpack and minnow seine to electric seine) because increased stream size generally makes sampling less efficient. The trend towards increased fish species richness in post-project Cox Creek samples was evident but not observed in Panther Creek samples.

Species richness is a simple, but useful measure and an important aspect of biological integrity. Like the species richness trend, Index of Biotic Integrity (IBI) values generally increased in Cox Creek after project implementation. Statistical relationships between habitat and diversity or between habitat and biological integrity remain elusive in these streams, however. Overall, substantial improvements in habitat and fish assemblages resulted from these practices, including twelve fish species not previously collected in Cox Creek prior to project installation.

# Illinois Conservation Practices Tracking System and CREP Assessment

## *Draft Executive Summary*

The development of CREP and extensive enrollment of land within the Illinois River Basin is a useful measure of the immense popularity of this program with landowners. These enrollments provide a critical component to assisting the Program with addressing the four major CREP goals that include:

- Reducing silt and sedimentation entering the mainstem of the Illinois River by 20 percent.
- Reducing phosphorus and nitrogen in the Illinois River by 10 percent.
- Increasing in the Illinois River watershed, by 15 percent, the population of waterfowl, shorebirds, nongame grassland birds, and state and federally listed threatened and endangered species such as bald eagles, egrets and herons.
- Increasing the native fish and mussel stocks by 10% in the lower reaches of the Illinois River (Peoria, LaGrange, Alton reaches).

Although considerable information exists regarding acres enrolled, state and federal funds expended, practices applied and percent of program implemented, more information, especially spatial data, is needed to evaluate Illinois CREP's progress in achieving these four goals. To aid this evaluation, the IDNR developed a proposal to the USDA-Farm Service Agency (State Project CAFSA-01), to provide three key components. This agreement included:

- expansion of the number of counties covered by the Illinois Conservation Practices Tracking System (ICPTS) in order to document and more fully understand the nature, distribution, and efficacy of conservation practices implemented in the Illinois River basin through CREP and other USDA Farm Bill conservation programs.
- development of an instruction manual for ICPTS, especially for USDA-FSA county office staff and other potential users of the systems, to serve as a training and reference document for current and new staff who may be involved with using or adding data to ICPTS.
- application of current wildlife habitat models to develop a standard protocol for assessing the quality of wildlife habitat provided by wetland restorations implemented through Illinois CREP.

All of the above tasks have been completed under this agreement save for the final report, which is pending. During this project, spatial and descriptive data on all active USDA conservation program contracts in four additional CREP counties (i.e., Menard, Morgan, Christian and Sangamon) were incorporated in the ICPTS. County scale maps of all digitized conservation practices were developed and distributed to each county FSA office and to the State FSA office. The digital data in ESRI ArcView shapefile format were also provided to each of the counties USDA service center offices where data were gathered.

To assist local county FSA offices with the digitizing process, a detailed, step-by-step manual was developed (see Index to the manual below). With increasing use of geographic information systems (GIS) within the USDA and its partner agencies, such as IDNR, and given the complexity of the software, it is essential to have consistent and easily interpretable instructional materials. This manual provides guidance on the basic functions and protocols required by FSA

personnel involved with digitizing CREP or other conservation practices in the Illinois Conservation Practices Tracking Systems or into similar databases such as the CRP layer of the Common Land Unit (CLU) database.

## **Index to the ICPTS Manual**

### **Section**

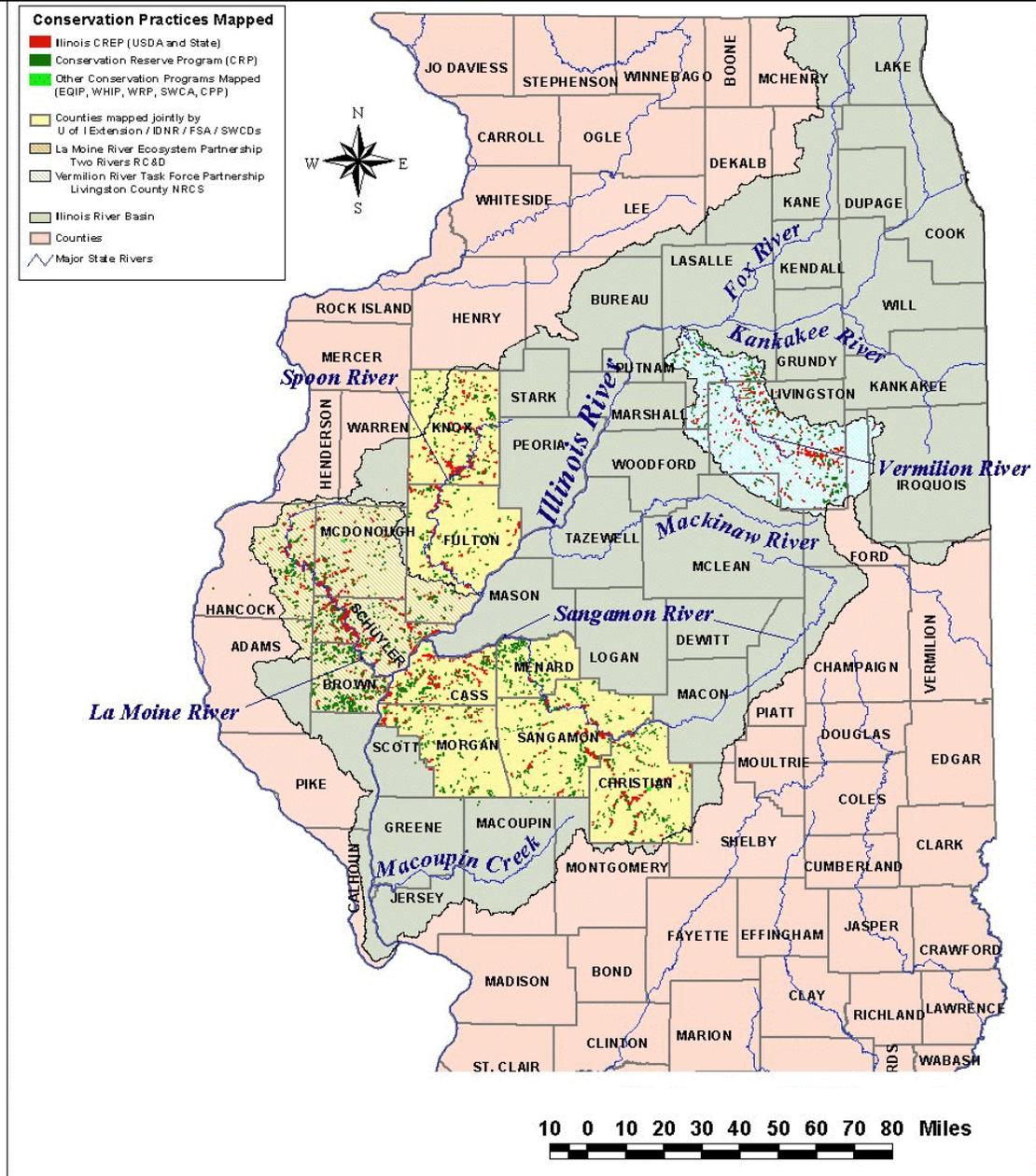
<b><u>Number</u></b>	<b><u>Section Title</u></b>
1	INTRODUCTION
2	LOCATING DATA WITHIN THE USDA CONTRACT FOLDER
3	LOCATING THE BIG MAP ASSOCIATED WITH THE CONSERVATION CONTRACT
4	LOCATING LEGAL DESCRIPTIONS
5	USING THE LEGAL DESCRIPTION TO LOCATE THE CONTRACT AREA IN ARCVIEW
6	DISPLAYING DOQQ'S
7	ZOOMING IN
8	DIGITIZING POLYGONS
9	CALCULATING ACREAGE USING ARCVIEW
10	EDITING POLYGONS
11	CALCULATING POLYGON AREAS USING A DIGITAL PLANIMETER
12	MEASURING DISTANCE ON USDA BIG MAPS
13	ARCVIEW ATTRIBUTE FILE DESCRIPTION - ICPTS SHAPEFILE
14	RECORDING CROPPING HISTORY
15	DIGITIZING WATERWAYS
16	COMPLEX WATERWAYS
17	DIGITIZING FILTER STRIPS
18	SPLITTING POLYGONS
19	ADJACENT POLYGONS
20	SNAPPING
21	DOUGHNUT POLYGONS
22	RIGHT-CLICK FEATURES IN ARCVIEW
23	PARADOX DATA ENTRY
24	RECORDING EQIP CONTRACTS
25	RECORDING WETLAND CONTRACTS
26	BACKUP PROCEDURES
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27	APPENDIX B
28	APPENDIX C
29	APPENDIX D
30	APPENDIX E
31	APPENDIX F
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### **(From report by Steve Niemann)**

With the extensive number of acres enrolled in CREP, especially in wetland restoration projects, the use of assessment models is a valuable approach to evaluating the effect of the practices on wildlife populations. Under CAFSA-01, 92 CREP wetland restoration sites within a six county

area of the middle Illinois River basin were evaluated for the quality of wildlife habitat that they provide using a multi-faceted approach which incorporated a wildlife suitability index, a floristic quality index and a hydrophyte index. Habitat cover data were also used during this project to evaluate the quality and potential usefulness of these sites as habitat for threatened, endangered and migratory vertebrate species. The findings indicate the three indices noted above had a significant positive relationship with size of the site and their proximity to sources of water, but these relationships did not show a temporal effect. In other words, larger wetland restoration sites generally provide for better wildlife habitat and sites with connectivity to hydrology, such as backwater areas, provided much better habitat than isolated wetland sites. The shift of CREP sites from agricultural production into wetland communities appeared to be negatively influenced by human impacts, drainage and nuisance plants. CREP is restoring a significant amount of wetland acres and creating critical wildlife habitat within the Illinois River basin. However, further research is needed to better assess the success of various wetland restoration techniques and siting decisions (i.e., which sites make for ideal restorations, which are less successful) in creating quality wildlife habitat, and, more specifically, to further quantify the influence of parcel size and their juxtaposition to other wetlands. If managed properly, with special consideration towards size of the wetland, hydrology and control of noxious species, these areas may develop into valuable habitats for wildlife. (Adapted from a report by Don Phillips, INHS Assessment of CREP Wetland Habitat Quality for Wildlife, 13 July, 2004.)

# Illinois Conservation Practices Tracking System USDA and State Conservation Easements digitized Through December 2004



**Figure 2.** Extent of the over 8,000 conservation practice contracts from Illinois CREP eligible counties and subwatersheds mapped for the Illinois Conservation Practices Tracking System through December 2004.

# **Monitoring and Evaluation of Sediment and Nutrient Delivery to the Illinois River: Illinois River Conservation Enhancement Program (CREP)**

by  
Watershed Science Section  
Illinois State Water Survey  
Illinois Department of Natural Resources

## **Introduction**

The Illinois River Conservation Reserve Enhancement Program (CREP) was initiated as a joint federal/state program with the goal of improving water quality and wildlife habitat in the Illinois River basin. Based on numerous research and long-term data, the two main causes of water quality and habitat degradations in the Illinois River were known to be related to sedimentation and nutrient loads. Based on this understanding, the two main objectives of the Illinois River CREP were stated as follows:

1. Reduce the amount of silt and sediment entering the main stem of the Illinois River by 20 percent.
2. Reduce the amount of phosphorous and nitrogen loadings to the Illinois River by 10 percent.

To assess the progress of the program towards meeting the two goals, the Illinois Department of Natural Resources and the Illinois State Water Survey are developing a scientific process for evaluating the effectiveness of the program. The process includes data collection, modeling, and evaluation. Progress made so far in each of these efforts is presented in this report.

## **Monitoring and Data Collection**

The monitoring and data collection component consist of a watershed monitoring program to monitor sediment and nutrient for selected watersheds within the Illinois River basin and also to collect and analyze land use data throughout the river basin. Historically, there are a limited number of sediment and nutrient monitoring stations within the Illinois River basin, and most of the available records are of short duration. For example, figure 1 shows all the active and inactive sediment monitoring stations within the Illinois River basin prior to the start of monitoring for CREP. Out of the 44 stations shown in the map, only 18 stations had records longer than 5 years and only 8 stations had more than 10 years of record. Therefore the available data and monitoring network was insufficient to monitor long-term trends especially in small watersheds where changes can be observed and quantified more easily than in larger watersheds.

To fill the data gap and to generate reliable data for small watersheds, the Illinois Department of Natural Resources funded the Illinois State Water Survey to initiate a monitoring

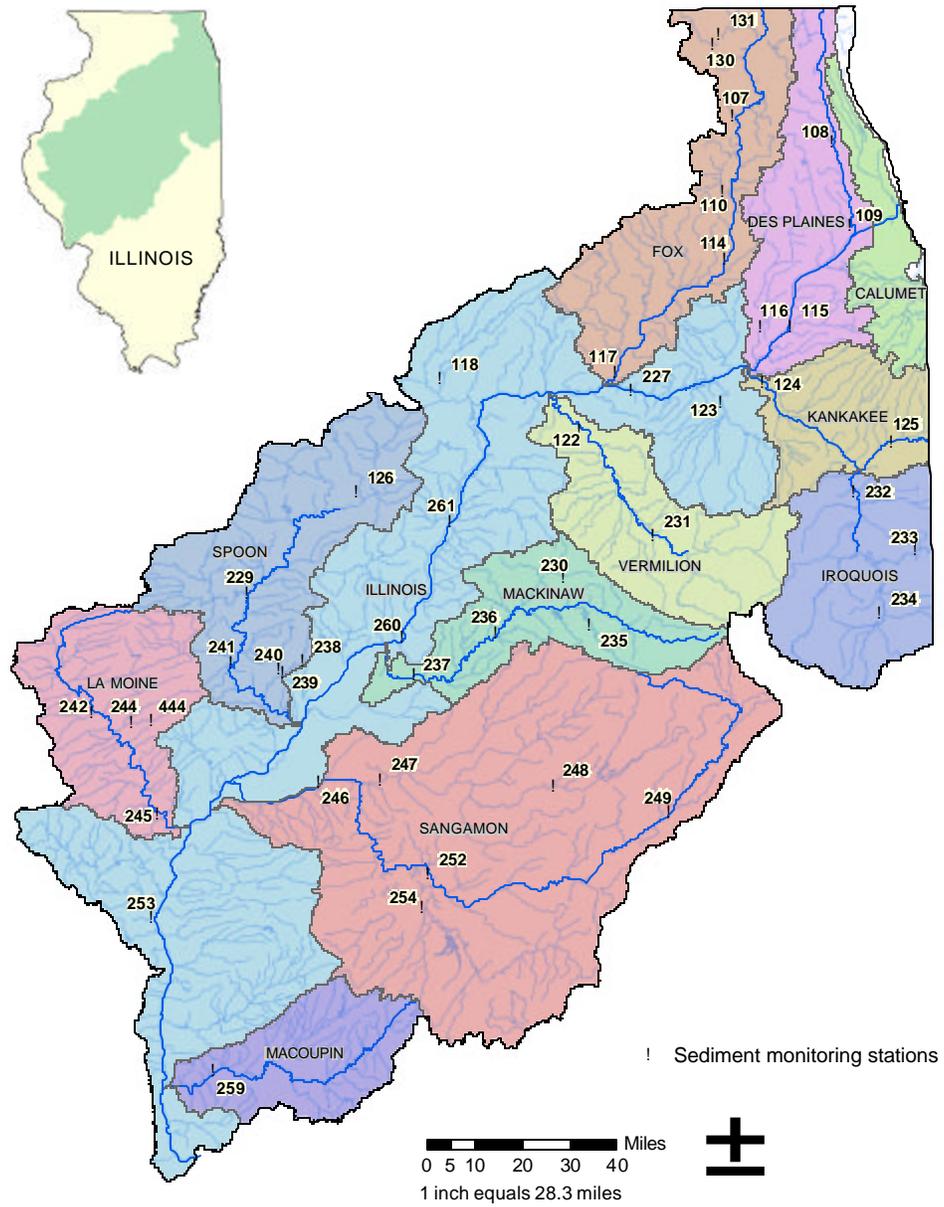


Figure 1. Locations of available in-stream sediment data within the Illinois River watershed, 1981-2000

program that will collect precipitation, hydrologic, sediment, and nutrient data for selected small watersheds in the Illinois River basin that will assist in making a more accurate assessment of sediment and nutrient delivery to the Illinois River.

## Sediment and Nutrient Data

Five small watersheds located within the Spoon and Sangamon River watersheds were selected for intensively monitoring sediment and nutrient within the Illinois River basin. The locations of the watersheds and the monitoring stations are shown in figures 2 and 3 and information about the monitoring stations is provided in table 1. Court and North Creeks are located within the Spoon River watershed, while Panther and Cox Creeks are located within the Sangamon River watershed. The Spoon River watershed generates the highest sediment per unit area in the Illinois River basin, while the Sangamon River watershed is the largest tributary watershed to the Illinois River and delivers the largest total amount of sediment to the Illinois River. The type of data collected and the data collection methods have been presented in detail in the first progress report for the monitoring program (Demissie et al., 2001). This progress report presents some of the data that has been collected and analyzed at each of the monitoring stations.

### *Sediment Data*

The suspended sediment concentrations observed at all the five monitoring stations from Water Year 2000 to Water Year 2003 are shown in figures 4 to 13. Over 6,000 samples have been collected and analyzed at the five monitoring stations since the monitoring program was initiated. As can be seen in the figures, suspended sediment concentrations are highly variable throughout a year and also from year to year depending on the climatic conditions. It is also evident that sediment concentrations are the highest during storm events resulting in the transport of most of the sediment during storm events. Therefore, it is extremely important that samples are collected frequently during storm events to accurately measure sediment loads at monitoring stations.

**Table 1. Sediment and Nutrient Monitoring Stations Established for the Illinois River CREP**

<i>Station ID</i>	<i>Name</i>	<i>Drainage area</i>	<i>Watershed</i>
301	Court Creek	66.4 sq mi (172 sq km)	Spoon River
302	North Creek	26.0 sq mi (67.4 sq km)	Spoon River
303	Haw Creek	55.2 sq mi (143 sq km)	Spoon River
201	Panther Creek	16.5 sq mi (42.7 sq km)	Sangamon River
202	Cox Creek	12.0 sq mi (31.1 sq km)	Sangamon River

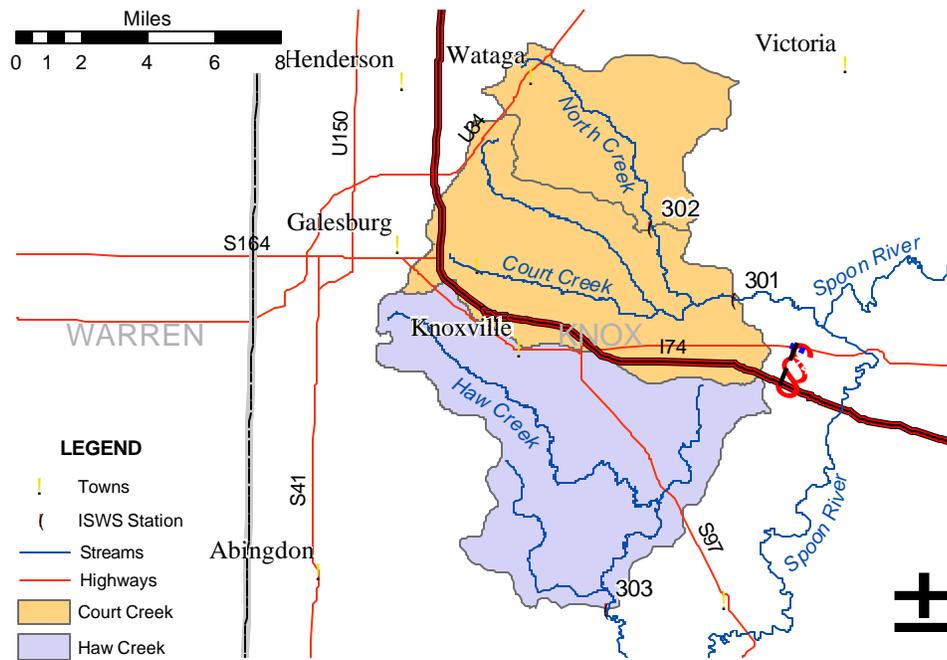


Figure 2. Locations of monitoring stations in the Court and Haw Creek watersheds

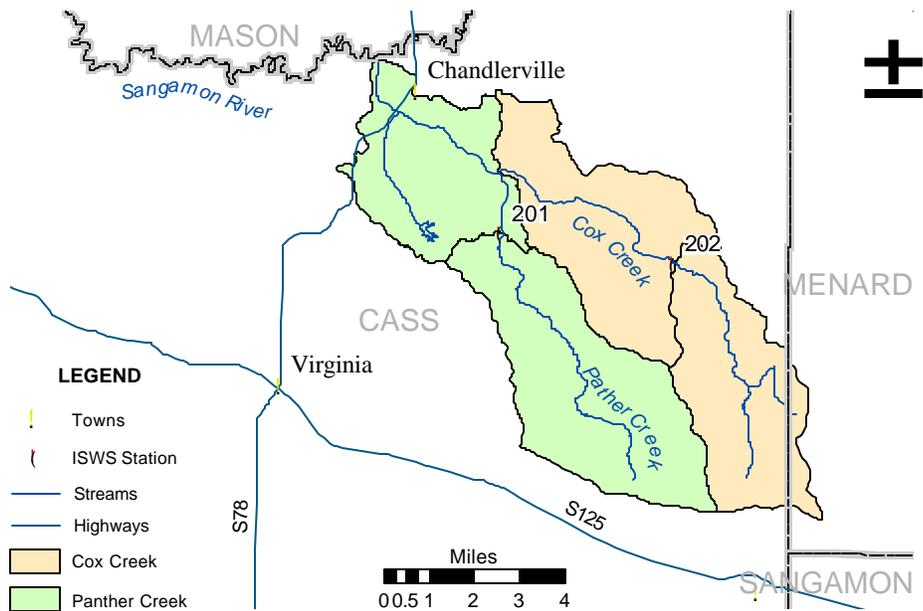


Figure 3. Locations of monitoring stations in the Panther and Cox Creek watersheds

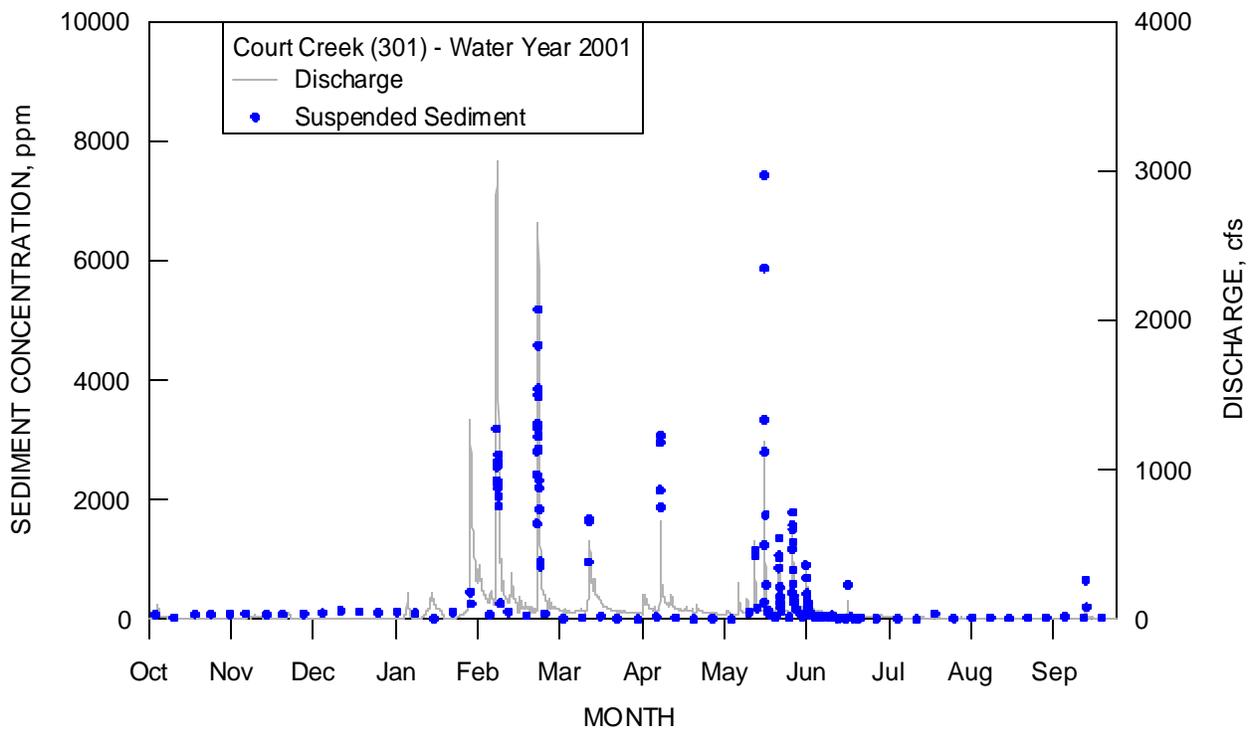
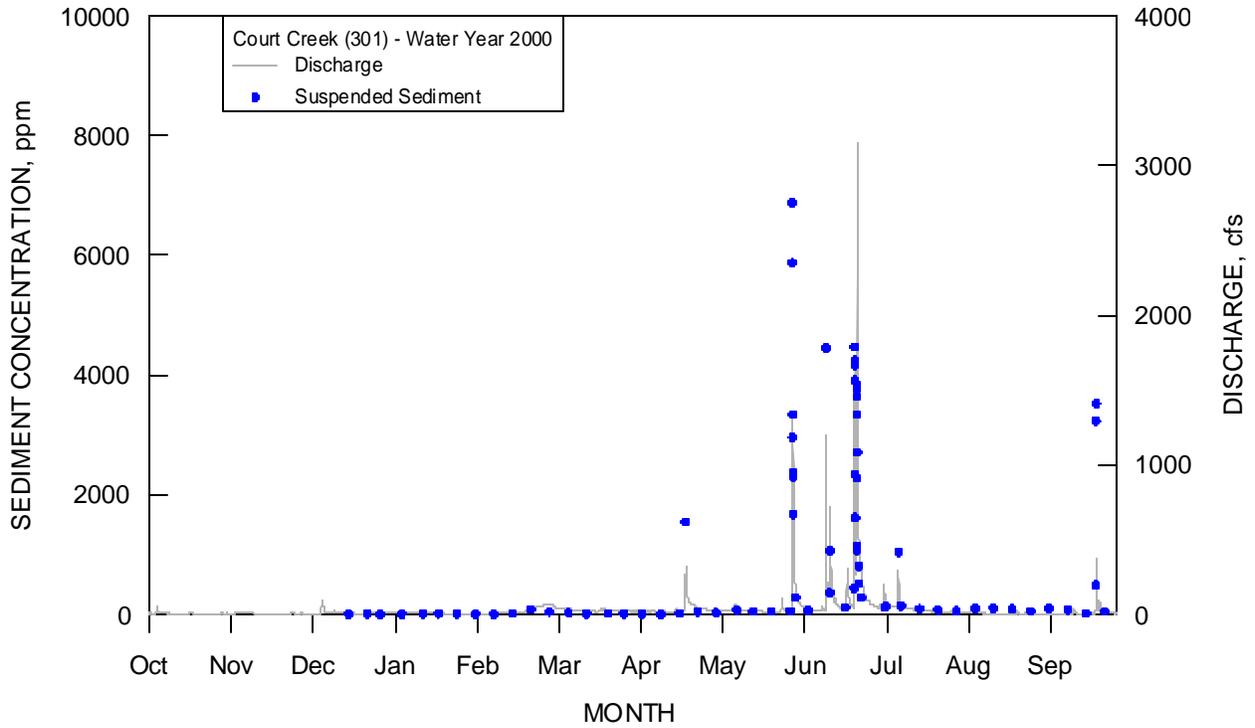


Figure 4. Suspended sediment concentrations and water discharge at Court Creek (301) – Water Years 2000 and 2001

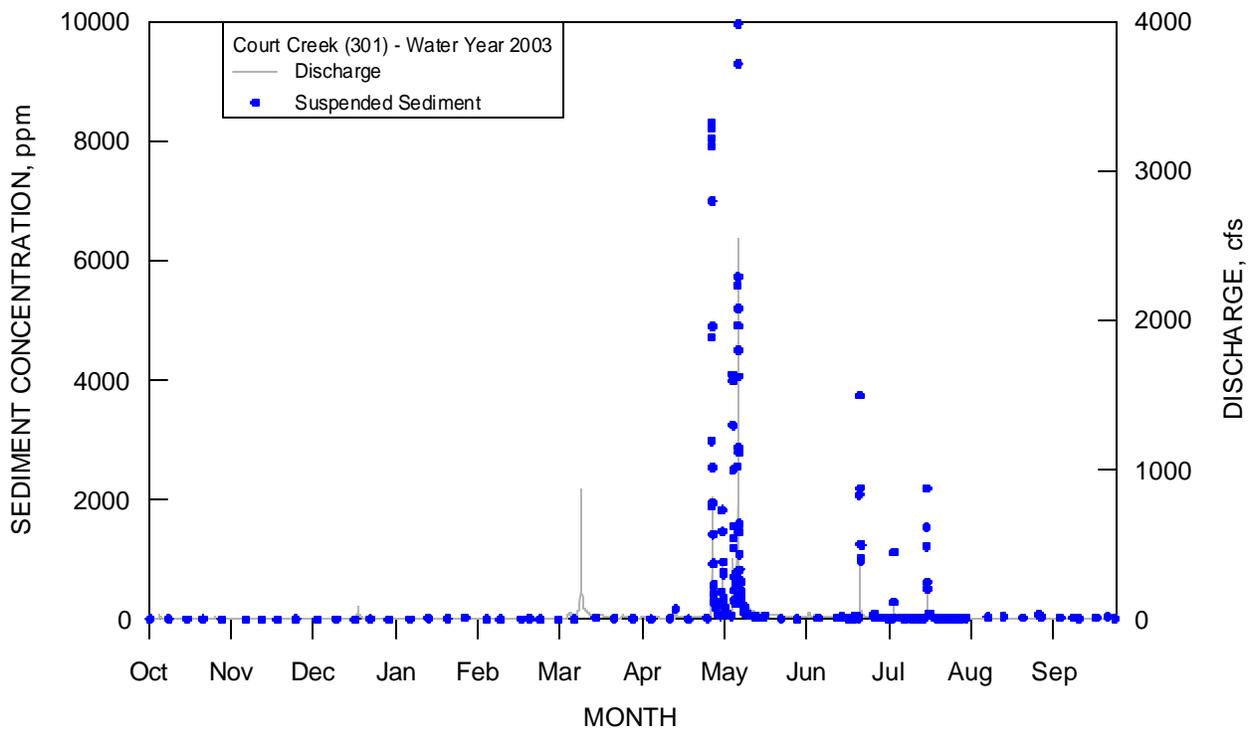
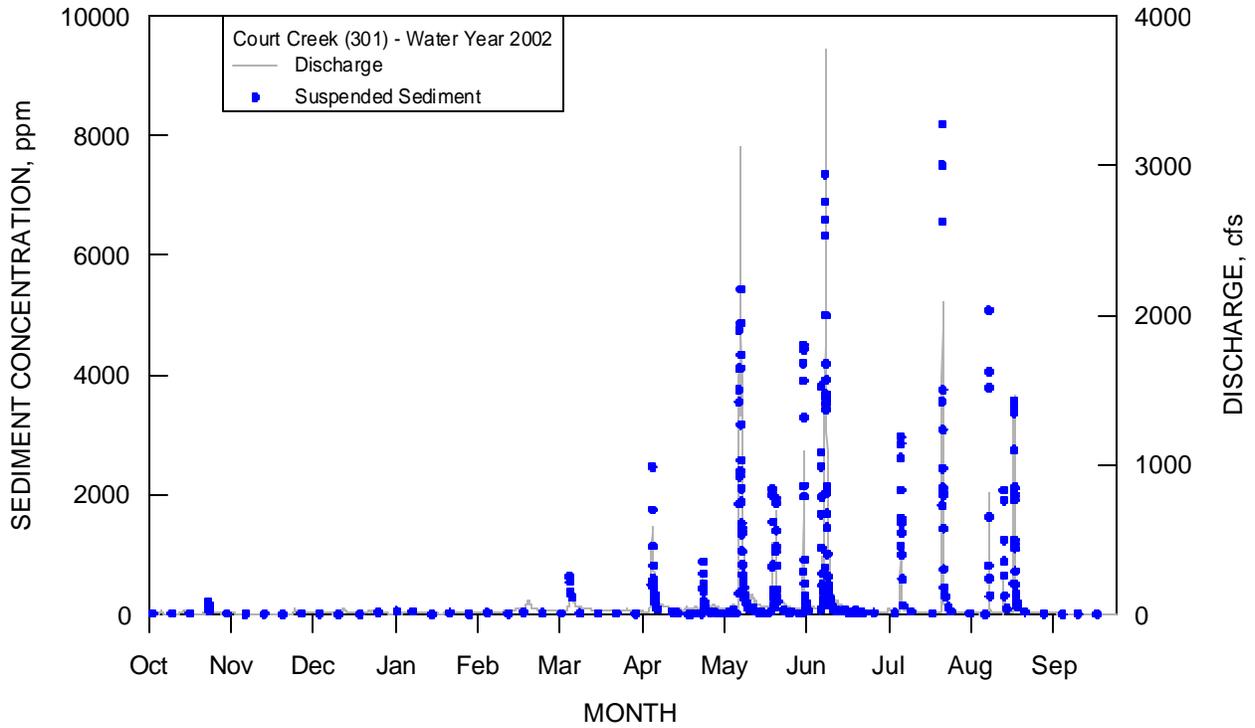


Figure 5. Suspended sediment concentrations and water discharge at Court Creek (301) – Water Years 2002 and 2003

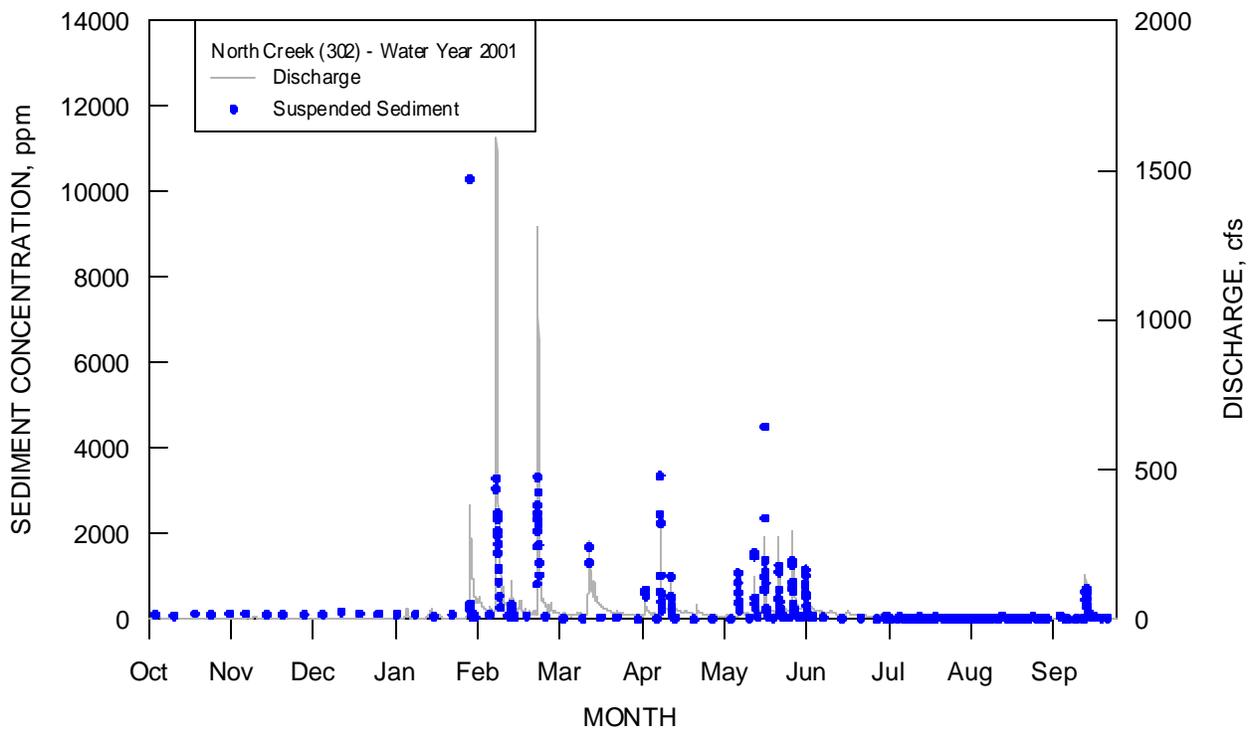
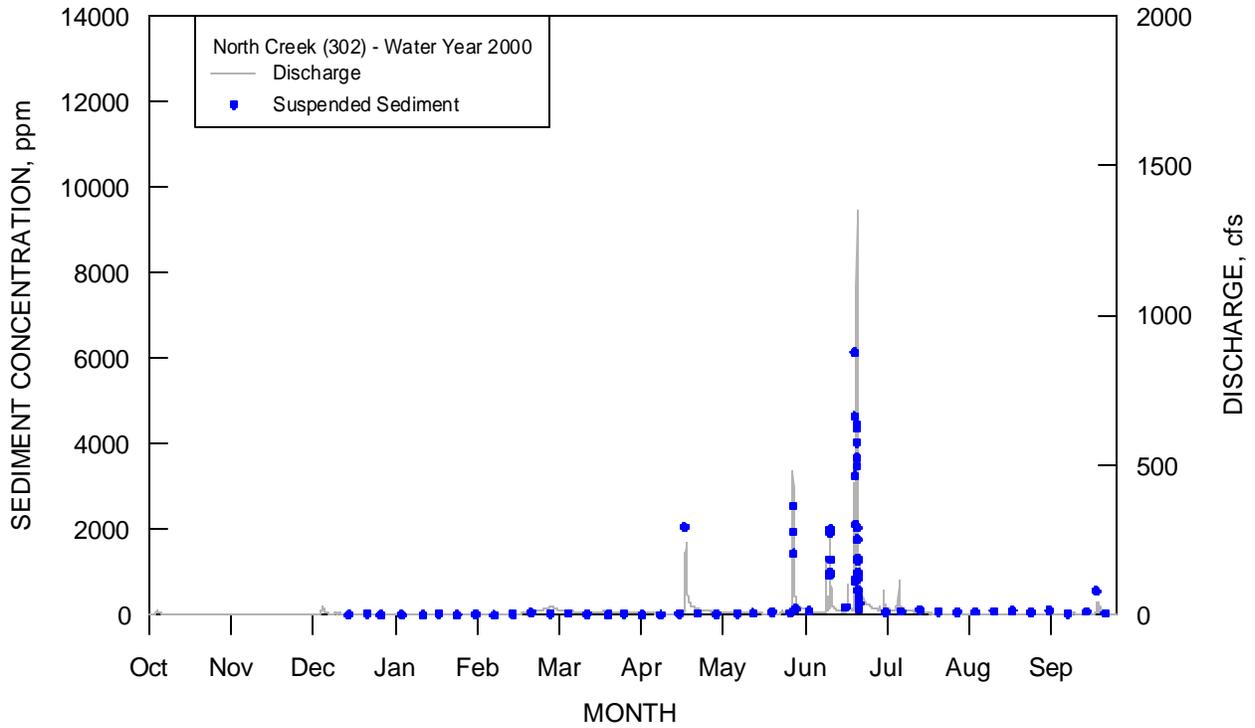


Figure 6. Suspended sediment concentrations and water discharge at North Creek (302) – Water Years 2000 and 2001

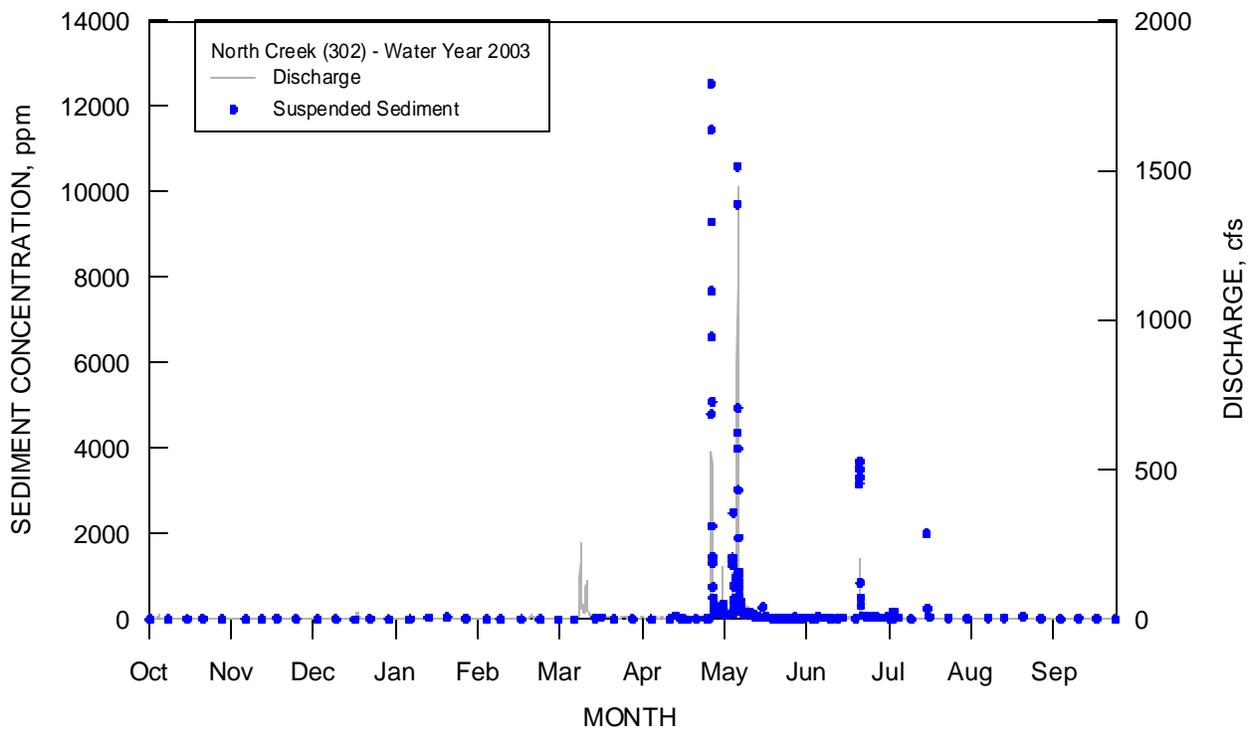
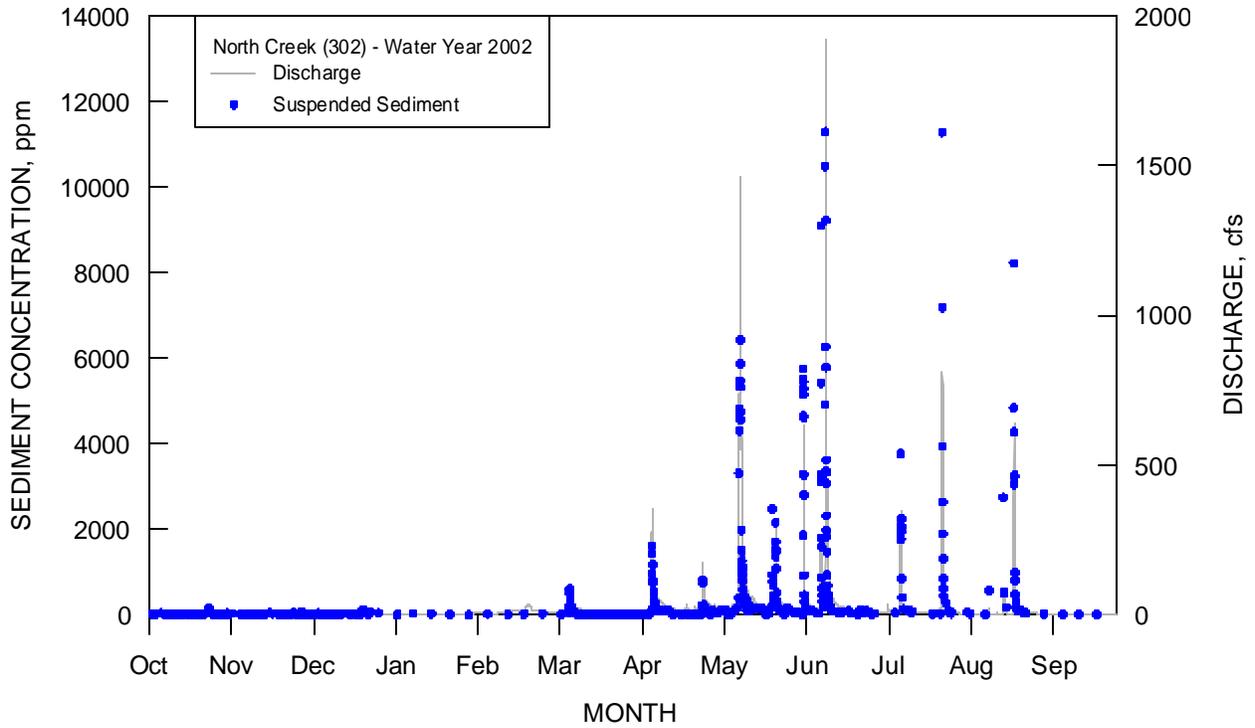


Figure 7. Suspended sediment concentrations and water discharge at North Creek (302) – Water Years 2002 and 2003

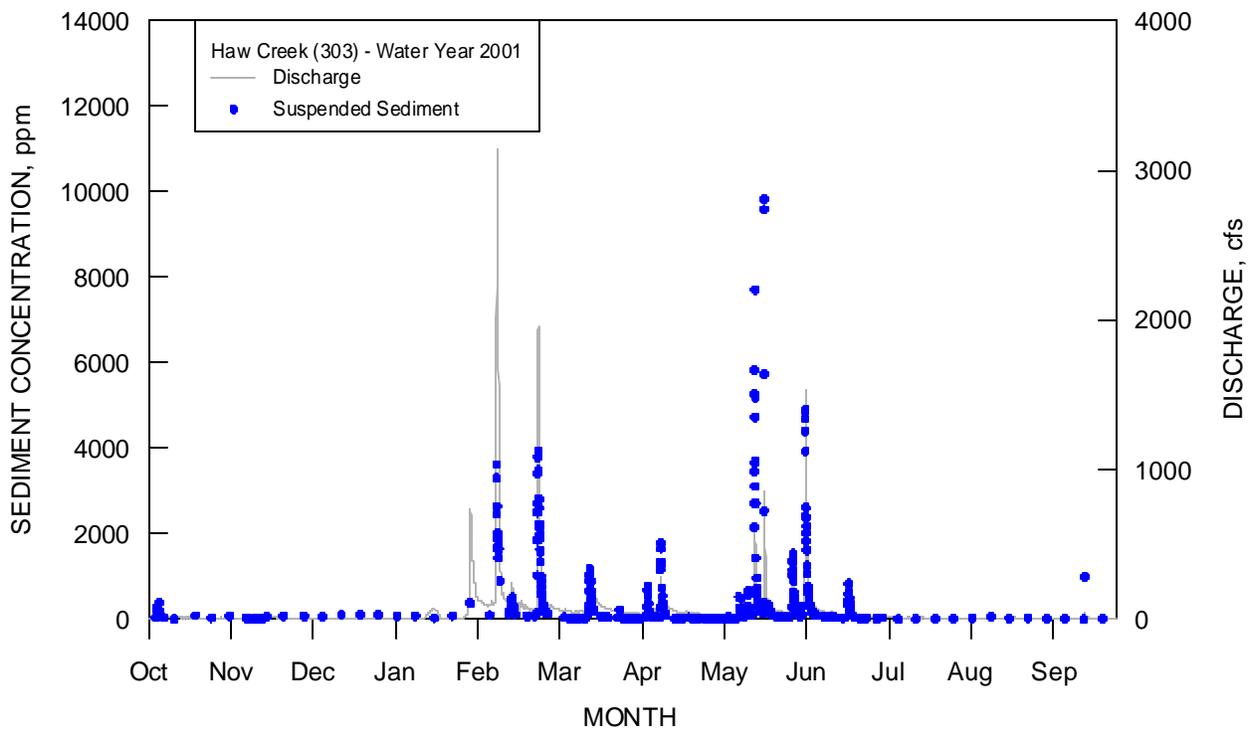
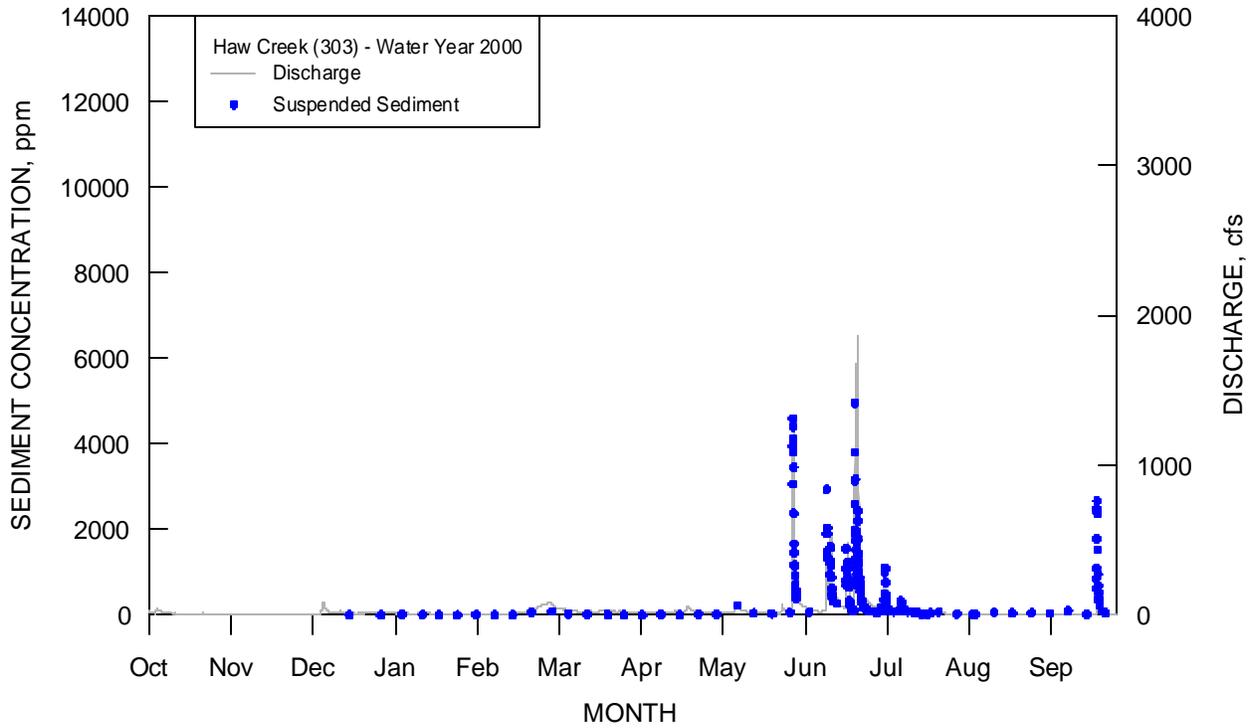


Figure 8. Suspended sediment concentrations and water discharge at Haw Creek (303) – Water Years 2000 and 2001

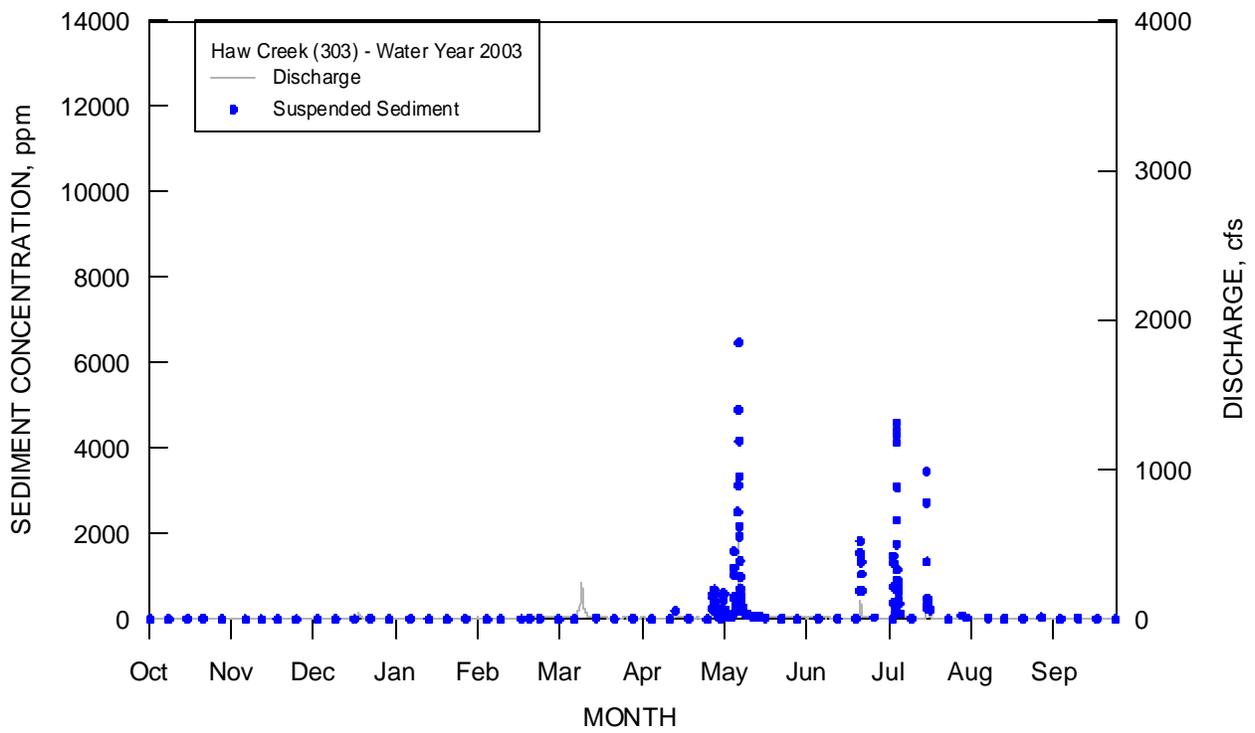
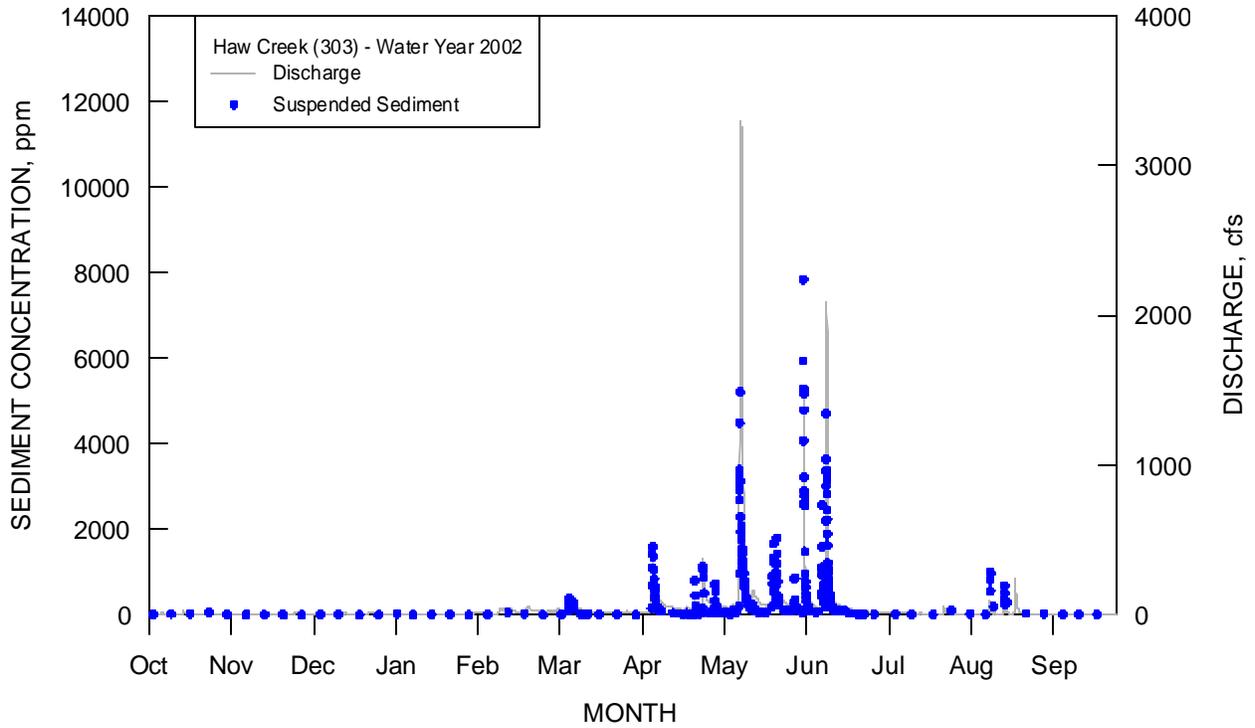


Figure 9. Suspended sediment concentrations and water discharge at Haw Creek (303) – Water Years 2002 and 2003

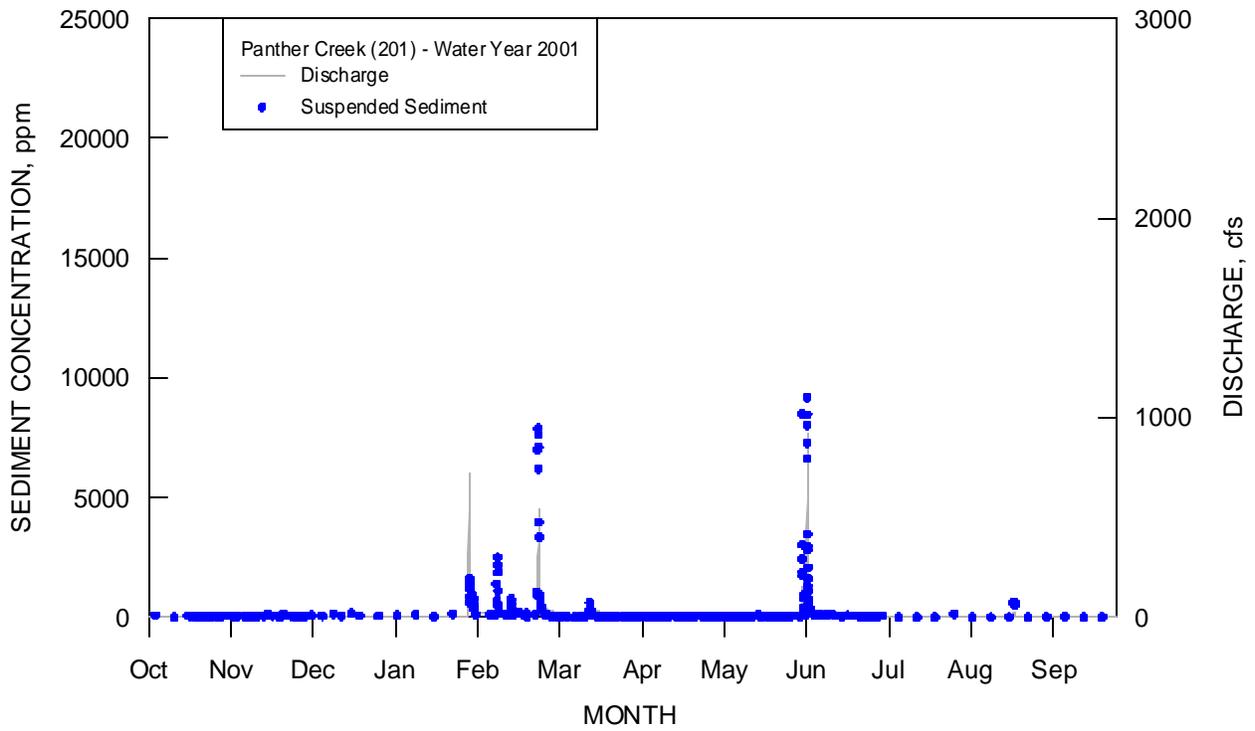
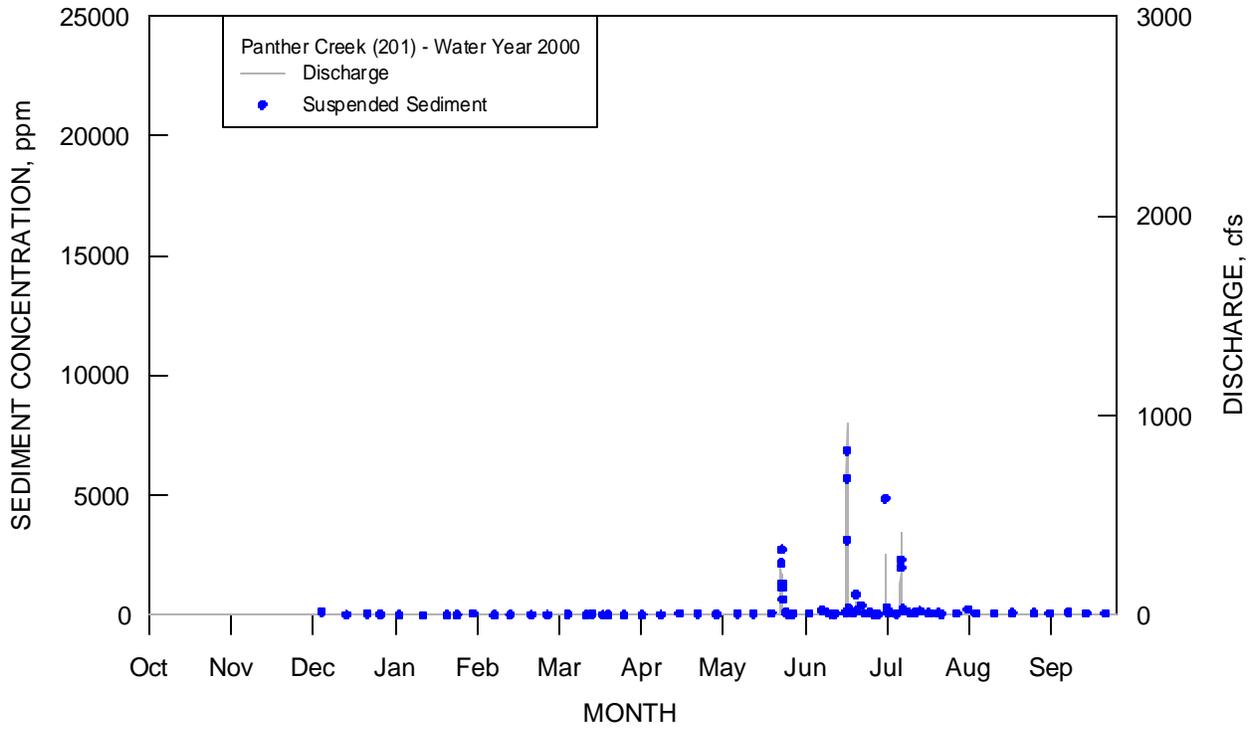


Figure 10. Suspended sediment concentrations and water discharge at Panther Creek (201) – Water Years 2000 and 2001

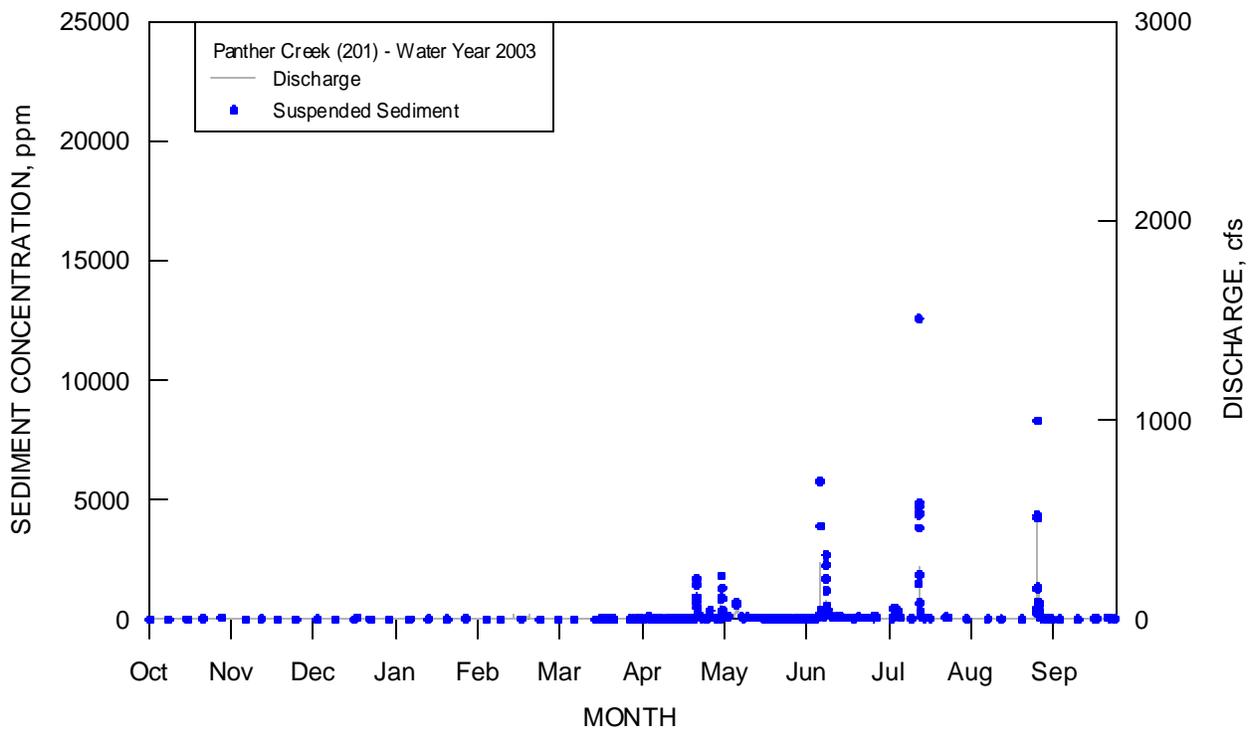
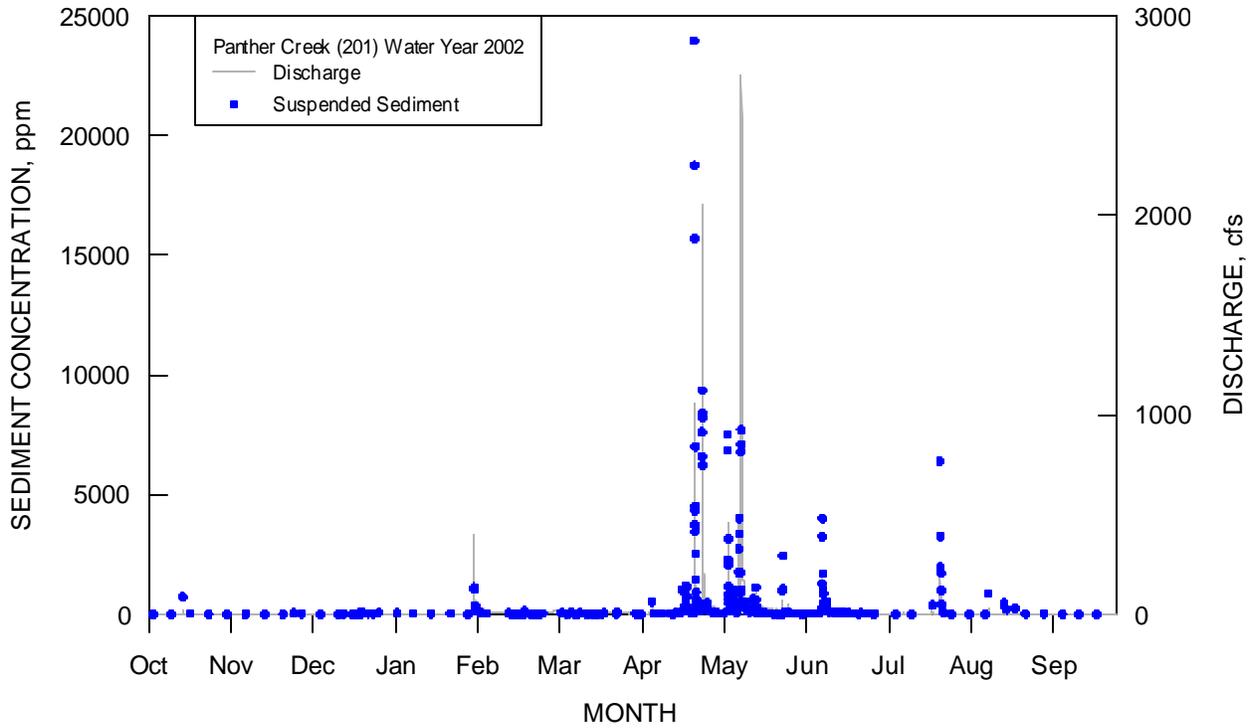


Figure 11. Suspended sediment concentrations and water discharge at Panther Creek (201) – Water Years 2002 and 2003

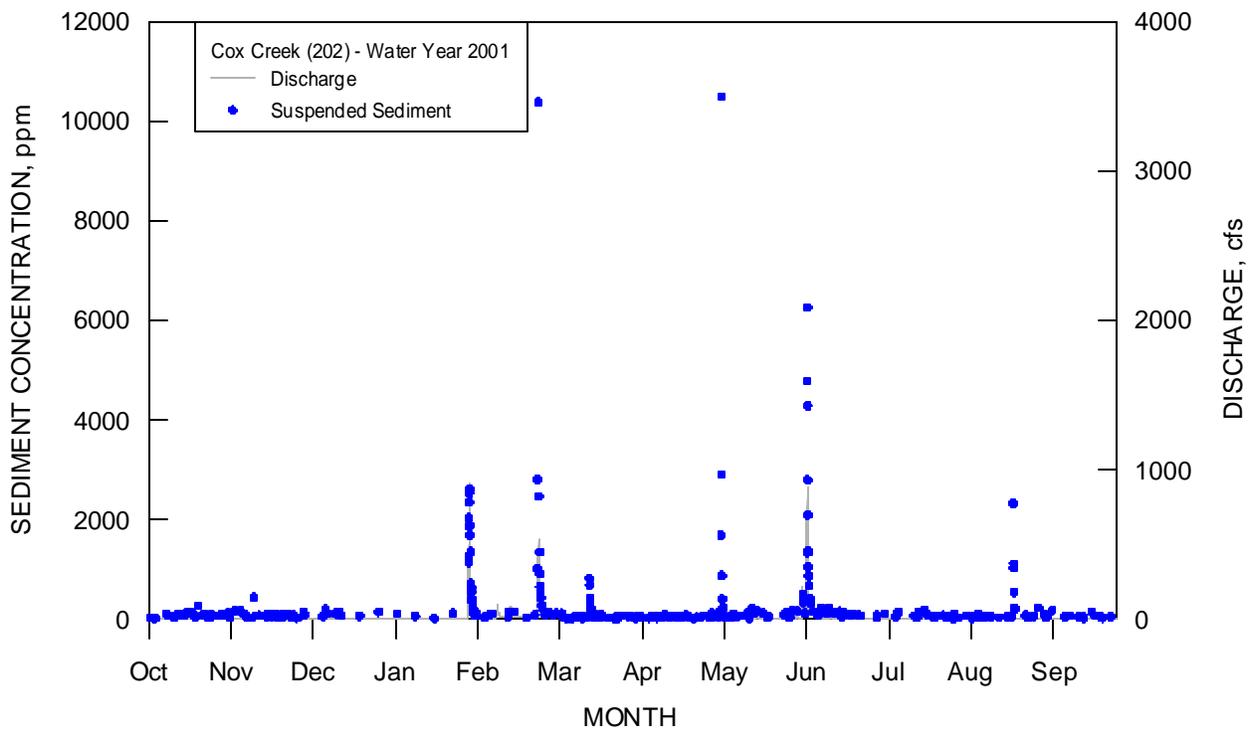
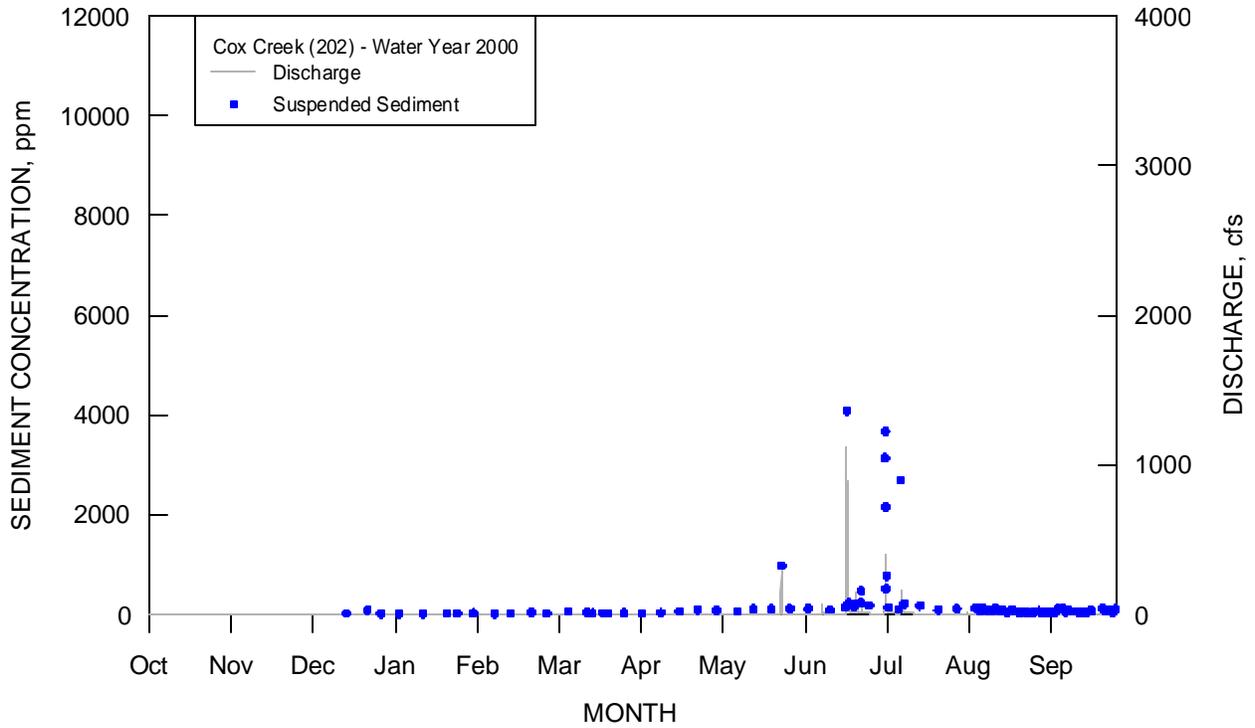


Figure 12. Suspended sediment concentrations and water discharge at Cox Creek (202) – Water Years 2000 and 2001

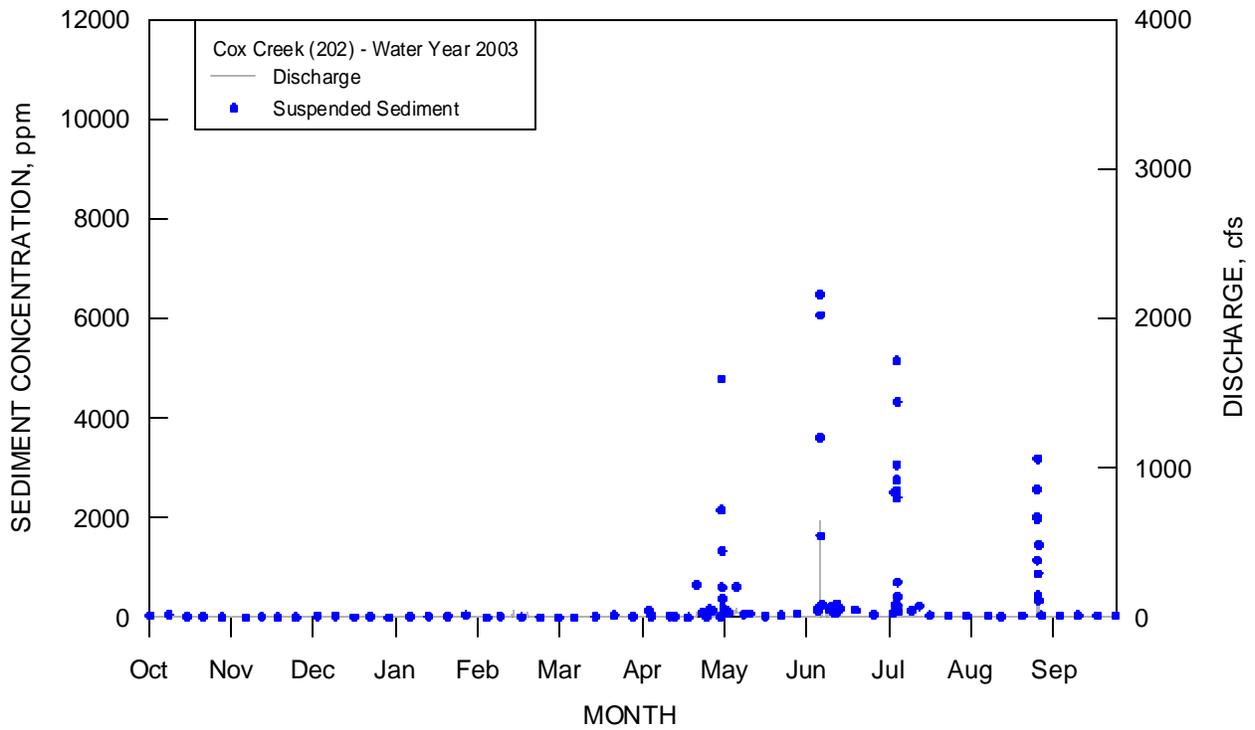
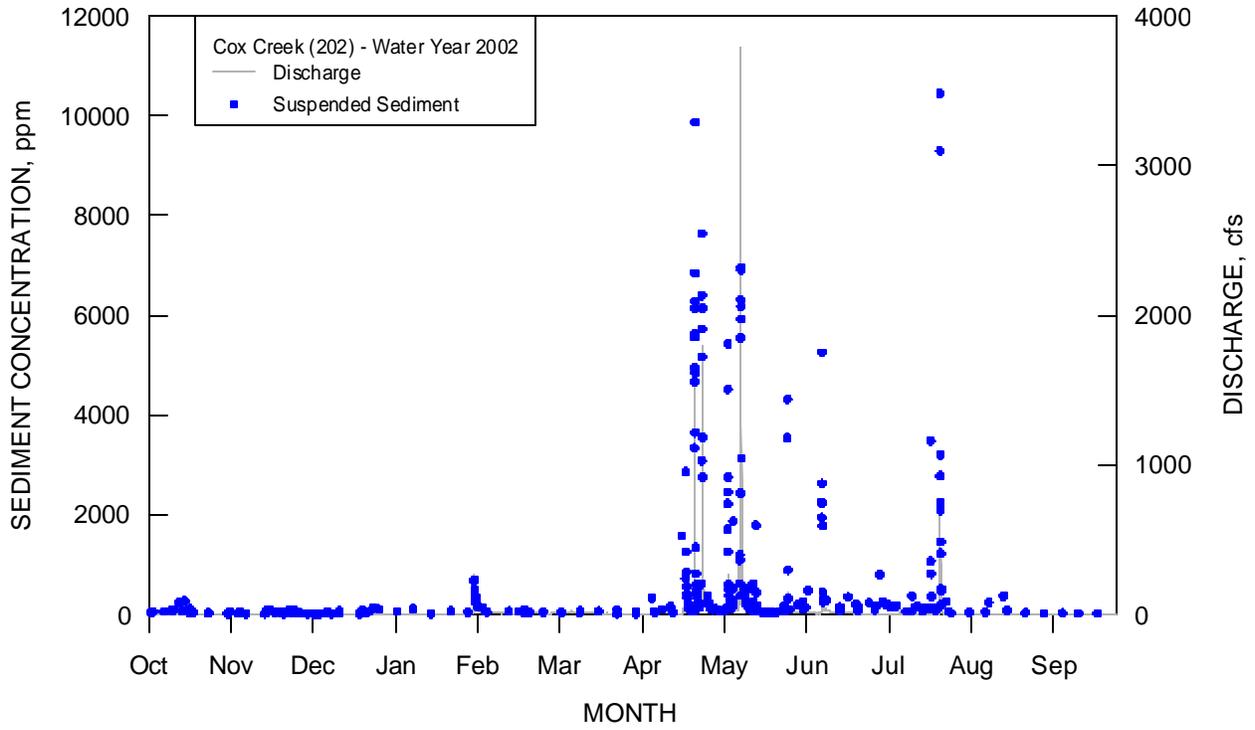


Figure 13. Suspended sediment concentrations and water discharge at Cox Creek (202) – Water Years 2002 and 2003

## *Nutrient Data*

All the nutrient data collected and analyzed from Water Year 2000 through Water Year 2003 at the five monitoring stations are presented in figures 14 to 33. The nutrient data are organized into two groups: nitrogen species and phosphorous species. The nitrogen species include nitrate-nitrogen ( $\text{NO}_3\text{-N}$ ), nitrite-nitrogen ( $\text{NO}_2\text{-N}$ ), ammonium-nitrogen ( $\text{NH}_4\text{-N}$ ), and total Kjeldahl nitrogen (TKN). The phosphorous species include total phosphorous (TP), total dissolved phosphorous (TDP), and orthophosphate (P-ortho). Over 1,300 samples have been collected and analyzed for nitrate ( $\text{NO}_3\text{-N}$ ), ammonium ( $\text{NH}_4\text{-N}$ ) and orthophosphate (P-ortho). In addition, more than 500 samples have been analyzed for nitrate ( $\text{NO}_2\text{-N}$ ), total Kjeldahl nitrogen (TKN), total phosphorous (TP), and total dissolved phosphorous (TDP). The data for the nitrogen species are shown in figures 14-23, while those for the phosphorous species are shown in figures 24-33.

The data for the nitrogen species at all five monitoring stations show that the dominant form of nitrogen transported by the streams is nitrate-N. During storm events, the concentration of TKN rises significantly, sometimes exceeding the nitrate-N concentration. TKN is highly correlated to suspended sediment concentrations.

One significant observation that can be made from the data, is the consistently higher concentrations of nitrate-N at Panther Creek and Cox Creek (tributaries to the Sangamon River) than at Court Creek, North Creek, and Haw Creek (tributaries of the Spoon River).

The data for the phosphorous species at all five monitoring stations show that most of the phosphorous load is transported during storm events. Concentrations of total phosphorous are the highest during storm events and relatively low most of the time. This is very similar to that shown by sediment and thus implies high correlations between sediment and phosphorous concentrations and loads. In terms of phosphorous concentrations, it does not appear there is any significant difference between the different monitoring stations from the Spoon and Sangamon River watersheds.

## **Sediment and Nutrient Loads**

The sediment and nutrient concentrations and water discharges are used to compute the amount of sediment and nutrient transported past monitoring stations. Based on the available flow and concentration data, daily loads are computed for sediment and the different species of nitrogen and phosphorous. The daily loads are then compiled to compute monthly and annual loads. The result of those calculations are summarized in tables 2-6 for each of the five monitoring stations. Each table presents the annual water discharge, sediment load, nitrate-N load and the total phosphorous load for one of the stations. Similar calculations have been made for the other species of nitrogen and phosphorous but are not presented in this report to minimize report size. The annual sediment loads are highly correlated to the water discharge, and thus the wetter years, 2001 and 2002, generated more sediment at all stations as compared to drier years, 2000 and 2003. The annual loads ranged from a low of 1,820 tons in 2003 at Cox Creek to a high of 62,841 tons in 2002 at Court Creek. The nitrate-N loads ranged from a low of 10.3 tons in

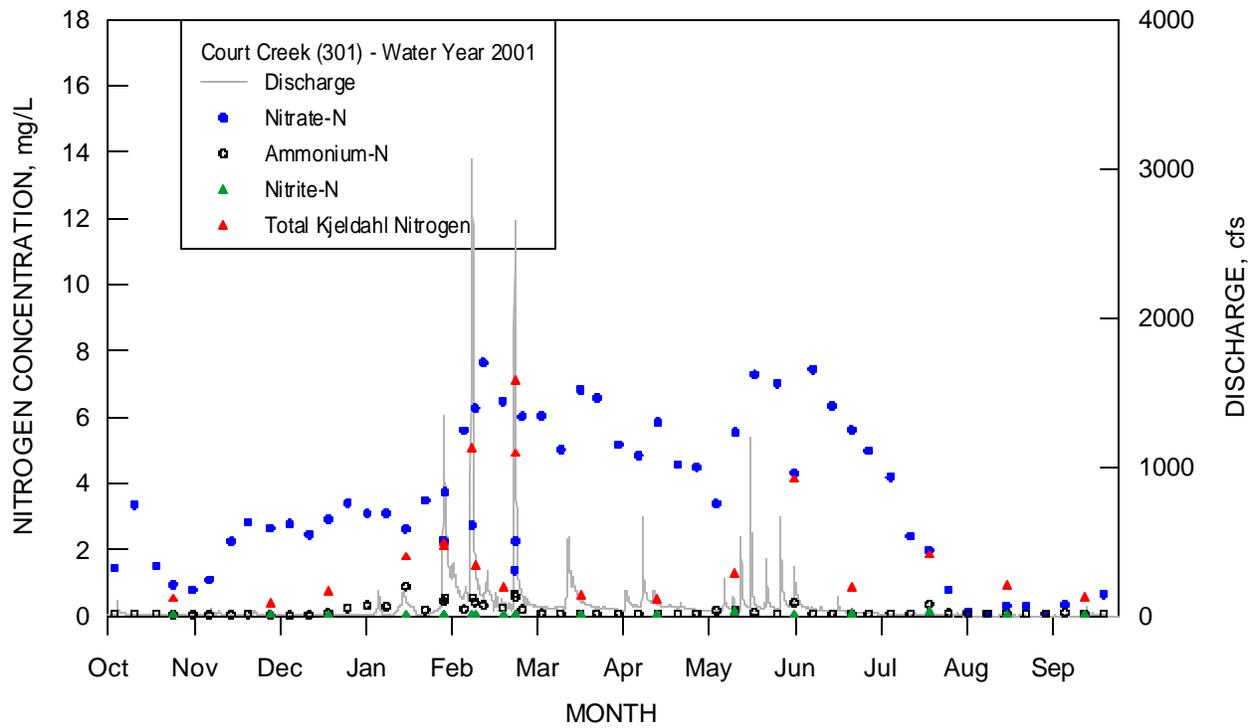
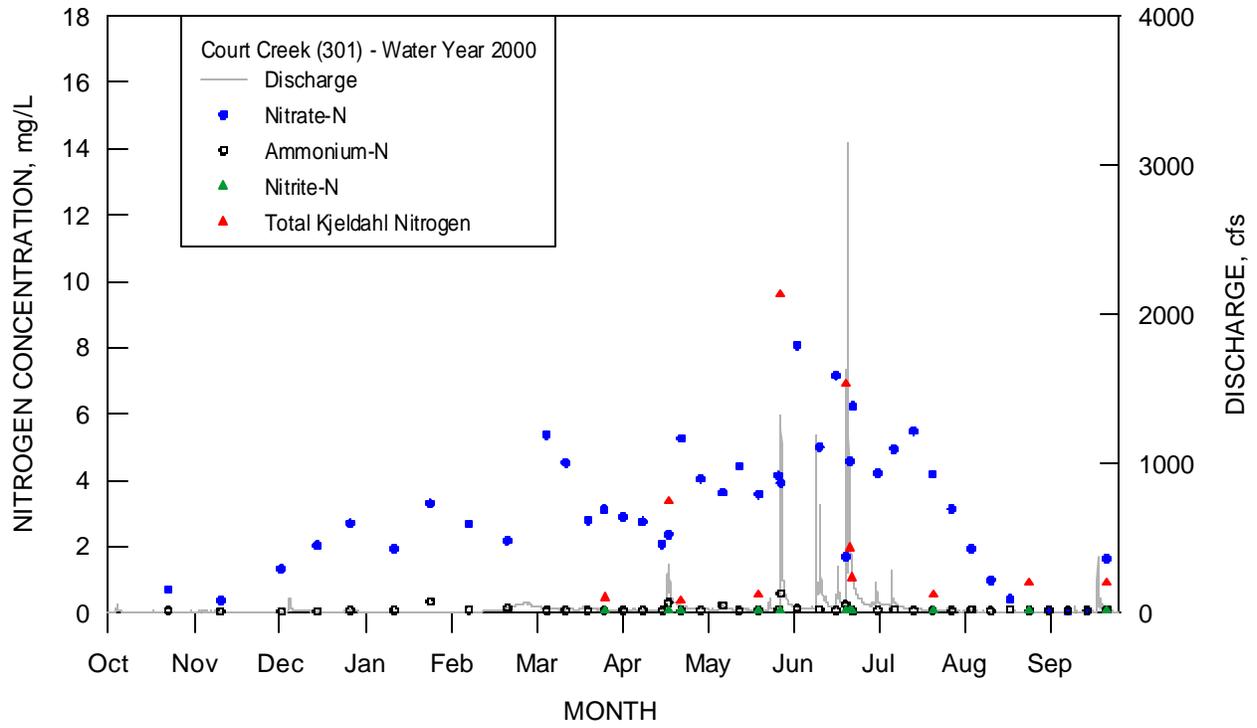


Figure 14. Concentrations of nitrogen species and water discharge at Court Creek (301) – Water Years 2000 and 2001

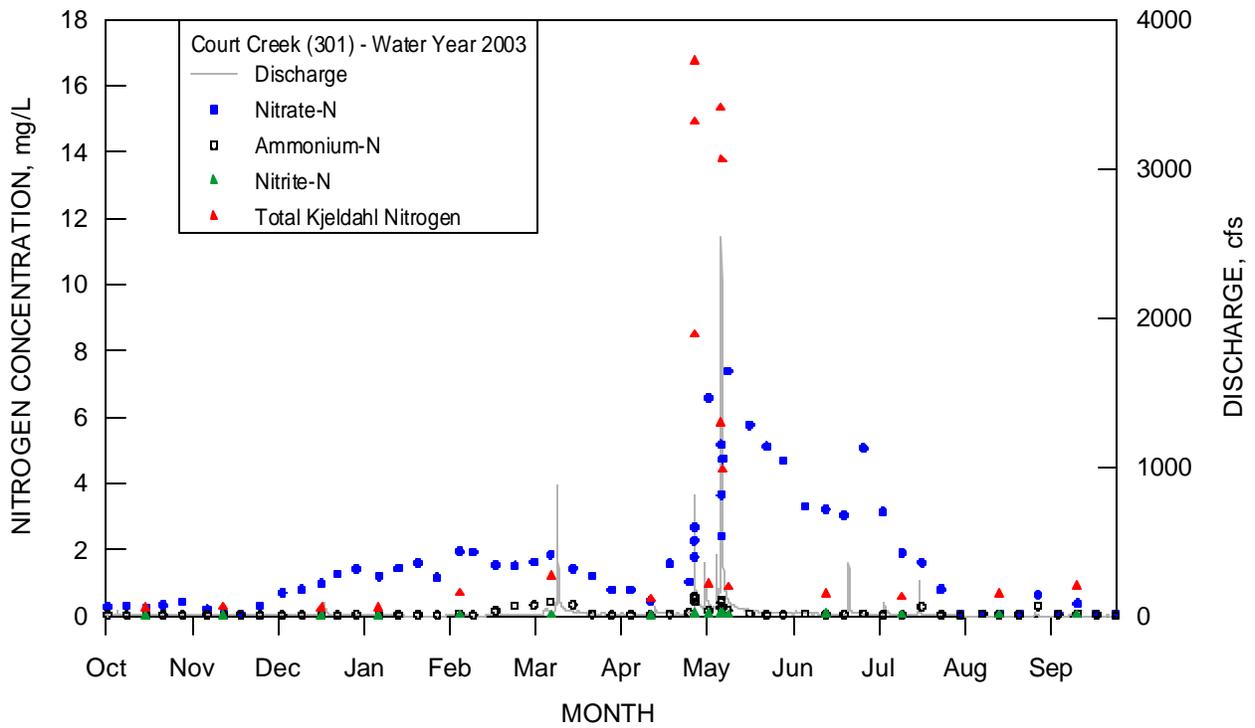
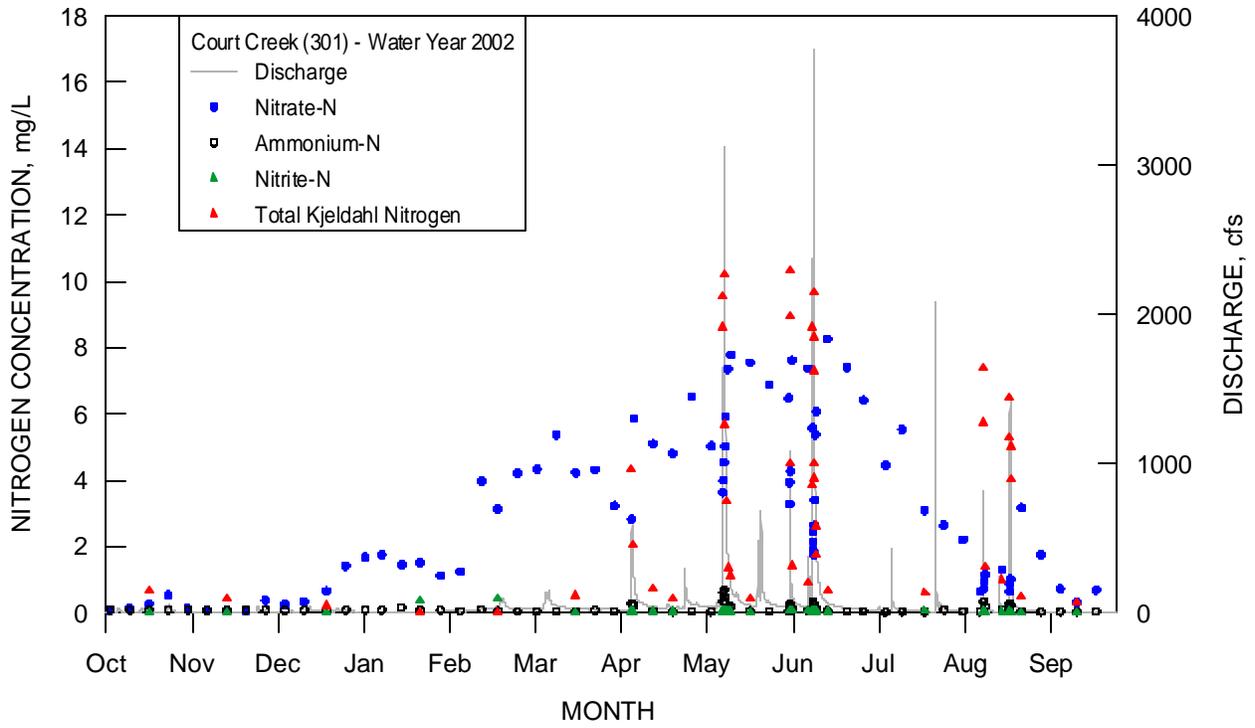


Figure 15. Concentrations of nitrogen species and water discharge at Court Creek (301) – Water Years 2002 and 2003

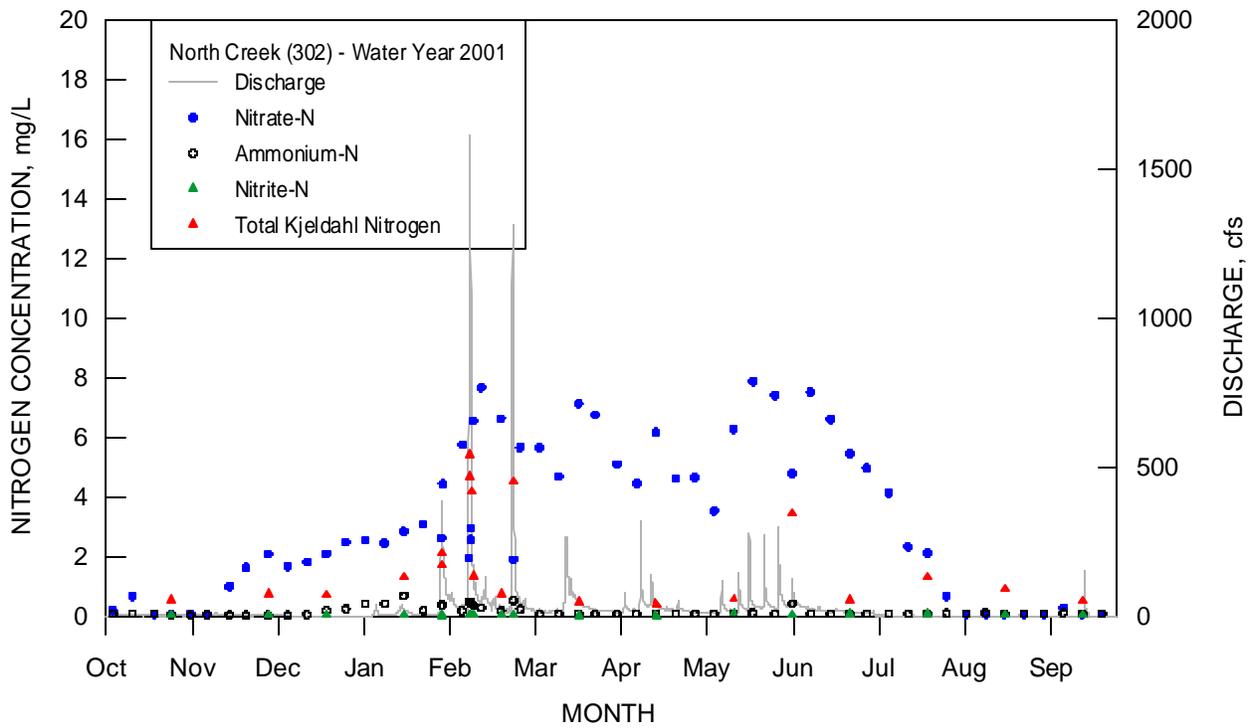
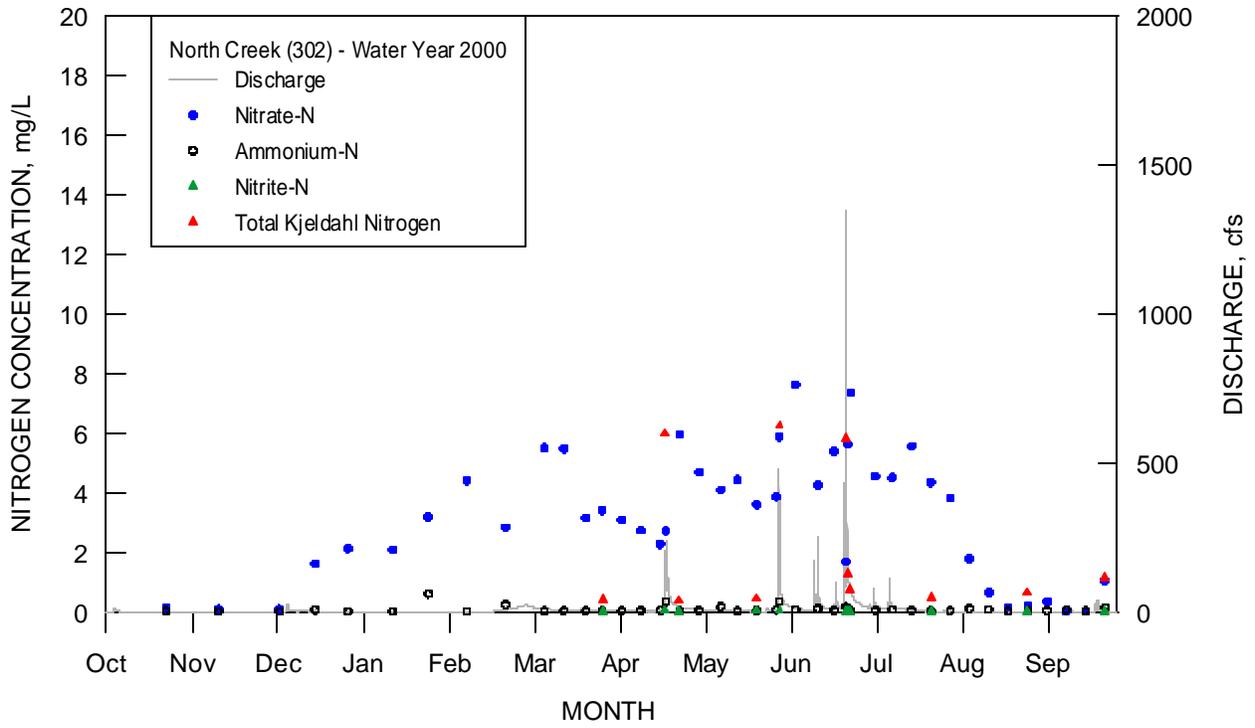


Figure 16. Concentrations of nitrogen species and water discharge at North Creek (302) – Water Years 2000 and 2001

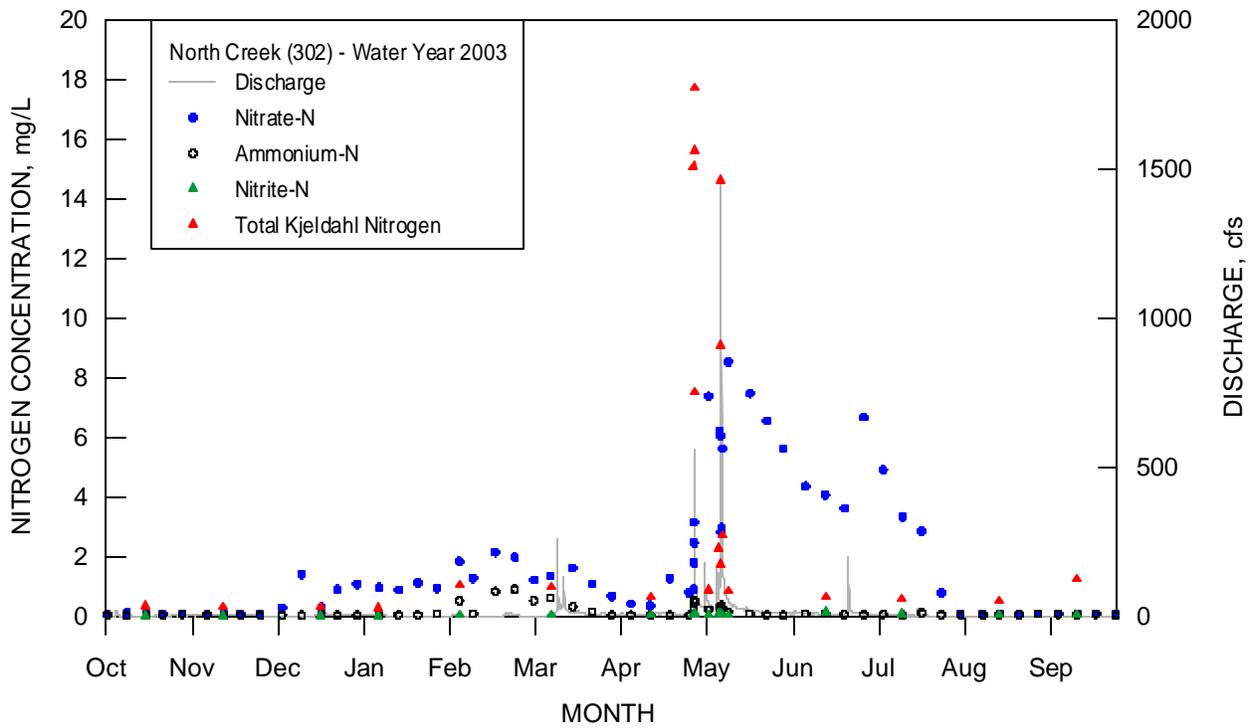
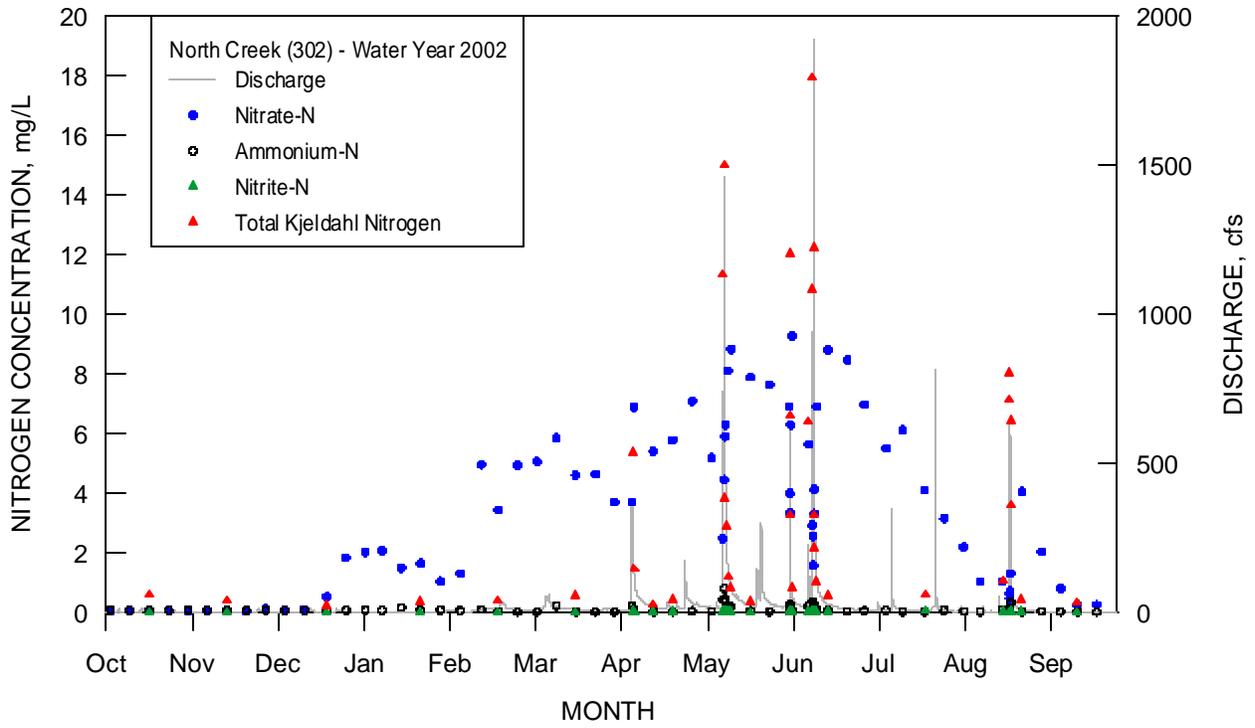


Figure 17. Concentrations of nitrogen species and water discharge at North Creek (302) – Water Years 2002 and 2003

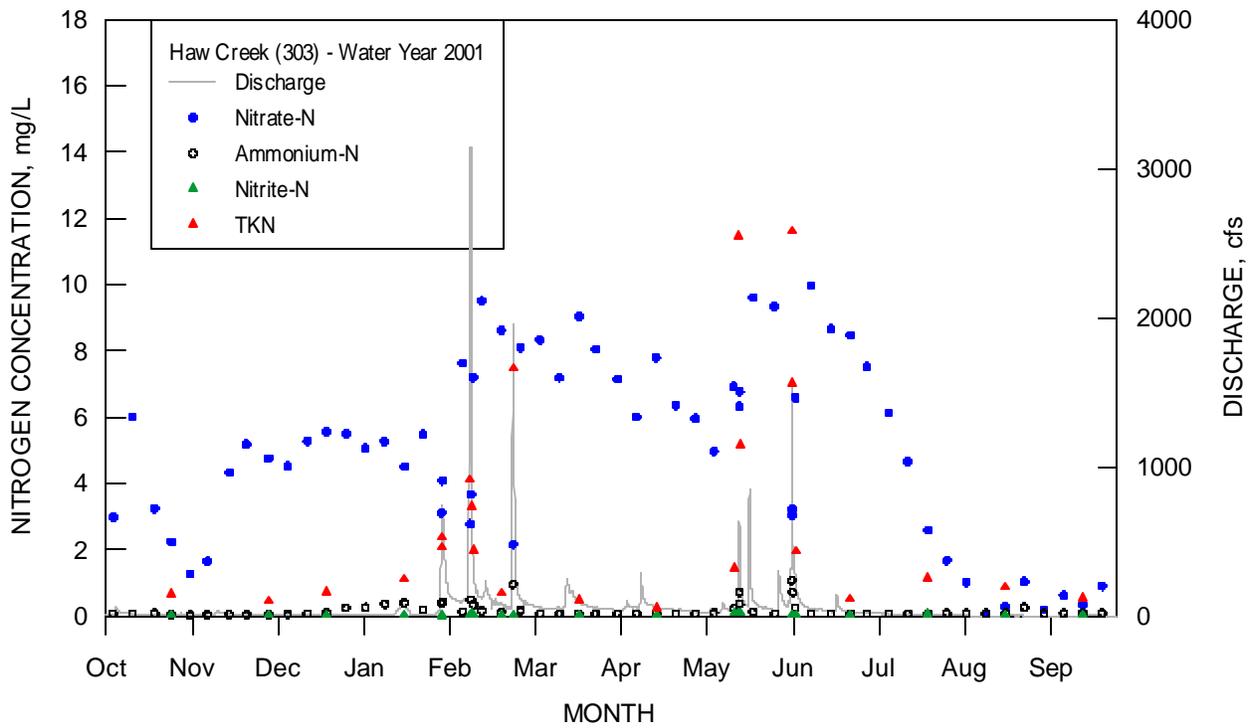
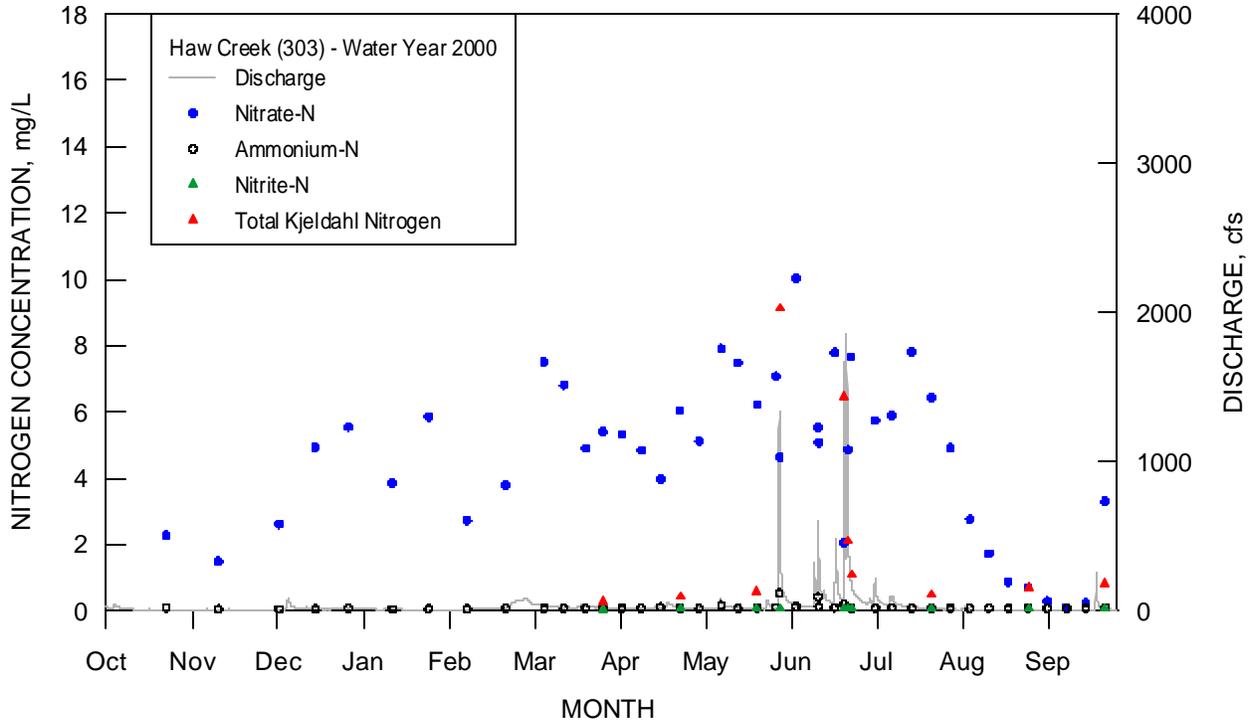


Figure 18. Concentrations of nitrogen species and water discharge at Haw Creek (303) – Water Years 2000 and 2001

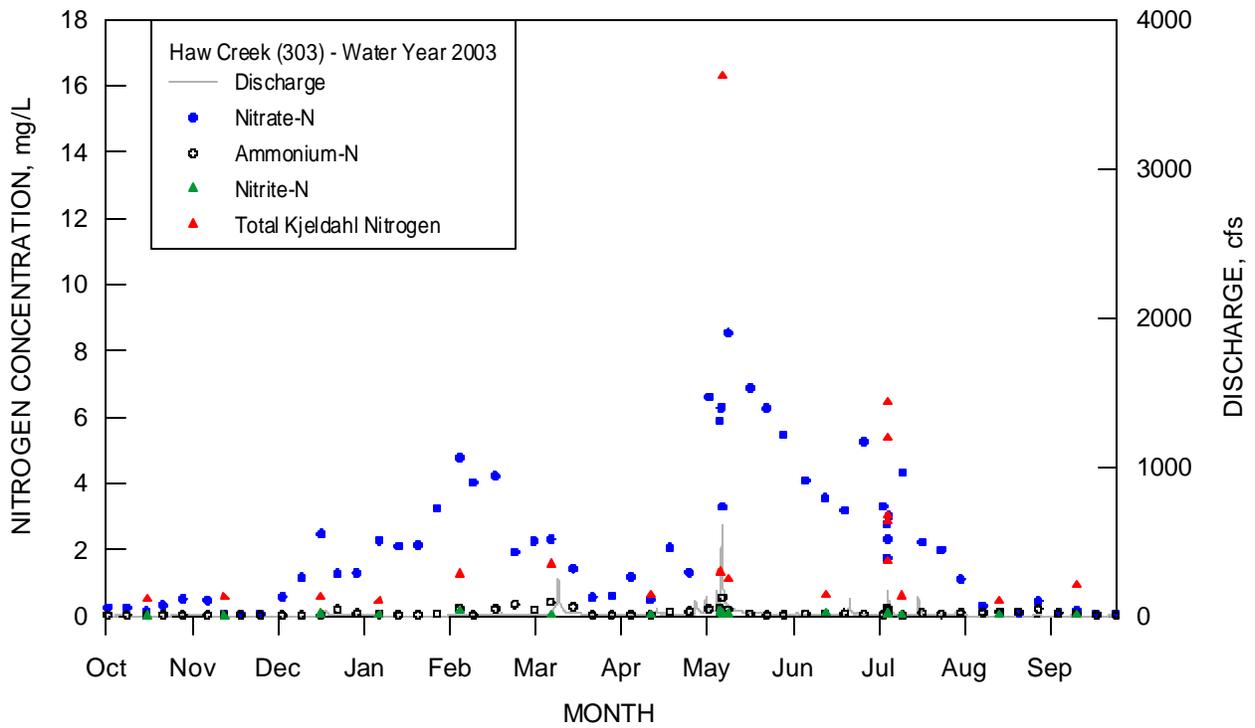
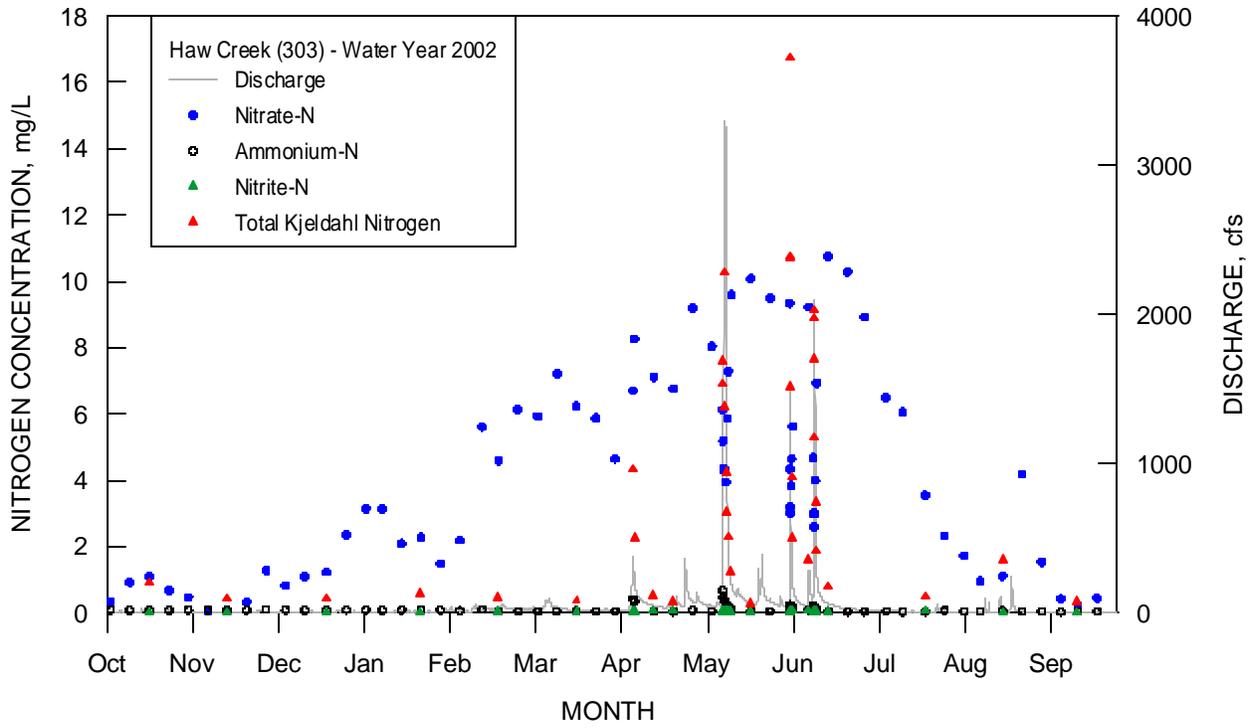


Figure 19. Concentrations of nitrogen species and water discharge at Haw Creek (303) – Water Years 2002 and 2003

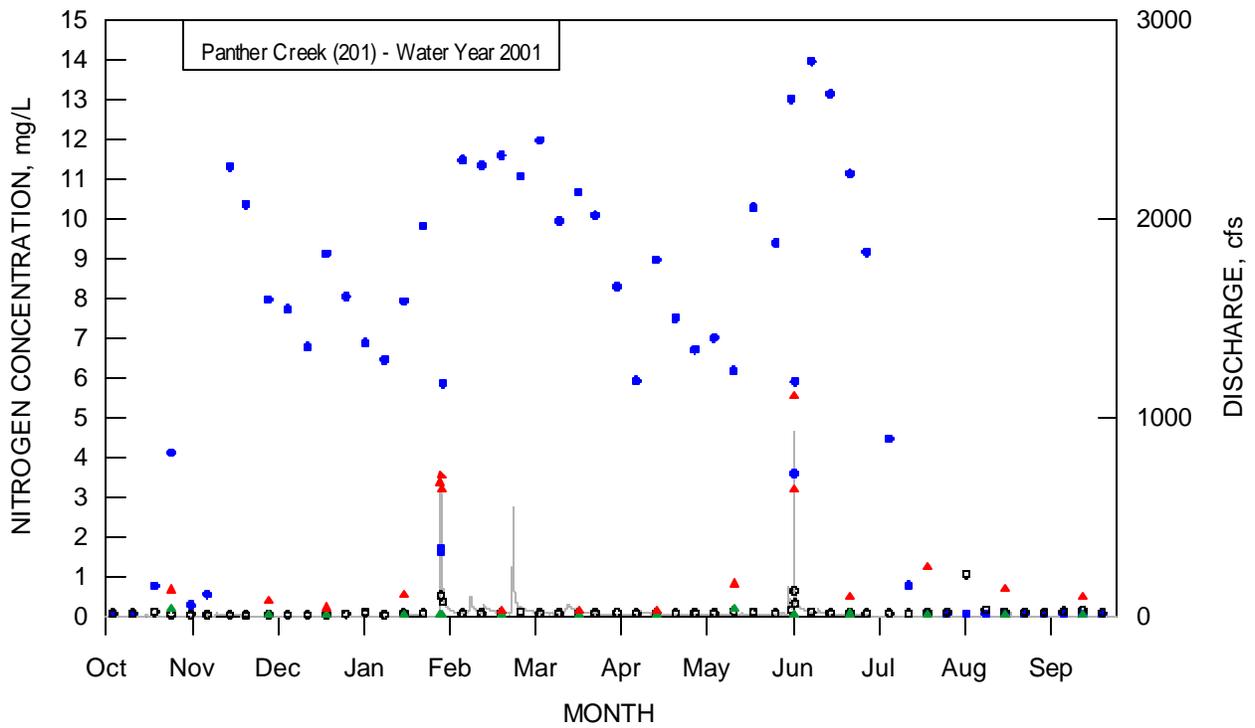
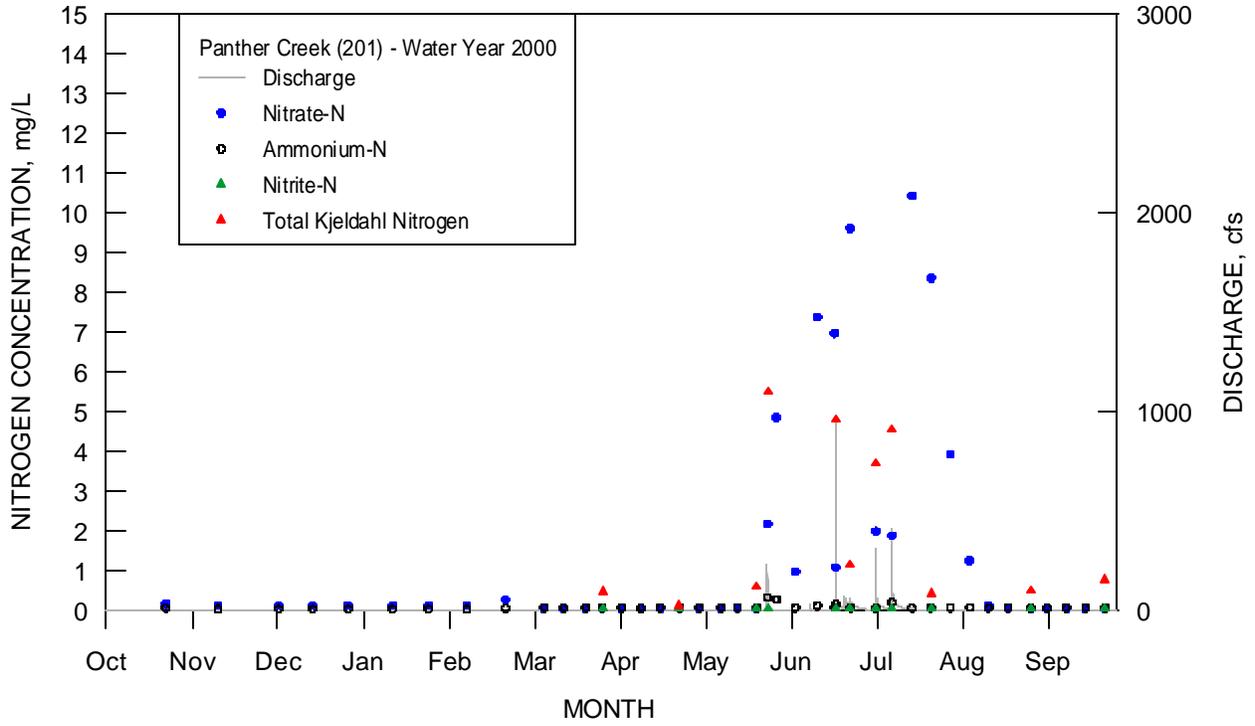


Figure 20. Concentrations of nitrogen species and water discharge at Panther Creek (201) – Water Years 2000 and 2001

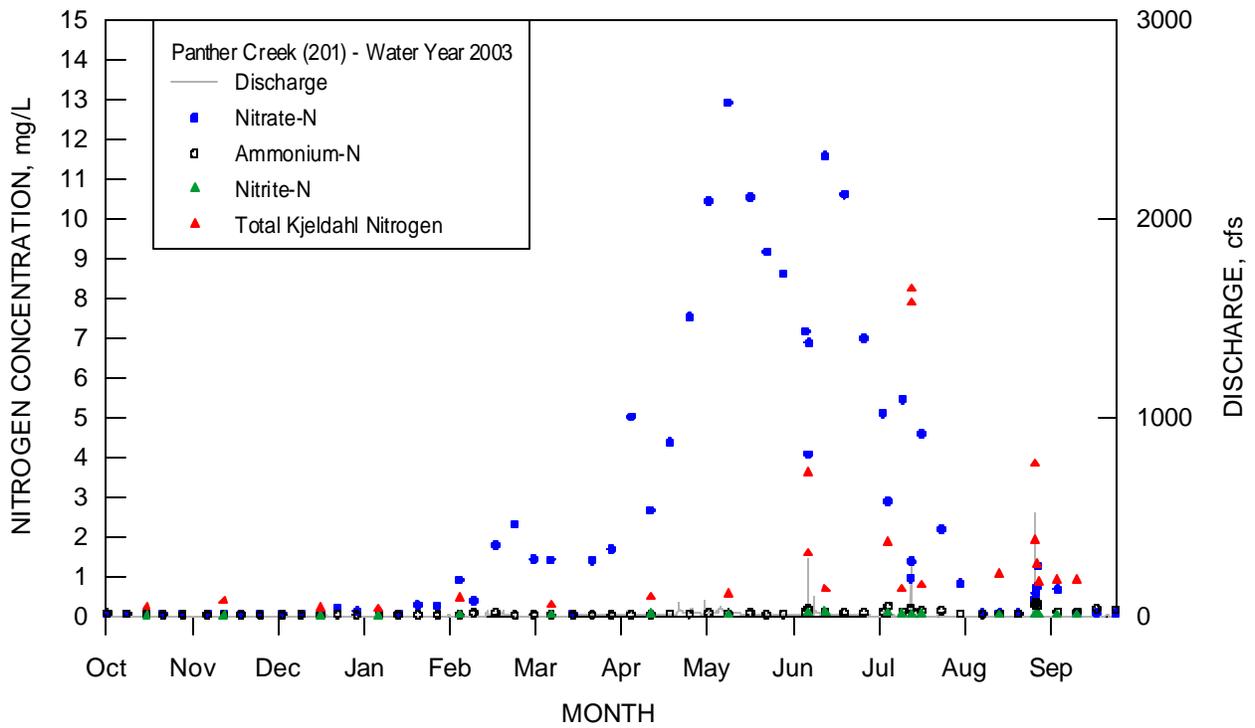
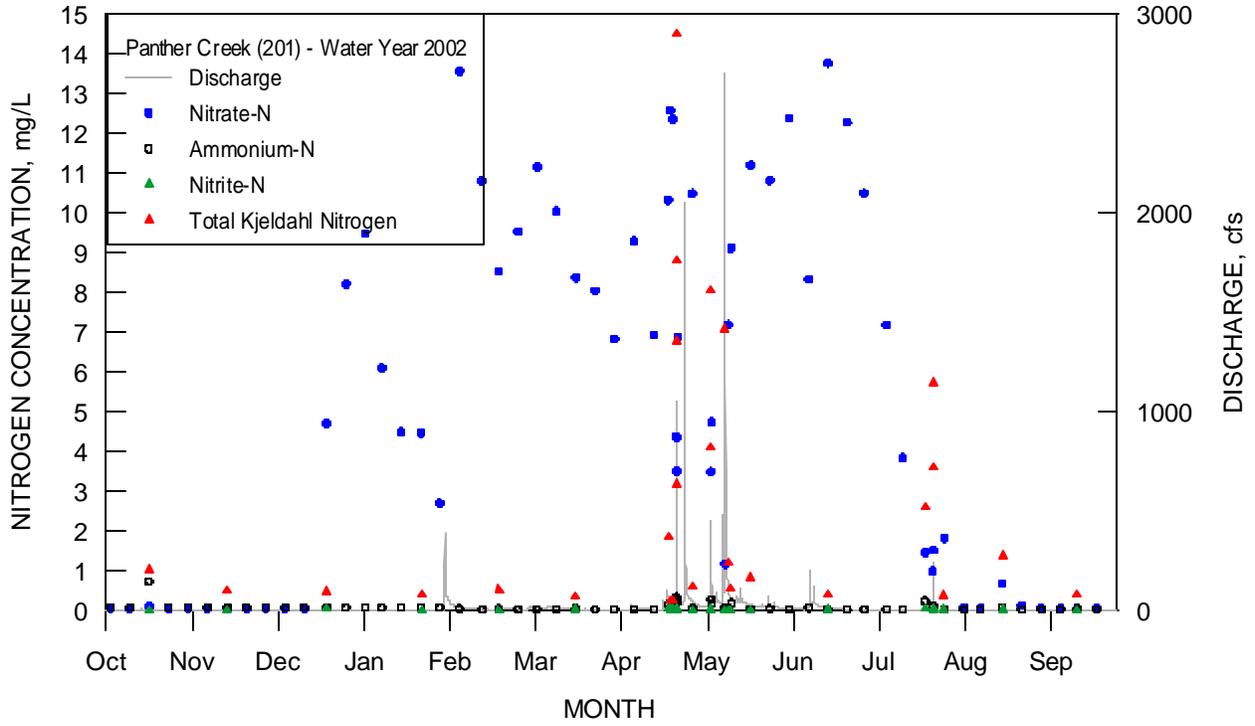


Figure 21. Concentrations of nitrogen species and water discharge at Panther Creek (201) – Water Years 2002 and 2003

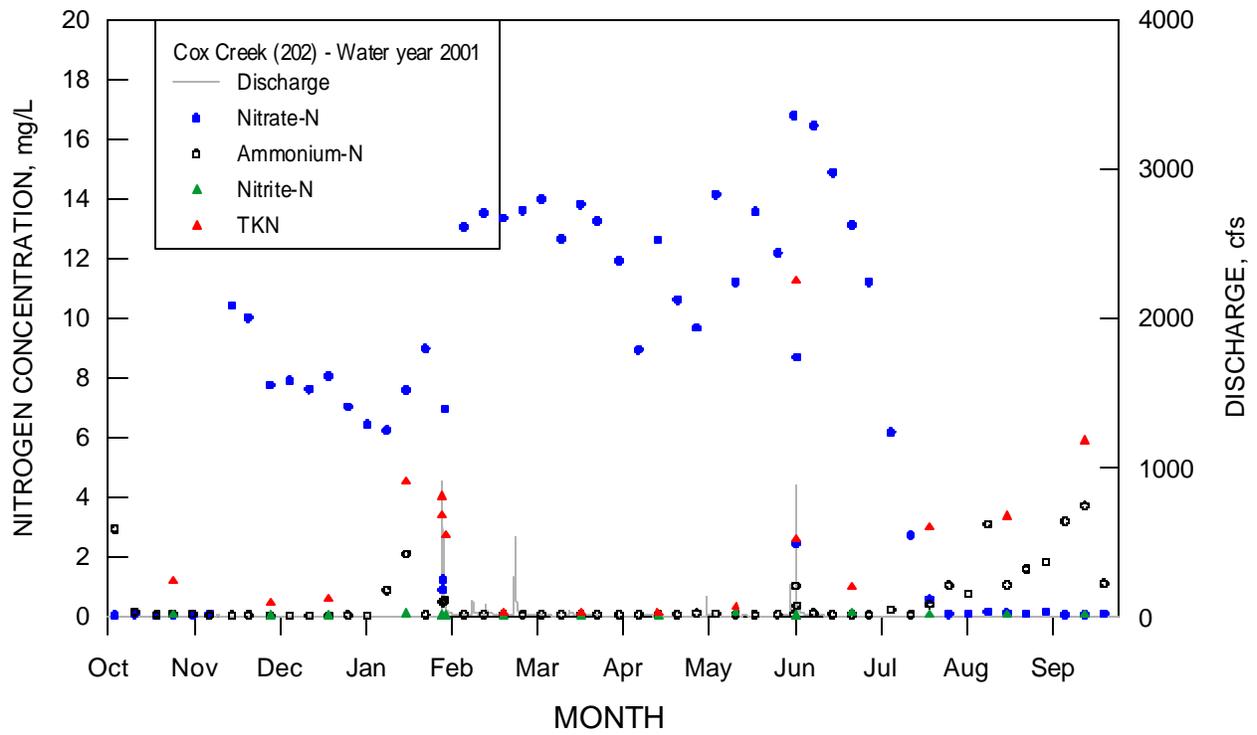
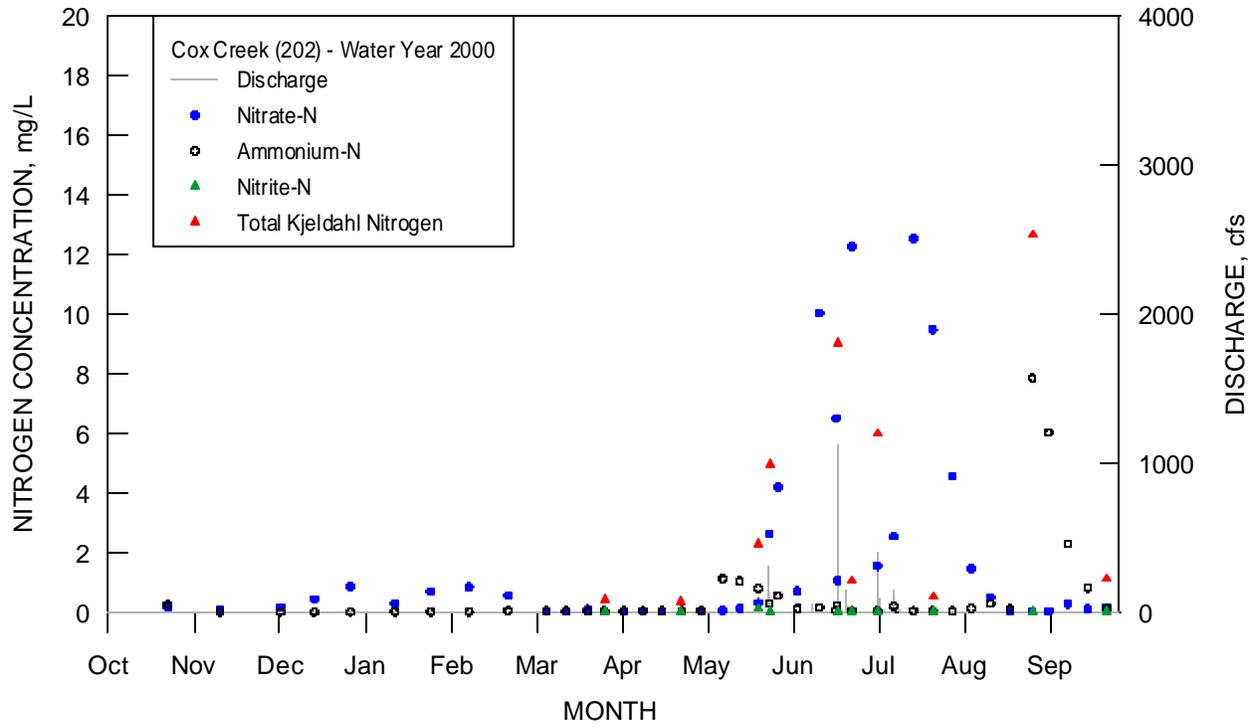


Figure 22. Concentrations of nitrogen species and water discharge at Cox Creek (202) – Water Years 2000 and 2001

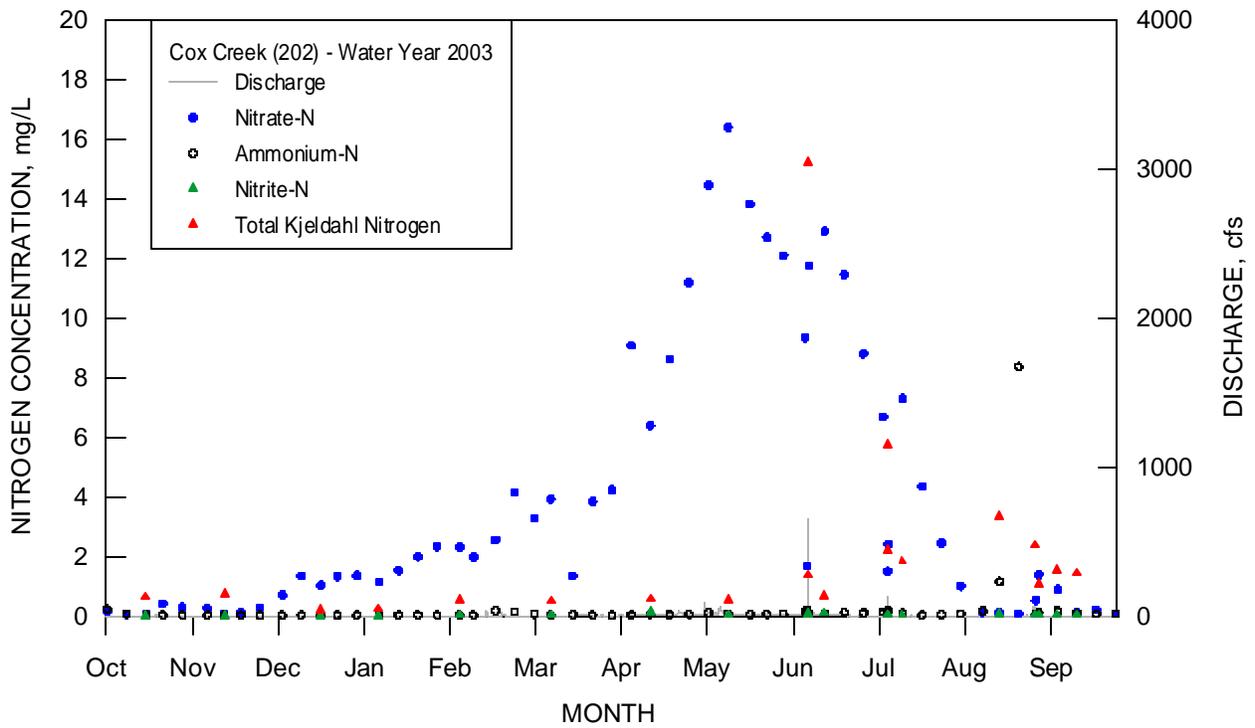
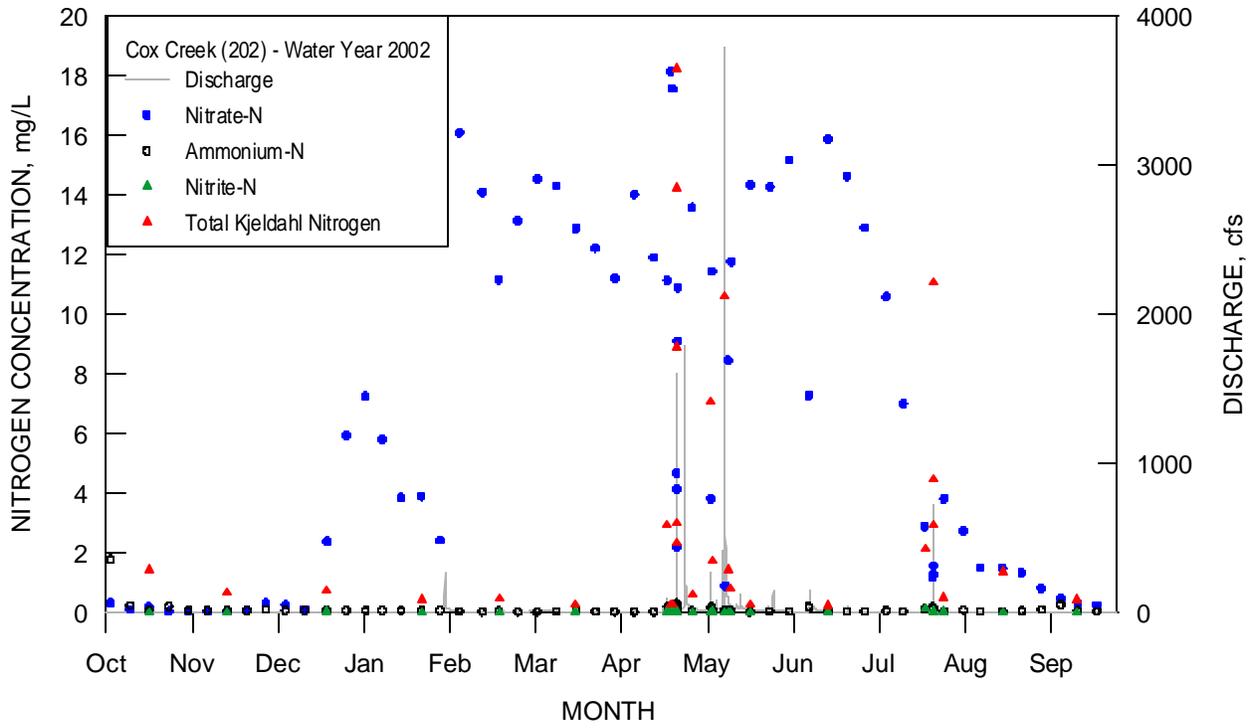


Figure 23. Concentrations of nitrogen species and water discharge at Cox Creek (202) – Water Years 2002 and 2003

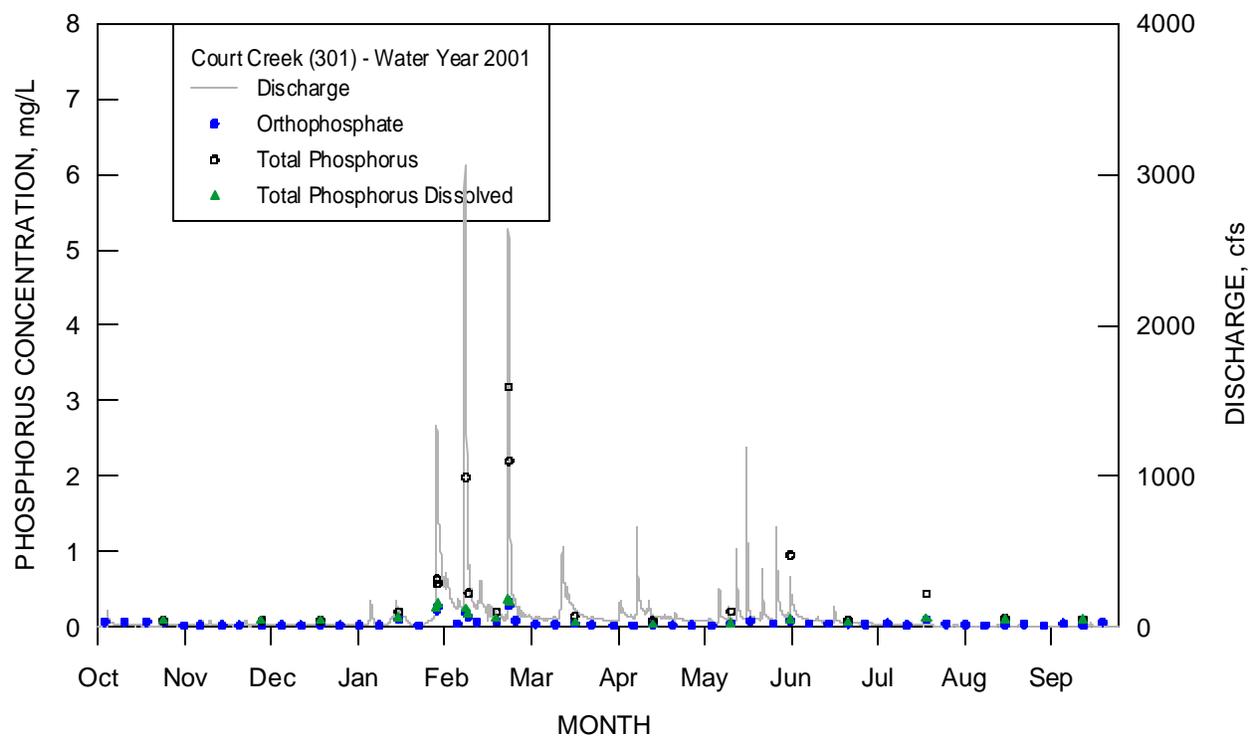
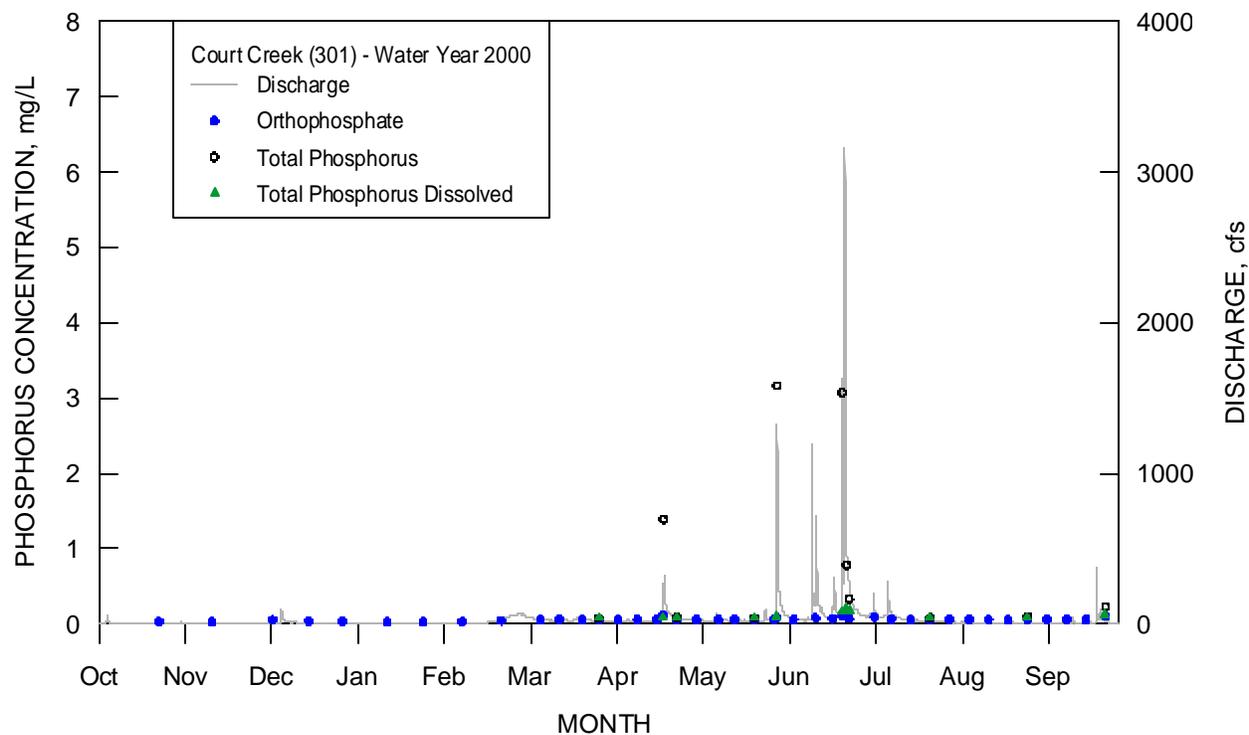


Figure 24. Concentrations of phosphorous species and water discharge at Court Creek (301) – Water Years

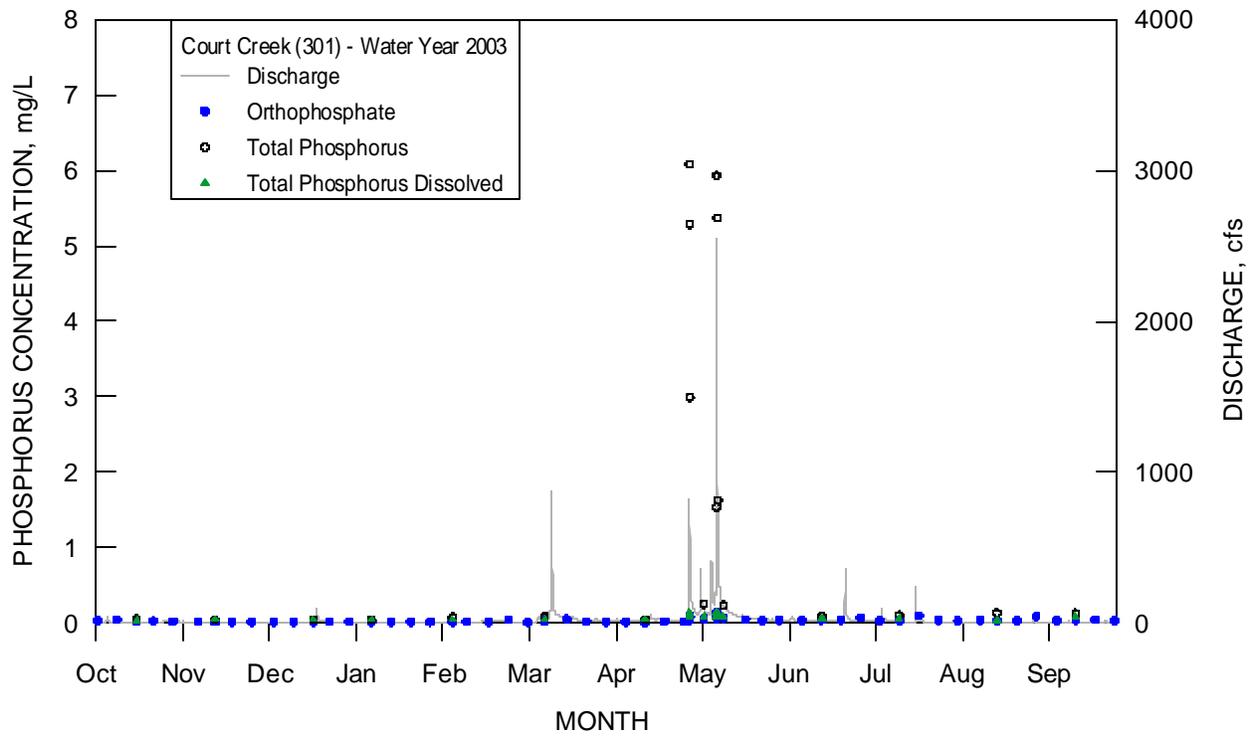
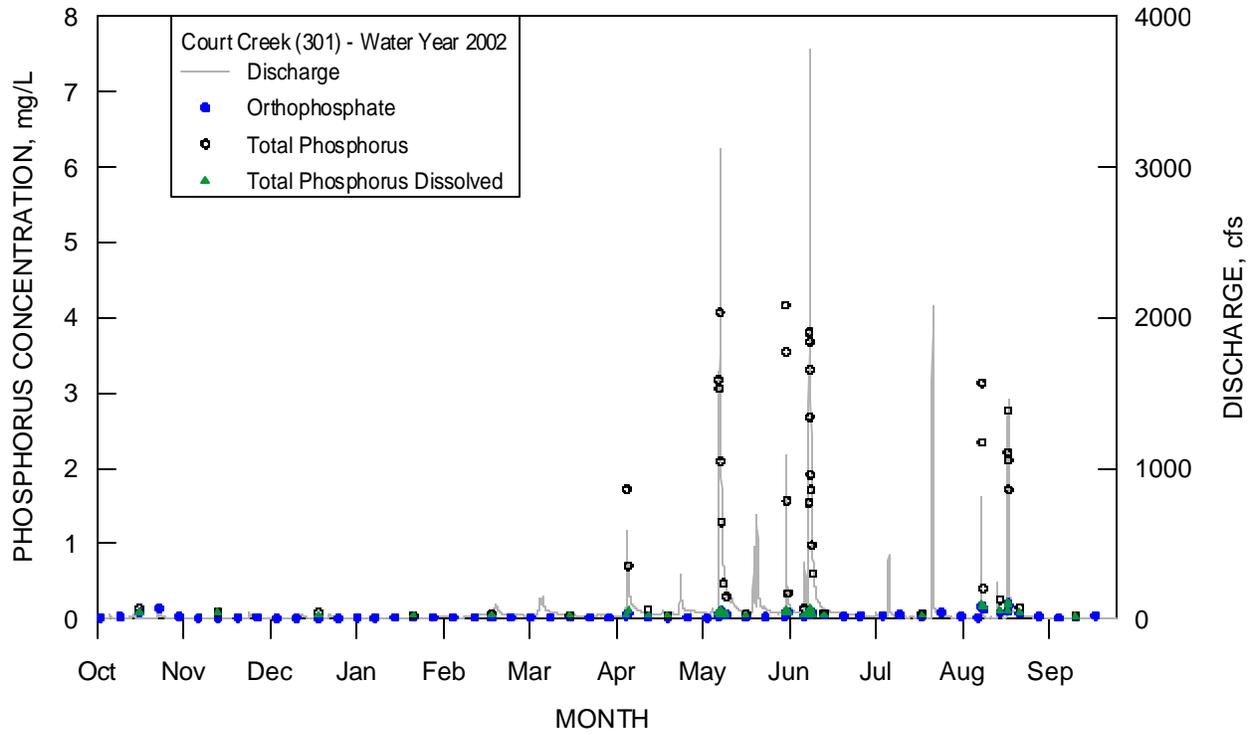


Figure 25. Concentrations of phosphorous species and water discharge at Court Creek (301) – Water Years 2002 and 2003

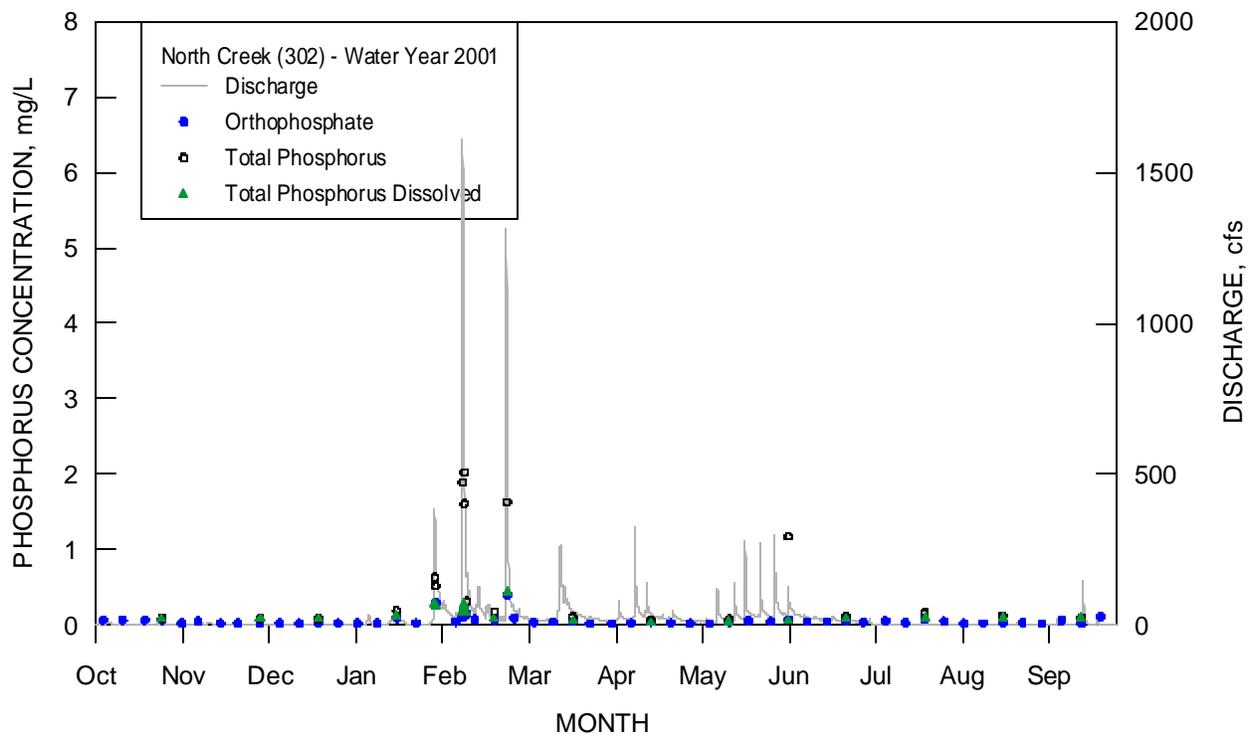
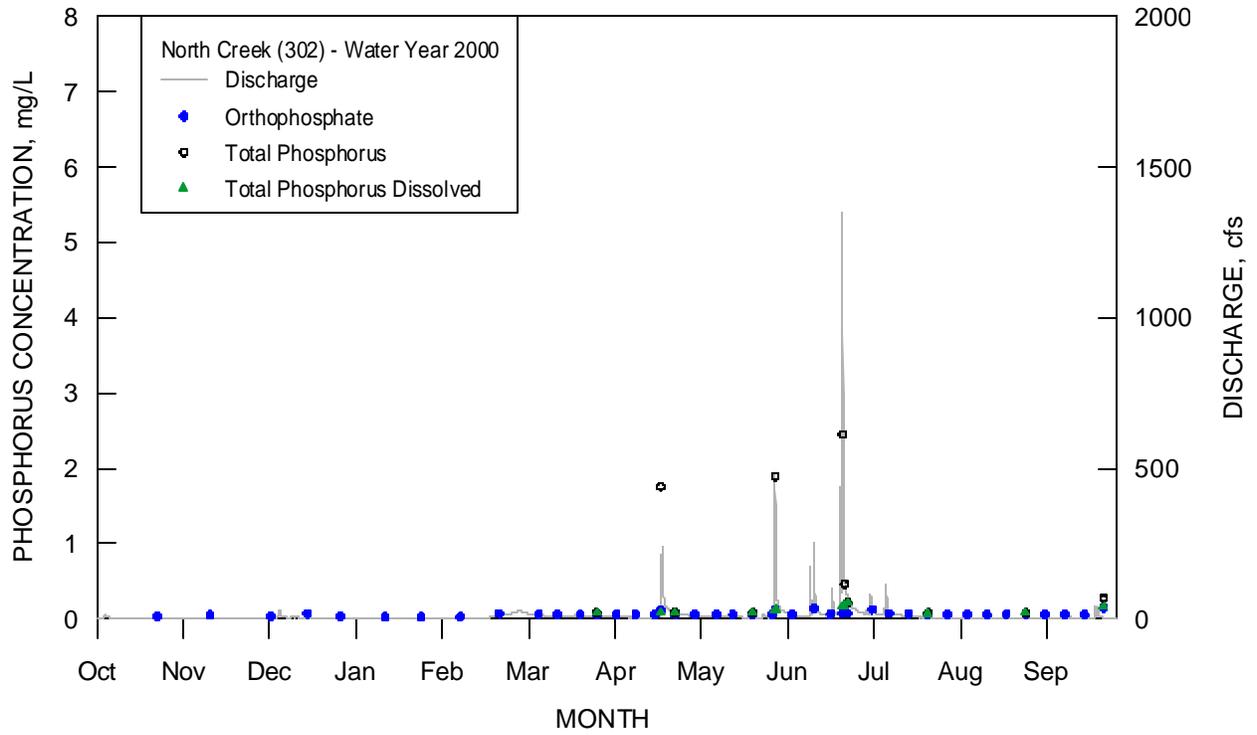


Figure 26. Concentrations of phosphorous species and water discharge at North Creek (302) – Water Years 2000 and 2002

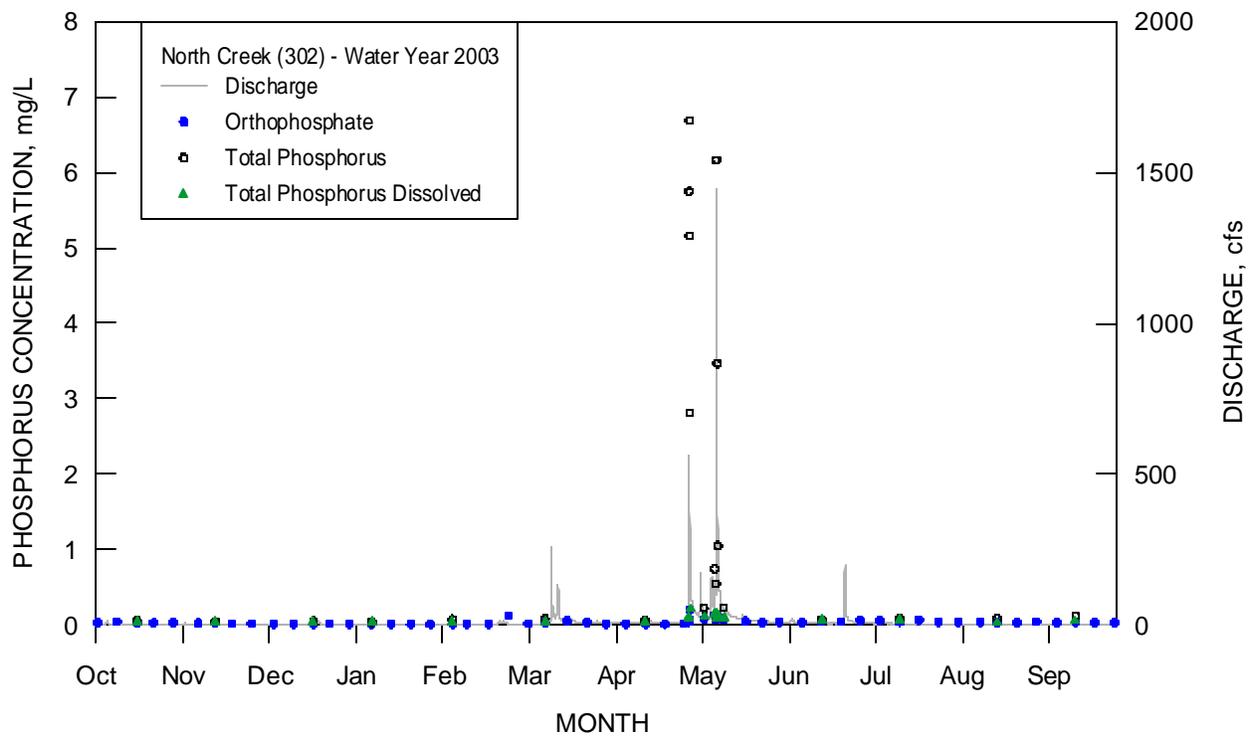
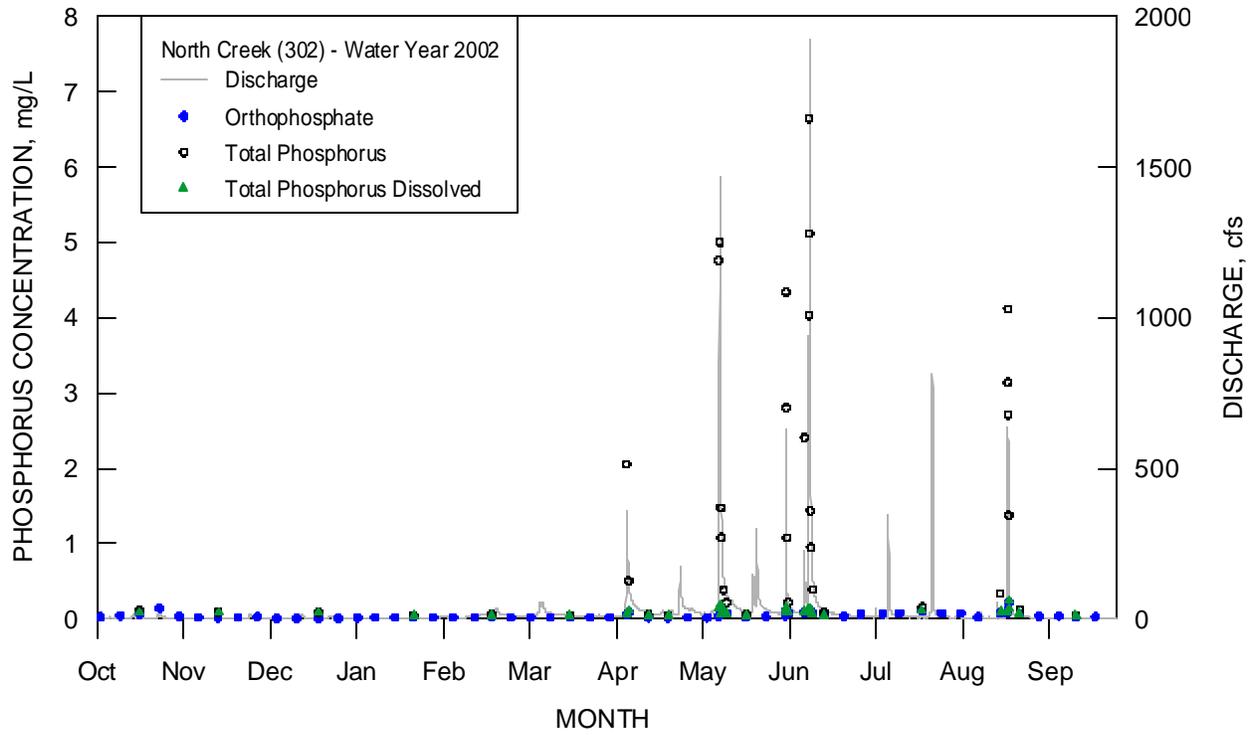


Figure 27. Concentrations of phosphorous species and water discharge at North Creek (302) – Water Years 2002 and 2003

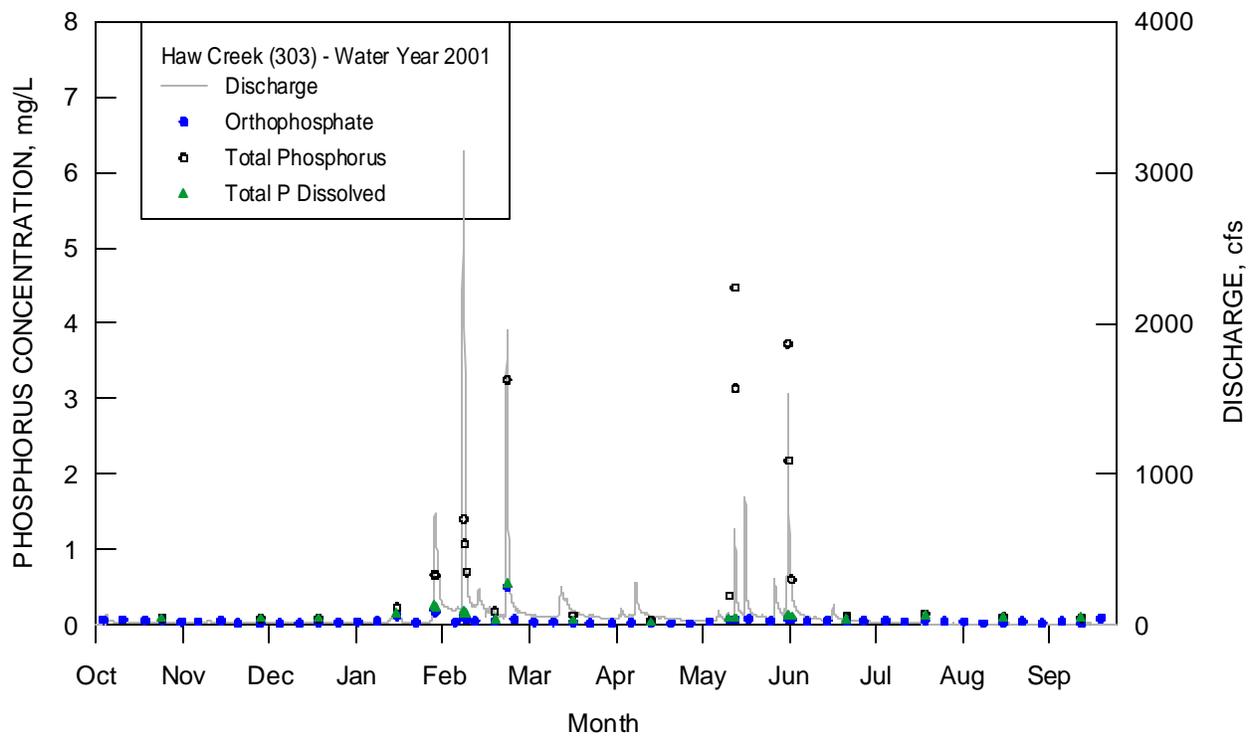
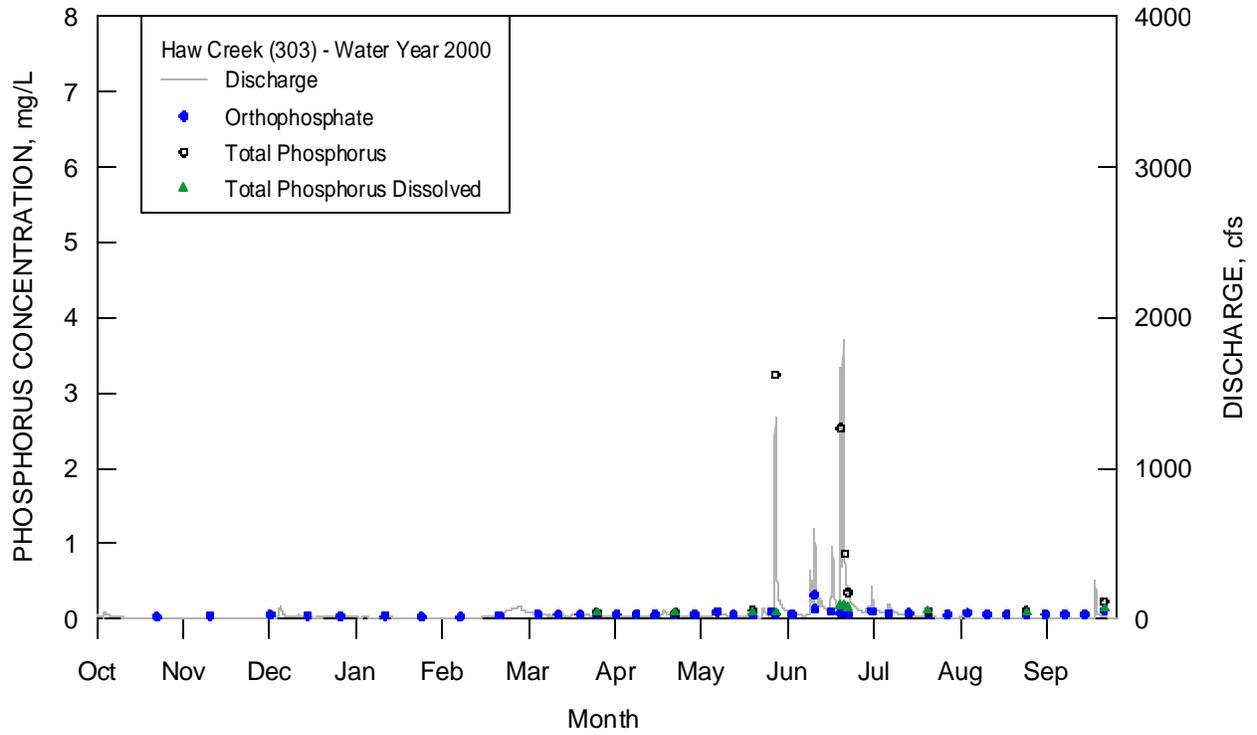


Figure 28. Concentrations of phosphorous species and water discharge at Haw Creek (303) – Water Years 2000 and 2001

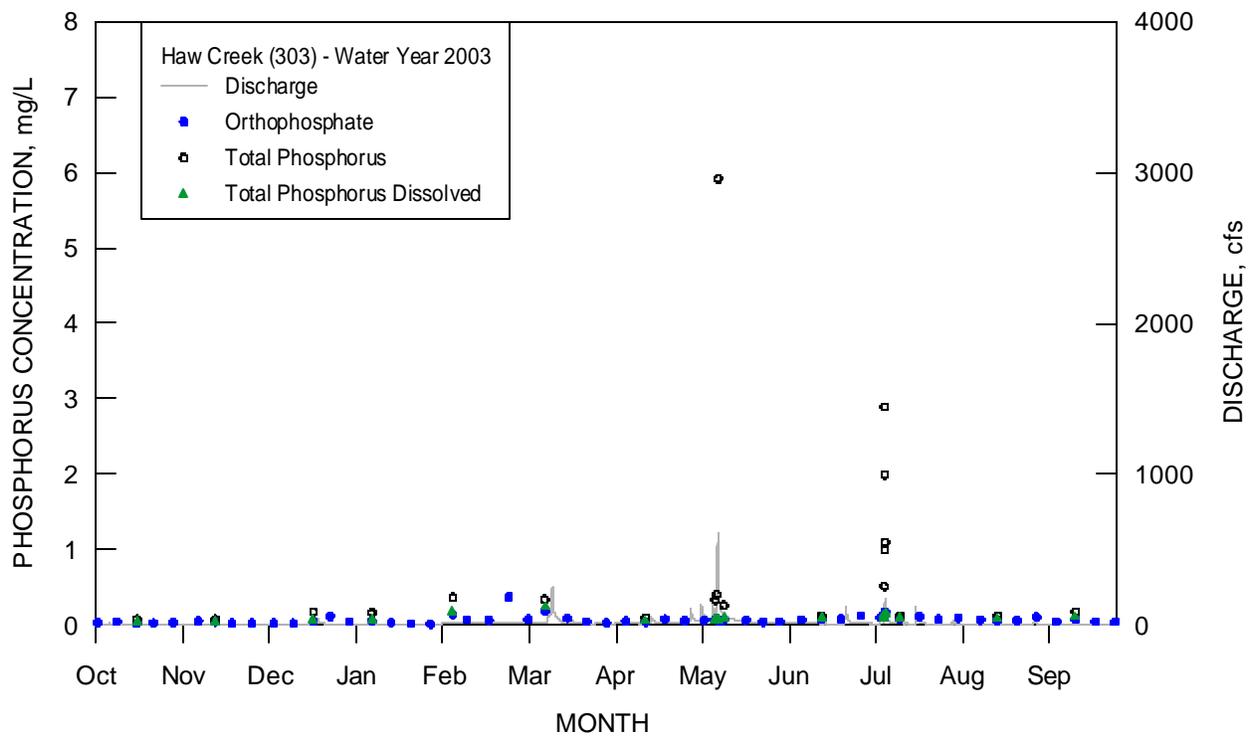
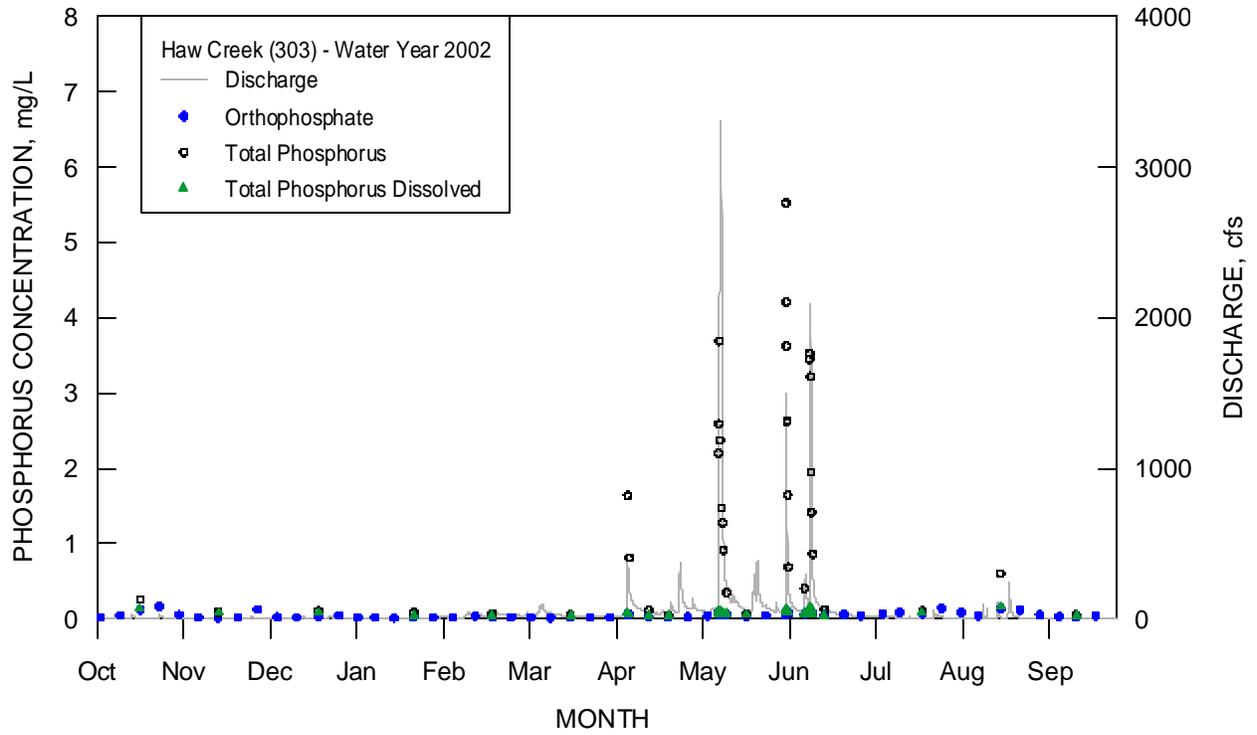


Figure 29. Concentrations of phosphorous species and water discharge at Haw Creek (303) – Water Years 2002 and 2003

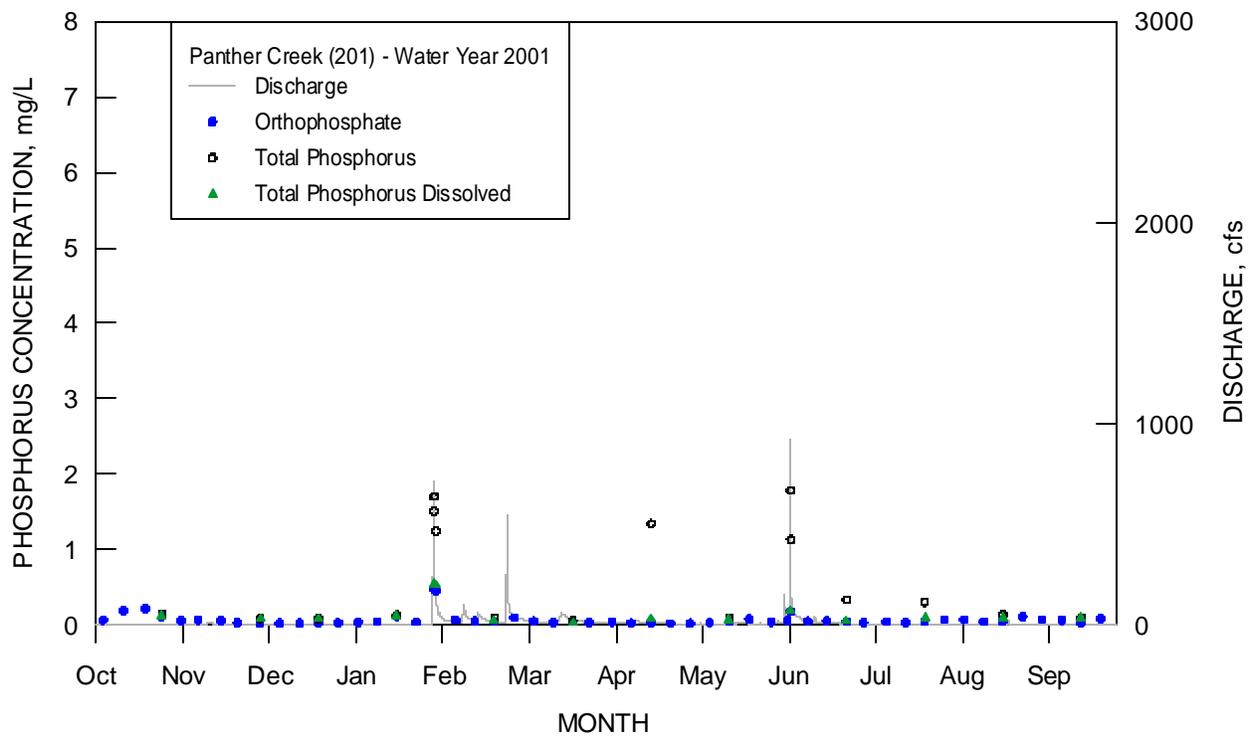
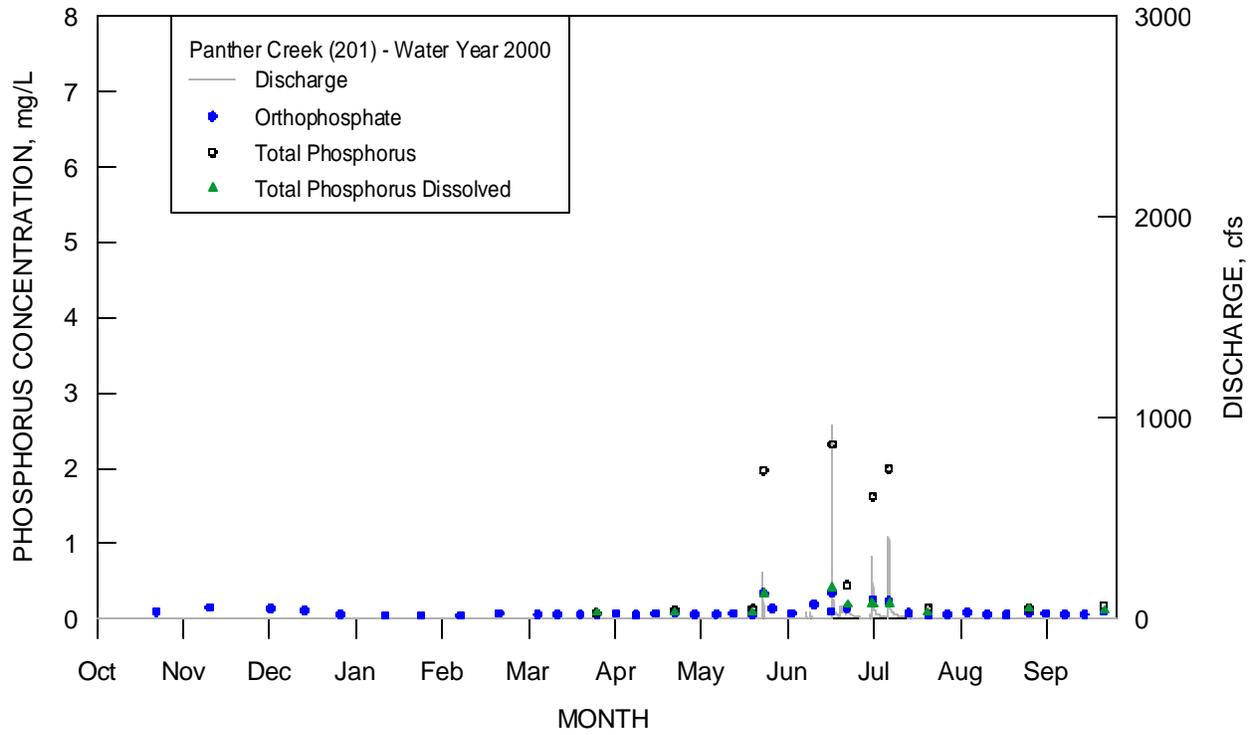


Figure 30. Concentrations of phosphorous species and water discharge at Panther Creek (201) – Water Years 2000 and 2001

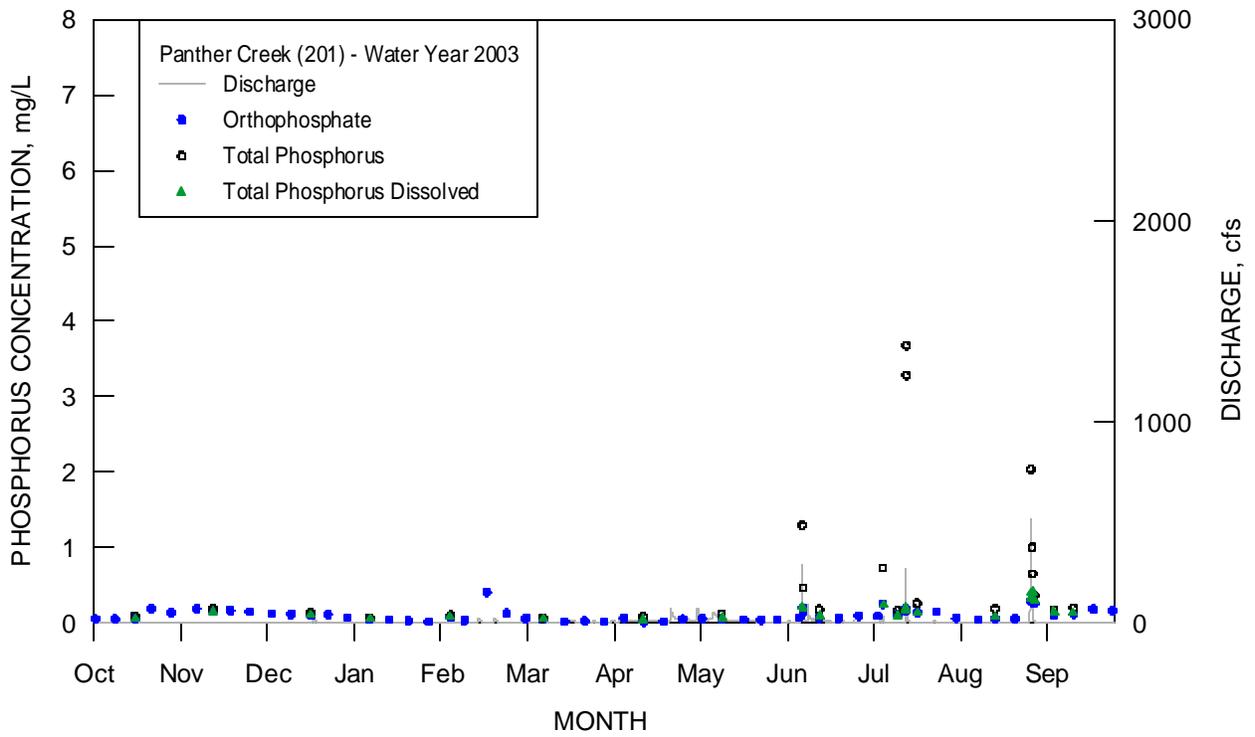
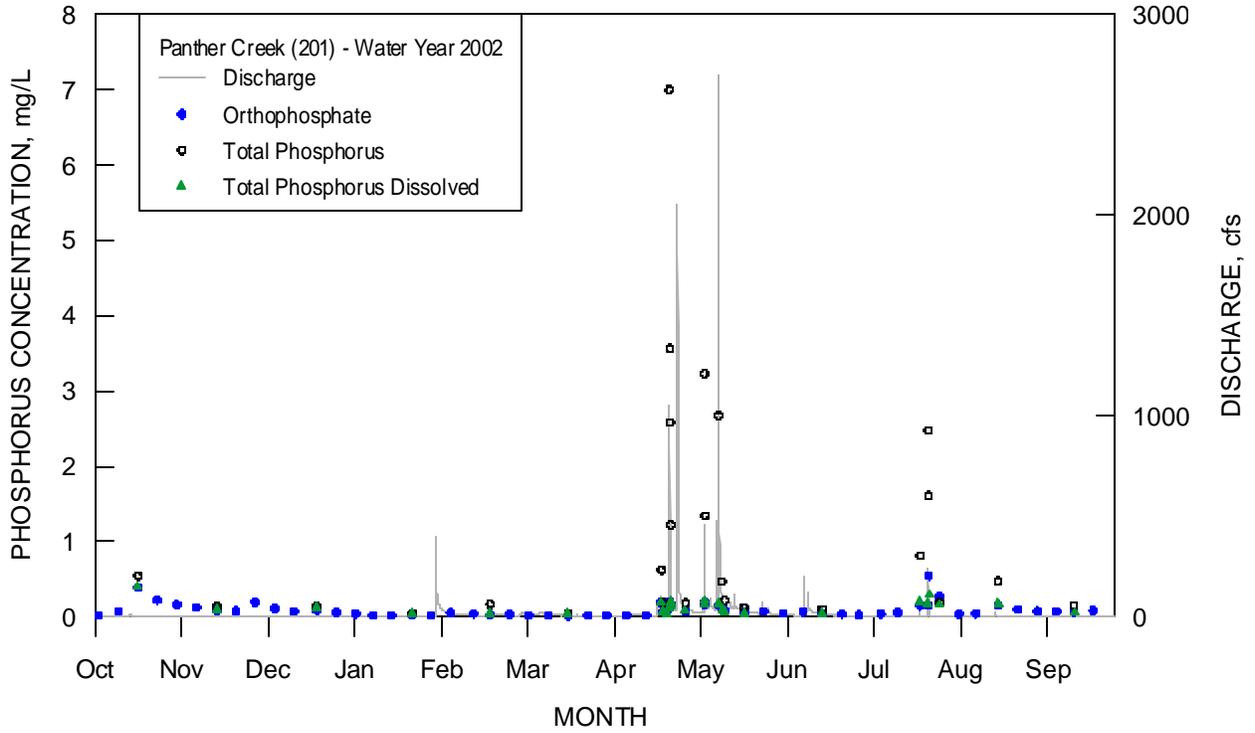


Figure 31. Concentrations of phosphorous species and water discharge at Panther Creek (201) – Water Years 2002 and 2003

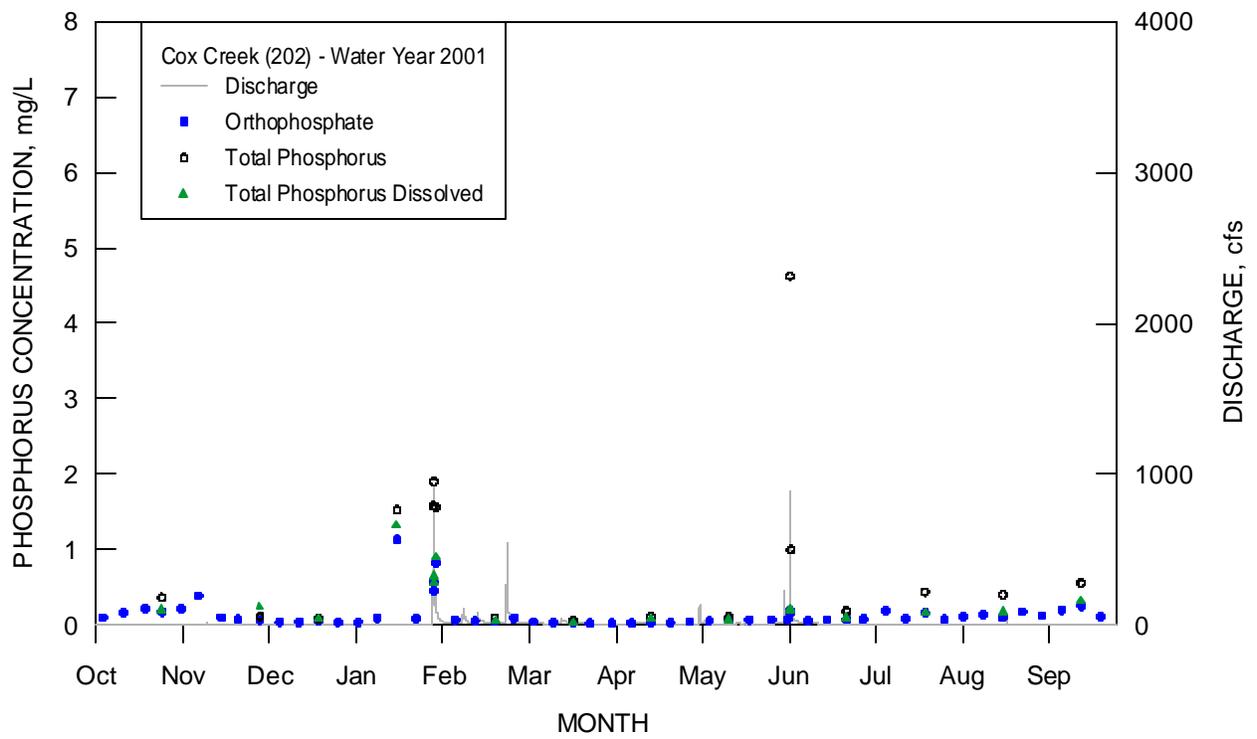
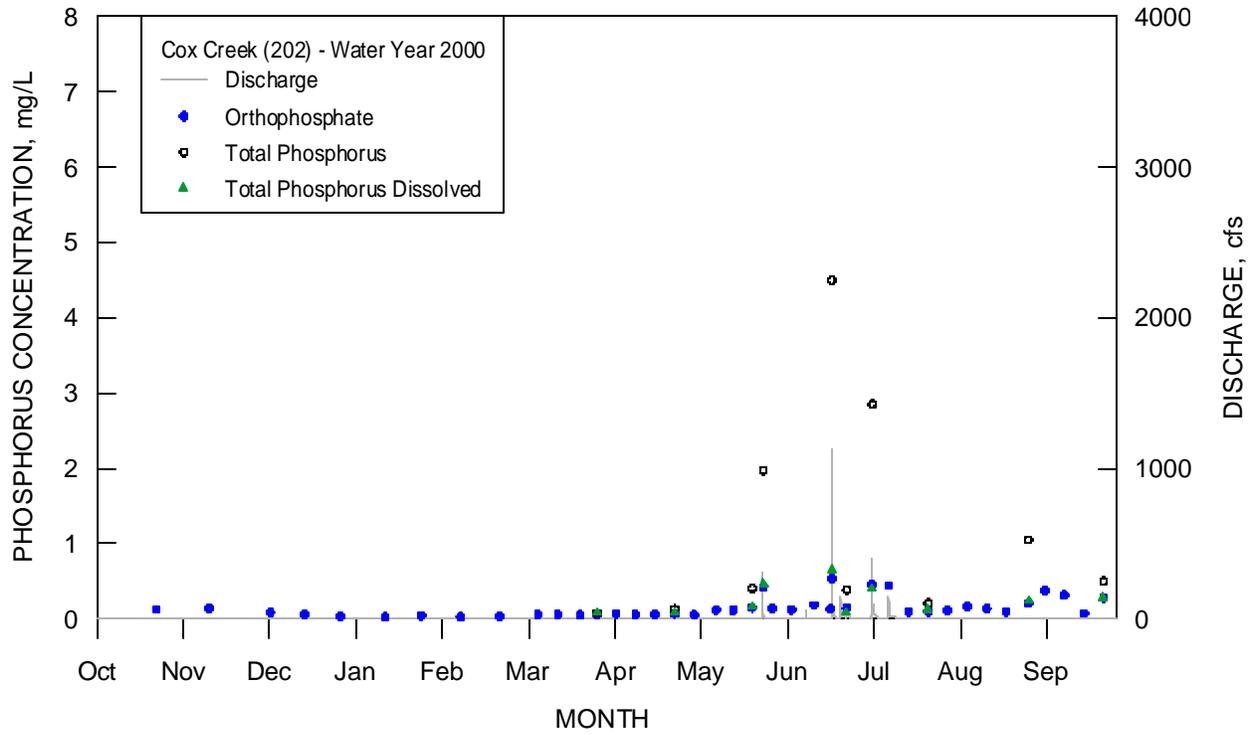


Figure 32. Concentrations of phosphorous species and water discharge at Cox Creek (202) – Water Years 2000 and 2001

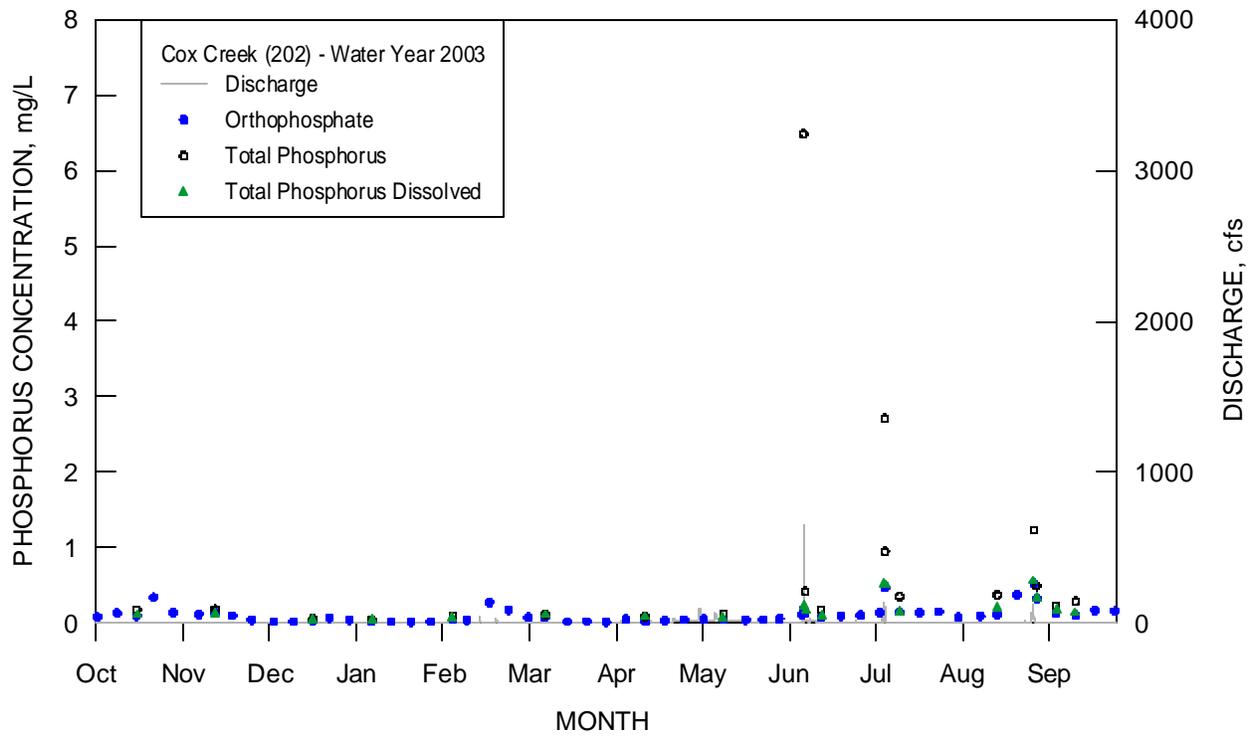
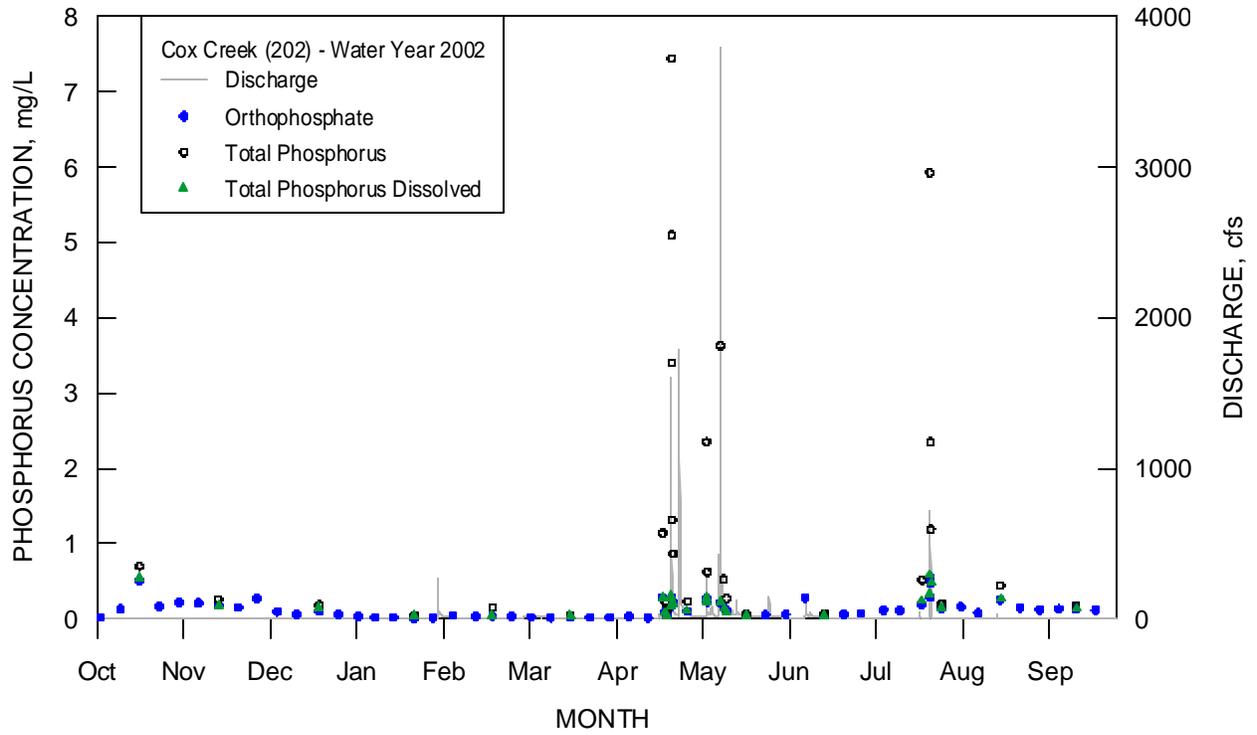


Figure 33. Concentrations of phosphorous species and water discharge at Cox Creek (202) – Water Years 2002 and 2003

**Table 2. Summary of Annual Water Discharges, Sediment and Nutrient Loads at Court Creek Monitoring Station (301)**

<i>Water Year</i>	<i>Water Discharge</i> (cfs)	<i>Load</i>		
		<i>Sediment</i> (tons)	<i>Nitrate-N</i> (tons)	<i>Total phosphorous</i> (tons)
2000	11,880	26,504	131.2	35.0
2001	22,100	43,511	274.8	39.2
2002	17,320	62,841	203.7	47.9
2003	6,805	21,725	59.9	18.3

**Table 3. Summary of Annual Water Discharges, Sediment and Nutrient Loads at North Creek Monitoring Station (302)**

<i>Water Year</i>	<i>Water Discharge</i> (cfs)	<i>Load</i>		
		<i>Sediment</i> (tons)	<i>Nitrate-N</i> (tons)	<i>Total phosphorous</i> (tons)
2000	4,009	6,954	42.8	10.4
2001	8,091	16,718	102.9	12.7
2002	7,372	29,266	97.8	24.2
2003	3,039	11,381	32.9	9.1

**Table 4. Summary of Annual Water Discharges, Sediment and Nutrient Loads at Haw Creek Monitoring Station (303)**

<i>Water Year</i>	<i>Water Discharge</i> (cfs)	<i>Load</i>		
		<i>Sediment</i> (tons)	<i>Nitrate-N</i> (tons)	<i>Total phosphorous</i> (tons)
2000	11,433	21,258	162.2	32.0
2001	19,878	49,403	322.0	58.0
2002	15,603	44,148	256.5	42.8
2003	4,337	5,896	41.7	8.3

**Table 5. Summary of Annual Water Discharges, Sediment and Nutrient Loads at Panther Creek Monitoring Station (201)**

<i>Water Year</i>	<i>Water Discharge</i> (cfs)	<i>Load</i>		
		<i>Sediment</i> (tons)	<i>Nitrate-N</i> (tons)	<i>Total phosphorous</i> (tons)
2000	1,236	4,337	13.8	4.4
2001	3,550	9,806	84.9	5.1
2002	5,440	34,384	101.8	16.4
2003	1,578	2,946	26.4	1.8

**Table 6. Summary of Annual Water Discharges,  
Sediment and Nutrient Loads at Cox Creek Monitoring Station (202)**

<i>Water Year</i>	<i>Water Discharge</i> <i>(cfs)</i>	<i>Load</i>		
		<i>Sediment</i> <i>(tons)</i>	<i>Nitrate-N</i> <i>(tons)</i>	<i>Total phosphorous</i> <i>(tons)</i>
2000	894	4,149	10.3	5.7
2001	2,833	9,609	77.9	5.5
2002	4,242	23,143	100.6	16.1
2003	1,226	1,820	29.6	1.7

2000 at Cox Creek to a high of 322 tons in 2001 at Haw Creek. The total phosphorous loads ranged from a low of 1.7 tons in 2003 at Cox Creek to a high of 58 tons in 2001 at Court Creek. For comparison purposes, the water discharges, sediment, nitrate-N, and total phosphorous loads (for the five monitoring stations) are shown in figures 34-37. In terms of the total annual loads, the larger watersheds, Court and Haw consistently carry higher sediment and nutrient loads than Panther and Cox Creeks. However, per unit area Panther and Cox generate more sediment than Court, North, and Haw Creeks. For Nitrate-N load, Cox Creek was the highest per unit area load followed by Haw and Panther Creeks. Court and North Creek had lower per unit area nitrate-N load. The load per unit area for total phosphorous is very similar for all the five monitoring stations.

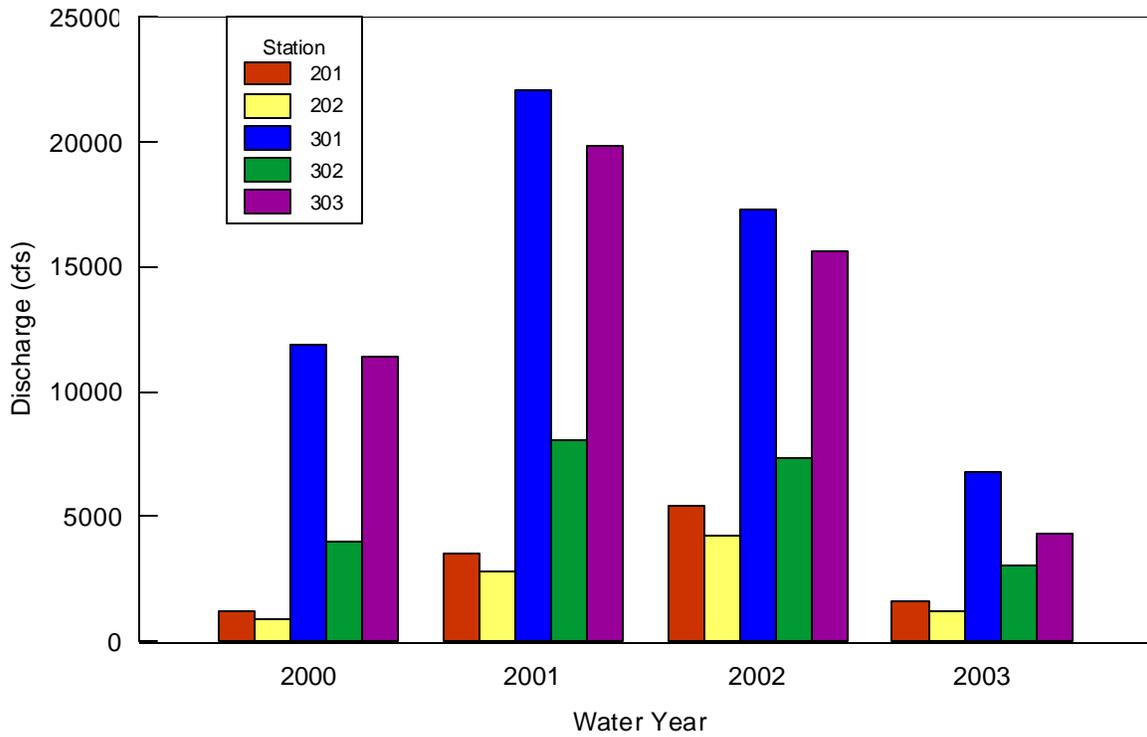


Figure 34. Annual water discharges at the five CREP monitoring stations

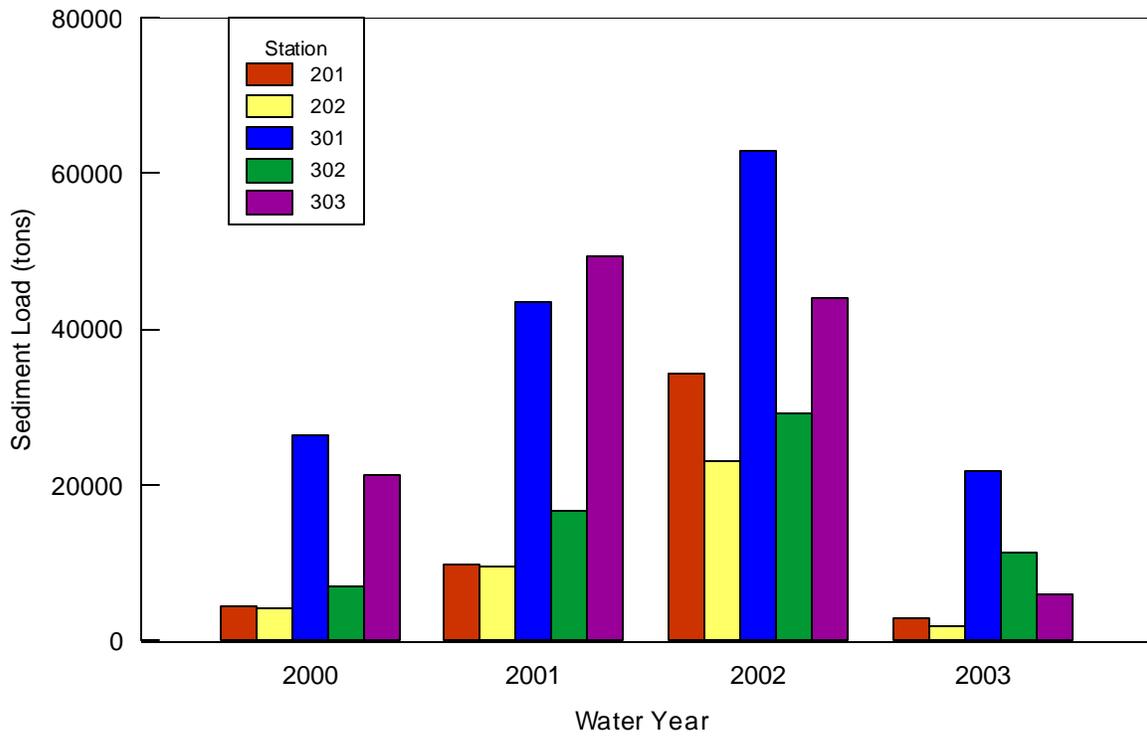


Figure 35. Annual suspended sediment load at the five CREP monitoring stations

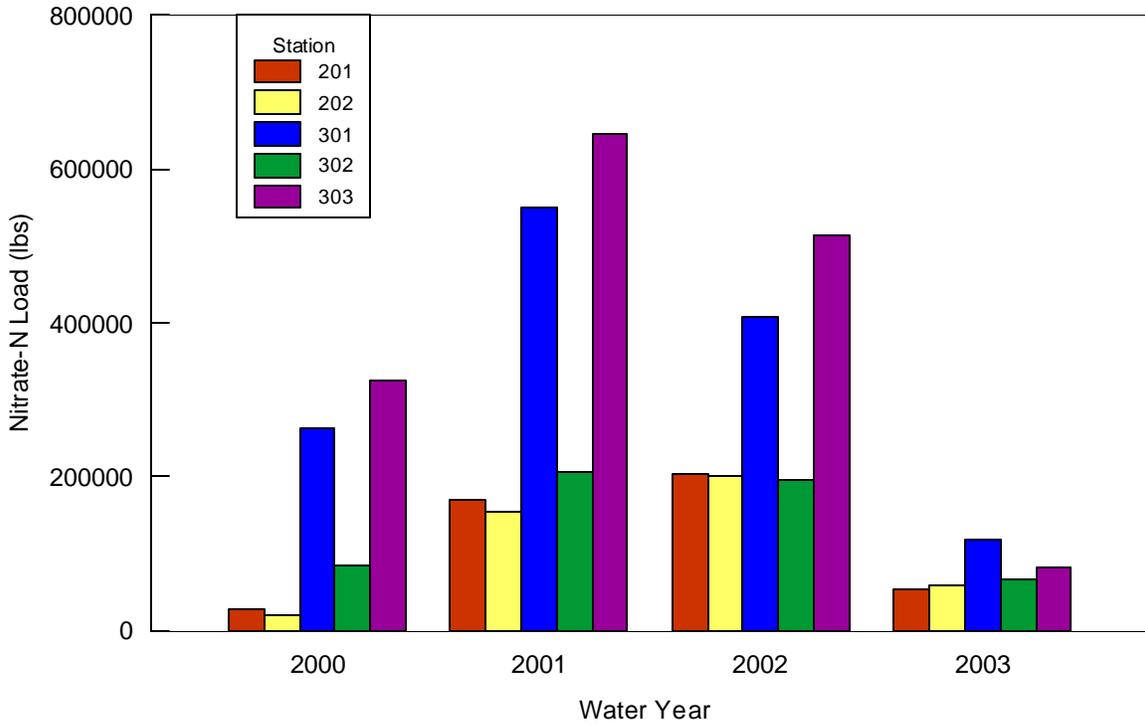


Figure 36. Annual nitrate-N load at the five CREP monitoring stations

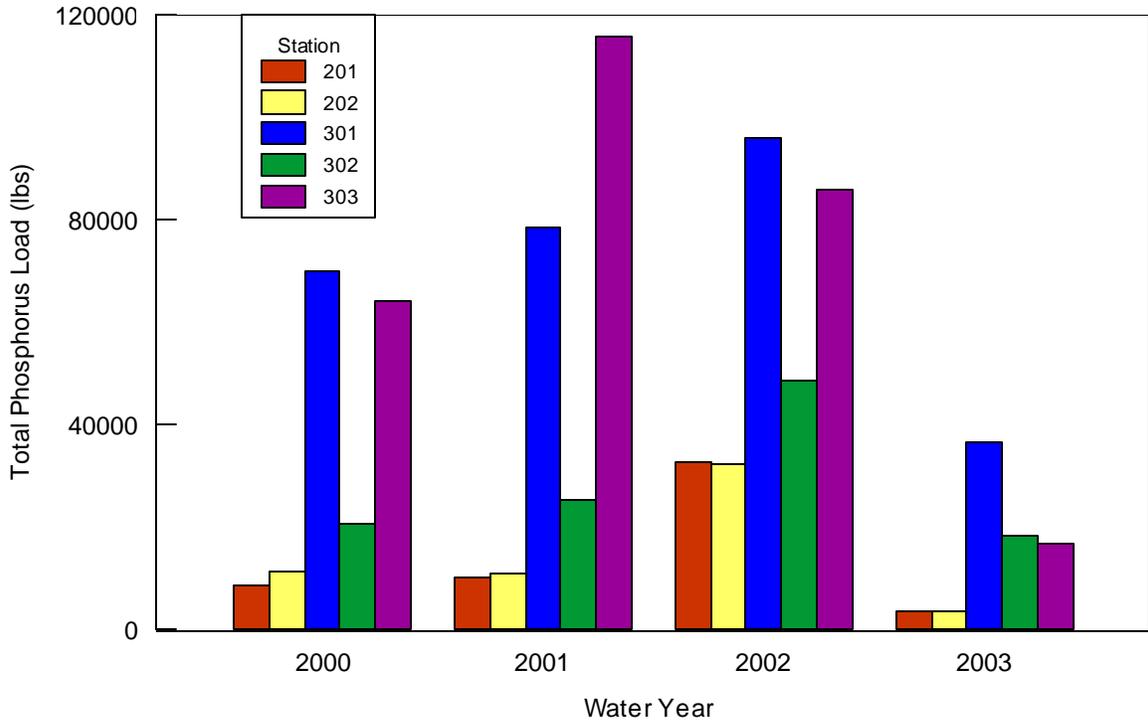


Figure 37. Annual total phosphorous load at the five CREP monitoring stations

## Land Use Practices

Outside of natural factors such as the physical settings and climate variability, land use practices are the main driving factors that affect watershed's hydrology, erosion, and sedimentation, and water quality. It is therefore important to document and analyze changes in land use practices in a given watershed to properly understand and explain changes in its hydrology, water quality, and the erosion and sedimentation process. The Illinois River basin has undergone significant changes in land use practices during the last century. These changes have been used to explain degradation in water quality and aquatic habitat along the Illinois River. In recent years, there have been significant efforts at the local, state, and federal level to improve land use practices by implementing conservation practices throughout the watershed. The Illinois River CREP is a course of major state and federal initiatives to significantly increase conservation and restoration practices in the Illinois River basin.

Historical agricultural land use practices and the recent conservation efforts including CREP are briefly discussed in the following paragraphs.

### Historical Agricultural Land Use Trends in Illinois

To provide a historical perspective to changes in land use practices in the Illinois River basin, we have compiled and analyzed historical land use data from different sources for the whole state. The earliest land use data is based on the Illinois Agricultural Statistics (IAS) records. The IAS data shows that in 1866 approximately 23 percent of the state's land area was in agricultural crop production. In 2003, agricultural production has increased to 65 percent of the state's land. As can be seen in figure 38a, there are two periods of significant changes in crop production. From 1866 through to the 1920s, crop production increased by 57 percent mostly due to a three-fold increase in small grain (wheat, oats, and hay) acreage. The other change occurred in the 1920s when small grain acreage declined in favor of soybeans. Essentially, from this period to present, a steady reversal in acreage has occurred between small grains and soybeans such that current soybean acreage is the same as was small grains were in the 1920s. From the 1920s to 2003, total Illinois land area in crop production increased by 35 percent. The dominant crops in 1866 were corn and small grains, whereas corn and soybeans (row crops) acreage was 93 percent of the total crop acreage in 2003. During the period of record (1866-2003), corn acreage has remained fairly steady at 9.2 million acres. Corn was harvested on 4.9 million acres in 1866 but increased to the long-term average acreage by 1881. Acreage peaked in 1976 at 11.6 million acres and was almost at that level in 2003 at 11.2 million acres.

In 1925, IAS began delineating agricultural crop production data by county, rather than as a state total, which allows for the estimation of crop acreage by basins. The Illinois River Basin (IRB) is nearly half of the Illinois land area, and occupies over 18 million acres when the watershed area in the states of Indiana and Wisconsin are included. Figure 38b shows similar trends in crop production as was seen for the State of Illinois. In 1925, 50 percent (9.2 million acres) of the IRB land area was in crop production while in 2003, 63 percent (11.5 million acres) was in crop production. The same reversal of small grain and soybean acreage is also seen. Corn acreage is fairly steady for the period of record, averaging 5.5 million acres, increasing from 4.4 to 7.0 million acres from 1925 to 1984, and slightly decreasing to 6.2 million

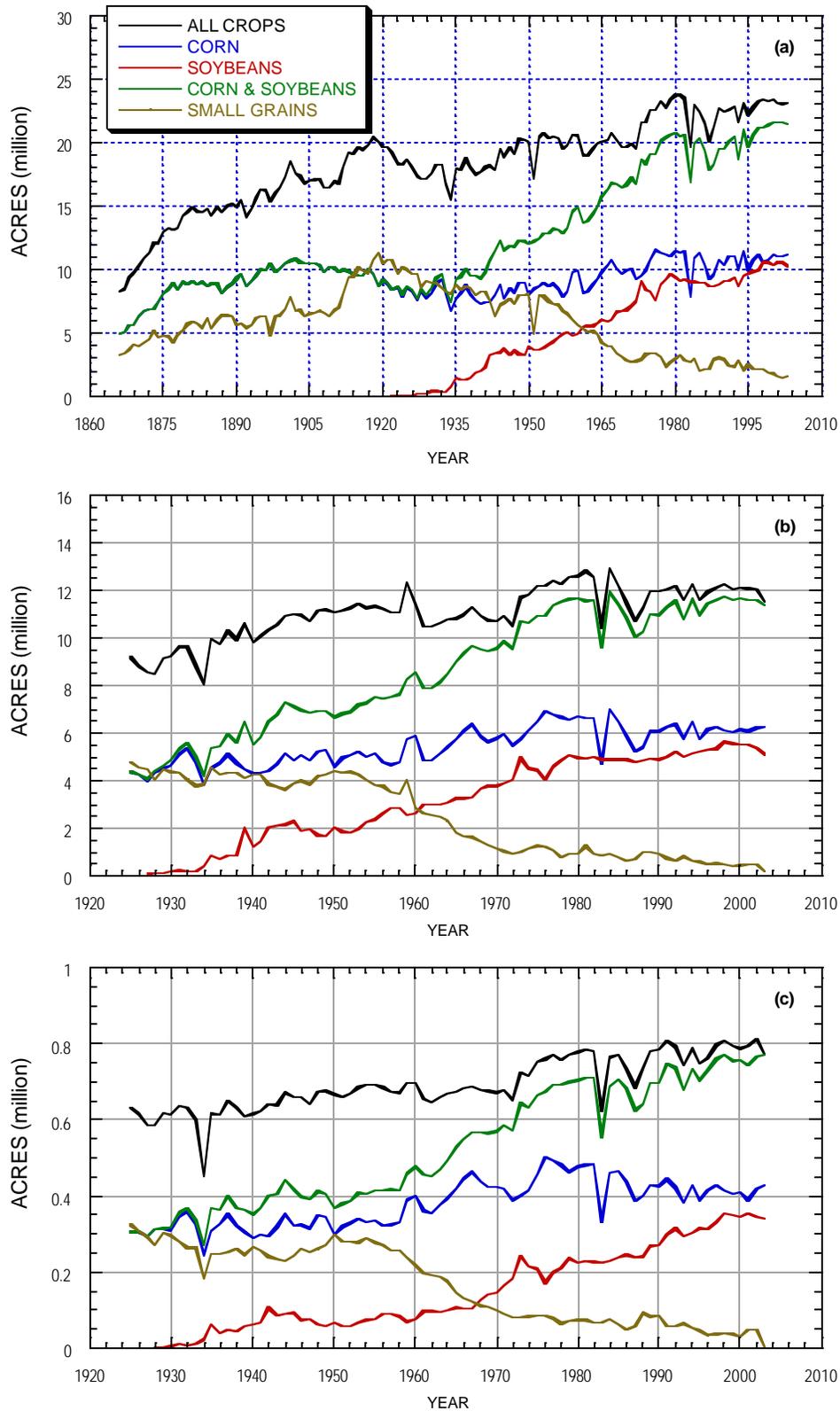


Figure 38. Acreage of agricultural land uses in Illinois: a) State of Illinois, 1866-2003; b) Illinois River Basin, 1925-2003; and c) Spoon River Watershed, 1925-2003

acres in 2003. Total IRB watershed area in crop production increased by 25 percent from 1925 to 2003, which is smaller than the 35 percent increase for the whole State of Illinois during the same period.

The Spoon River watershed is one of ten major tributaries to the Illinois River with a drainage area of 1.2 million acres (6.5 percent of the IRB drainage area). From 1925 to 2003, watershed area in crop production increased from 53 to 65 percent, which is similar to the increases in the IRB and the State of Illinois. Figure 38c shows that the trends in corn, small grains, and soybeans are also similar. Corn and small grain acreage was 0.63 million acres in 1925 and in 2003 corn and soybeans were 0.77 million acres. Corn acreage increased by 65 percent from 1925 to 1976 and then decreased by 15 percent through 2003. The total Spoon River watershed area in crop production increased by 22 percent during 1925-2003 period and is only slightly below that of the increase in the IRB.

### **Conservation Practices**

There has been a significant increase in the implementation of conservation practices in Illinois in recent years with CREP making a major contribution. IDNR has established different programs to document and track conservation practices in Illinois. The major initiative is known as the Illinois Conservation Practices Tracking System (ICPTS). The ICPTS is developing “a comprehensive database documenting the precise location, nature, and planned duration of conservation practices being implemented through Illinois CREP as well as other conservation incentive programs within the Illinois River basin,” (State of Illinois, Department of Natural Resources, 2002). The database will be very useful for assessing and evaluating the effectiveness of different programs in meeting their objectives. The land use data from the ICPTS database will be used along with the sediment and nutrient data being collected under the monitoring program to evaluate how conservation practices are influencing sediment and nutrient delivery to the Illinois River. Two examples of information and data on land use are shown in figures 39 and 40.

Figure 39 shows the location of approved Illinois CREP contracts from the USDA and state of Illinois from 1999 through 2003. With this type of information it will be possible to identify areas where there has been significant participation in the CREP program and where changes in sediment and nutrient delivery should be expected. The information will provide important input data to the watershed models that are being developed to evaluate the impact of land use changes on sediment and nutrient delivery. It is also possible to extract much more detailed land use information from the ICPTS as shown in figure 40 where the total acres in conservation practices are provided for small watersheds like Court and Haw Creeks on annual basis. The data shows the significant rate of increase in conservation practices in the Court and Haw Creek watersheds since 1997. This type of data will be extremely useful for assessing and evaluating the effectiveness of CREP and other conservation practices .

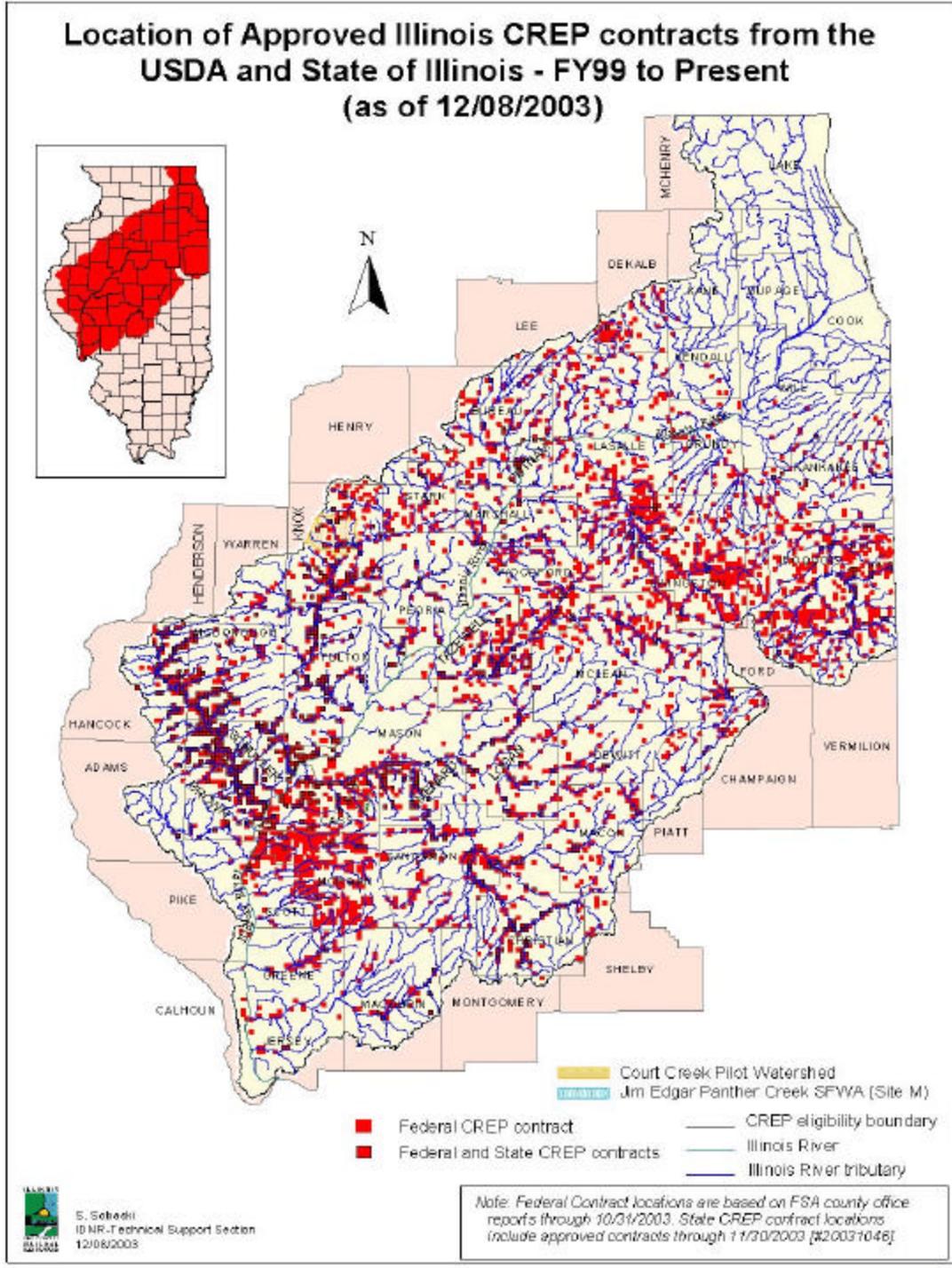
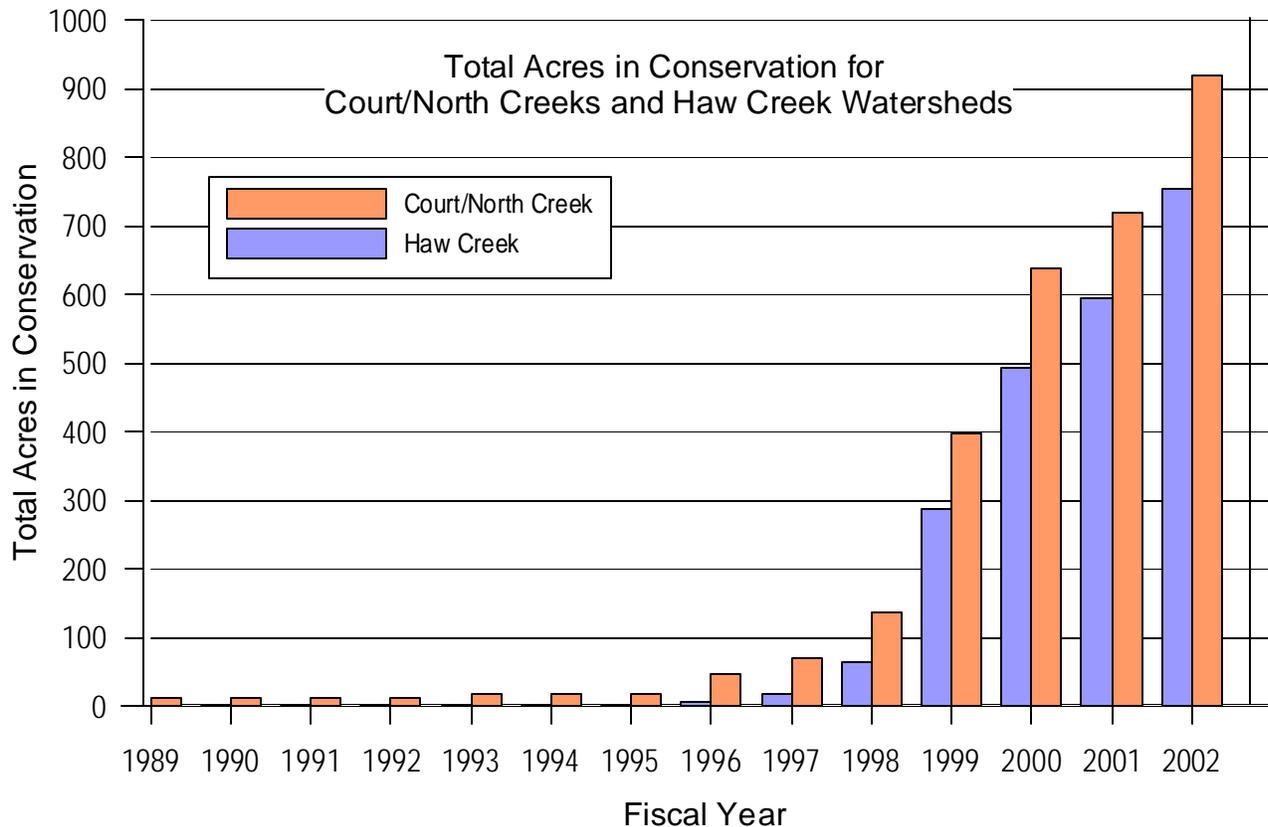


Figure 39. Location of approved Illinois CREP contracts from the USDA and State of Illinois – FY99 to 12/08/2003 (from S. Sobaski, IDNR)



**Figure 40. Total acres in conservation in Court, North and Haw Creek watersheds within the Spoon River watershed**

### **Model Development and Application**

The Illinois State Water Survey has been developing a watershed model for the Illinois River basin in support of the Illinois River Ecosystem project. In the initial phase, a hydrologic model of the entire Illinois basin has been developed and used to evaluate potential impacts of land use changes and climate variability on streamflow in the Illinois River basin. The model is based on the U.S. Environmental Protection Agency’s BASINS 3.0 modeling system. The Hydrologic Simulation Program – FORTRAN or HSPF (Bicknell et al., 2001) which is part of BASINS was used to simulate the hydrology of the Illinois River basin. The HSPF is a comprehensive and dynamic watershed model that also has the capability to simulate water quality and sediment transport.

To make the model applicable for assessing and evaluating the impact of CREP and other land use changes on water quality and sediment transport, the Water Survey has been developing the sediment transport and water quality capabilities of the HSPF model for the Illinois River basin. The initial effort has focused on the Spoon River watershed (figure 41) where two of the four intensively monitored watersheds, Court and Haw Creek, are located. Streamflow, sediment, and water quality data being collected at three monitoring stations are being used to calibrate and test the model for the Spoon River watershed. Once the calibration and validation process are completed for the Spoon River watershed, the model parameters can be used to develop models

for other similar watersheds to simulate the hydrology, sediment transport and water quality under different climatic and land use scenarios. Over time, as land use practices change significantly as a result of CREP and other conservation practices, the models being developed will provide the tools to evaluate and quantify changes in water quality and sediment delivery to the Illinois River.

The progress in model development for the Spoon River watershed is discussed in the following sections.

## **HSPF Model**

The HSPF model is a conceptual, comprehensive, long term continuous simulation watershed scale model which simulates non-point source hydrology and water quality, combines it with point source contributions, and performs flow and water quality routing in the watershed and its streams. The HSPF model simulates land-surface portion of the hydrologic cycle by a series of interconnected storages – an upper zone, a lower zone, and a ground-water zone. The fluxes of water between these storages and to the stream or atmosphere are controlled by model parameters. The model uses a storage routing technique to route water from one reach to the next during stream processes.

For sediment simulation, the surface erosion component of the HSPF model performs processes such as sediment detachment from the soil matrix in the pervious land segments during rainfall event, washoff of this detached sediment, scour of the soil matrix, and reattachment or compaction of the sediment. Storage and washoff of sediments from the impervious surfaces is also considered. The sediment load and transport in the stream channel is dependent on the particle diameter, density, fall velocity, shear stress for deposition and scour, and erodibility. The



Figure 41. Location of the Spoon River watershed

noncohesive (sand) and cohesive (silt and clay) sediment transport is simulated in the model using different subroutines.

Nutrients in the watershed soil in the HSPF model are simulated either as attached to organic or inorganic solids, dissolved in the overland flow, or as concentrations in the subsurface flow reaching the streams laterally. For both nitrogen and phosphorous compounds, the processes simulated include immobilization, mineralization, nitrification/denitrification (nitrogen only), plant uptake, and adsorption/desorption. The nutrient loads from the watershed undergo further transformation in the stream reaches.

## **Model Input Data**

The HSPF model requires spatial information about watershed topography, river/stream reaches, land use, soils, and climate. The hourly time-series of climate data required for hydrologic simulations using HSPF include precipitation, potential evapotranspiration (ET), potential surface evaporation, air temperature, dew-point temperature, wind speed, and solar radiation. The hourly precipitation data from the two ISWS gages, one each in Court Creek (ISWS31) and Haw Creek (ISWS32) watersheds, was used (figures 42 and 43). Daily precipitation data from the MRCC (Midwestern Regional Climate Center) gaging station at Galesburg (ID 113320) was also used after it was disaggregated into hourly data based on the hourly precipitation data from an ICN (Illinois Climate Network) station located in Monmouth (MON). The other time series of the climate inputs for the above three precipitation stations were obtained from the ICN station at Monmouth. Daily data from nine additional MRCC stations (figure 44) in or near the Spoon River watershed was also disaggregated into hourly data based on the hourly data from three stations at Peoria, Moline, and Augusta, as found in the BASINS database. These additional stations were used for the Spoon River watershed model.

For topographic inputs, the 30-meter Digital Elevation Model (DEM) raster dataset produced by the Illinois State Geological Survey (ISGS) and the United States Geological Survey (USGS) was used. The high resolution National Hydrography Dataset (NHD) developed by the USGS was used to provide stream/river reach information to the model. The land use data was obtained from the Illinois Department of Agriculture which is based on the satellite imagery of the State of Illinois acquired from three dates during the spring, summer, and fall seasons of 1999 and 2000. Land use in the study watersheds was classified as corn, soybean, rural grassland, forest, urban, wetland and other (figures 45, 46, and 47). The soils data was based on digitized County Soil Association Maps of the Knox County and the STATSGO dataset (figure 48). The soil type for various parts of the study watersheds were determined spatially from the digitized soils maps, but the parameters corresponding to the soil type were manually entered during development of the HSPF model.

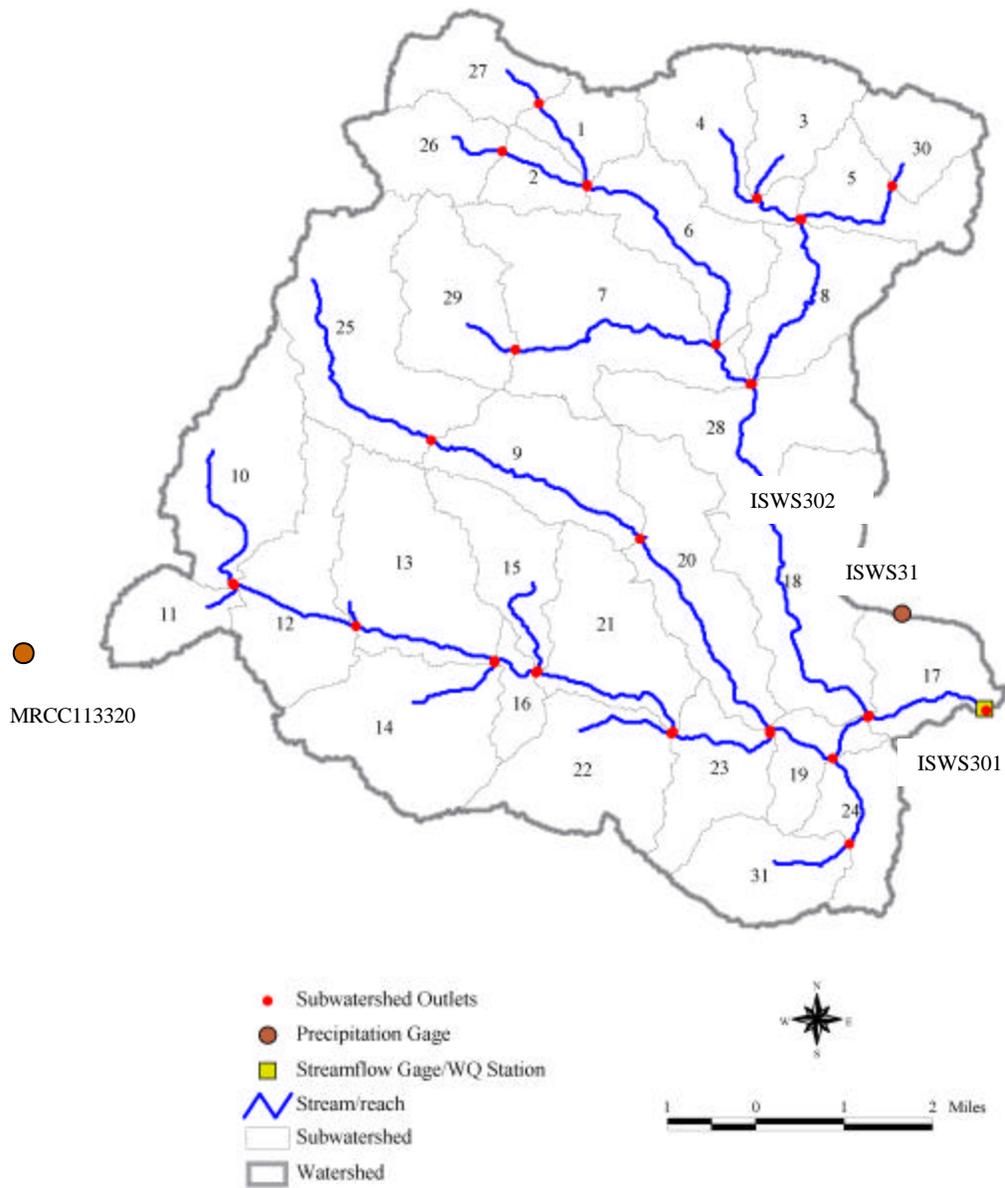


Figure 42. Schematic of the subwatershed and stream delineation, and precipitation gages used for the Haw Creek model



Figure 43. Schematic of the subwatershed and stream delineation, and precipitation gages used for the Haw Creek model

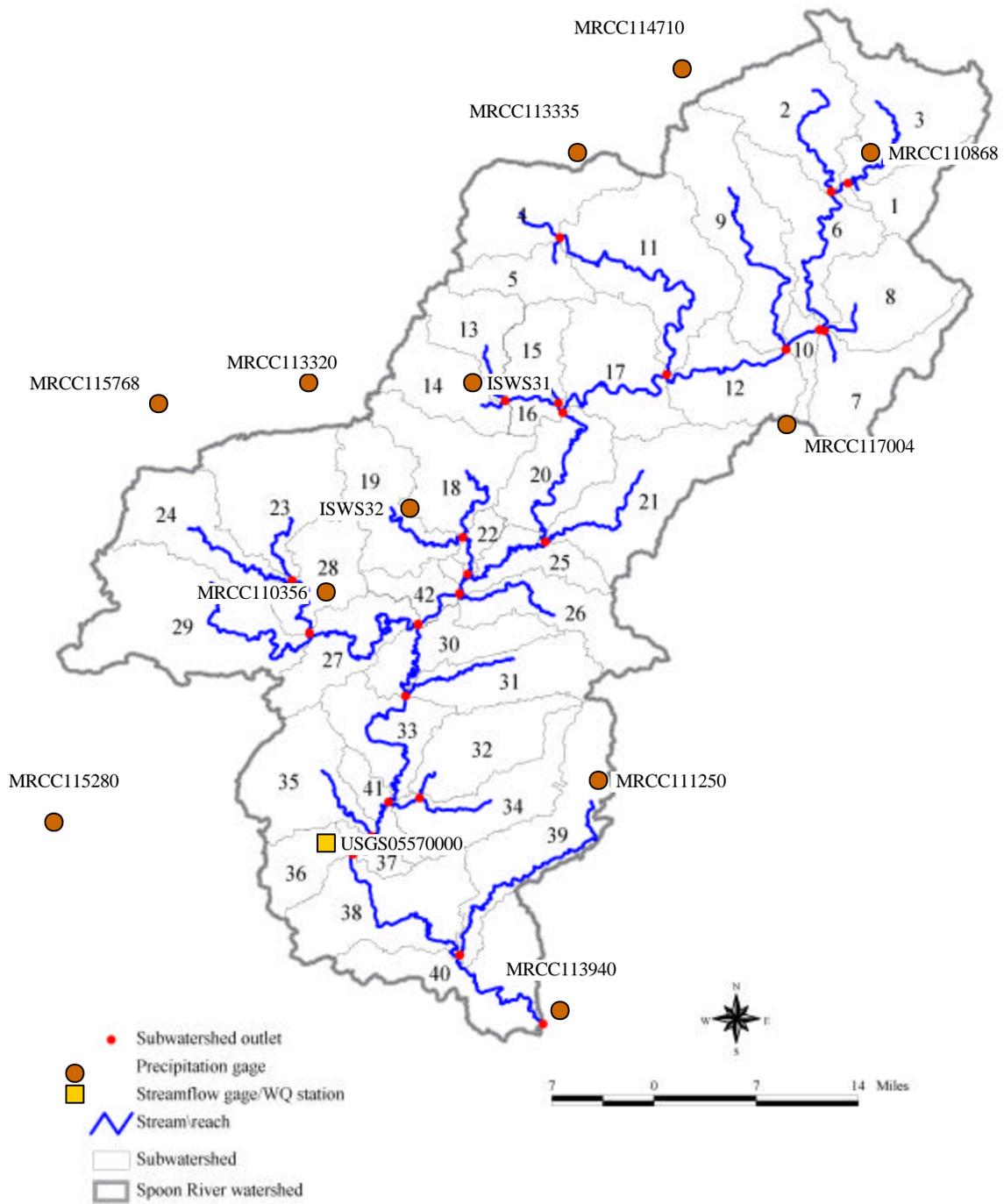


Figure 44. Schematic of the subwatershed and stream delineation, and precipitation gauges used for the Spoon River watershed model

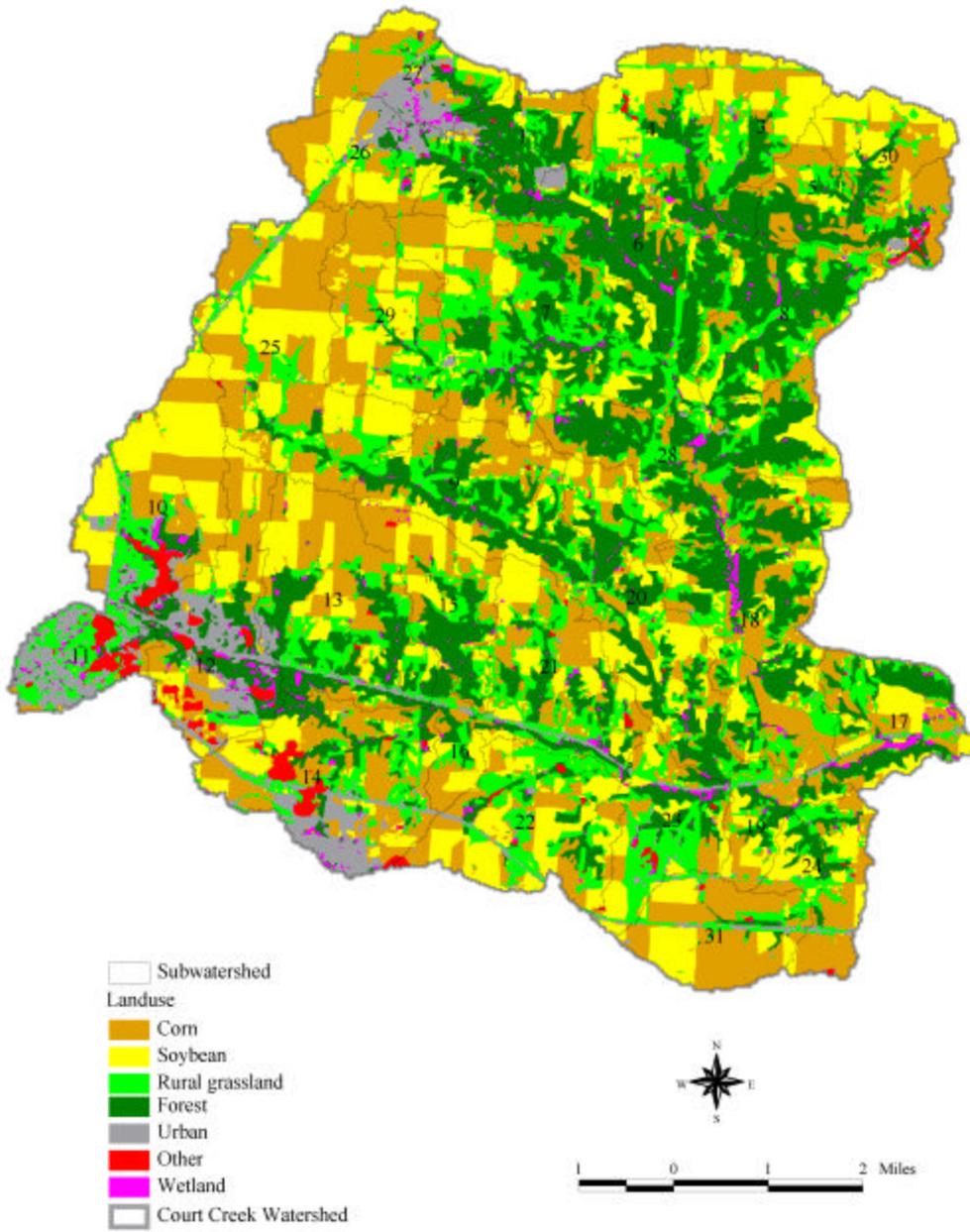


Figure 45. Land use in the Court Creek watershed

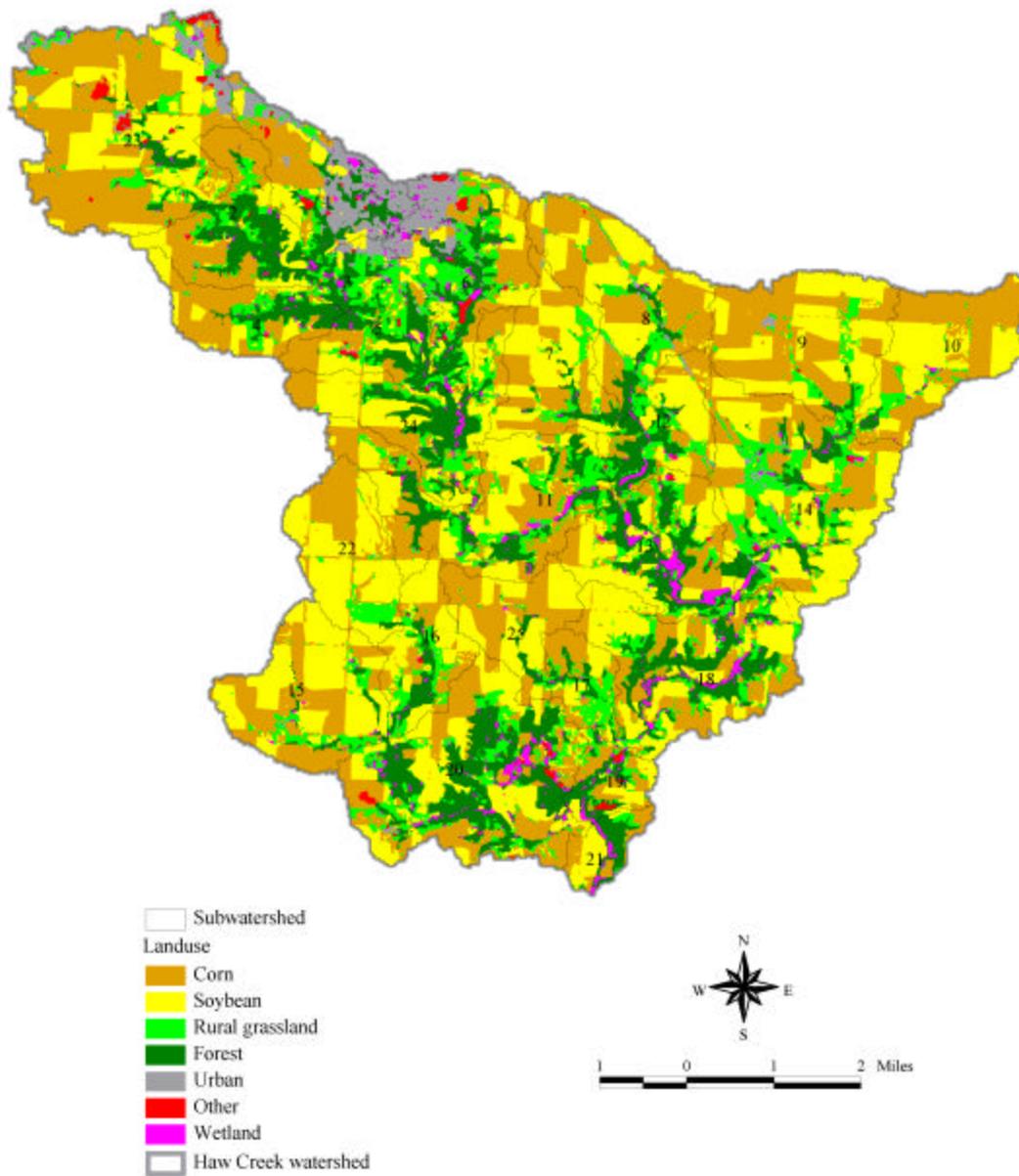


Figure 46. Land use in the Haw Creek watershed

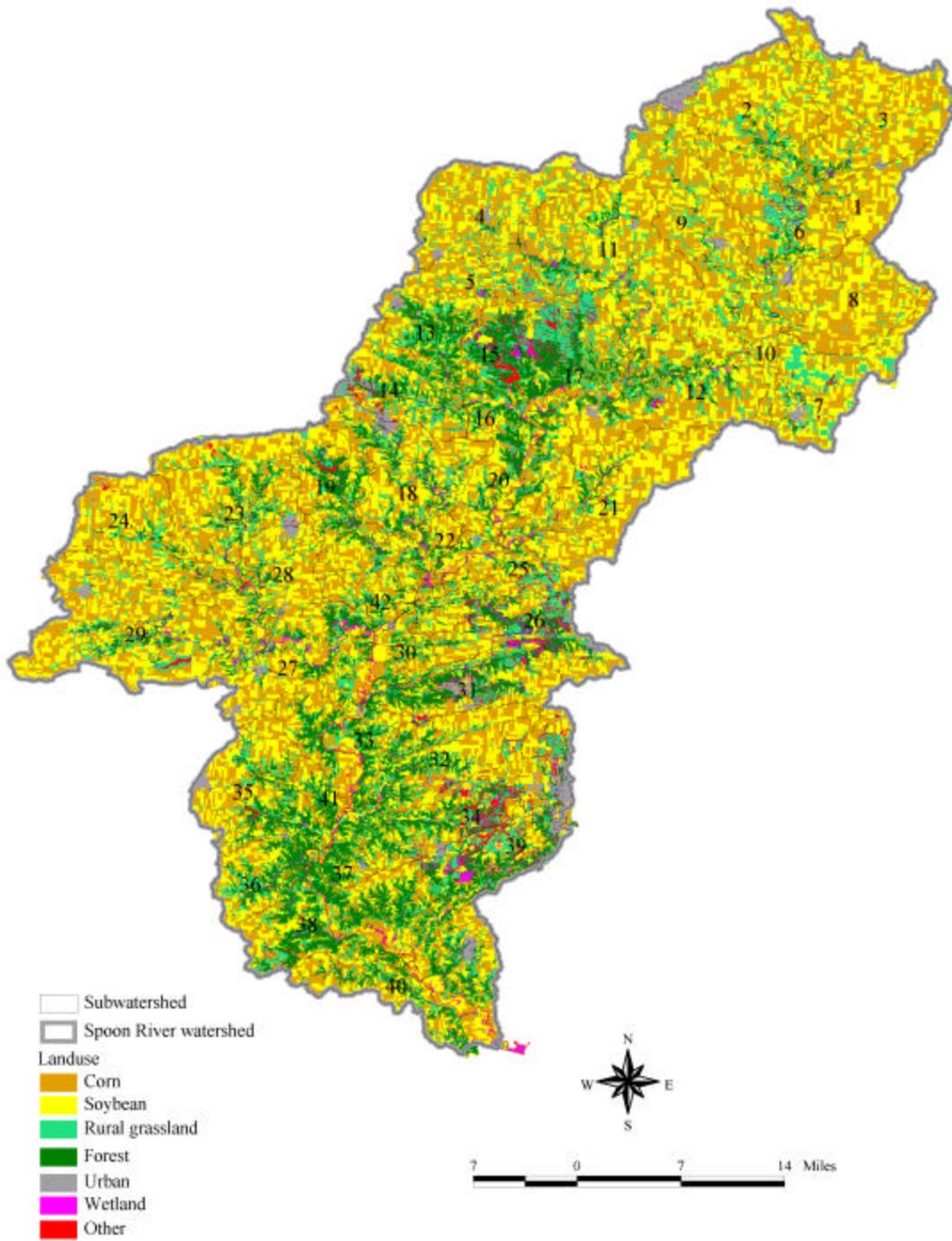


Figure 47. Land use in the Spoon River watershed

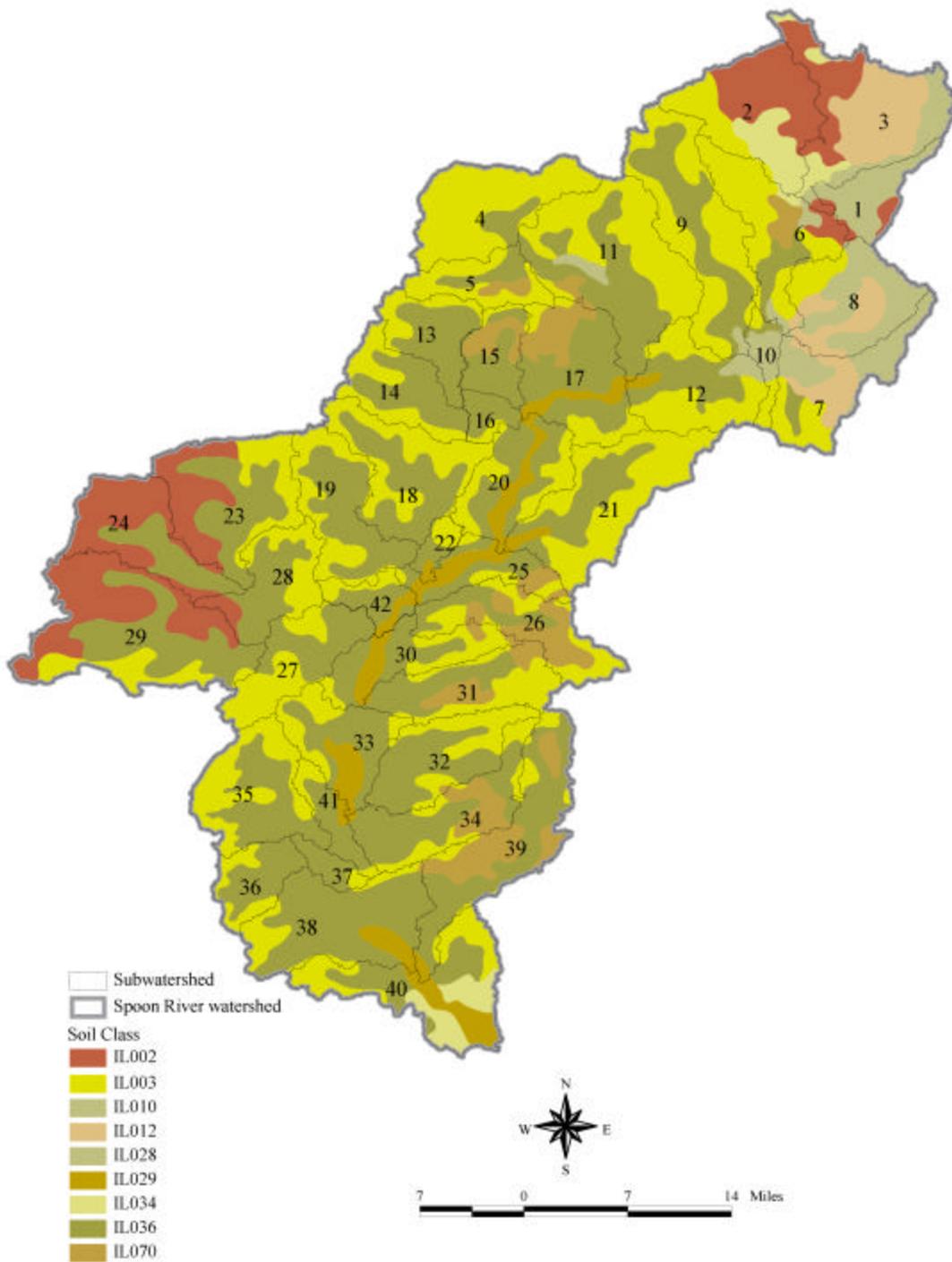


Figure 48. Soil types in the Spoon River watershed

## **Model Development**

Based on the topographic and hydrographic data, the watersheds were subdelineated into smaller hydrologically-connected subwatersheds and stream reaches, and respective outlets. The Automatic Delineation procedure in BASINS with an option of ‘burning in’ existing streams was used. Subdelineation was done for representing spatially variable physical and other characteristics of a watershed in the HSPF model. The Court, Haw, and Spoon River watersheds were subdivided into 31, 25, and 42 subwatersheds, respectively (figures 42, 43, and 44). During subdelineation, outlets were specified in the models corresponding to the streamflow gaging/water quality monitoring stations on the North Creek (ISWS302), Court Creek (ISWS301), Haw Creek (ISWS303), and the USGS streamflow gaging station at Seville (USGS05570000) in the Spoon River watershed (figures 42, 43, and 44). The subwatersheds were further subdivided into Hydrologic Response Units (HRUs) based on land use, soil, and climate to account for the spatial variability of a basin’s physical and hydrologic characteristics at a finer scale. An HRU is an area within a watershed that is expected to have a similar hydrologic response to input of precipitation and evapotranspiration. Each HRU has a set of parameter values that must be determined through the calibration process to define runoff characteristics as well as loading of various constituents from that HRU. In the Court Creek watershed HSPF model, climate data from the Court Creek and Galesburg precipitation gages was input to different subwatersheds based on the proximity. Similarly, in the Haw Creek HSPF model data from the Haw Creek and Galesburg gages was input to various subwatersheds. In case of Spoon River watershed HSPF model, data from all ten MRCC stations was specified for different subwatersheds based on their proximity to the gages.

Model of the Court Creek watershed was developed first using two years (WY2001-WY2002) streamflow and sediment concentration data from the ISWS301 streamflow gage/WQ station on the Court Creek. Calibrated model parameters from this model were then used to populate the models of the Haw Creek and Spoon River watersheds. No further calibration of these two models was performed. Haw Creek watershed model was run for the same two year period as Court Creek watershed model and the model results were compared with the observed data from the ISWS303 gage on the Haw Creek. Since long term climate and streamflow data were available for the Spoon River watershed, this model was run for 1972-1995 period using data from the USGS05570000 at Seville.

## **Modeling Results**

Values of a large number of HSPF model parameters can not be obtained from field data and need to be determined through model calibration exercise. The Court Creek watershed model was calibrated to assign best possible parameter values to each HRU and stream reach so that the model simulated daily streamflows and pollutant concentrations similar to the values observed at the gaging/monitoring stations. Calibration of the hydrologic component of the model was followed by the calibration of the water quality component for the sediment concentration. Model was run for hourly time step. For the two year calibration period of WY2001-WY2002, percent volume error between the model simulated and observed streamflows at gages ISWS301 on the Court Creek and ISWS302 on the North Creek were 1.2% overestimation, and 3.5% underestimation, respectively. Comparisons of the daily streamflows simulated by the model for

WY2001-WY2002 period with those observed at gages ISWS301 and ISWS302 are shown in figures 49a and 49b. The performance of this preliminary model is promising and overall the simulated streamflows follow the similar trend as the observed values. The timings and shape of the simulated streamflow hydrographs resemble the observed ones but some peak flows were underestimated by the model. In this study the model was not calibrated to match the individual stormflow events, rather it was calibrated to fit the long term and daily data over the two year calibration period. Also, data from only two precipitation gaging stations, both near the boundary of the watershed (figure 42), was used to spatially represent the precipitation over the entire watershed. It is possible that rainfall measured for a particular event at one of the gages did not represent the rainfall that actually occurred in different parts of the watershed, thereby resulting in discrepancies between the observed and simulated streamflow hydrographs. Thus, more precipitation gaging stations will help improve the performance of the hydrologic model by more accurately simulating the stormflow hydrographs.

For sediment simulation by the model in the Court Creek watershed, parameters controlling soil erosion on the surface and sediment transport in the stream channel were calibrated. Comparison of sediment concentration simulated by the model and those observed at gages ISWS301 and ISWS302 are shown in figure 50 for the WY2001-WY2002 period. The simulated values generally followed the same trend as the observed sediment concentration values at both gages. Since most soil erosion occurs during extreme runoff events, some high sediment concentrations were underestimated by the model as a result of poor estimation of the stormflow peaks by the model during hydrologic simulations.

Streamflow and sediment concentration simulation results from the Haw Creek watershed model are compared with the observed data as shown in figures 51 and 52, respectively. Similar results from the Spoon River watershed model are shown in figures 53 and 54. In this preliminary phase, the performances of these two models were similar to the calibrated model of the Court Creek watershed. Performance of these models can be improved in the future if climate, streamflow, and water quality data are available for more stations and longer time period to improve the model calibration.

## Assessment and Evaluations

The methods that will be used to assess current and future conditions and to evaluate the progress the Illinois River CREP is making towards meeting the goals set for reducing sediment and nutrient delivery to the Illinois River will rely on data that is being collected in the basin and the watershed models that are being developed to compliment the data. For sediment delivery, the baseline condition has been prepared based on available data collected from 1981-2000 (Demissie et al. 2004). The sediment budget estimate for the Illinois River for the 1981-2000 period is shown in figure 55. The figure shows the average annual sediment delivery from tributary streams to the Illinois River. The estimate was based on data collected at some of the tributary streams and regression equations developed based on available data in the basin. In summary, the sediment budget estimate for the 1981-2000 period, shows that tributary streams delivered an average of 12.1 million tons of sediment to the Illinois River valley per year. The measured sediment load in the Illinois River at Valley City, 61.3 miles upstream of the junction

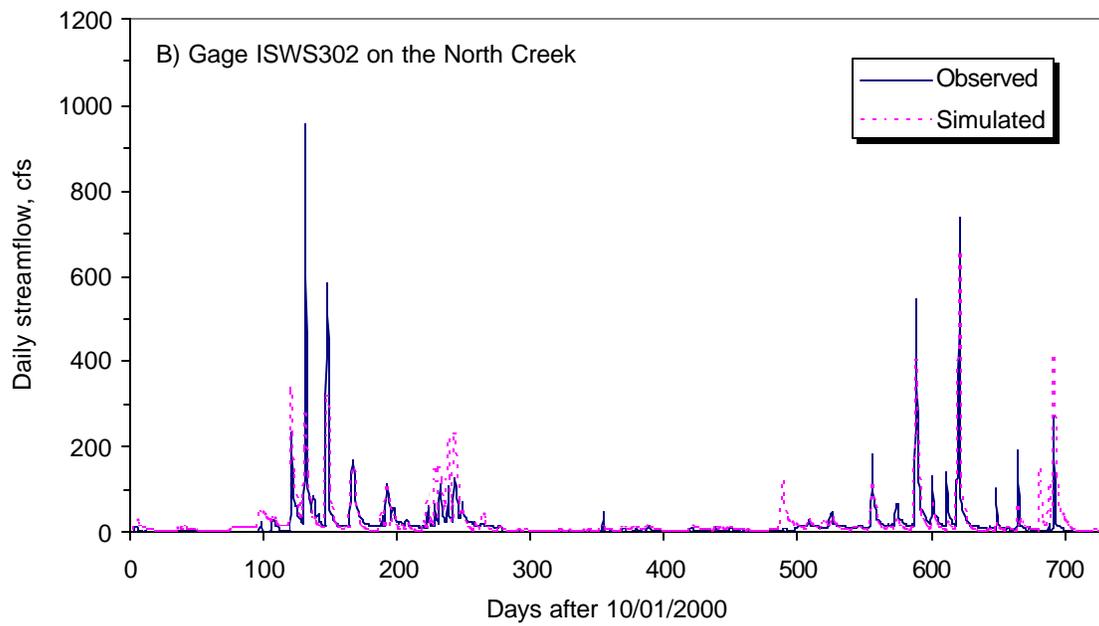
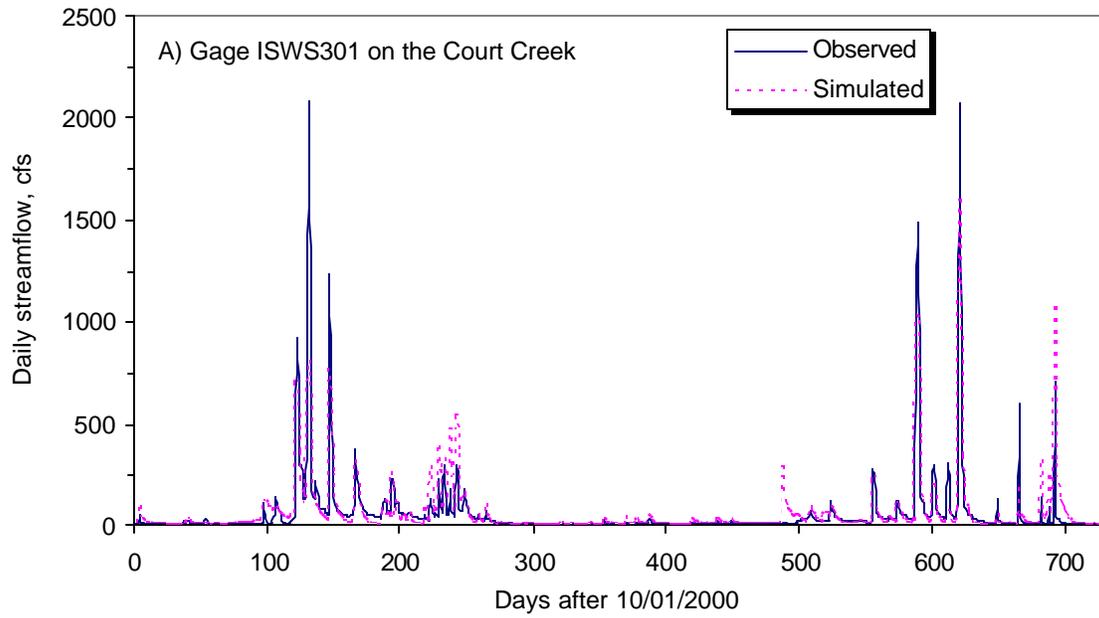


Figure 49. Results of model calibration for streamflow simulation for the Court Creek watershed

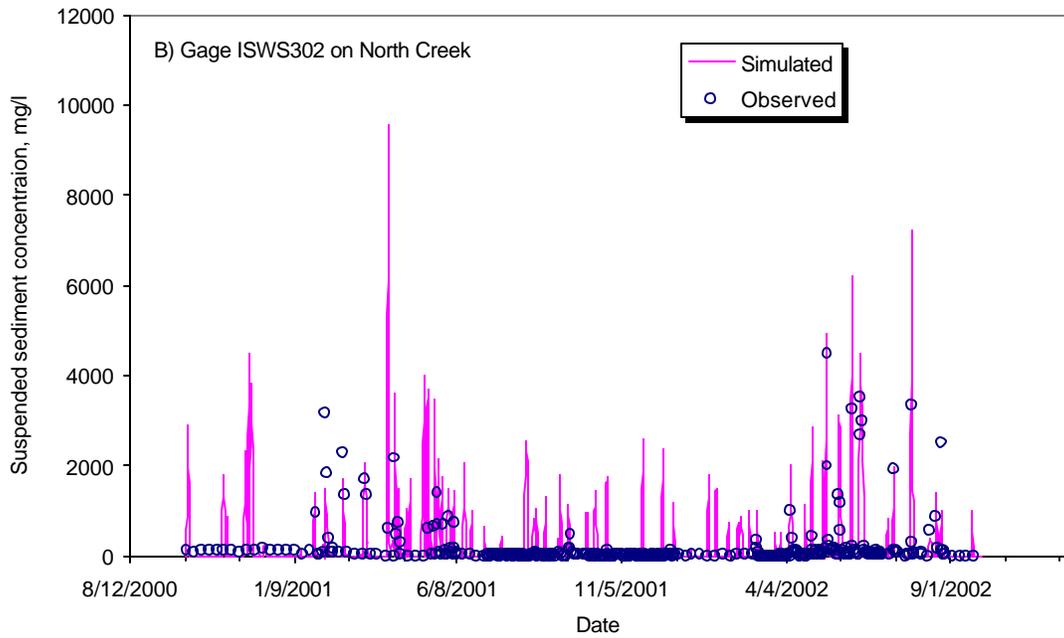
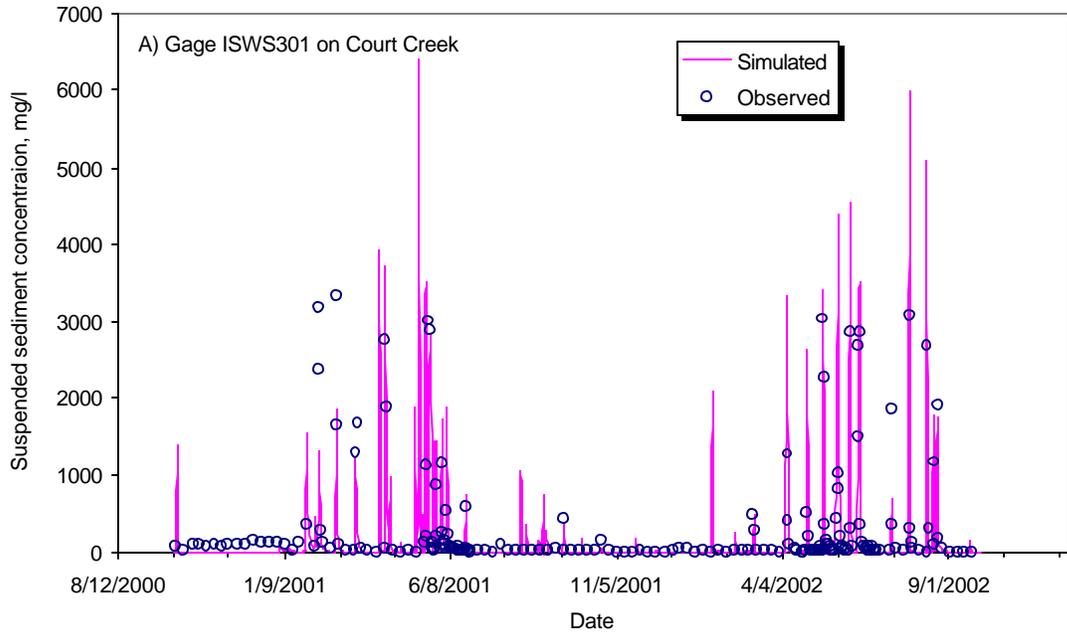


Figure 50. Preliminary results of model calibration for suspended sediment concentration simulation for the Court Creek watershed

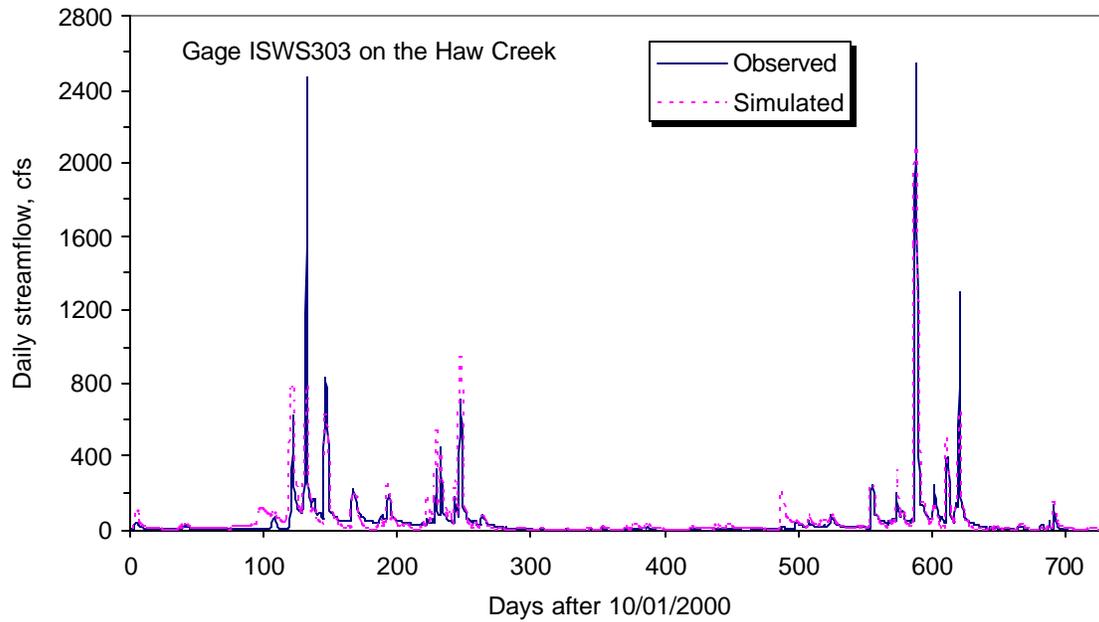


Figure 51. Comparison of observed and simulated streamflow by the Haw Creek watershed model developed using the calibrated parameters from the Court Creek watershed model

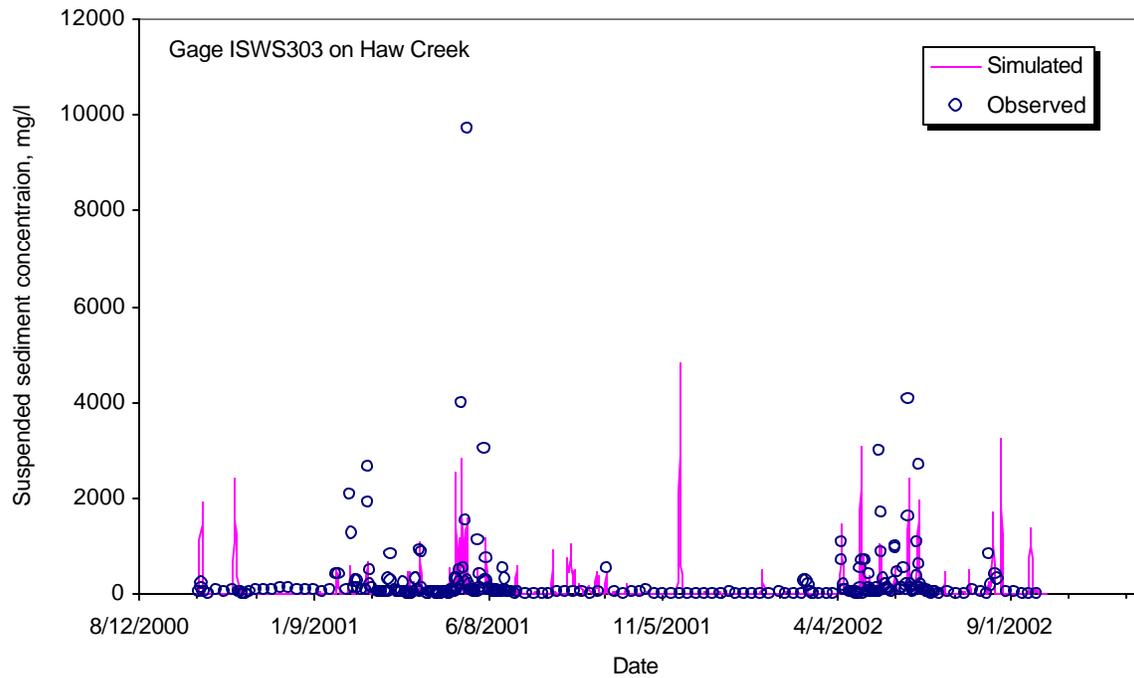


Figure 52. Preliminary results for suspended sediment concentration from the Haw Creek watershed model developed using the calibrated parameters from the Court Creek watershed model

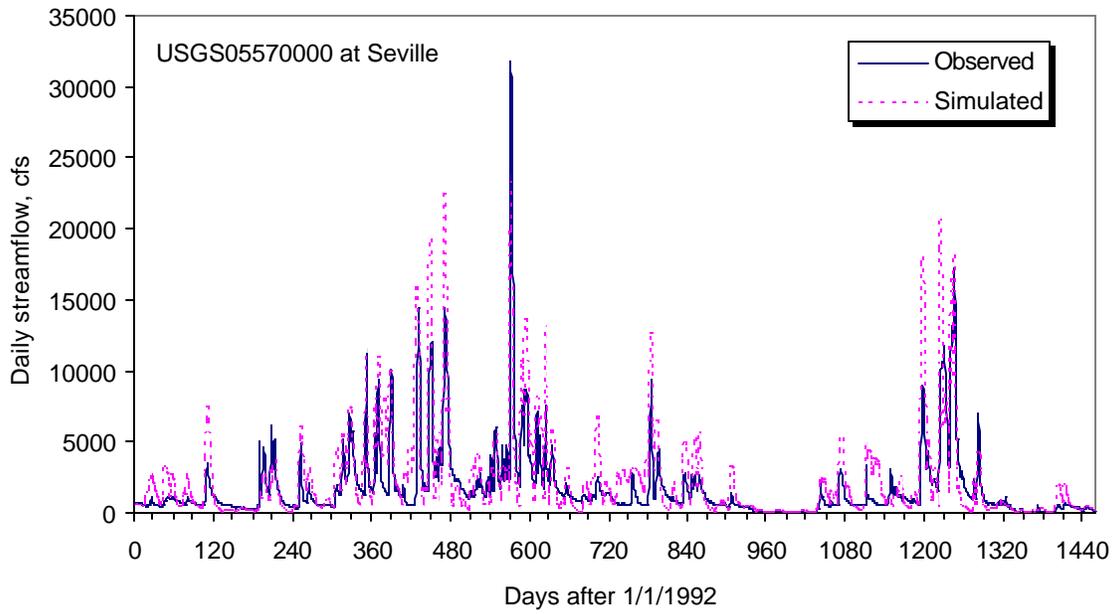


Figure 53. Comparison of observed and simulated streamflow simulation by the Spoon River watershed model developed using the calibrated parameters from the Court Creek watershed model.

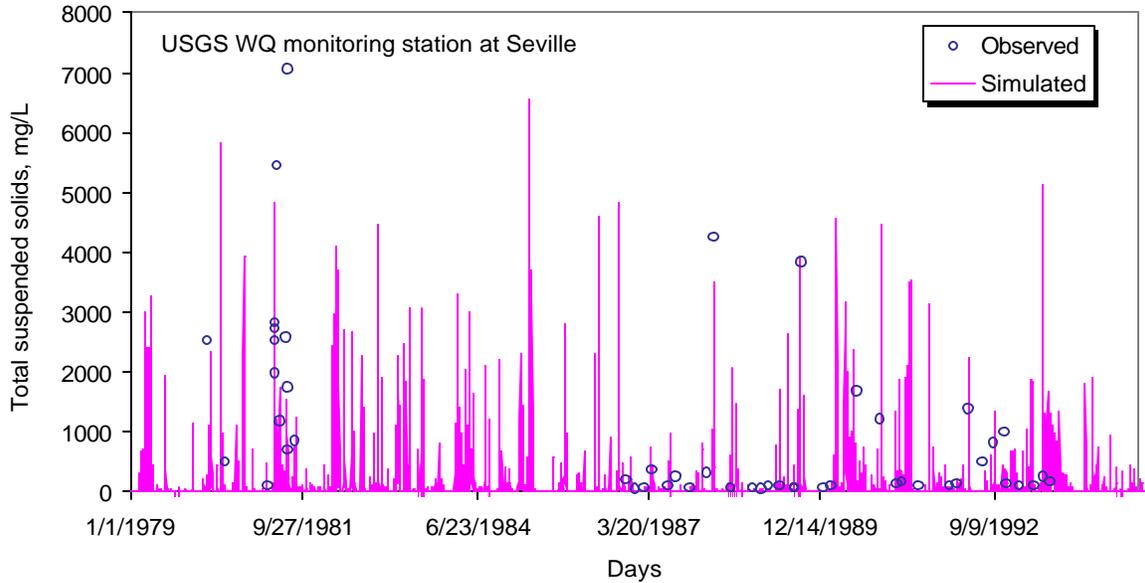
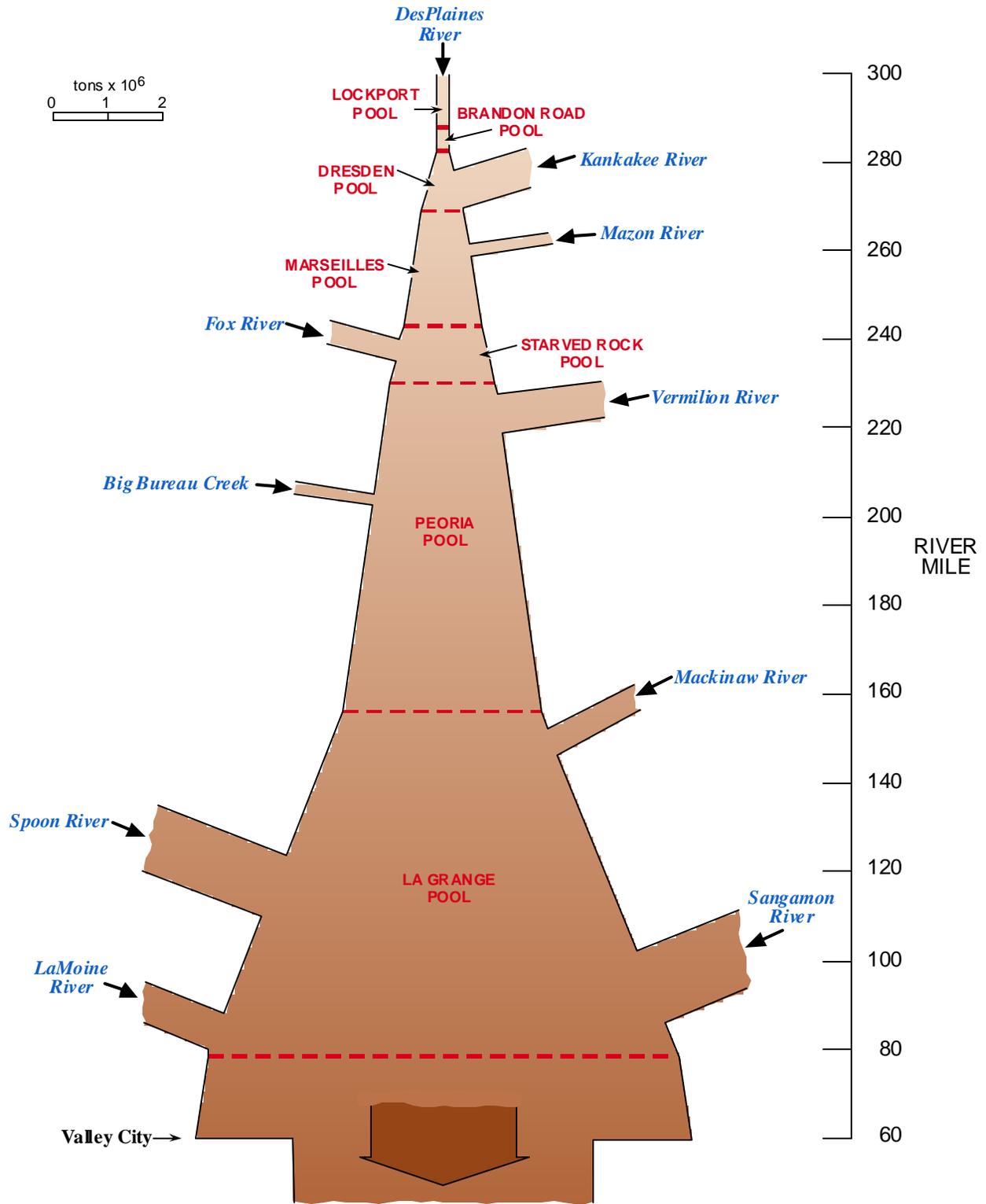


Figure 54. Preliminary results for suspended sediment concentration from the Spoon River watershed model developed using the calibrated parameters from the Court Creek watershed model.



*Illinois State Water Survey*

Figure 55. Sediment budget estimate for the Illinois River, 1981-2000

of the Illinois River with the Mississippi River, averaged 5.4 million tons per year. This left, on average, about 6.7 million tons or 55 percent of the sediment estimated to be delivered from tributary streams for deposition within the valley every year. As shown in the figure, most of the sediment flows into LaGrange Pool from the Spoon, Sangamon, LaMoine, and Mackinaw Rivers. The Spoon River delivers the most sediment per unit area among the major tributaries to the Illinois River. The Vermilion and Kankakee Rivers contribute significant sediment into Peoria and Dresden Pools, respectively. In general, the lower Illinois River receives much more sediment than the Upper Illinois River. It should however, be noted that Figure 55 is a cumulative sediment budget for the whole Illinois River valley. Sediment entrapment and thus deposition within each pool could not be calculated for each pool from available data. Therefore, only the estimated total sediment deposition within the Illinois River valley is shown at Valley City.

Having this information and data for the 1981-2000 period will enable us to assess and compare sediment delivery and sedimentation in the Illinois River valley for different periods. For example, if we continue to collect sediment data in the river basin up to the year 2010, we can construct a different sediment budget estimate for the period 2000-2010. Assuming climate conditions are relatively comparable, we can then assess if sediment delivered to the Illinois River has been reduced due to conservation practices including CREP. At the same time we can also evaluate the trend in sediment delivery from individual watersheds and identify where there is progress and where there are problems. The reliability of this method of comparing sediment budgets for different periods will depend on the availability of good quality data for the periods being compared.

A similar approach is also being developed for nutrients. A nutrient budget estimate for the Illinois River will be developed for the 1981-2000 period based on data collected by the Illinois Environmental Protection Agency (Short, 1999). Estimate of nutrient delivery from each of the major tributaries will be developed for the same period. Another budget estimate will be developed for the 2000-2010 period and compared to the 1981-2000 period. Any significant trend either from the overall nutrient budget or from the delivery from the different tributaries should be detected through the comparison.

Another method for evaluating the cumulative impact of land use changes (on sediment and nutrient delivery) is through the application watershed models that are capable of simulating sediment and nutrient transport. That capability is already being developed for the Illinois River basin and its tributaries as was discussed in the modeling section. Hydrologic, sediment and nutrient data being collected under the Illinois River CREP program will be used to calibrate and validate the models so that they could provide reliable results that could be used to assess the effectiveness of CREP and other conservation programs within the Illinois River basin.

Land use records are being collected and compiled so that they could be used as input to the watershed models. Significant changes in land use would be expected to result in changes in hydrology and in sediment and nutrient delivery.

By using both methods outlined here, it would be possible to assess and evaluate the changes in land use and sediment and nutrient deliveries and the relations between the two.

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## THE ILLINOIS RIVER BASIN HYDROLOGIC OBSERVATORY

### A Center for Understanding the Hydrologic Cycle of Intensively Managed Landscapes

The attached is a proposal to the National Science Foundation. Its overriding goal is to establish the Illinois River Basin as a Hydrologic Observatory for the study of critical water related issues associated with atmosphere, land, and water bodies in intensively managed landscapes.

This effort is being proposed through the collaboration of representatives from a group of universities in the region in partnership with a growing cast of state and federal agencies and stakeholders who value hydrologic science and the Illinois River Basin.

Overall objectives include:

1. Enable interdisciplinary research by providing infrastructure that will attract scientists and water resource professionals to pursue research in the basin.
2. Answer interdisciplinary questions of high societal relevance around the broad themes of (i) hydrologic variability and extremes, (ii) biogeochemistry, (iii) ecology, (iv) contaminant transport, and (v) water resources management.
3. Develop stakeholder partnerships, and education and outreach programs for rapid dissemination of knowledge to derive immediate societal benefits for sustainable development.

The Observatory will provide improved scientific understanding of the hydrologic cycle and predictive capability to support better management and decision-making by stakeholders. The Observatory will provide an unparalleled environmental science resource to support the integrated study of rivers and lakes, water cycle, agriculture, ecosystems, and climate. Regional communities will benefit directly as critical environmental issues are studied and groundbreaking applications are developed in a local watershed. An alliance with parties who will benefit directly from the data resources and scientific investigations is being developed.

**This effort has the potential to establish baseline data which will further efforts to measure and document the effectiveness of the CREP Program in the Illinois River Basin. In particular, information gathered on Sediment Flux will relate directly to the overall goals of the CREP Program and the State's monitoring efforts.**

**For those readers viewing this document electronically, please access the file entitled Observatory.pdf for a more detailed description of this effort.**