Rayse Creek Watershed Management Plan

**by Elisa A. Grafford,
Karl W.J. Williard,
& Cyril Barton**

**Department of Forestry
Southern Illinois University Carbondale**
**Research Publication No. NS-019
October 2006**

SOUTHERN ILLINOIS UNIVERSITY CARBONDALE

RAYSE CREEK WATERSHED MANAGEMENT PLAN

Prepared for

Illinois Environmental Protection Agency

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Department of Forestry

Southern Illinois University Carbondale

and the

Rayse Creek Watershed Planning Committee:

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This report was prepared using U.S. Environmental Protection Agency funds under Section 319 of the Clean Water Act distributed through the Illinois Environmental Protection Agency. The findings and recommendations contained within this report are not necessarily those of the funding agencies.

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TECHNICAL ADVISORY BOARD

The following pages include a current list of contacts from private and state agencies to help Rayse Creek stakeholders with their resource questions, comments or concerns. Most of the contacts are local to the watershed. The contacts are not listed in any particular order. If you are unsure about who to talk to at an agency, depending on your needs, they will direct you to the person you need to speak.

Since the first TAC (Technical Advisory Board) list was created (about 10/2004), there have been many agency rearrangements and reorganizations. Many employees, addresses and phone numbers have changed. This list should be updated two to three times a year or as the need arises.

Technical Advisory Board

Jefferson County Soil and Water Conservation District **618-244-0773**
Stacy Pytlinski, Resource Conservationist
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Mt. Vernon, IL 62864

Jefferson County Natural Resources Conservation Service **618-244-0773**
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Cole Gaebe, Resource Conservationist
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Nashville, IL 62263

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Village of Waltonville (Village Hall) **618-279-7226**

Village of Woodlawn (Village Hall & Water Dept.) **618-735-2110**

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Jefferson County Farm Bureau **618-242-7069**
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EXECUTIVE SUMMARY

In 1998, Rayse Creek was listed on the Illinois Environmental Protection Agency's (IEPA) 303d list of impaired waters. A *total maximum daily load* (TMDL) was developed by MWH (formerly Montgomery Watson Harza), an environmental engineering firm and the IEPA. This report assessed data gathered from the United States Environmental Protection Agency (EPA), IEPA, Illinois Department of Natural Resources (IDNR), and United States Geological Survey (USGS). *Non-point sources of pollution*, particularly agriculture were recognized as the major source of pollution. Phosphorus and sediment were the primary pollutants of concern.

In response to the TMDL process, a group of concerned watershed stakeholders formed the Rayse Creek Watershed Planning Committee. Their mission was to preserve agricultural heritage and improve water quality in the Rayse Creek watershed through stakeholder collaboration, community education and implementation of best management practices. The Watershed Implementation Plan is an outgrowth of their genuine concern for their watershed and the land many have spent their whole lives working and living on. Their primary resource concerns include cropland erosion and runoff, streambank erosion, and flooding. The plan contains a comprehensive resource inventory of the Rayse Creek watershed. Of particular interest to the planning committee is the trend analysis of long-term stream water quality records. Total suspended solids (TSS), total manganese, and total iron concentrations have experienced declining trends over the past two to three decades. Stream nitrate, ammonium, and total phosphorus concentrations have shown slightly increasing levels over the past three decades; however, over the last two to three years of record (1998 to 2000) the stream levels of all three nutrients have decreased. These results, coupled with the declining trend in TSS may be an indication that voluntary implementation of agricultural best management practices such as no-till, grass filter strips, riparian buffers, and grassed waterways through government cost-share programs have made a positive impact on water quality in Rayse Creek. The plan contains best management practice recommendations for each of the twelve watersheds to promote continued water quality improvement. This section includes a prioritized listing of the twelve subwatersheds for future restoration activities from highest to lowest priority. This should help the watershed planning committee more effectively target their restoration activities for maximum water quality benefit.

A *TMDL* is the maximum amount of any pollutant that a waterbody can receive and still meet water quality standards, and in turn, that amount is allocated toward all the point and non-point sources generating entities in the watershed.

Non-point source pollution is pollution that originates from a diffuse area, such as an agricultural field or a harvested timber stand, during a storm event and it does not have a definite source like point source pollution.

ACKNOWLEDGEMENTS

Art Friederich	NRCS, District Conservationist, Jefferson County NRCS
Stacy Pytlinski	SWCD, Resource Conservationist, Jefferson County, SWCD
Margaret Fertaly	IEPA, Environmental Protection Specialist, Planning Section
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Wayne Kinney	IDA, Streambank Specialist
Sandy Frick	FSA, Jefferson County
Jennifer	Jefferson County Health Department
Brian Klubek	SIUC, Professor of Soil Microbiology
Gerri Philipps	Village of Richview
Kevin Davie	SIUC, GIS specialist
Joe Stitely	Jefferson County CAFO inspector, IEPA Bureau of Water, Marion
Bruce Rodely	Washington County CAFO inspector, IEPA Bureau of Water, Marion

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INTRODUCTION

A Historical Account of Rayse Creek

by long-time resident
Cyril Barton

A few of the changes that have occurred in the last 75 years in the Rayse Creek Watershed.

The Barton family moved to Jefferson County in September of 1929 at the very beginning of the "Great Depression", 1930 to 1934. (.03 cents per lb. hogs, .48 cents per bu. wheat, .12 1/2 cents per bu. corn .) Settling on a 470 acre farm called, "the Gus Norris farm", that belonged to the John Hancock Ins. Co. This farm straddled what is now called , Rayse Creek, but at that time was called, by the locals at least, "Big Muddy " or "West Muddy", with the east fork being called "East Muddy " or "Little Muddy". As far as I know, no one had ever heard of "Rayse Creek" , at least I hadn't until there began to be talk of building Rend Lake down stream several miles.

"Big Muddy" or Rayse Creek came into this farm from the west and turned almost straight south on the east half of the farm. I would like to know , myself, how and when it got the moniker of "Rayse Creek" or whether the Army Corp Engineers just didn't like the old name.

Being only 14 years old when we moved here, with a good 22 rifle, a hound dog, a good saddle horse, and a world full of rabbit, squirrel, quail, muskrat, and mink, I thought I was in heaven. If there was one coon in Jefferson County at that time he was in a cage, but there sure was plenty of everything else. The coon was restocked by the game dept. in the late 1940's. I had hunted, trapped and fished since I was 8 years old , so any time Dad would turn me loose I was roaming up and down that creek bottom; in the summer, hunting and fishing, in the winter, trapping. This wasn't too often though, I used to think he would find something for us to do if it was nothing but throwing bricks over the fence and then throwing them back again. I found out years later that wasn't too bad an idea on two or three teenagers. I think it should be used on some today also.

I loved that creek bottom, which would average nearly a mile wide in most places. I have roamed it all, from the forks of the creek, East and West Muddy, (or Rayse Creek) which is north of Il. St. Rt. 148, East of Waltonville, then north almost to Il. St. Rt. 15.

By the way, when we first moved here, Rt. 148 was far from finished and was not opened for several years. There was nothing but dirt roads, not even gravel, out of Waltonville, in any direction. So, under muddy conditions , which was most of the winter times, you stayed home or used a wagon and team or went horse-back, or rode what we called "The Dinky"; which was a small passenger and mail train and ran on schedule from Mt.Vernon to Chester on ,at that time, the "W. C. & W". Today , it's the "Missouri Pacific...at that time, most of us called it the "Wobble, Crook and Wobble", for it had a derailment at least once a week it seemed.

We had an orphan boy Dad had given a home to at age of about 12. He was two years older than myself. He walked that track to Mt. Vernon many times when he wanted to go for some particular reason...there and back...usually that reason being girls. I went with him a few times, myself, but not many. Being 2 years younger, my interest was more in that creek bottom with my hound dog and my little rifle, and besides that , it was 12 miles to Mt.Vernon and it was also 12 miles back to Waltonville, then nearly 3 miles more to home. I didn't see much future in that.

Rayse creek had originally ran across the very north end of the farm Dad rented, to the extreme east side before it turned south and wound up exiting the farm after making half circles all over the east side. Probably took all of a mile to go a half mile. The, Gus Norris, that had lost the farm to "John Hancock Ins Co." had took horses (or mules) and small dirt slips, after first plowing a straight furrow with a walking plow a quarter mile west of the creek bed and dug a small straight short cut from the north end of the farm to where it exited in the south east corner. The local men that had worked on this farm told us that he had made that ditch only 2 or 3 ft. deep and not much wider, and only a few years before he lost the farm, but when we moved on it in 1929 that ditch, which is now and was even then, 12 to 14 ft deep and at least 30 ft. wide--and carries all the water, and ,boy, does it move! I have stripped off and floated down stream many times in hot weather when it would be bank full, or nearly so, and walk back across the field to get my clothes. The water might be almost muddy enough to float a pocket knife, but nothing much matters to a kid. Today that particular stretch carries practically all the water until it gets high enough to be completely out of bank, for the old creek bed, while still there, is filled up and holds very little water, and even goes completely dry in the summer time. However, for many years it constantly had from three to five feet of water with fish and frogs in abundance...catfish, perch, crappie, buffalo and carp. The deep water, however, was the main creek, both above and below the shortcut made by Gus Norris. Except for two shallow spots with a rock bottom, that were used for dry weather crossings , (one at the "Doc Fairchild" place on Bakerville rd, the other one east of the C. B. & Q. tracks on East Salisbury rd.) that creek would run 5 feet deep nearly anywhere and eight feet or deeper in many, many places.

I remember one time, I think in the late 30's, when our mailman, Dave Wells, and the postmaster, who was Jim Baker, hogged out a 48 pound flat-head catfish in an eight ft. hole that is now on ground belonging to Bill Eastham, north of Waltonville two and a half or three miles. According to Baker, they even had to make a trip back to waltonville for a rope to put through his gills for they were not expecting to catch anything that big and had quite a time getting him out even after they had the rope secured. That particular hole was nearly a quarter mile long. That big fish was the talk of the countryside at that time and even made the Mt. Vernon newspaper.

Two more places were noted for depth on the creek. One was a swimming hole just downstream barely a quarter mile from where Baker and Wells caught their big fish, (this was also at least eight feet in depth for at least 100 yards), the other one upstream about the same distance from the "Old Doc Fairchild" crossing. These two swimming holes were used by all the boys in the neighborhood, of course always in the nude and any Sunday after about the first of April would usually be occupied, besides being used to clean up in after a hard days work in the field. Remember, we did not have electricity then, so no running water.

One episode that I think deserves mentioning, involving two local boys and the "Old Doc Fairchild" swimming hole was when the whole crew, or most of us anyway, (at least ten or twelve men), left my threshing machine at the end of the day to clean up in the creek.

We left the machine in one of the trucks that was used for hauling the clean grain, I think belonging to Shorty Fairchild, with all of us in the back of that truck. I had hired one drifter to pitch in the fields, who said he was from the Bronx in New York. He was a good worker but definitely a greenhorn. When he found out we were going to a swimming hole I heard him say he couldn't swim. Some of that crew convinced him if he didn't jump in they would throw him in. When we got there he started stripping off like everybody else. I told him, myself, if he couldn't swim to not jump off the bank, (like everyone else was doing) for it was way over his head two feet out. I went on in but kept my eye on him, and darned if he didn't just jump in like everyone else. Of course, he went clear under, came up fighting and spouting water and went right back down. When he came up that time he was frantic, but I was close enough to him to grab an arm. When I did that he tried to climb me like a tree, and I began to wish I had let him drown. I couldn't even get loose from the guy. I drew back my fist to try to knock him out and just then Max Shurtz had seen the predicament we were in and came to help, and I mean just in time too. Max grabbed one arm and I got the other and we stretched him out between us and got him out on solid ground at the north end of that deep water. I've always been grateful to Max Shurtz for if someone hadn't come to our rescue, I do believe he'd have drowned both of us. Of course, the creek was full of men and surely some one would have helped in time. I think I remember my brother getting there in time to help drag him out on the bank but not during the real emergency.

Today those same swimming holes are between three and four feet and the average creek depth will run from one foot to three feet. In the early years it ran the year around, albeit sometimes a very small stream during a long dry spell, but now there are many times during the summer when it is completely stopped for long periods at a time. There was one exception to this, and that was the year of 1936. That was the hottest, dryest, year Jefferson County has ever seen. It did stop running that year, the first time ever, according to the old timers. Of course the whole countryside was drinking from wells and about 80% went dry and so did most of the ponds in the country. Water for a lot of people really got to be a problem. Personally, we hauled water for about 50 head of cattle from Rayse Creek (or Big Muddy) from early fall into the winter months when it finally started raining. I wish I knew, but I am sure the corn yield that year would have been less that 15 bu. per acre for Jefferson County. Of course, with open pollinated corn and not much, if any fertilizer and 110 degrees heat day after day, after day, all through July and August, and no rain whatsoever, it was a complete crop failure. Most of the corn was cut and put in shocks for fodder or put up as silage. Personally, I had rented an extra 40 acres to get married on that fall and I am sure, had it been shucked, the whole field would not have made one 30 bu. load. It got waist high and died and was used as silage. I think, according to the record books, one year in the early 50's and again in the early 80's was supposed to have broke all records, but I lived and farmed through them all and not one has even come close to the heat and dryness and length of both dry and hot of the terrible year of 1936. And there sure would be no use in trying to convince me otherwise, regardless of what the record books say.

We've had three record high waters on this creek. The first and by far the highest was

in August of 1946. In one 36 hour period we had 13 inches of rain and by the next night it was unbelievable how high that creek got. The C. B. & Q. at that time was a double track road and the east track was completely washed out for at least a quarter mile between the railroad bridge and the "Abe Elliston" crossing. This stretch is on, I would guess, at least an 18 ft. fill. At the time I lived south of this bridge one quarter mile and we had heard, all night, what we thought was a train stalled on the tracks, but in reality was the roar of water going over those tracks. The creek bridge on North Hall Ln. and also the one on Bakerville rd. was the old fashion banister bridge with, I think, 8 ft. banisters and after the water had fell 2 ft. those banisters were still under water. The telephone lines at that time were strung on poles about 12 ft. high and through the bottom ground they had cornstalks and everything else hanging on them.

In 1961 we had another flood but not nearly the amount of the 1946 flood. It did, however, wash out the Missouri Pacific track east of Waltonville. It stopped all traffic on both Il St. Hwy 148 and Il St. Hwy 15 and forced several farmers out of their homes that lived in low lying areas. In 1961 it did like at least 4 ft. of being as high as the 1946 flood, but after helping a nephew of mine, who lived a half mile east of the Know Hirons farm move his furniture onto scaffolding, three of us, Nolan Lenington, Myself, and Bub Martin, in a boat powered by an 85 horsepower outboard engine, crossed Rt. 148 and went alongside it or even down the middle to rescue a farmer by the name of Raleigh Gilbert, who lived on what is now the parking lot on the west side of the present day bridge. The old man had been offered a ride out in 1946 but refused. Both he and his wife in fair health and still a relatively young man, though completely stranded, he wasn't worried, but this time was different. He was living alone after losing his wife, 15 years older and in poor health and he was extremely glad to see that boat load of rescuers.

We did have one more extremely high water, I think on or about 1993. This time it took a lot more rain that even the 13 inches we'd had in 1946. All in all, in my estimation, it does not get as high, with the same amount of precipitation, as it did before Rend Lake, and I know it goes down much quicker. This is also the thinking of another man that has been born and raised on the edge of this creek bottom by the name of Abe Elliston.

There was also one fairly high water, on or about , 1968 that stopped all traffic on 148 and though not even close to either one of the other two, did some real damage to the newly constructed, or possibly it was not even completed yet, sub impoundment dam that was being built for Rend Lake, washing it out, or nearly out.

It was reported that some of the "Old Timers" had tried to tell some of the engineers on that project how high that water had been. The "Old Timers" were scoffed at and were told that there was no records to show that it had ever even been over the hard road and that it could not ever get that high.

In the 30's and even early 40's this creek was relatively clear and always running and fairly deep but then the farmer began to clear out all the fence rows, plow every inch he could get, of course with a flat bottom plow and erosion was very severe. Where we had

in previous times put out throw lines and bank poles and filled them with fish there was next to nothing. This lasted for several years but I like to think that I am beginning to see a difference. I do believe the filter strip, conservation farming, C. R. P., tree planting and no-till farming is making a difference. I do believe it runs longer and clearer before stopping on a long dry spell. Of course, all the deep holes are not there anymore. I really don't believe there is one place of even a few feet between the forks of the creek and Rt. 15 that would be 5 ft. deep.

One other thing that had thinned the fish (in my personal opinion), that had happened the same time as all the other pollution, that has been stopped, was the oil pollution. There were numerous oil wells, some exceedingly good producers, drilled in all except the extreme Southern end of Rayse Creek drainage area. Some of these wells, and all of the storage tanks had salt water holding pits and somehow it seemed like anytime we had a storm coming up they sprang a leak or got dumped. I've seen that creek covered with a solid coating of oil for hundred's of yards. You couldn't see the salt, but it was there. I remember one time I had the bright idea of burning it off. I took about 2 gallons of gasoline in a 5 gallon bucket, almost under the bridge, Threw it on that coating of oil and threw a match in. Man, I nearly had an explosion! I did manage to throw enough water with that same bucket to put it out. I sure thought I was going to burn the bridge down. That wasn't near as smart an idea as I had thought. I called the agency that was supposed to take care of such pollution every time that oil came floating down the creek, but not one time was there any results. This was at it's worst during the late 40's and through the 50's and nearly demolished the fish and frog population, but gradually got a little better as the laws got a little more stringent and some of the wells began to dry up. However, very occasionally, we still have a coating of oil come down that creek.

Back in the early days of the oil boom when almost all of the Rayse Creek drainage area was saturated with oil wells I am positive those pits were dumped deliberately, but when it does happen today it is stopped pretty quick. I never did think the oil on top of the water that we could see, hurt nearly as much as the salt water underneath the oil that we could not see, but knew was there.

Yes, I've hunted it's banks for miles in both directions from home, trapped the same area, picnicked on it's banks, fished in it's waters, swam in it and was even baptized in it and I do love that creek and it's tributaries. I am extremely glad to see it beginning to be treated with the respect it deserves, and I do believe it is beginning to have a positive effect. In my humble opinion it is beginning to run a little clearer, a little longer. It comes up about as quick but may not get quite as high and very definitely, goes down much quicker.

The one thing that has changed to an unbelievable extent in these 75 years is agriculture. When we came here in 1929 I don't think I had ever heard the word, "soybean". The crops were corn, with an average yield of maybe 35 bu. per acre; wheat, oats, and cow peas. Soybeans were unheard of and when they did start appearing in the mid thirties, the first to appear was a small brown bean, called "the Virginia". It was a

very viney and almost exclusively cut and used for hay, mostly cow feed. The cow pea was widely grown, especially by anyone that had a milk cow, or cows; and nearly everyone, without exception, had milk cows. These cow peas were strictly for hay and made exceedingly good feed, either threshed or unthreshed. When nearly ripe they would be cut, usually with a 5 ft. horse drawn mower, raked and put in small shocks. As soon as they got dry enough and when dry, either baled or hauled to a thresher and then baled. When threshed they might make from 4 to 6 bu. per acre and both the seed and hay was pretty valuable. Corn was planted with a two row horse drawn planter on 38 or 40 inch rows with at least 18 inch spacing, all open pollinated corn. You went to the crib and shelled your seed. I don't remember getting hybrid seed until the 40's. That old open pollinated corn mostly white, grew twelve ft. high and 35 bu. was considered a pretty good yield. When fertilizer first began to come around most people thought if you used more than 200 pounds of 2-12-6 you would burn it up and almost none was used until we began to get tractor drawn implements in the mid 30's. Before then nearly all farming was done with horses and mules; with only a few, mostly 10-20 Internationals, G.P. John Deers, Fordsons or W.C. Allis Chalmers. Wheat and Oats were probably about equal in acerage with both being cut with a binder, put in shocks and hauled to a threshing machine. Wheat was pretty good at 20 bu. Oats might make 40 to 50. Oat straw was usually baled for hay. The wheat stack was left for live stock to enjoy. The yellow, (or oil) bean began to appear in the mid thirties and that added to the mix. No combines yet so they too were cut, shocked, and hauled to a threshing machine. All this began to change drastically, however when prices began to pick up at the end of the depression, (about 1934 or 1935). Farmers began buying tractors and the small combine came out a little later. At first the little 40 inch Allis Chalmers and then their GREAT BIG 5 footer. John Deer and International both came out , I think with a 6 footer. All these were power takeoff driven. No tractor at that time had a live power takeoff. In fact, some didn't even have a power shaft.

So many changes from the horse drawn 12 inch walking plow and 5 ft. disc to the 200 horsepower tractor pulling a 30 ft. implement; the grain binder and threshing machine with a crew of 18 or 20 men to the 30 ft. combine, and 2 or 3 men. The same cornfields that were good at 40 bushel now making 150 with no cultivation. The spray dope that kills everything except the soybean plant or the cornstalk. The old shucking peg or hook and the double thumbed gloves that a real good man could shuck 100 bu. of corn in a day with back when it was all harvested by hand, to the combines that think nothing of 1000 bu. per hour, even on the smaller ones.

This nation is so extremely, very well blessed and I am afraid very unappreciative of that fact. About 90 percent of the population of these United States thinks that food grows up there on the grocery store shelf in a can, not in any way realizing that some farmer, somewhere, grew it out of the ground. I very well remember when one of our Senators on the East Coast, (that we've still got), back in the 60's, tried to introduce a bill to make the farmer and rancher put diapers on his cows. Does anyone think he knows where his beans and taters come from?

Written by: Cyril Barton Jan.2005

MISSION STATEMENT OF THE RAYSE CREEK WATERSHED MANAGEMENT PLAN

Developed by the Rayse Creek Watershed Planning Committee

To preserve agricultural heritage and improve water quality in the Rayse Creek watershed through stakeholder collaboration, community education and implementation of best management practices.

Goal of the Plan: To work with the Rayse Creek Watershed Planning Committee to develop a comprehensive watershed management plan, with the primary goal of improving water quality. We will utilize and expand upon the Rayse Creek TMDL plan developed by Montgomery, Watson, and Harza for the Illinois Environmental Protection Agency.

LOCALLY IDENTIFIED RESOURCE CONCERNS

1. Cropland Erosion and Runoff
2. Streambank Erosion
3. Flooding
4. Abandoned Wells
   -oil wells
5. Urban Build-up
6. Pastureland and Livestock Runoff
7. Mine Erosion
8. Timber Management

WATERSHED DESCRIPTION

Rayse Creek watershed (Figure 1) encompasses approximately 99 square miles of land, water and other natural resources. Approximately 82% or 52,307 ac of the watershed is located in western Jefferson County and 18% or 11,277 ac lies in eastern Washington County in southcentral Illinois. Rayse Creek is 27 miles long and is located at the headwaters of the larger Big Muddy watershed of southern Illinois. Towns included within the watershed are the Village of Richview in Washington County and the Villages of Woodlawn and Waltonville in Jefferson County.

The Illinois Environmental Protection Agency (IEPA) identification code for Rayse Creek is ILNK01. The hydrologic unit code (HUC) as well as the United States Geological Survey (USGS) identification number is identified near Waltonville as 05595730. Stream segments for Rayse Creek are NK02 near Woodlawn and NK01 near Waltonville.

The NK02 station, also known as the INTB (Intensive River Basin Survey) Sampling Station, is sampled by the IEPA and Illinois Department of Natural Resources (IDNR) every 5 years. The INTB stations are selected when data is lacking or historical data needs to be updated. The parameters sampled include water chemistry, fish and macroinvertebrates, instream habitat, and stream discharge. Fish tissue and sediment are sampled for toxic substances. These data are used to characterize the stream as healthy or impaired in terms of water quality and aquatic life (http://www.epa.state.il.us/water/surface-water/river-stream-mon.html#sw4, 2004).

The NK01 station is part of the IEPA's Ambient Water Quality Monitoring Network (AWQMN). Surface water chemistry is sampled on a six week sampling frequency and analyzed for various parameters (i.e. pH, temperature, specific conductance, dissolved oxygen, suspended solids, nutrients, fecal coliform bacteria, and total and dissolved heavy metals) (http://www.epa.state.il.us/water/surface-water/river-stream-mon.html#swl, 2004). Each subwatershed of Rayse Creek is identified in the plan and identifies the segments relating to each of its tributaries. This information is helpful for identifying the location of the stream and the water quality assessments that are published by the IEPA, Illinois Department of Natural Resources (IDNR), and the United States Geological Survey (USGS).

A *watershed* is defined as a topographically delineated area that is drained by a network of streams and/or rivers. Thus, the high elevation points around a stream and its' tributaries form the watershed boundary.

Figure 1. Rayse Creek watershed boundary

(Source: IEPA, 2005)

WATERSHED PROGRAM ACTIVITIES - PREVIOUS AND ONGOING

The Jefferson County Natural Resources Conservation Service (NRCS), Soil and Water Conservation District (SWCD) and Farm Service Agency (FSA) have each conducted numerous educational programs and activities in the watershed. The Jefferson County Farm Bureau (JCFB) and Jefferson County SWCD held their 84th Annual Meeting on November 16, 2004. The local FFA Chapters are usually in attendance. Most of these programs are conducted county-wide. The Illinois Water Well Abandonment Program is also an active program within Jefferson and Washington County.

The Jefferson County SWCD publishes their newsletter *Conservation News*. The SWCD holds fish sales for stocking ponds and sells tree seedlings for conservation and wildlife purposes. The Neighbor to Neighbor program was initiated by a former employee of the SWCD but was terminated. A 27-acre Outdoor Education Facility was designed with various locally adapted conservation practices for the citizens of Jefferson County to tour. A tour was held in early April 2005 with stakeholders from the watershed and representatives from the SWCD, NRCS and FSA. A local newspaper journalist was also present and published a story about the tour and conservation efforts. The practices on the site included: grassed waterways, water and sediment control basins (WASCOB), a block chute structure, a grade stabilization structure, a wetland, a composting bin and a cattle panel structure. The pamphlet guide to the self-guided tour was very instructional and educational and also informed the citizens of how soil and wind erosion occurs, using a global positioning system (GPS), livestock exclusion fence, water conservation and watershed protection. Unfortunately, the Facility is lacking maintenance.

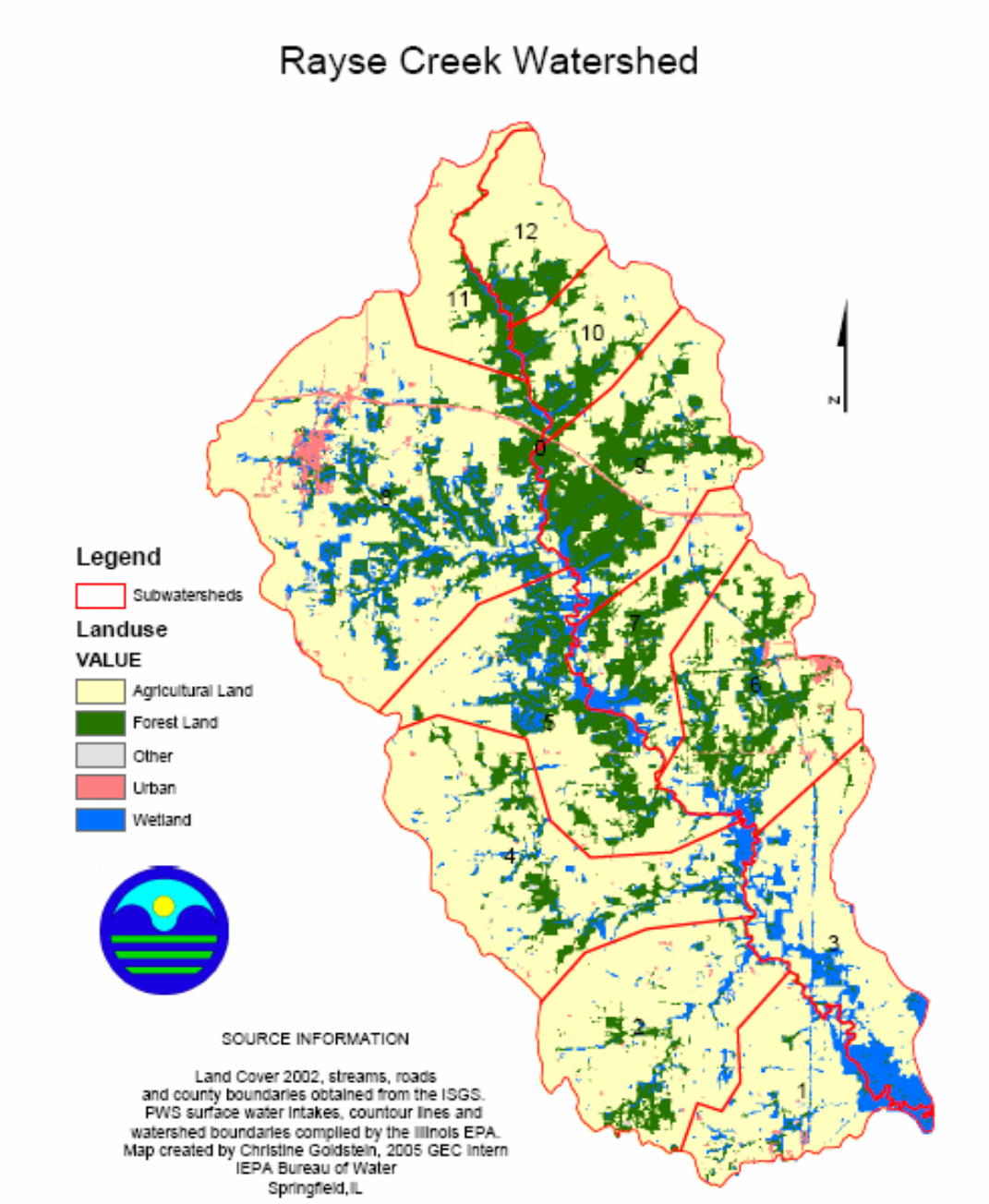
The SWCD also holds a popular Conservation Tour on a landowner's property who has adopted one or more conservation practices. The most recent tour was August 26, 2004. The area was located outside of the watershed but many stakeholders from Rayse Creek attended. Wayne Kinney, a privately contracted fluvial geomorphologist (formerly employed with the IL Department of Agriculture), was present at the tour to discuss the streambank stabilization and restoration efforts which he helped design in the area.

To enhance public understanding of the watershed planning process, we held two watershed stakeholder workshops. In the first workshop held in Woodlawn, IL on January 28, 2004, we introduced the watershed planning process and discussed stakeholder's potential roles in the development of a watershed plan. The second workshop on January 12, 2005 in Woodlawn, gave stakeholders the opportunity to ask questions about the water quality data for Rayse Creek, learn what the Rayse Creek Watershed Planning Committee is doing to help improve the environment, and give their comments on the Rayse Creek Watershed Management Plan outline. Also, in the winter and spring of 2003-2004, we conducted three facilitated focus groups and in-depth interviews with planning committee members, agency personnel, and elected officials and other watershed stakeholders to assess watershed value and meaning and the overall watershed planning process in Rayse Creek.

WATERSHED RESOURCE INVENTORY

The ten subwatersheds of Rayse Creek are shown in Figure 2. Management on a subwatershed level may be more practical in terms of helping to prioritize future restoration activities.

Figure 2. Subwatersheds of Rayse Creek watershed



(Source: IEPA, 2005)

WATERBODIES

Lakes

The data retrieved is county-wide. Jefferson County data are recorded in the townships of Grand Prairie, McClellan, Casner, and Blissville. These data are not delineated by the watershed boundary.

Table 1. Number of ponds and lakes in Jefferson County

Township	Ponds	Total Acres
Grand Prairie	76	59
McClellan	31	18
Casner	203	177
Blissville	207	140

(Source: NRCS, 2005)

Ashley Lake

Ashley Lake is located east of Illinois Central Gulf Railroad within the Ashley Township in Washington County at a latitude/longitude of 38.3471/-89.1797 and is located at the mouth of segment (or tributary) 690 in Subwatershed 8. The lake was used as a public water supply and food processing prior to October 1998 (http://www.sws.uiuc.edu/warm/iwcs/1998/nov98.pdf, 2005). It was monitored by the IEPA in 2002 for aquatic life, primary and secondary contact. Results are listed in the table below.

Table 2. IEPA 2004 water quality results for Ashley Lake, Richview, IL

Segment ID	Catalog Unit	Segment Name	Size in acres	Key Sample Date	Assessment Type/Methods		Designated Uses	Potential Causes of Impairment	Potential Sources of Impairment
RNZB	07140106	ASHLEY RESERVOIR	18	05011990	E	155	P1,P20,P42,P44, X21,X50	900,910,1100,1220,2100, 2200	1000,1050,1100,8500,8960

(source: 2004 Illinois Water Quality Report--http://www.epa.state.il.us/water/water-quality/305b/305b-2004.pdf, 2005)

Assessment Type: M = Monitored, E = Evaluated. Monitored assessments are based on current waterbody-specific monitoring data believed to accurately represent existing resource conditions. Evaluated assessments are resource-quality determinations not based primarily on such information. Since multiple uses are commonly assessed for each lake, an "E" refers only to the assessment of *aquatic life, primary contact*, and *secondary contact* uses.

Assessment method used: 155 = Ambient Lake Monitoring Program chemical/physical data >5 but <15 years old.

Designated uses:
F = Full
P = Partial Support
N = Nonsupport
X = this use was not assessed

1 = *Overall* 44 = *Secondary Contact (Recreation)*
20 = *Aquatic Life* 46 = *Indigenous Aquatic Life*
21 = *Fish Consumption* 50 = *Public Water Supply*
42 = *Primary Contact (Swimming)*

Designated uses for Ashley Lake:
P1 = Partial support for overall use
P20 = Partial support for aquatic life
P42 = Partial support for primary contact (swimming)
P44 = Partial support for secondary contact (recreation)
X21 = Fish consumption was not assessed
X50 = Public water supply use was not assessed

Table 3. Potential causes of impairment for Ashley Lake

Source code	Potential Causes of Impairment
0900	Unspecified Nutrients
0910	Total Phosphorus
1100	Sedimentation/Siltation
1220	Oxygen, Dissolved
2100	Total Suspended Solids
2200	Aquatic Plants Native

Table 4. Potential sources of impairment for Ashley Lake

Source Code	Potential Sources of Impairment
1000	Agriculture
1050	Crop-related Sources
1100	Non-irrigated Crop Production
8500	Contaminated Sediments
8960	Forest/Grassland/Parkland

Rend Lake

Rend Lake is not located within the Rayse Creek watershed but poses as a potential source of impairment for the southern most segments (NK01) of Rayse Creek especially during waterfowl season (October through May). In turn, the water quality of Rayse Creek affects the water quality of Rend Lake.

Land is managed for agricultural crops during the growing season. Flooding of this same area during the waterfowl season can potentially bring residual nutrients into the water body. This water is released into Rend Lake in May at the end of the waterfowl season. IDNR is responsible for the Big Muddy subimpoundment and the Rend Lake Refuge area (http://dnr.state.il.us/lands/landmgt/PARKS/R5/RENDLAKE/REND.HTM retrieved 10/16/05).

Table 5. IEPA 2004 water quality results for Rend Lake

Segment ID	Catalog Unit	Segment Name	Size in acres	Key Sample Date	Assessment Type/Methods	Designated Uses	Potential Causes of Impairment	Potential Sources of Impairment
RNB	07140106	REND	18900	05012000	M	205,260, 270,275	F21,P1,P20,P42, P44,P50	595,900,910,1100,1220, 2100,2210	200,1000,1050,1100,4000,7550, 7700,8700,9000

(source: http://www.epa.state.il.us/water/water-quality/305b/305b-2004.pdf, 2005)

Assessment type:
M = Monitored assessments are based on current waterbody-specific monitoring data believed to accurately represent existing resource conditions.

Table 6. Method of monitoring used for Rend Lake

Code	Monitoring program used for assessment
205	Ambient Lake Monitoring Program chemical/physical data <5 years old.
260	Fish tissue analysis data.
270	PWS chemical monitoring (ambient water)
275	PWS chemical monitoring (finished water)

Table 7. Designated uses for Rend Lake

Code	Designated uses
F21	Full support for fish consumption
P1	Partial support for overall use
P42	Partial support for primary contact (swimming)
P44	Partial support for secondary contact (recreation)
P50	Partial support for public water supply

Table 8. Potential causes of impairment for Rend Lake

Code	Potential causes of impairment
595	Manganese
900	Unspecified nutrients
910	Total phosphorus
1100	Sedimentation/siltation
1220	Oxygen, dissolved
2100	Total suspended solids
2210	Excess algal growth

Table 9. Potential sources of impairment for Rend Lake

Code	Potential sources of impairment
200	Municipal point sources
1000	Agriculture
1050	Crop-related sources
1100	Non-irrigated crop production
4000	Urban runoff, storm sewers
7550	Habitat modification (other than hydromodification)
7700	Bank or shoreline modification/destabilization
8700	Recreation and tourism activities
9000	Source unknown

Streams

Rayse Creek is the main stream draining the watershed. It is approximately 27 miles long and drains 99 square miles or 63,581 ac. It is a 4th order stream and is intermittent in its flow regime. Most of the tributaries of Rayse Creek are ephemeral or intermittent. Table 10 lists the subwatersheds and tributaries of Rayse Creek. The segments were identified by the Resource Management Mapping Service provided at http://space1.itcs.uiuc.edu/website/rmms/. IEPA and IDNR use the segment numbers to identify streams in water quality reports.

The surface area of lakes and streams totals 667 acres or 1% of the watershed's total area (IDNR, 2002).

Table 10. Stream segments as identified by IEPA & IDNR

Subwatershed/ Name	Segments
12	1373, 1374, 1375
11	1376
10	1370, 1371, 1372
9	1364, 1365, 1366, 1367, 1368, 1369
8	690, 1377, 1379, 1380, 1381, 1383, 1384, 1385, 1386, 1387, 1388, 1391
7	1361, 1362, 1363
6	1356, 1357, 1358, 1359, 1360
5	1392, 1394, 1395, 1396, 1397
4 / Novak Creek (NKC)	1398, 1399, 1400, 1401, 1403
3	691, 692, 1355
2 / Back Branch (NKD)	701, 1404, 1405, 1406, 1407, 1408, 1409
1 / Knob Prairie Creek (NKB)	1410, 1411, 1413, 1415, 1416, 1417

(source: http://space1.itcs.uiuc.edu/website/rmms/, 2005)

Intermittent stream – a stream that flows only a portion of the year; generally during the winter and spring in this climatic zone.

Ephemeral stream – a stream that flows only during and immediately following significant precipitation events.

Water Quality

Historical Water Quality Trends

As stated earlier, two water quality monitoring sites have been established in the Rayse Creek watershed. The NK01 site is near the mouth of the watershed at Waltonville. This site is part of IEPA's Ambient Water Quality Monitoring Network (AWQMN) and is sampled approximately every six weeks for physical and chemical water quality parameters. Historical water quality data is available for NK01 from 1972 to 2000 (Tables 11 – 19). Monitoring site NK02 is located west of Woodlawn, approximately in the middle of the watershed, upstream of NK01. NK02 is only sampled periodically as part of the Intensive River Basin Surveys. Water quality data for NK02 is available from 1986 to 1995 and from 1998 to 2000 (Table 20). Since the NK01 monitoring site is near the mouth of the watershed, is downstream from NK02, and has a longer period of record, we will focus our assessment of water quality trends on the NK01 site.

Over the past three decades, mean annual stream temperature has slightly increased (Table 11), while mean annual dissolved oxygen levels have decreased (Table 12). This inverse relationship is expected, since cooler water can hold higher dissolved oxygen levels. The mean annual stream oxygen levels have remained above 5 mg/L or ppm, which is above hypoxic levels (<2 mg/L) where fish and macroinvertebrate health declines. Based on the individual AWQMN data points, hypoxic conditions were reached twice in 1974, once in 1976, twice in 1980, and once in 1994. Thus, it appears there is a decrease in the number of hypoxic events in Rayse Creek over time. The vast majority of the low oxygen levels occurred during summer and early fall when water temperatures were higher and streamflow discharge was relatively low.

Table 11. Annual mean stream temperature at NK01 monitoring site, Waltonville, in Rayse Creek

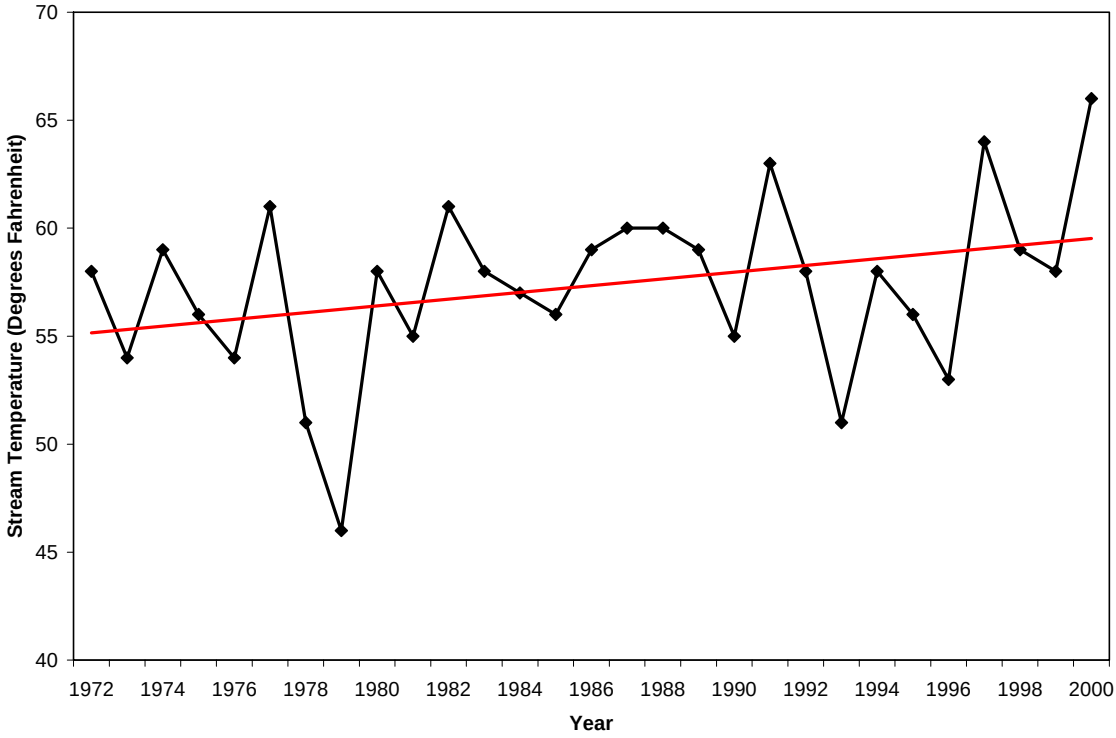
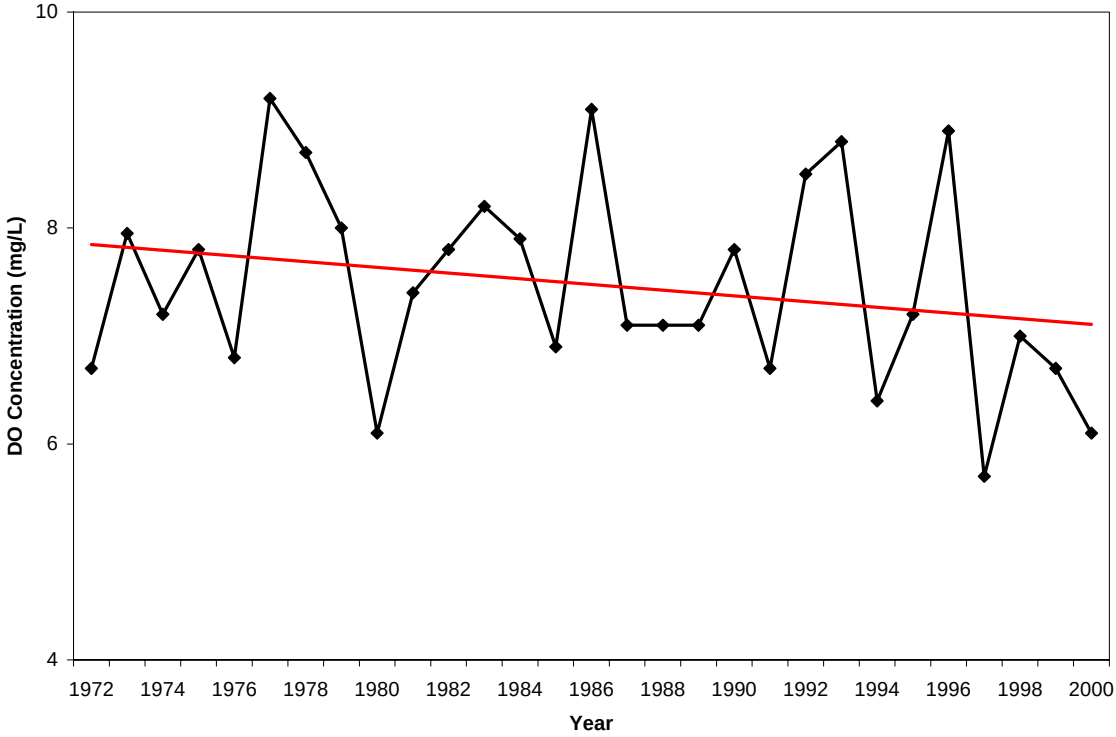
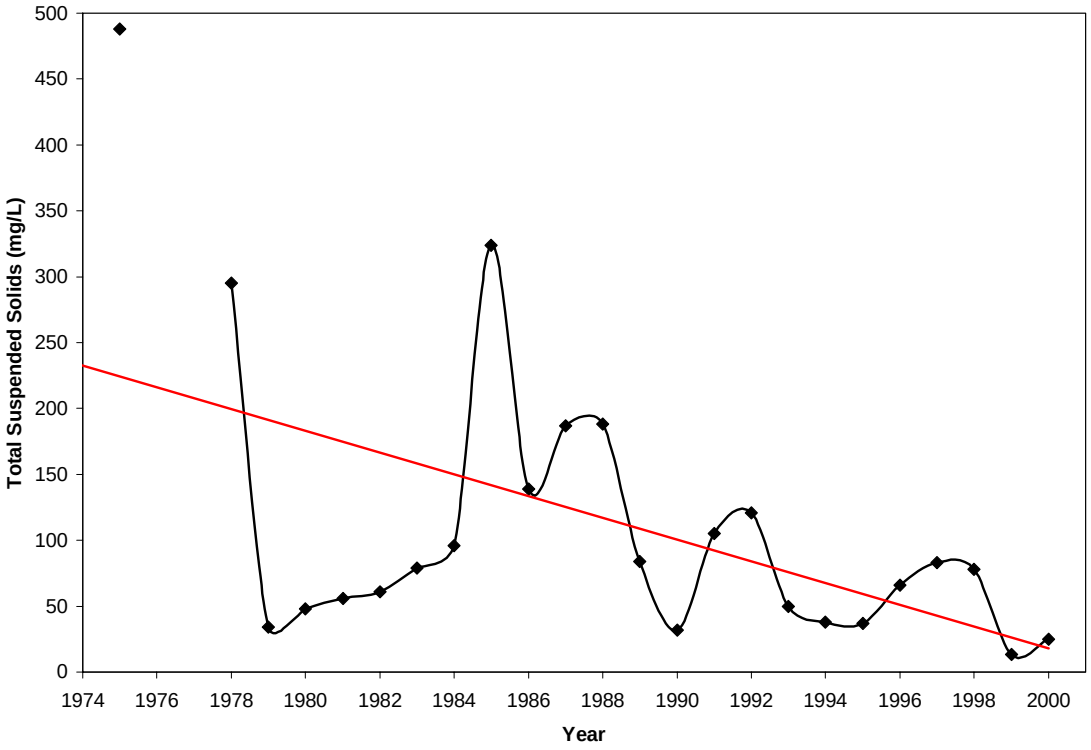


Table 12. Annual mean dissolved oxygen concentrations at NK01 monitoring site, Waltonville, in Rayse Creek



Annual mean total suspended solid concentrations, a measure of how many soil particles are carried in the water, experienced a declining trend over the past three decades (Table 13). This may be due to the increased use of no-till and conservation tillage within the watershed. There have also been a significant number of filter strips and riparian buffers established in the watershed (Art Frederich, personal communication), which help to filter sediment from surface runoff before it enters Rayse Creek and its tributaries.

Table 13. Annual mean total suspended solid concentrations at NK01 monitoring site, Waltonville, in Rayse Creek



Annual mean dissolved nitrate-N, ammonium-N, total phosphorus (sediment-bound + dissolved phosphorus), and dissolved reactive phosphate (plant available phosphate) all had slightly increasing trends over the past two to three decades (Tables 14 - 17). However, nitrate-N, ammonium-N, and total phosphorus concentrations all experienced significant decreases in the last two to three years of the period of record. Given that nitrogen and phosphorus are the primary nutrients added to soils via agricultural fertilizers, additional nutrient management planning and establishment of best management practices such as filter strips and riparian buffers are warranted in the watershed to maintain and/or improve upon this downward trend in nutrient leaching. To further improve water quality, agricultural best management practice recommendations were developed at the subwatershed level in the Rayse Creek watershed (see Section XII Best Management Practice Recommendations).

Table 14. Annual mean dissolved nitrate-N concentrations at NK01 monitoring site, Waltonville, in Rayse Creek

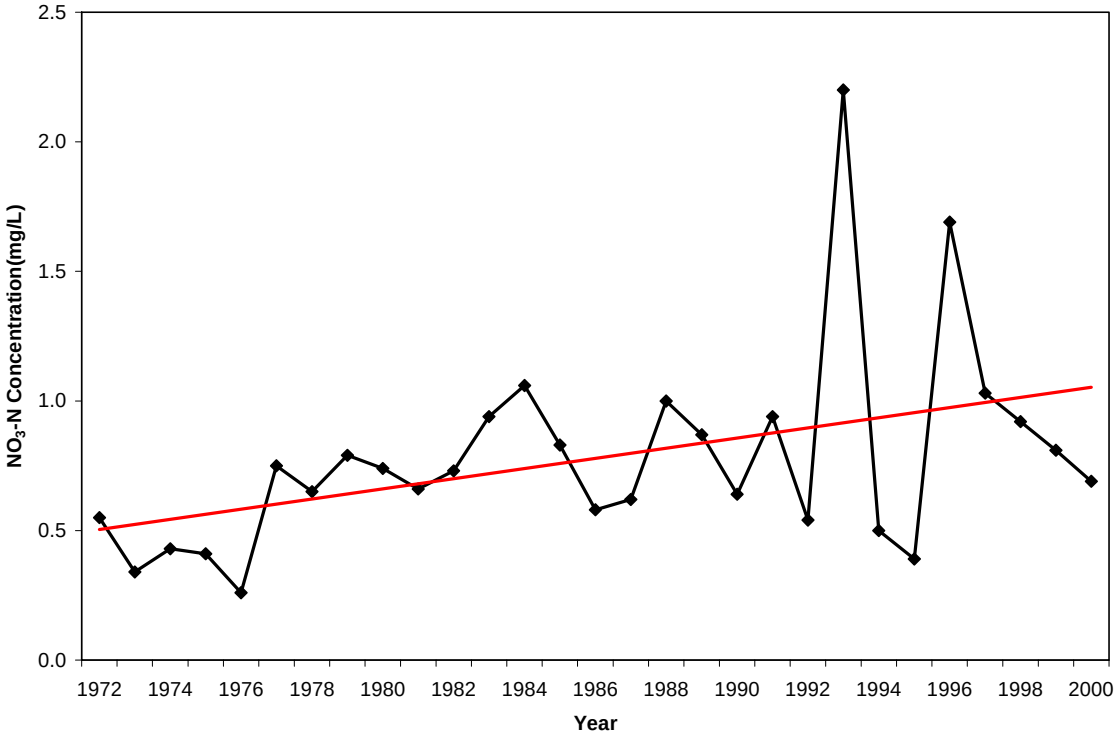


Table 15. Annual mean dissolved ammonium-N concentrations at NK01 monitoring site, Waltonville, in Rayse Creek

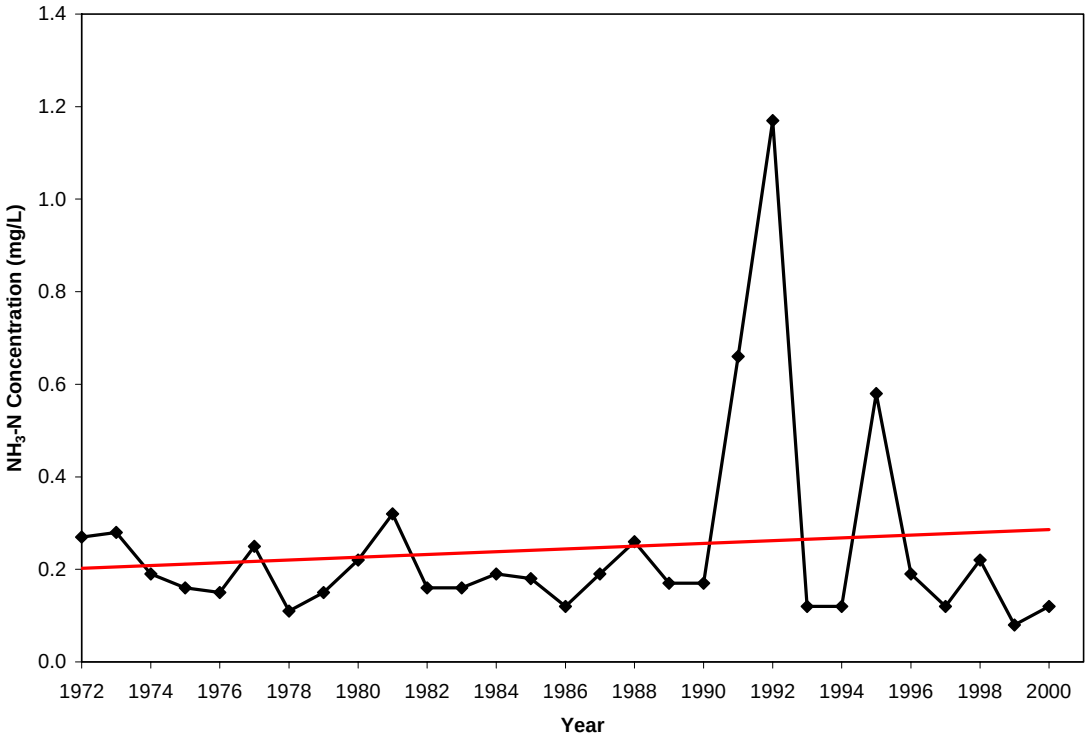


Table 16. Annual mean total phosphorus concentrations at NK01 monitoring site, Waltonville, in Rayse Creek

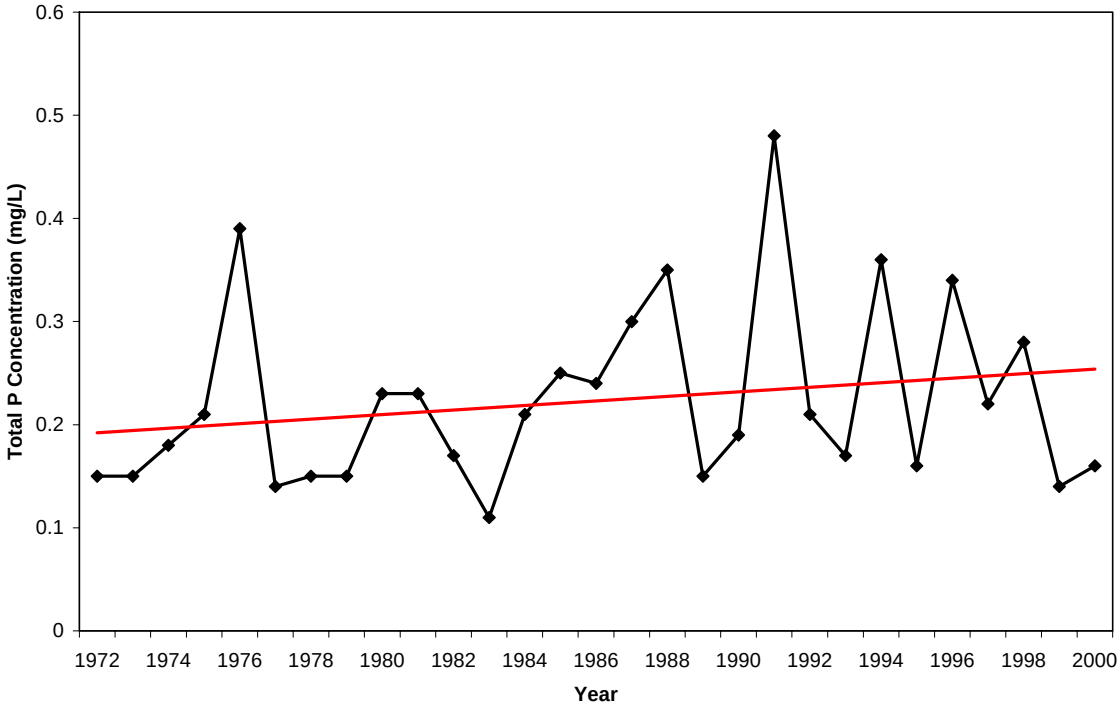
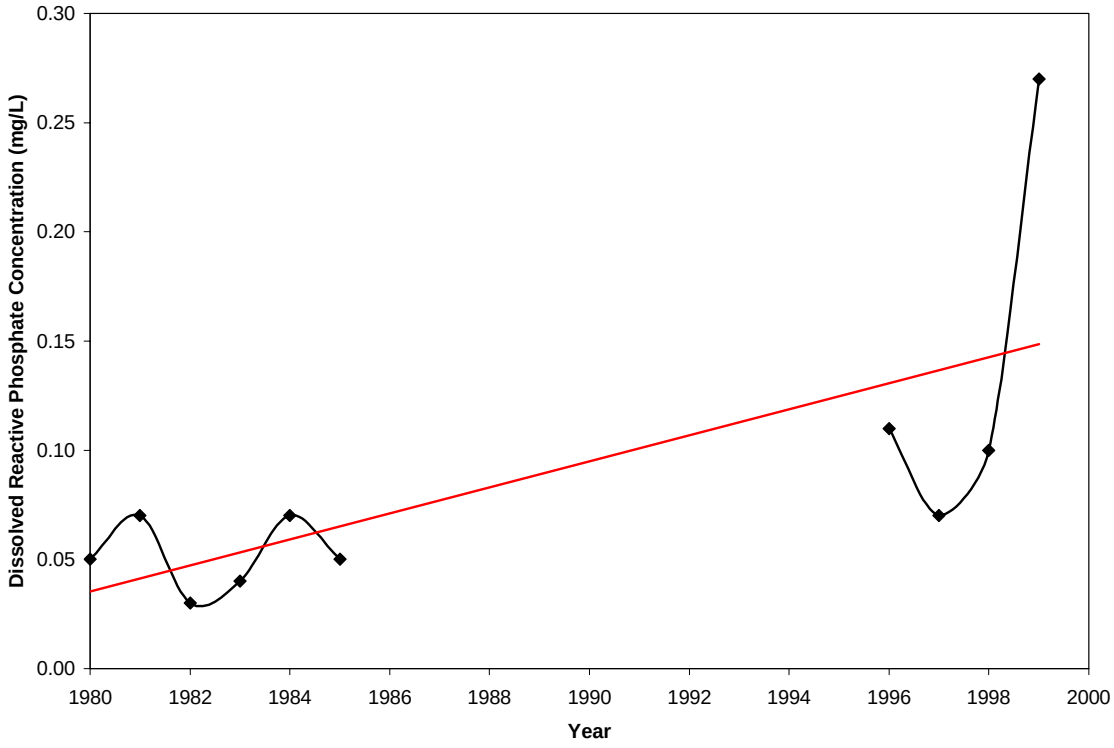


Table 17. Annual mean dissolved reactive phosphate concentrations at NK01 monitoring site, Waltonville, in Rayse Creek



Mean total manganese and iron concentrations both decreased over the past two decades. High manganese and iron concentrations can be attributed to acid mine drainage and natural sources.

Table 18. Annual mean total manganese concentrations at NK01 monitoring site, Waltonville, in Rayse Creek

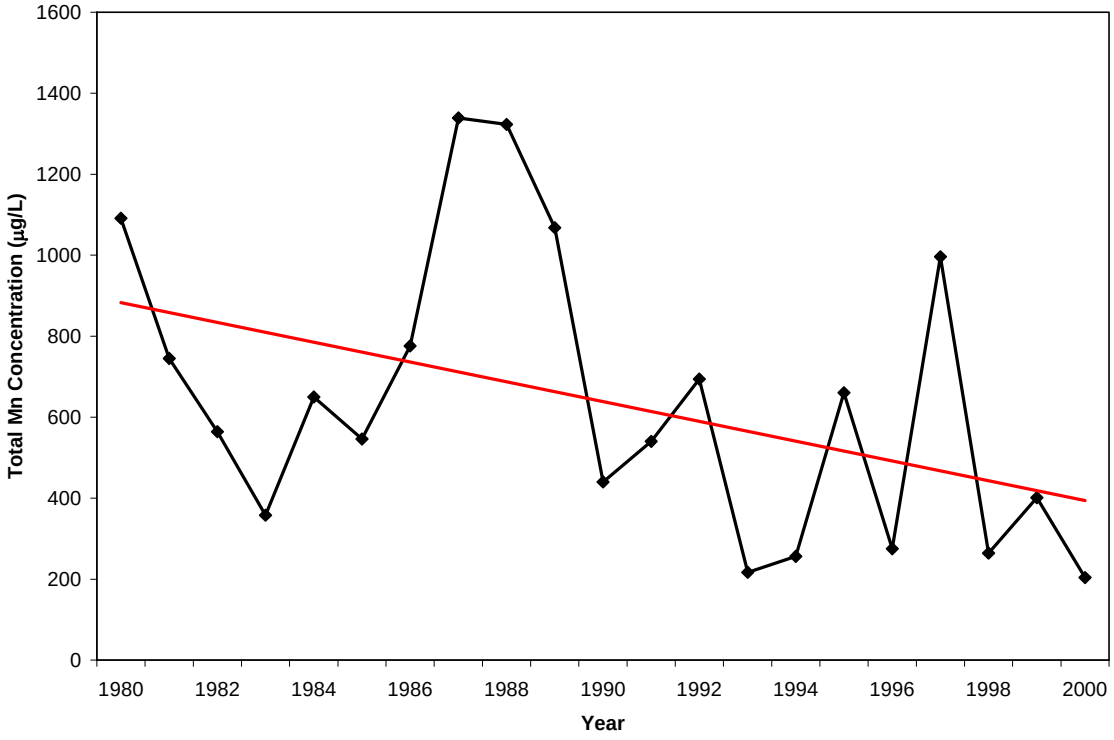


Table 19. Annual mean total iron concentrations at NK01 monitoring site, Waltonville, in Rayse Creek

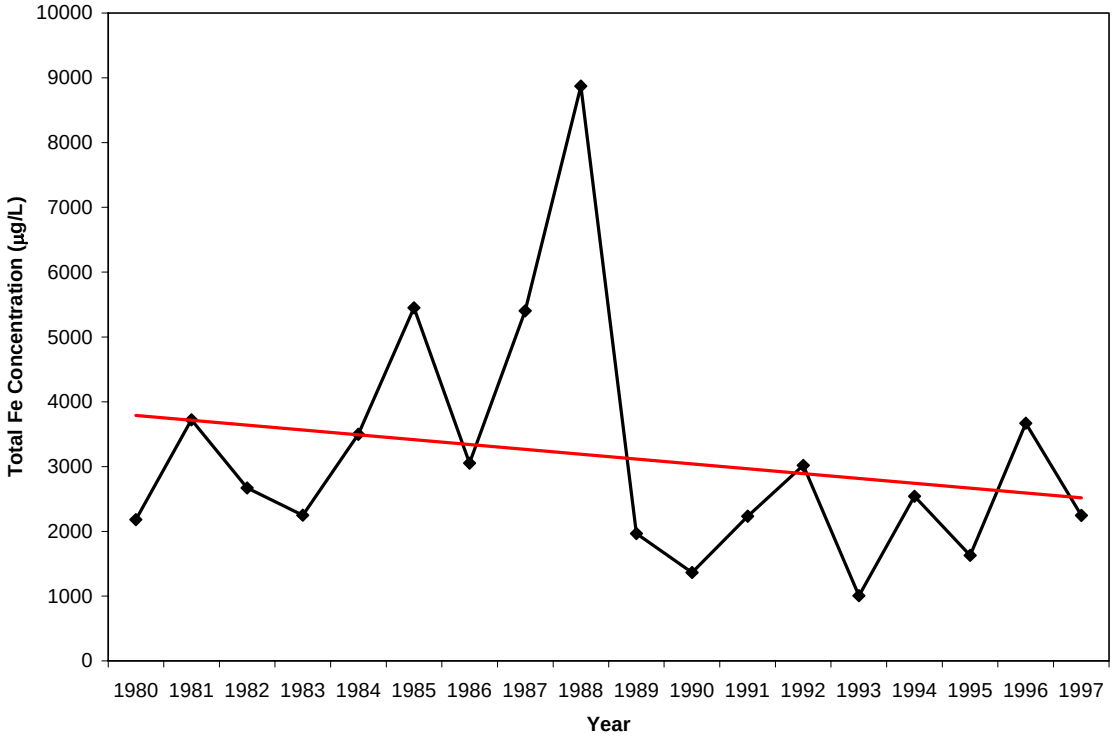


Table 20. Annual mean stream water quality data for NK02 monitoring station near Woodlawn

Water Year	TSS (mg/L)	NO_3-N (mg/L)	NH_3-N (mg/L)	Total P (mg/L)
1986	139	0.63	0.12	0.22
1987	187	0.71	0.19	0.29
1988	188	0.49	0.26	0.34
1989	84	0.48	0.17	0.18
1990	32	0.38	0.17	0.20
1991	105	0.96	0.66	0.22
1992	121	0.81	1.20	0.46
1993	50	1.34	0.12	0.17
1994	38	0.99	0.12	0.15
1995	37	0.37	0.58	0.32
1998	78	0.55	0.22	0.23
1999	21	0.80	0.17	0.20
2000	25	0.38	0.12	0.15

Designated Use

Designated use is established by the IEPA, and a stream should be supportive of the designated use.

Rayse Creek is divided into two sections by sampling station; NK02 is the upper half of the watershed and NK01 is the southern portion.

Designated uses for NK02:

Overall use, fish consumption, aquatic life and swimming

Designated uses for NK01:

Overall use, fish consumption, aquatic life and swimming

Designated Use Support

Designated use support is defined as the degree to which a waterbody can provide a given use.

This chart is taken from the IEPA Bureau of Water May 2004 Illinois Water Quality Report, also known as the 305(b) report (Table 21).

Table 21. IEPA designated use support for Rayse Creek

Segment ID	Catalog Unit	Segment Name	Size in Miles	Key Sample Date	Assessment Type/Methods	Designated Use	Use Support	Cause Code	Cause Name	Source Code	Source Name
NK 01	07140106	Rayse Cr.	8.35	01/01/2000	M/230	Aquatic Life	P	594	Iron	9000	Source Unknown
NK 01	07140106	Rayse Cr.	8.35	01/01/2000	M/230	Aquatic Life	P	595	Manganese	9000	Source Unknown
NK 01	07140106	Rayse Cr.	8.35	01/01/2000	M/230	Aquatic Life	P	1000	pH	9000	Source Unknown
NK 01	07140106	Rayse Cr.	8.35	01/01/2000	M/230	Aquatic Life	P	1100	Sedimentation/Siltation	1100	Nonirrigated Crop Production
NK 01	07140106	Rayse Cr.	8.35	01/01/2000	M/230	Aquatic Life	P	1220	Oxygen, Dissolved	1600	Intensive Animal Feeding Operations
NK 01	07140106	Rayse Cr.	8.35	01/01/2000	M/230	Aquatic Life	P	2100	Total Suspended Solids	1100	Nonirrigated Crop Production
NK 01	07140106	Rayse Cr.	8.35	01/01/2000	M/230	Aquatic Life	P	9910	Total Phosphorus	1100	Nonirrigated Crop Production
NK 01	07140106	Rayse Cr.	8.35	01/01/2000	M/230	Aquatic Life	P	9910	Total Phosphorus	1600	Intensive Animal Feeding Operations
NK 02	07140106	Rayse Cr.	19.24	01/01/2000	M/700	Aquatic Life	F				
NKB	07140106	Knob Prairie Cr.	3.37		E	Aquatic Life	X				
NKC	07140106	Novak Cr.	8.71		E	Aquatic Life	X				
NKD	07140106	Back Branch	4.31		E	Aquatic Life	X				

F = Full support (i.e., fully attained)
P = Partial support (i.e., partially attained)
N = Nonsupport (i.e., not attained)
X = not assessed

(source: http://www.epa.state.il.us/water/water-quality/305b/305b-2004.pdf, 2005)

The full support for the designated uses in the NK02 section is indicative of a high quality water. However, the stream water quality data for NK 02 (Table 20) suggests that agricultural non-point source pollution in that portion of the watershed is impacting water quality in the stream reach.

Impairments

Table 22. Prioritization of causes and sources of impairments in Rayse Creek watershed

Potential sources of impairment	Potential causes of impairment
Cropland erosion and runoff	Sediment, nutrients, suspended solids, dissolved oxygen, iron
Streambank erosion	Sediment, nutrients, suspended solids, dissolved oxygen, iron
Flooding	Seasonally high water tables, clayey soils, siltation
Abandoned wells (i.e. oil wells)	Sediment, suspended solids, nutrients, dissolved oxygen, pH, iron
Pastureland and livestock runoff	Sediment, nutrients, suspended solids, iron
Mine erosion	Sediment, nutrients, iron, manganese, pH, iron
Timber management	Sediment, nutrients, iron, manganese

(NRCS, 2005)

Oil brine

Oil wells, both functioning and abandoned, are spread throughout the watershed. Oil brine is removed with crude oil from below the surface. Poor handling of brine can result in severe land and water degradation. The brine is composed of dissolved salts primarily sodium and chloride. Other components include, to a lesser extent, magnesium, potassium, chloride, sulfate, bicarbonate, and carbonate. Small areas of brine damage can spread across and below adjacent land to cover a larger areas. Soil fertility and water availability to plants are diminished following brine damage. It is important to note that brine has negative effects on water quantity as well as water quality such as higher rates of evaporation and surface runoff due to poor soil infiltration rates(Atalaya et al. 1999; www.il.nrcs.usda.gov/features/success/restbrnsls.html 2004).

Remediation (or treatment) of these areas, depending on how severe the damage, involves adding gypsum, which is costly, and installing a drainage system and other amendments. The local USDA Service Center should be contacted for assistance. Successful remediation has taken place in White, Saline, Gallatin and Hamilton Counties with the help of the Shawnee RC&D (Resource Conservation and Development) and local NRCS personnel through EQIP (Environmental Quality Incentives Program) (www.il.nrcs.usda.gov/features/success/restbrnsls.html, 2004). The Southeastern Illinois Oil Brine Damage Taskforce located in Harrisburg, IL has developed management practices to remediate and reclaim oil brine damaged land and has helped perform successful oil brine remediation in the region.

Researchers from Virginia and Oklahoma performed a study in Clearview, Oklahoma on the effects of brine on soil and water quality (Atalaya et al., 1999). They took surface and subsurface soil samples and water samples from the brine disturbed areas and compared those samples to the soil and water that were not affected by brine. They found that the brine changed the soil type from a sandy loam which was

nondispersive to a clay loam which was slightly dispersive. This was caused by the high sodium content and higher erosion rate. Earth metal concentrations in the soil were also higher in the brine damaged site than in the undamaged site. Soil pH was higher in the damaged area (7.5) than in the area with no brine damage (6.6).

Water quality results from the Oklahoma site showed significant impairments. Electrical conductivity (EC), total dissolved sediment (TDS), hardness, sodium, and chloride all increased. Total suspended solids (TSS) and soluble salt were increased at the mouth of the area during heavy rains. Using relatively inexpensive remediation techniques, within 6 months the brine damaged land in Oklahoma was able to support vegetation.

GROUNDWATER

Geology

The DuQuoin Monocline follows parallel and close to the Washington and Jefferson County borders. The monocline* also stretches through the watershed in Jefferson County. Bedrock geology for the watershed is mainly Pennsylvanian Bond Formation which consists of mainly thick, pure limestone (IDNR, 2002). The northeastern section of the watershed is Pennsylvanian Mattoon Formation which is the youngest formation and is characterized by thin limestone and discontinuous thin coal (IDNR, 2002).

*A *monocline* is an upward band or fold in the geologic rock.

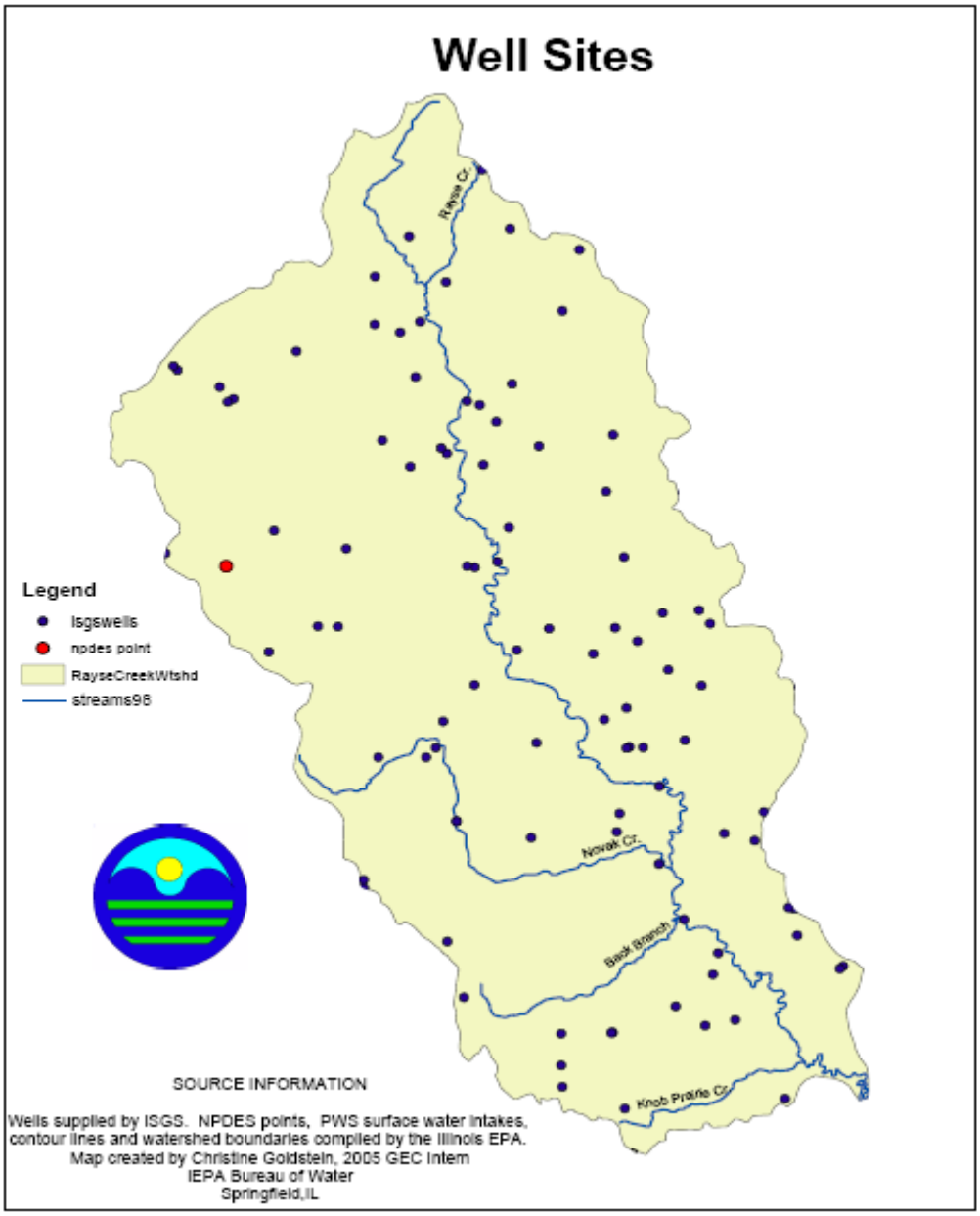
Glacial Geology

The Illinois Episode of glaciation left a layer of till that is classified as the Vandalia Till Member of the Glasford Formation (Willman and Frye, 1970). The Equality Formation located in the forested area of the northwestern finger of Rend Lake is composed of fine sediments where lakes existed. The majority of the deposits in most of Rayse Creek's streambed is recognized as the Cahokia Alluvium (Willman and Frye, 1970) The material is composed of silts, clays, and sand and gravel deposited in floodplains. Glacial drift of loess ranges from less than 25 feet deep across the uplands to more than 50 to 100 feet deep to the streambed.

Water Wells

There are numerous private water wells throughout the watershed. Although data for Rayse Creek is not available, most of the ground water in Big Muddy watershed is obtained through water wells that are dug and bored and finished within unconsolidated materials above bedrock (IDNR, 2001 vol.2). There are no public water supply wells within the watershed. Most of the reported private water wells within Jefferson County are less than 50 feet deep (#516) followed by 186 wells that are less than 100 feet deep (IDNR, 2001 vol. 2). Well decommissioning is a continuing project throughout the Rayse Creek watershed, Jefferson and Washington Counties (contact local county health department for more information).

Figure 3. Wells within the Rayse Creek watershed



(IEPA, 2005)

Vulnerability to Pesticides

Most of the Rayse Creek watershed has very limited aquifer sensitivity to pesticide contamination. However, there are areas in the north and northwestern headwaters that have moderate to excessively high susceptibility to pesticide leaching (IDNR, 2002).

IRRIGATION

There are presently no known irrigation practices within the watershed.

MUNICIPAL / INDUSTRIAL

Industrial agricultural pollution

A large CAFO is located within the watershed, specifically in Subwatershed 4 or Novak Creek watershed. It was built in 1998 and is under IEPA regulation using a Waste Management Plan.

Septic systems

The Jefferson County Health Department published "A Guide for the Selection of a Private Sewage Disposal System." Three types of sewage systems are listed (buried sand filter, waste stabilization pond, and aerators) along with descriptions and advantages and disadvantages of each. Aerators are most common in the county according to an official at the Health Department. Guidelines are given pertaining to the size of the residence and the size of septic tank and method used.

NPDES Permitted Sites

The Richview Sewage Treatment Plant (STP) is a permitted point source discharge in the watershed located in Richview, Washington County (Subwatershed 8). The treatment plant was completed in 2003. Discharge and water quality data for the influent and effluent from the plant was obtained through the Freedom of Information Act via the IEPA. The parameters monitored include discharge, BOD (biological oxygen demand), residual chlorine, pH and TSS (total suspended solids).

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REPORTED DMR MEASUREMENT DATA
BEGINNING WITH FIRST AVAILABLE TO PRESENT, AS AVAILABLE

FACILITY NAME NPDES SIC2 CODE

PIPE DESCRIPTION STATUS DATE PIPE TYPE

PARAMETER MONITORING POINT

CODE	DMR DATE	MS AV(Q)	MS MX(Q)	UNITS	MS MN(C)	MS AV(C)	MS MX(C)	UNITS	NODI
RICHVIEW STP		IL0038717	4952	SEWERAGE SYSTEMS					
INFL	INFLUENT MONITORING	A	I	INFLUENT					
	BOD, 5-DAY	(20 DEG. C)	RAW SEW/INFLUENT						
		MO AVG	WKLY AVG			MO AVG	WKLY AVG		
00310	11/30/02								C
00310	12/31/02								C
00310	01/31/03								C
00310	02/28/03								C
00310	03/31/03								C
00310	04/30/03								C
00310	05/31/03								C
00310	06/30/03					112		MG/L	
00310	07/31/03					88		MG/L	
00310	08/31/03					148		MG/L	
00310	09/30/03					195		MG/L	
00310	10/31/03					158		MG/L	
00310	11/30/03					160		MG/L	
00310	12/31/03					175		MG/L	
00310	01/31/04					145		MG/L	
00310	02/29/04					272		MG/L	
00310	03/31/04					205		MG/L	
00310	04/30/04					208		MG/L	
00310	05/31/04					292		MG/L	
00310	06/30/04					233		MG/L	
00310	07/31/04					227		MG/L	
00310	08/31/04					145		MG/L	
	SOLIDS, TOTAL	SUSPENDED	RAW SEW/INFLUENT						
		MO AVG	WKLY AVG			MO AVG	WKLY AVG		
00530	11/30/02								C
00530	12/31/02								C
00530	01/31/03								C

REPORTED DMR MEASUREMENT DATA
BEGINNING WITH FIRST AVAILABLE TO PRESENT, AS AVAILABLE

QL ********** QL

FACILITY NAME NPDES SIC2 CODE

PIPE DESCRIPTION STATUS DATE PIPE TYPE

PARAMETER MONITORING POINT

CODE	DMR DATE	MS AV(Q)	MS MX(Q)	UNITS	MS MN(C)	MS AV(C)	MS MX(C)	UNITS	NODI
00530	02/28/03								C
00530	03/31/03								C
00530	04/30/03								C
00530	05/31/03								C
00530	06/30/03					94		MG/L	
00530	07/31/03					159		MG/L	
00530	08/31/03					167		MG/L	
00530	09/30/03					233		MG/L	
00530	10/31/03					118		MG/L	
00530	11/30/03					188		MG/L	
00530	12/31/03					197		MG/L	
00530	01/31/04					127		MG/L	
00530	02/29/04					202		MG/L	
00530	03/31/04					177		MG/L	
00530	04/30/04					308		MG/L	
00530	05/31/04					220		MG/L	
00530	06/30/04					107		MG/L	
00530	07/31/04					182		MG/L	
00530	08/31/04					183		MG/L	

FLOW, IN CONDUIT OR THRU TREATMENT PLANT RAW SEW/INFLUENT

CODE	DMR DATE	MO AVG	DAILY MX	UNITS	NODI
50050	11/30/02				C
50050	12/31/02				C
50050	01/31/03				C
50050	02/28/03				C
50050	03/31/03				C
50050	04/30/03				C
50050	05/31/03				C
50050	06/30/03	0.006	0.010	MGD	
50050	07/31/03	0.006	0.010	MGD	
50050	08/31/03	0.005	0.010	MGD	
50050	09/30/03	0.006	0.010	MGD	
50050	10/31/03	0.006	0.012	MGD	
50050	11/30/03	0.006	0.010	MGD	
50050	12/31/03	0.007	0.015	MGD	

REPORTED DMR MEASUREMENT DATA
BEGINNING WITH FIRST AVAILABLE TO PRESENT, AS AVAILABLE

QL ********** QL

FACILITY NAME NPDES SIC2 CODE

PIPE DESCRIPTION STATUS DATE PIPE TYPE

PARAMETER MONITORING POINT

CODE	DMR DATE	MS AV(Q)	MS MX(Q)	UNITS	MS MN(C)	MS AV(C)	MS MX(C)	UNITS	NODI
50050	01/31/04	0.010	0.012	MGD					
50050	02/29/04	0.008	0.012	MGD					
50050	03/31/04	0.012	0.022	MGD					
50050	04/30/04	0.010	0.016	MGD					
50050	05/31/04	0.013	0.022	MGD					
50050	06/30/04	0.011	0.018	MGD					
50050	07/31/04	0.009	0.012	MGD					
50050	08/31/04	0.010	0.016	MGD					

SUB-TOTAL QUICK LOOK PRINT LINES: 74

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REPORTED DMR MEASUREMENT DATA
BEGINNING WITH FIRST AVAILABLE TO PRESENT, AS AVAILABLE

QL ********** QL

FACILITY NAME NPDES SIC2 CODE

PIPE DESCRIPTION STATUS DATE PIPE TYPE

PARAMETER MONITORING POINT

CODE	DMR DATE	MS AV(Q)	MS MX(Q)	UNITS	MS MN(C)	MS AV(C)	MS MX(C)	UNITS	NODI
0010 STP OUTFALL		A		EFFLUENT					
PH				EFFLUENT GROSS VALUE					
					MINIMUM		MAXIMUM		
00400	11/30/02								C
00400	12/31/02								C
00400	01/31/03								C
00400	02/28/03								C
00400	03/31/03								C
00400	04/30/03								C
00400	05/31/03								C
00400	06/30/03				7.8		7.8	SU	
00400	07/31/03				8.2		8.2	SU	
00400	08/31/03				7.6		7.6	SU	
00400	09/30/03				9.2		9.2	SU	
00400	10/31/03				8.9		8.9	SU	
00400	11/30/03				9.3		9.3	SU	
00400	12/31/03				8.3		8.3	SU	
00400	01/31/04				8.8		8.8	SU	
00400	02/29/04				7.9		7.9	SU	
00400	03/31/04				8.0		8.0	SU	
00400	04/30/04				8.4		8.4	SU	
00400	05/31/04				8.7		8.7	SU	
00400	06/30/04				9.6		9.6	SU	
00400	07/31/04				8.0		8.0	SU	
00400	08/31/04				8.0		8.0	SU	
SOLIDS, TOTAL	SUSPENDED			EFFLUENT GROSS VALUE					
		MO AVG	WKLY AVG			MO AVG	WKLY AVG		
00530	11/30/02								C
00530	12/31/02								C
00530	01/31/03								C
00530	02/28/03								C
00530	03/31/03								C
00530	04/30/03								C
00530	05/31/03								C

REPORTED DMR MEASUREMENT DATA
BEGINNING WITH FIRST AVAILABLE TO PRESENT, AS AVAILABLE

QL ********** QL

FACILITY NAME NPDES SIC2 CODE

PIPE DESCRIPTION STATUS DATE PIPE TYPE

PARAMETER MONITORING POINT

CODE	DMR DATE	MS AV(Q)	MS MX(Q)	UNITS	MS MN(C)	MS AV(C)	MS MX(C)	UNITS	NODI
00530	06/30/03	2	2	LBS/DY		18	18	MG/L	
00530	07/31/03	0.2	0.2	LBS/DY		9.2	9.2	MG/L	
00530	08/31/03	0.1	0.1	LBS/DY		6.0	6.0	MG/L	
00530	09/30/03	0.2	0.2	LBS/DY		4.8	4.8	MG/L	
00530	10/31/03	0.2	0.2	LBS/DY		5.2	5.2	MG/L	
00530	11/30/03	2	2	LBS/DY		12	12	MG/L	
00530	12/31/03	1	1	LBS/DY		6.4	6.4	MG/L	
00530	01/31/04	1	1	LBS/DY		8.0	8.0	MG/L	
00530	02/29/04	0.5	0.5	LBS/DY		4.4	4.4	MG/L	
00530	03/31/04	3	3	LBS/DY		20	20	MG/L	
00530	04/30/04	2.0	2.0	LBS/DY		23	23	MG/L	
00530	05/31/04	3	3	LBS/DY		16	16	MG/L	
00530	06/30/04	4	4	LBS/DY		34	34	MG/L	
00530	07/31/04	1	1	LBS/DY		15	15	MG/L	
00530	08/31/04	2	2	LBS/DY		29	29	MG/L	

FLOW, IN CONDUIT OR THRU TREATMENT PLANT EFFLUENT GROSS VALUE

		MO AVG	DAILY MX		
50050	11/30/02				C
50050	12/31/02				C
50050	01/31/03				C
50050	02/28/03				C
50050	03/31/03				C
50050	04/30/03				C
50050	05/31/03				C
50050	06/30/03	0.016	0.030	MGD	
50050	07/31/03	0.003	0.041	MGD	
50050	08/31/03	0.002	0.025	MGD	
50050	09/30/03	0.005	0.018	MGD	
50050	10/31/03	0.005	0.057	MGD	
50050	11/30/03	0.002	0.006	MGD	
50050	12/31/03	0.013	0.035	MGD	
50050	01/31/04	0.016	0.020	MGD	
50050	02/29/04	0.013	0.025	MGD	
50050	03/31/04	0.020	0.055	MGD	
50050	04/30/04	0.012	0.032	MGD	

REPORTED DMR MEASUREMENT DATA
BEGINNING WITH FIRST AVAILABLE TO PRESENT, AS AVAILABLE

QL ********** QL

FACILITY NAME NPDES SIC2 CODE

PIPE DESCRIPTION STATUS DATE PIPE TYPE

PARAMETER MONITORING POINT

CODE	DMR DATE	MS AV(Q)	MS MX(Q)	UNITS	MS MN(C)	MS AV(C)	MS MX(C)	UNITS	NODI
50050	05/31/04	0.024	0.086	MGD					
50050	06/30/04	0.015	0.022	MGD					
50050	07/31/04	0.008	0.014	MGD					
50050	08/31/04	0.010	0.030	MGD					

CHLORINE, TOTAL RESIDUAL EFFLUENT GROSS VALUE

		MO AVG	DAILY MX			MO AVG	DAILY MX		
50060	11/30/02								C
50060	12/31/02								C
50060	01/31/03								C
50060	02/28/03								C
50060	03/31/03								C
50060	04/30/03								C
50060	05/31/03								C
50060	06/30/03							0 MG/L	
50060	07/31/03							0 MG/L	
50060	08/31/03							0 MG/L	
50060	09/30/03							0 MG/L	
50060	10/31/03							0 MG/L	
50060	11/30/03							0 MG/L	
50060	12/31/03							0 MG/L	
50060	01/31/04							0 MG/L	
50060	02/29/04							0 MG/L	
50060	03/31/04							0 MG/L	
50060	04/30/04							0 MG/L	
50060	05/31/04							0 MG/L	
50060	06/30/04							0 MG/L	
50060	07/31/04							0 MG/L	
50060	08/31/04							0 MG/L	

BOD, CARBONACEOUS 05 DAY, 20C EFFLUENT GROSS VALUE

		MO AVG	WKLY AVG			MO AVG	WKLY AVG		
80082	11/30/02								C
80082	12/31/02								C

REPORTED DMR MEASUREMENT DATA
BEGINNING WITH FIRST AVAILABLE TO PRESENT, AS AVAILABLE

QL ********** QL

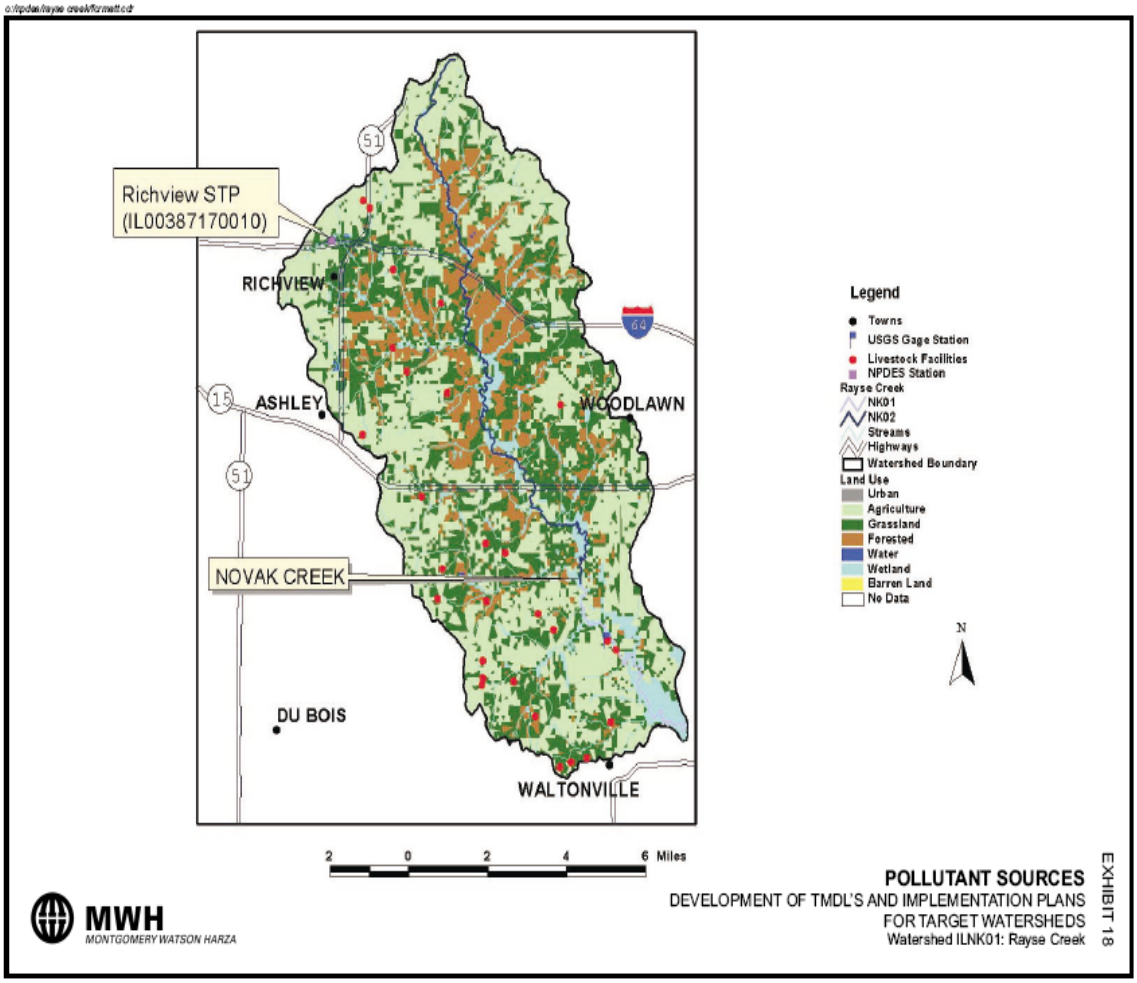
FACILITY NAME NPDES SIC2 CODE

PIPE DESCRIPTION STATUS DATE PIPE TYPE

PARAMETER MONITORING POINT

CODE	DMR DATE	MS AV(Q)	MS MX(Q)	UNITS	MS MN(C)	MS AV(C)	MS MX(C)	UNITS	NODI
80082	01/31/03								C
80082	02/28/03								C
80082	03/31/03								C
80082	04/30/03								C
80082	05/31/03								C
80082	06/30/03	1	1	LBS/DY		5.4	5.4	MG/L	
80082	07/31/03	0.1	0.1	LBS/DY		2.4	2.4	MG/L	
80082	08/31/03	0.1	0.1	LBS/DY		5.5	5.5	MG/L	
80082	09/30/03	0.3	0.3	LBS/DY		8.0	8.0	MG/L	
80082	10/31/03	0.1	0.1	LBS/DY		2.0	2.0	MG/L	
80082	11/30/03	1	1	LBS/DY		4.8	4.8	MG/L	
80082	12/31/03	1	1	LBS/DY		6.3	6.3	MG/L	
80082	01/31/04	1	1	LBS/DY		6.3	6.3	MG/L	
80082	02/29/04	0.5	0.5	LBS/DY		4.6	4.6	MG/L	
80082	03/31/04	3	3	LBS/DY		15	15	MG/L	
80082	04/30/04	1	1	LBS/DY		11	11	MG/L	
80082	05/31/04	1	1	LBS/DY		4.5	4.5	MG/L	
80082	06/30/04	3	3	LBS/DY		25	25	MG/L	
80082	07/31/04	1	1	LBS/DY		12	12	MG/L	
80082	08/31/04	1	1	LBS/DY		16	16	MG/L	

Figure 4. Pollutant sources in Rayse Creek watershed



(MWH, 2003)

Table 23. Allowable USEPA effluent limits for Richview STP

WASTEWATER TREATMENT FACILITY EFFLUENT LOADINGS

(Source: USEPA Permit Compliance System)

Monitoring Location	Parameter	Monthly Average Limit (lb/d)	Weekly Average Maximum Limit (lb/d)	Monthly Average Concentration Limit (mg/L)	Weekly Average Maximum (mg/L)
Effluent	BOD_5	35	56	25	40
Effluent	TSS	52	63	37	45
Effluent	pH range between 6 and 9				

(MWH, 2003)

Stormwater management

Stormwater runoff carries oil, grease, road salt, metals, dirt particles from impermeable surfaces (highways, streets, driveways, etc). Paints, solvents and chemicals need to be disposed of properly. Rock salt, or sodium chloride, and a 32% calcium chloride liquid solution are used on maintained highways such as Highway 51, Interstate 64, and Highway 15 in the watershed (IDOT, 2005). When snow and ice melt, the sodium and calcium chloride are dissolved and can runoff into the waterways.

Stormwater Ordinances

The Village of Richview has sewer and stormwater ordinances.

The Village of Waltonville does not have any type of stormwater management systems.

RIPARIAN CORRIDORS

A flyover video was recorded by the Illinois Department of Agriculture (IDOA) of the main stream of Rayse Creek in late October 2004 and is available for viewing at the Jefferson County USDA Service Center. A copy of the written report describing the details of the flyover was not available to include in this publication of the plan. When the copy is received by the Jefferson County SWCD, it should be included within this plan for future planning efforts.

Streambank Erosion

Streambank erosion occurs naturally but is significantly increased by human activities on the land and within stream channels. Vegetation removal from the riparian area (the area adjacent to the creek), fallen trees, debris (vegetative or human litter) can all increase erosion of streambanks.

Hydrologic Modifications

Channelization of Rayse Creek is evident in Subwatershed 1 from images of digital ortho photos and the Waltonville quadrangle topographic map from 1998. It is unknown when the channelization occurred due to the lack of historical aerial maps. Stream channelization activities can result in a process referred as a headcutting, where the stream channel incises or downcuts in the upstream direction to establish a new base level.

Habitat

Table 24. Stream habitat data for segment NK02 of Rayse Creek

SUBSTRATE (%) IN NK 02
(Source IEPA BIOS Database)

Date Sampled	July 26, 1995
Mud	5.4
Sand	42.6
Fine Gravel	1.4
Medium Gravel	1.4
Coarse Gravel	20.9
Small Cobble	4.7
Large Cobble	2.0
Boulder	3.4
Bedrock	0
Claypan	2.7
Detritus	6.8
Vegetation	3.4
Logs	3.4

(MWH, 2003)

TERRESTRIAL RESOURCES

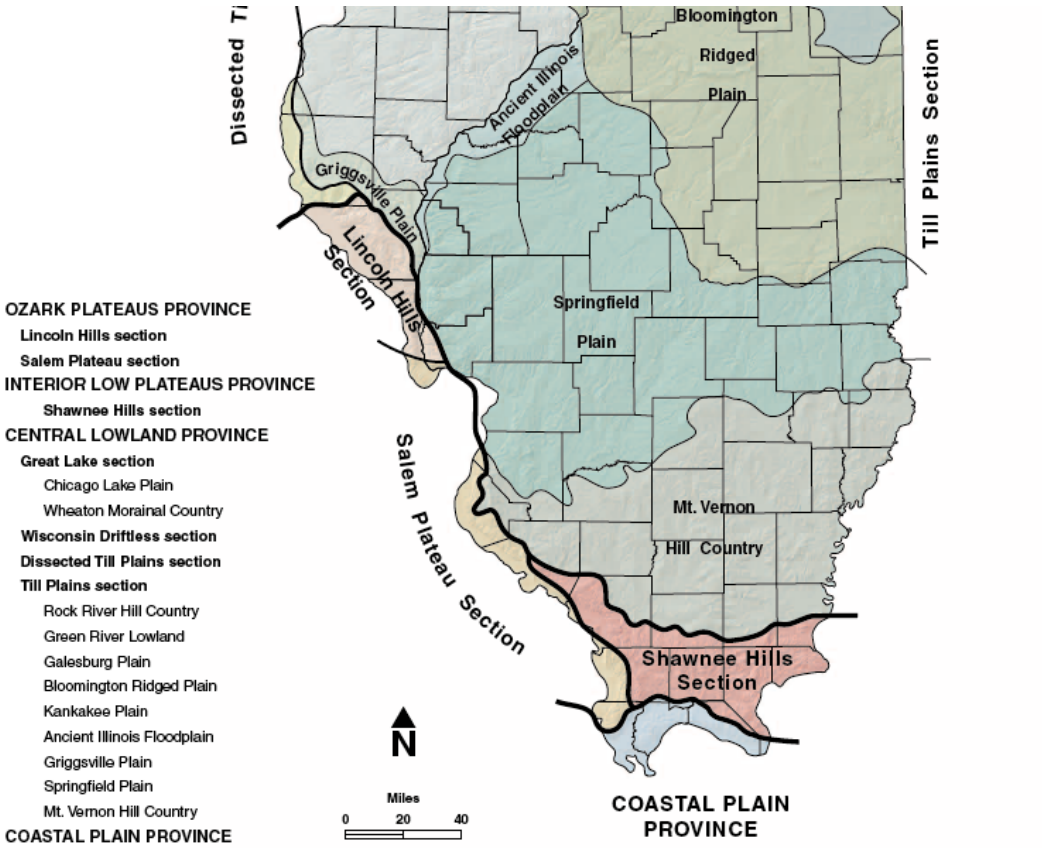
Soils

The Jefferson/Franklin County and Washington County Soil Surveys were used as the primary source of soil information (USDA NRCS 2003).

Erosion and wetness are the primary management concerns that affect the majority of acres of soil classes throughout the watershed.

The Natural Division area of the watershed is known as the Mt. Vernon Hill Country of the Southern Till Plain Division (Figure 5). The dominant soil associations of the area are Bluford-Wynoose, Ava-Bluford-Plumfield, Hoyleton-Cisne, Belknap-Bonnie and Wynoose, Bench-Rend-Bluford, and Bench (USDA NRCS 1998, USDA NRCS 2003).

Figure 5. Physiographic divisions of the state of Illinois



(IDNR 2002)

Bluford-Wynoose Association

The *Bluford-Wynoose* soils are nearly level to gently sloping, somewhat poorly drained to poorly drained soils that formed in loess and erosional sediments over till. This soil association is found in the most of upland areas in the Rayse Creek watershed. The more specific soils in this association are described below.

Soils found in the uplands of Bluford-Wynoose

Bluford silt loam (13A) is a soil found within this association. The soil is found in 0% to 2% slopes on broad convex flats on divides or interfluves, which are areas of higher land between two rivers that are in the same drainage system. The water table is perched at 1 foot to 3 feet below the surface. Permeability is slow. The land use capability classification is 2w (2=soils have moderate limitations that reduce the choice of plants or

that require moderate conservation practices; w=water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage). The erodibility index, or K, is 0.43 (K values run between 0.02 and 0.69; the higher the value, the more susceptible the soil is to sheet and rill erosion by water). Hydric soils: The surface soil is located between 0" to 5" below the surface and is a grayish-brown, silt loam. Subsurface soil is brown, mottled silt loam. The drained areas in these soils are considered prime farmland.

Wynoose silt loam (12) is found on broad divides in the upland areas. The water table is perched at the surface to 1 foot below the surface. Permeability is very slow. The land use capability classification is 3w (3=soils have severe limitation that reduce the choice of plants or that require special conservation practices or both; w= water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage). The erodibility index, or K, is 0.43. Hydric soils: The surface soil is located between 0" to 7" from the surface and is a grayish-brown, silt loam. Subsurface soil ranges from a depth of 7" to 11" and is a light gray, mottled silt loam.

Grantsburg silt loam (301B) is found on 2% to 5% slopes on convex ridgetops on interfluves. The water table is perched at a depth of 1.5 feet to 3.5 feet below the surface. Permeability is very slow. The land use capability classification is 2e (2=soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices; e=the main hazard is the risk of erosion unless close-growing plant cover is maintained). The erodibility index, K, is 0.43. Hydric soils: The surface soil is located between 0" to 4" from the surface and is a brown silt loam. Subsurface soil ranges from 4" to 9" and is a strong brown silt loam. These soils are considered prime farmland.

Soils found in the ephemeral areas of Bluford-Wynoose

Creal silt loam (337A) are found on 0% to 2% slopes in the footslopes and shallow closed depressions. The water table is located at 1 foot to 3 feet below the surface. Permeability is moderately slow. The land use capability classification is 2w (2=soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices; w= water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage). The erodibility index, K, is 0.37. Hydric soils: The surface soil is located between 0" to 6" from the surface and is a brown silt loam. The subsurface soil is 6" to 25" and is brown, mottled silt loam. The drained areas on these soils are considered prime farmland.

Bluford silt loam (13B2) is found in 2% to 5% slopes and is eroded. The soil is found mainly on the side slopes along drainageways. The water table is perched at a depth of 1 foot to 3 feet below the surface. Permeability is slow. The land use capability classification is 2e (2=soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices; e= the main hazard is the risk of erosion unless close-growing plant cover is maintained). The erodibility index, K, is 0.43. Hydric soils: The surface soil is located between 0" to 7" from the surface and is a dark,

grayish brown silt loam. The subsurface soil is located at 7" to 11" and is pale, brown silty clay loam. The eroded soils of this class are considered prime farmland.

Ava silt loam (14B2) is found on 2% to 5% slopes and is eroded. The soil is found on side slopes of interfluves. The water table is perched at 1.5 feet to 3.5 feet below the surface. Permeability is very slow. The land use capability classification is 2e (2=soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices; e= the main hazard is the risk of erosion unless close-growing plant cover is maintained). The erodibility index, K is 0.43. Hydric soils: The surface soil is located between 0" to 6" from the surface and is a dark, grayish brown silt loam. 6" to 9" is also classified as surface soil and is mixed brown and yellowish brown. The subsurface soil is located at 9" to 17" and is a yellowish-brown silty clay loam. The eroded soils of this class are considered prime farmland.

Grantsburg silty clay loam (301C3) is found on 5% to 10% slopes on side slopes. The water table is perched at 1.5 feet to 3.5 feet. Permeability is very slow. The land use capability classification is 4e (4=soils have very severe limitations that reduce the choice of plants or that require very careful management, or both; e= the main hazard is the risk of erosion unless close-growing plant cover is maintained). The erodibility index, K, is 0.43. Hydric soils: The surface soil is located at 0" to 5" from the surface and is a yellowish-brown silty clay loam. The next layer is the subsoil which is located at a depth of 5" to 11" from the surface and is a strong, brown silty clay loam.

Plumfield silty clay loam (10C) is found on 5% to 10% slopes on side slopes. The water table is perched at 1.5 feet to 3.5 feet. Permeability is very slow. The land use capability classification is 4e (4=soils have very severe limitations that reduce the choice of plants or that require very careful management, or both; e= the main hazard is the risk of erosion unless close-growing plant cover is maintained). The erodibility index, K, is 0.43. Hydric soils: The surface soil is located at 0" to 5" from the surface and is yellowish, brown silty clay loam. The subsoil is located at a depth of 5" to 7" and is a yellowish-brown, brittle silty clay loam.

Ava-Bluford-Wynoose Association

The Ava-Bluford-Wynoose soils formed under deciduous forests and have lightly colored soils. Claypans, which are dense, impervious layers of clay in the soil, are characteristic of this soil. It is difficult if not impossible for plant roots to penetrate the pan layer. Water movement through these layers is very slow and results in poor drainage except in areas with steeper slopes. This results in standing water during the wet seasons and drought conditions once the water has penetrated the claypan layer (IDNR, 2002). Ava-Bluford-Plumfield soils are located adjacent to Rayse Creek and its tributaries and in the ephemeral areas. Crops, hay, pasture and woodland are all found within this association. Silt loam and silt clay loam also dominate this soil association. The more specific soils in this association are described below.

Soil found in the upland areas of the Ava-Bluford-Wynoose Association

Ava silt loam (14B) is found on 2% to 5% slops on convex ridgetops on interfluves. The water table is perched at 1.5 feet to 3.5 feet. Permeability is very slow. Land use capability classification is 2e (2=soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices; e= the main hazard is the risk of erosion unless close-growing plant cover is maintained). The erodibility index, K, is 0.43. Hydric soils: The surface soil is located at 0" to 5" from the surface and is a brown silt loam. The subsurface soil is located at 5" to 13" from the surface and is a yellowish-brown silt loam. These soils are considered prime farmland.

Soil found in the ephemeral areas of the Ava-Bluford-Wynoose Association

Blair silty clay loam (5C3) is found on 5% to 10% slopes and is severely eroded. This soil is found in the head slopes along drainageways. The water table is located at 1.5 foot to 3.5 feet below the surface. Permeability is moderately slow. Land use capability classification is 4e (4=soils have very severe limitations that reduce the choice of plants or that require very careful management, or both; e= the main hazard is the risk of erosion unless close-growing plant cover is maintained). The erodibility index, K, is 0.37. Hydric soils: The surface soil is located at 0" to 6" from the surface and is a yellowish-brown silty clay loam. The subsoil is located at 6" to 15" below the surface and is yellowish-brown, mottled silty clay loam.

Hickory-Kell silt loam (908F) is located on side slopes between 18% and 35%. The water table is located at a depth of more than 6 feet below the surface. The erodibility index, K, for Hickory is 0.37 and for Kell is 0.32. The land use capability classification is 6e (6=soils have severe limitations that make them generally unsuitable for cultivation; e= the main hazard is the risk of erosion unless close-growing plant cover is maintained). Hydric soils: Hickory soil at the surface (0" to 3" deep) is dark brown silt loam. The subsurface (3" to 11") is brown silt loam. The Kell soil at the surface (0" to 3") is very dark grayish-brown silt loam. The subsoil (3" to 7") is mixed dark grayish-brown and dark yellowish-brown silt brown.

Hickory clay loam (8D3) is found on side slopes of 10% to 18% and is severely eroded. The water table is at a depth of more than 6 feet. Permeability is moderate. The land use capability classification is 4e (4=soils have very severe limitations that reduce the choice of plants or that require very careful management, or both; e= the main hazard is the risk of erosion unless close-growing plant cover is maintained). The erodibility index, K, is 0.37. Hydric soils: The surface soil (0" to 8") is mixed brown and yellowish-brown clay loam. The subsoil is located between 8" to 48" below the surface and is yellowish-brown clay loam.

Hoyleton-Cisne Association

This soil association is characterized by nearly level to gently sloping areas and are somewhat poorly drained to poorly drained soils that formed in loess and erosional sediments over till and is located mainly in the uplands of Rayse Creek watershed. The more specific soils in this association are described below.

Soils found in the uplands of the Hoyleton-Cisne association

Cisne silt loam (2) is found in the broad flats and depressions on divides. The water table is perched at the surface to 1 foot below the surface. Permeability is very slow. The land use capability classification is 3w (3=soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both; w= water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage). The erodibility index, K, is 0.37. Hydric soil: The surface soil is located at a depth of 0" to 8" from the surface and is a dark brown silt loam. The subsurface is located at a depth of 8" to 20" and is a light, brownish-gray silt loam. The drained areas of these soils are considered prime farmland.

Hoyleton silt loam (3A) is found on the slopes between 0% and 2% on broad convex flats on divides. The water table is at 1 foot to 3 feet below the surface. Permeability is slow. The land use capability classification is 2w (2=soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices; w= water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage). The erodibility index, K, is 0.32. Hydric soils: The soil surface is located between 0" and 7" and is a dark brown, silt loam. The subsurface layer is located between 7" and 9" and is a brown, mottled silt loam. The drained areas of these soils are considered prime farmland.

Soils found in the ephemeral areas of the Hoyleton-Cisne association

Hoyleton silt loam (3B2) is located on 2% to 5% side slopes and summits. The water table is located at a depth of 1 foot to 3 feet below the surface. Permeability is slow. The land use capability classification is 2e (2=soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices; e= the main hazard is the risk of erosion unless close-growing plant cover is maintained). The erodibility index, K, is 0.32. Hydric soils: The surface soil is located between 0" and 7" and is a mixed, dark brown and very dark grayish-brown silt loam. The subsoil is located between 7" and 10" and is a brown mottled, silty clay loam. The eroded areas of these soils are considered prime farmland.

The ephemeral areas in the Hoyleton-Cisne association also have the *Blair silty clay loam* (5C3) and *Hoyleton silt loam* (3A) described previously.

Wynoose, Bench-Rend-Bluford, Bench Association

These soils are located in the southeastern area of the Rayse Creek watershed just north of the west finger of Rend Lake. This soil association is characterized by nearly level to moderately sloping areas, poorly drained to moderately well-drained soils that formed in loess and erosional sediments over till. They are located on benches. The more specific soils in this association are described below.

Soils found in the upland areas of the Wynoose, Bench-Rend-Bluford, Bench Association

Wynoose silt loam, bench (639) soil is located on broad flats and depressions. The water table is perched at the surface to 1 foot below the surface. Permeability is very slow. The land use capability classification is 3w (3=soils have severe limitations that reduce the choice of plants or that require special conservation practice, or both; w= water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage). The erodibility index, K, is 0.43. Hydric soils: The surface layer is located between 0" and 3" and is a dark brown, silt loam. The subsurface is located between 3" and 22" and is a mixed light gray and gray, mottled silt loam. The drained areas of these soils are considered prime farmland.

Bluford silt loam, bench (640A) soil is located on broad, convex interfluves of 0% to 2% slopes. The water table is perched at a depth of 1 foot to 3 feet. Permeability is slow. The land use capacity classification is 2w (2=soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices; w=water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage). The erodibility index, K, is 0.43. Hydric soils: The surface soil is located between 0" and 10" and is dark grayish-brown silt loam. The subsurface layer is located between 10" and 17" and is a brown silt loam. The drained areas of these soils are considered prime farmland.

Bonnie silt loam (3108) is located in toeslopes and is frequently flooded. The water table is located at the surface to 1 foot below the surface. Permeability is moderately slow. The land use capability classification is 3w (3=soils have severe limitations that reduce the choice of plants or that require special conservation practice, or both; w= water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage). The erodibility index, K, is 0.43. Hydric soils: The surface soil is composed of 2 layers. The top layer is located between 0" and 5" and is a brown, silt loam. The bottom half of the surface layer is between 5" and 10" and is a mixed light brownish-gray and dark grayish brown, mottled silt loam. The frequently flooded areas are considered prime farmland when they are drained and either protected from flooding or not frequently flooded during the growing season.

Rend silt loam (518B) is located on slopes between 2% and 5% on convex ridgetops on interfluves. The water table is located 4 feet to 6 feet below the surface. Permeability is very slow. The land use capability classification is 2e (2=soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices; e=the main hazard is the risk of erosion unless close-growing plant cover is maintained). The erodibility index, K, is 0.43. Hydric soils: The surface layer is located between 0" and 8" and is yellowish-brown, silt loam. The subsurface layer is located between 8" and 11" and is a yellowish-brown silt loam. These soils are considered prime farmland.

Rend silt loam (518B2) is located on side slopes of interfluves on 2% to 5% slopes and are eroded. The water table is located 4 feet to 6 feet below the surface. Permeability is very slow. The land use capability classification is 2e (2=soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices; e=the main hazard is the risk of erosion unless close-growing plant cover is maintained). The

erodibility index, K, is 0.43. Hydric soils: The surface layer is between 0" and 7" and is a dark, grayish-brown, silt loam. The top layer of the subsoil is located between 7" and 11" and is a pale brown, silty clay loam. The eroded areas of these soils are considered prime farmland.

Bluford silt loam (13A) is also located in the uplands of this association and its characteristics are previously described.

Soils found in the ephemeral areas of the Wynoose, Bench-Rend-Bluford, Bench Association

Rend silt loam (518C2) soils are located on 5% to 10 % side slopes of interfluves. The water table is located 4 feet to 6 feet below the surface. Permeability is very slow. The land use capability classification is 3e (soils have severe limitations that reduce the choice of plants or that require special conservation practice, or both; e=the main hazard is the risk of erosion unless close-growing plant cover is maintained). The erodibility index, K, is 0.43. Hydric soils: The surface soil is located between 0" and 5" and is a brown silt loam. The top layer of the subsoil is located between 5" and 15" and is a yellowish-brown, silty clay loam.

Additional soils in the ephemeral areas of this association have been previously described. They include: *Rend silt loam* (518B), *Rend silt loam* (518B2), and *Bluford silt loam* (13B2).

Soil Erosion

Agriculture

Soil erosion estimates for the Rayse Creek watershed are not available. However, the most recent Soil Conservation Transect Survey Summary (2000) released by the Illinois Department of Agriculture indicates that Illinois producers are minimizing soil erosion by wisely managing their cropland. The tolerable soil loss (or "T") is between 3 and 5 tons per acre per year. This range keeps the soil at a productive level. Soil loss estimates are determined using RUSLE (Revised Universal Soil Loss Equation) developed by the NRCS. The report indicated that the management of retaining more crop residue could improve those areas that are exceeding tolerable soil loss.

Sheet and Rill Erosion

These types of erosion commonly occur when raindrops hit exposed soil and cause displacement of soil particles. The greatest amount of soil loss is produced by rill erosion (Brooks, et al. 2003).

Ephemeral erosion

Ephemeral erosion increased in 2002 and 2004 across Illinois by 25.1%. Ephemeral areas or streams are those located at the headwaters of creeks and rivers that appear as a dry ditch. They contain water during and immediately following a precipitation event and are dry most of the year.

Gully erosion

Gully erosion increased across Illinois by 25.9% according to the (http://www.agr.state.il.us/pdf/soiltransectsurvey.pdf, 2005).

Topography

The highest elevation in the watershed is 580 feet above sea level at the headwaters of Rayse Creek located in Subwatershed 12. The lowest elevation is located near the mouth of the creek at 420 feet above sea level located in Subwatershed 3. The size of the watershed is 99 square miles (63,360 acres).

Land Use/Cover

Most of the data associated with land use are county-wide, specifically Jefferson County, unless otherwise noted. The numbers and figures can be generalized for the entire watershed including land that lies in Washington County.

Table 25. Land use/cover for the Rayse Creek watershed

Land Use/Cover	Area (ac)	Proportion (%)
Agriculture	29,718	46.7
Grassland	20,404	32.1
Forest	9,885	15.5
Wetland	3,444	5.4
Urban	101	0.2
Water	33	0.1
Total	**63,584**	**100**

(Illinois Natural History Survey et al. 1996; adapted from MWH 2003)

Cropping rotations

The primary cropping rotation in the watershed is a corn/soybean rotation. Wheat and sorghum can also be included in some crop rotations.

Farm Size

Mean farm size in Jefferson County is 222 acres.

Table 26. Farm size and number in Jefferson County, Illinois

Farm Size (acres)	Number of Farms
1 to 9	26
10 to 49	364
50 to 179	461
180 to 499	178
500 to 999	76
1,000 acres or more	63
Total	**1168**

Confinement Livestock Operations

A large CAFO (confined animal facility operation) exists in the NE ¼ of Section 20, 3 S, R 1 E. The facility was built in 1998 by Maschoff and contains 4500 head of hogs. The facility is managed by the landowner who follows an IEPA approved Waste Management Plan (IEPA 2005). Odor from hog manure can be local air quality concern.

Open Feedlots

Thirteen feedlots were recognized by the IEPA in 1997.

Aquaculture

There are no known aquaculture facilities within the watershed.

Woodland Resources

An inventory of woodland resources within the watershed is unavailable, beyond watershed acreage.

Cemeteries

Table 27. Number of cemeteries within the Rayse Creek watershed

Subwatershed	Number of Cemeteries
12	1
8	3
5	1
4	2
3	1
2	1
1	1

Roads

Most of the roads within the watershed are oil and chip. In Richview, there are approximately 7 miles of oil and chip streets. (www.haengr.com/Newsletters/newsletter9102002m.htm, 2004).

Railroads

Illinois Central Railroad

Municipalities

The Village of Richview, located in Washington County, has a population of 308.

Airports

There are no airports within the boundaries of the Rayse Creek watershed.

Development

The local attitudes of the landowners within the watershed oppose development on fertile agricultural land.

Illegal Dumps

Illegal dumps exist in the watershed. Creek beds can be littered with trash from paper to large home appliances to rubber tires.

Landfills

There are three landfills in the watershed. The first is a retired or closed landfill located in section 36 in the Casner Township. It is 35 acres in size, and the owner and operator is the City of Mt. Vernon. It is a municipal sewage landfill and was covered/closed on an unknown date. According to the IEPA, this landfill continues to be monitored (http://space1.itcs.uiuc.edu/website/rmms/), 2005). The second landfill is Mt. Vernon Municipal #2 located in section 35. It is owned by Arthur Shewmake and operated by the mayor and council of Mt. Vernon. It is approximately 60 acres in size, but only 45 acres was filled. The landfill was closed/covered in 1977. It is located near County Road 450. According to the IEPA, it is monitored (http://space1.itcs.uiuc.edu/website/rmms/, 2005). The third landfill is located in section 24 in the Casner Township. Although there is record of this landfill, no detailed information is given (size, open date, close date).

Natural Areas

There are no natural areas noted in the Rayse Creek watershed.

Septic Systems

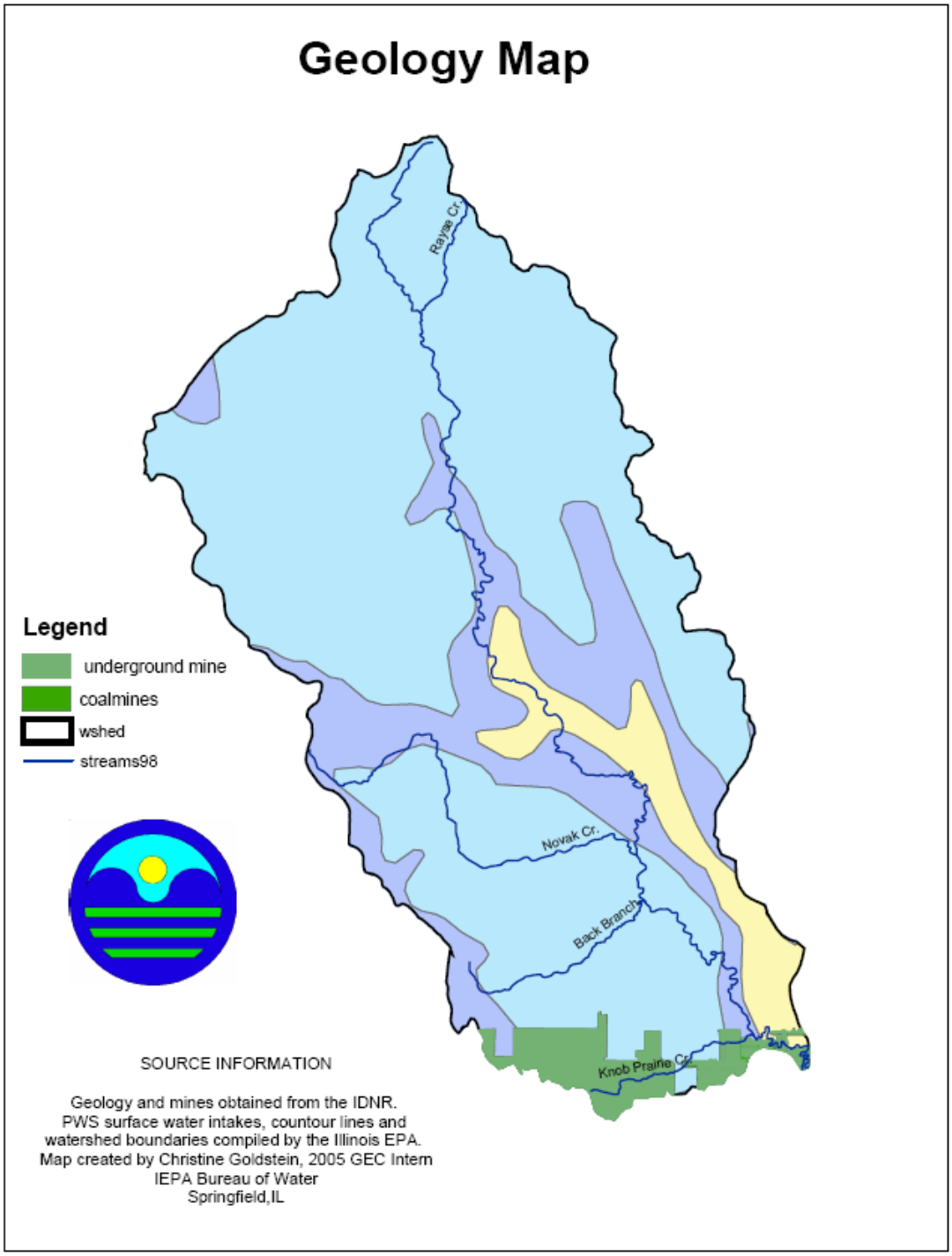
Septic systems are scattered throughout the watershed. The Jefferson and Washington County Health Departments have guidelines to follow for private septic systems.

Mining

There is the potential that closed mines across southern Illinois may be reopened for coal exploration. Various mines in the southernmost section of the watershed around Waltonville may be susceptible to *subsidence* (Figure 6). Subsidence is the sinking or

settling of the land's surface due to the removal of coal. Rend Lake has subsided at least 3 feet in areas since mining began (USACE 1993).

Figure 6. Locations of coal mines in the Rayse Creek watershed



Air Quality

There are two monitoring sites that monitor air quality downwind (east) from Jefferson and Washington County. They are both located in Wabash County on the Illinois-Indiana border (Figure 7). Both sites are owned and operated by Public Service of Indiana and are SPMS (Special Purpose Monitoring Stations) stations which measure sulfur dioxide (SO_2) (Table 28).

Figure 7. Air quality monitoring stations in the state of Illinois

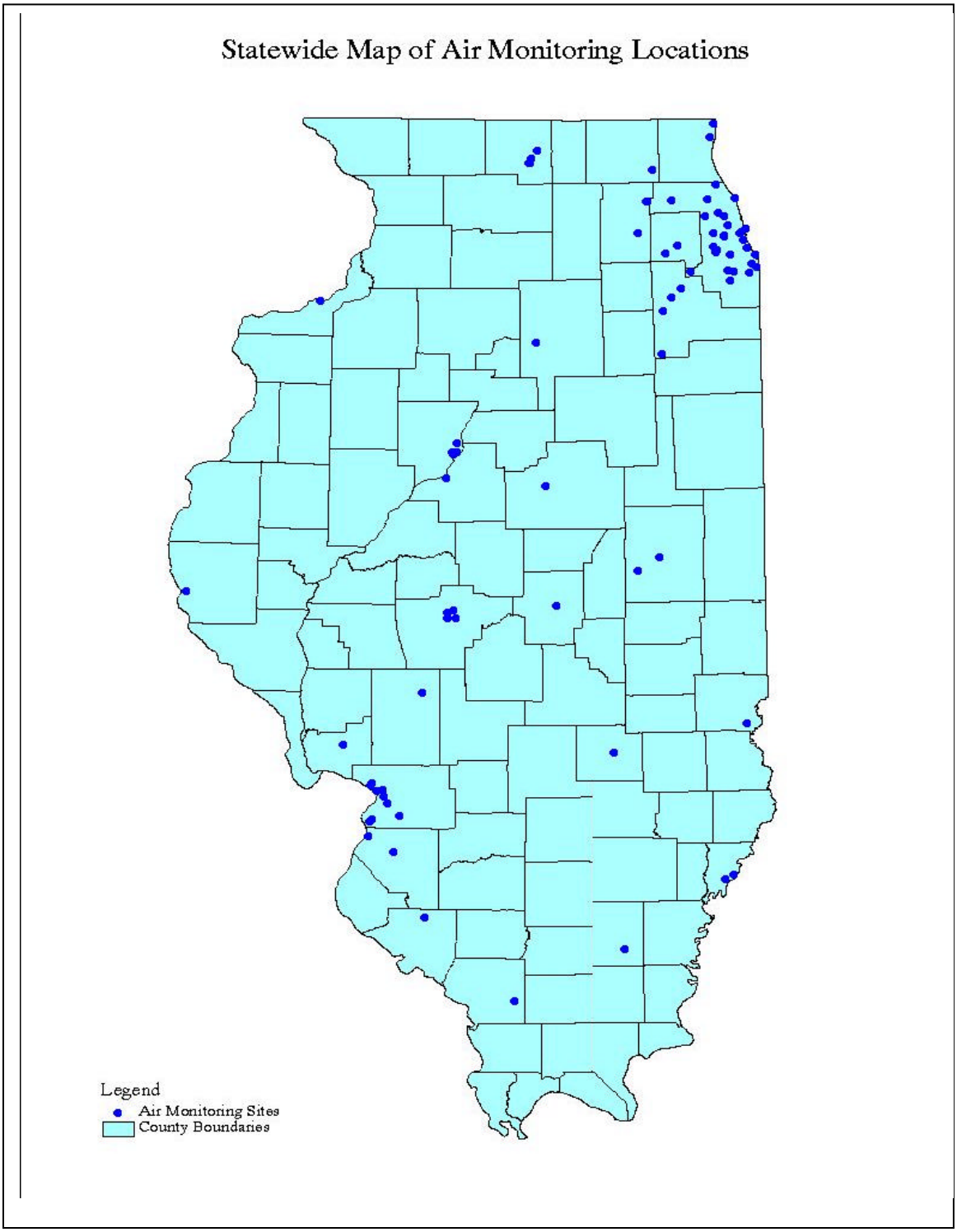


Table 28. Sulfur dioxide levels for two air quality monitoring sites east of Jefferson County

Site Name / AIRS Code	Highest 3-hr. Mean (ppm)	Highest 24-hr. Mean (ppm)	Annual Arithmatic Mean (ppm)
Mt. Carmel 1850001	0.132	0.055	0.004
Rural Wabash 1851001	0.129	0.035	0.003

IEPA standards for sulfur dioxide:
Annual arithmetic mean = 0.03ppm
24-hr = 0.14ppm
3-hr = none

Statewide, the most recent data available is in the 2003 Annual Air Quality Report (IEPA 2004) from data gathered in 2002. Air quality in Illinois was either good or moderate more than 94 percent of the time. Air quality trends for the pollutants monitored across the state (particulate matter, ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide and lead) continued on a downward trend (IEPA 2004). Estimated stationary point source emissions for Jefferson and Washington County are shown in Table 29.

Table 29. Estimated stationary point source emissions for Jefferson and Washington County

Air Quality Parameter	Jefferson County (Tons/yr)	Washington County (Tons/yr)
Carbon monoxide	427.5	20.0
Nitrogen oxides	93.1	43.2
Particulate matter	763.7	204.2
Sulfur dioxide	291.1	0.2
Volatile organic material	683.4	166.3

(IEPA, 2004)

Wildlife

Populations of wildlife within Rayse Creek have not been tabulated but the birds and mammals of the entire Big Muddy watershed, which includes Rayse Creek, have been recorded and are listed within Volume 3 of the Big Muddy River Area Assessment report (IDNR, 2002). Table 30 lists the amphibians and reptiles that live in Jefferson County.

Table 30. Amphibians and reptiles living in Jefferson County

Scientific Name	Common Name
Ambystoma maculatum	Spotted Salamander
Ambystoma opacum	Marbled Salamander
Ambystoma texanum	Smallmouth Salamander
Ambystoma tigrinum	Tiger Salamander
Plethodon dorsalis	Zigzag Salamander
Plethodon glutinosus	Northern Slimy Salamander
Bufo fowleri	Fowler's Toad
Acris crepitans	Cricket Frog
Hyla versicolor- chrysoscelis	Grey Treefrog Complex
Pseudacris triseriata	Western Chorus Frog
Rana areolata	Crawfish Frog
Rana catesbeiana	Bullfrog
Rana clamitans	Green Frog
Rana sphenocephala	Southern Leopard Frog
Chelydra serpentina	Snapping Turtle
Chrysemys picta	Painted Turtle
Pseudemys concinna	River Cooter
Terrapene carolina	Eastern Box Turtle
Terrapene ornata	Ornate Box Turtle
Sceloporus undulatus	Fence Lizard
Eumeces fasciatus	Five-Lined Skink
Eumeces laticeps	Broad-Headed Skink
Scincella lateralis	Ground Skink
Coluber constrictor	Racer
Elaphe obsoleta	Rat Snake
Heterodon platirhinos	Eastern Hognose Snake
Lampropeltis calligaster	Prairie Kingsnake
Nerodia erythrogaster	Plainbelly Water Snake
Nerodia sipedon	Northern Water Snake
Opheodrys aestivus	Rough Green Snake
Thamnophis sirtalis	Common Garter Snake
Agkistrodon contortrix	Copperhead
Crotalus horridus	Timber Rattlesnake

(Illinois Natural History Survey; updated 02/10/2003)

Geese

There is concern among watershed stakeholders about the possibility of goose droppings entering Rayse Creek and adding excess nutrients to the aquatic system. Goose droppings are a water pollution concern because the watershed is near the Mississippi flyway, a major migration route for geese. An IDNR wildlife area is also located south of the watershed. There is not quantitative data available concerning the magnitude or effect of this potential nutrient source. This is an issue that merits future attention and study. The southern section of Rayse Creek is flooded according to IDNR's management regime for waterfowl hunting, as stated previously.

Fish

The only fish kill known to IEPA and the IDNR took place in Rayse Creek in 1993 but the precise location is unknown. Table 31 shows fish data collected by the IEPA and IDNR in 1995 and 2000 from a reach of stream in segment NK02 near Woodlawn.

Table 31. Fish data collected near Woodlawn on segment NK02 of Rayse Creek

Rayse Creek Fish Species List for 1995 and 2000

Common name	Scientific name	Total	07/26/95 NK-02 Rayse Ck	07/18/00 NK-02 Rayse Ck
Grass pickerel	Esox americanus	2	2	
Carp	Cyprinus carpio	1	1	
Golden shiner	Notemigonus crysoleucas	4	4	
Creek chub	Semotilus atromaculatus	20	20	86
Suckermouth minnow	Phenacobius mirabilis	27		27
Redfin shiner	Lythrurus umbratilus	8	8	11
Bluntnose minnow	Pimephales notatus	2	2	37
White sucker	Catostomus commersoni	4	4	30
Creek chubsucker	Erimyzon oblongus	29	29	7
Yellow bullhead	Ameiurus natalis	9	9	1
Tadpole madtom	Noturus gyrinus	2	2	1
Pirate perch	Aphredoderus sayanus	16	16	16
Blackstripe topminnow	Fundulus notatus	2	2	5
White crappie	Pomoxis annularis	1	1	
Largemouth bass	Micropterus salmoides	4	4	17
Green sunfish	Lepomis cyanellus	28	28	10
Bluegill x Green sunfish hybrid	Lepomis macrochirus x L. cyanellus	7	7	
Longear sunfish x Green sunfish hybrid	Lepomis megalotis x L. cyanellus	3	3	
Bluegill	Lepomis macrochirus	39	39	3
Longear sunfish x Bluegill hybrid	Lepomis megalotis x L. macrochirus	1	1	
Redear sunfish	Lepomis microlophus	1	1	
Longear sunfish	Lepomis megalotis	2	2	
Johnny darter	Etheostoma nigrum	1	1	26
Slough darter	Etheostoma gracile	1	1	4
Freshwater drum	Aplodinotus grunniens	4	4	
	Total fish:	472	191	281
	Total species:	22	21	15

(IDNR, 2005)

Threatened and Endangered Species

The bald eagle is a threatened species that winters in Jefferson County. (http://www.fws.gov/midwest/RockIsland/activity/endangrd/il_list.htm#Jefferson, updated January 2005 and retrieved 10/17/05). The Indiana bat is another T&E species that potentially exists in both Jefferson and Washington Counties.

SOCIO-ECONOMIC / HUMAN RESOURCES

The following table lists the oral comments made by the stakeholders during the TMDL public comment period and submitted to the IEPA by the Jefferson County Soil and Water Conservation District.

Table 32. Public comments concerning the TMDL submitted to IEPA

- The watershed model used to develop the TMDL does not accurately simulate the nature of the watershed.
- The TMDL does not mention the large hog operation in existence in the watershed.
- The data used in the TMDL is not up-to-date. BMPs have been implemented since then, and water quality could have improved.
- Samples are not dated.
- The amount of data that the report states is “not enough”, “more needed”, and “none available” seems to make the report inaccurate. Landowners will likely dismiss the report since it is incomplete.
- The Jefferson County SWCD was requested by the engineers to provide data. The engineers were offered a chance to come help themselves to any information they needed. They did not accept, which caused the SWCD to wonder if there was information that the company needed that was not included.
- Are other events, such as construction, planting, heavy storms, and conservation project construction taken into account?
- Designated use of swimming is highly improbable. It is also doubtful that anyone fishes from the creek. The designated uses should be revised.
- The Sub Impoundment dam created backwater in Rayse Creek. This has not been taken into account.
- The amount of time and money spent on this is disturbing, as the TMDL simply suggests that the landowners implement BMPs they are already implementing. This money could have been used to improve the watershed by means of conservation money or for operations and salaries. The TMDL process seems counterproductive.
- Tests need to be conducted to determine the impact of an old landfill.
- Placing blame solely on the bottom half of the watershed is not practical.

- The involvement of the watershed, in the form of the Rayse Creek Watershed Planning Committee, needs to be noted.

A stakeholder workshop was organized by the researchers at SIUC in Woodlawn. Thirty-one people attended and comments and concerns were made about the health of the watershed.

Table 33. Concerns, comments, and questions generated at a stakeholder workshop

- Sedimentation
- Water Quality
- How big/bad is the problem? How bad does it have to be to have a TMDL?
- What action is taken, who takes it, and how?
- Are the actions mandatory or voluntary?
- Don't overreact
- Is there a Phosphorous problem?
- Disappointment that grant is not large enough to sample water quality
- Why is the Northern segment clean? What are they doing to make it so?
- Where did the water samples come from?
- Are the oil companies dumping in the watershed?
- What are the farmers' goals and objectives for the plan?
- What is the proposal for buffer zones in the bad areas?
- Do trees and grass really help?
- Is doing something voluntary first the best thing?
- Is there a Phosphorous problem in Rend Lake?
- Where does the Phosphorous originate?
- How many water samples are needed, how much does it cost, and can volunteers collect them?
- Is sedimentation the second main problem?
- What about dissolved oxygen?
- Is the IEPA continuing testing?
- What are the effects of no-till practices?
- How many testing stations would be needed for accuracy in a watershed this size?
- If we test and there are no problems, then what?

BEST MANAGEMENT PRACTICES RECOMMENDATIONS

INTRODUCTION

Rayse Creek watershed is located in Jefferson and Washington Counties in Illinois: 82% (52,307 acres) are located in Jefferson County and 18% (11,277 acres) are located in Washington County (MWH, 2003). The primary land use is row-crop agriculture, specifically corn/soybean rotation, followed by pasture land, and forest land (IDNR, 2002).

Rayse Creek is a sinuous 4th order stream. *Ephemeral* and *intermittent* streams are prominent throughout the watershed. Ephemeral streams comprise the beginning of the channel network and convey water during and immediately after periods of rainfall or snowmelt and are dry for most of the year. Intermittent streams normally contain baseflow only during part of the year, usually the winter, spring, and early summer. These headwater channel areas are important in terms of soil erosion and runoff. Land use within these headwater channel areas can negatively impact water quality in the perennial stream (Rayse Creek), since they comprise the majority of the drainage network in the watershed. Headwater areas are especially important contributors of sediment and sediment bound nutrients, as most of these pollutants are transported during storm events.

In the fall of 2004, an aerial video was recorded of the primary, perennial stream channel of Rayse Creek by the Illinois Department of Agriculture. Human-made crossings, log and debris jams and significant streambank erosion were evident. The location of these features was indicated on the DVD as well as in the report from the Illinois Department of Agriculture.

The majority of the cropland within Rayse Creek is on a corn/soybean rotation with some milo, winter wheat and cover crops. The watershed contains primarily moderately to poorly drained soils that contribute to seasonal wetness and ponding. The soils are susceptible to erosion and shrink-swell action. Most of the soils are suitable for the crops grown in the watershed except for those with moderate slopes. The riparian soils immediately adjacent to Rayse Creek and its tributaries are moderately to poorly drained and suited for woodland but are typically unsuited for cultivated crops, hay and pasture. Frequent flooding occurs between January and June. According to some landowners, historical *subsurface tiles* have been discovered in fields, particularly within the NK01 section. It is not possible to locate these tiles due to the lack of documentation. Currently, when a grassed waterway is designed, *surface tiles* are installed to remove excessive water through the waterway so that the grass seed becomes established. The tile remains there for the life of the waterway (NRCS personal communication, 2005).

When implementing BMPs (best management practices) on site, a soil survey should be consulted as to the specific soil characteristics and an on-site evaluation should also be conducted. According to the NRCS, most landowners are familiar with the practices that are needed to control soil erosion. Some landowners consult with local extension and FS (Farm Service) offices for nutrient and pesticide management. The most popular conservation practices used in the watershed are grassed waterways, filter strips (grass), quail buffers, grade stabilization structures, no-till, and nutrient management systems. There are a few landowners who have installed riparian buffers (trees), water and sediment control basins (WASCOBS), and terraces. There have been requests from landowners for wetland creation structures and timber stand improvements

(TSIs) (NRCS personal communication, 2005), but there's also been destruction of wetlands.

Dwellings with and without basements are moderately to severely susceptible to wetness, flooding, and shrink-swell potential. Septic tank absorption fields are common in the Rayse Creek watershed. However, most of the soils in the watershed are not suitable for septic tank absorption fields due to poor drainage. Local and state guidelines are administered by the Jefferson County Health Department.

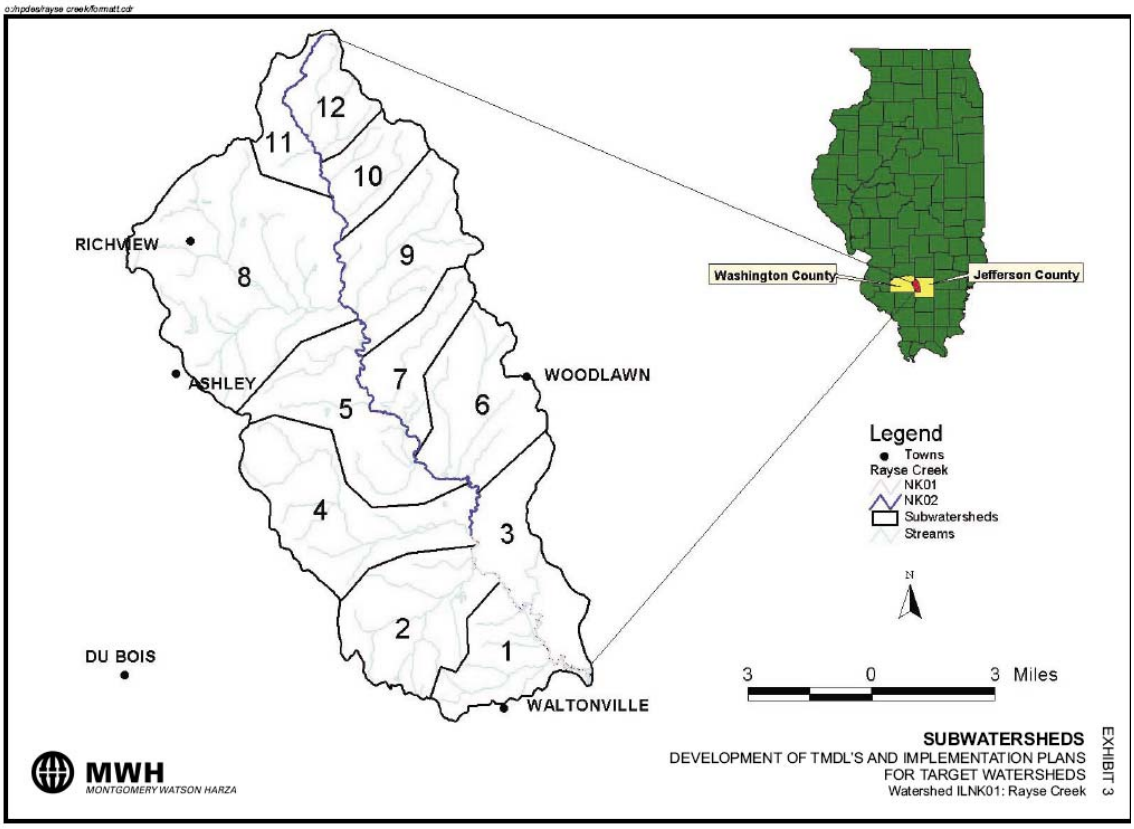
Two large oil fields are concentrated in the Richview and Woodlawn areas with a smaller field in the Roaches area. Scattered oil wells are located throughout the watershed (http://meltwater.isgs.uiuc.edu/website/iloil/viewer.htm). Oil pumping activities have caused brine and sodic spots which have left areas void of vegetation and are sources of significant soil erosion. Brine (or sodic) "hot spots" exist on the land and in waterways where structural systems are installed to try and prevent erosion because vegetation cannot be established (NRCS personal communication, 2005).

The location of livestock facilities and feedlots in the TMDL report was developed from data collected from the Illinois Environmental Protection Agency in 1997. According to stakeholders and personnel at the USDA Service Center, since 1997 the large animal feeding operations (AFOs) have drastically decreased within the watershed. Currently, a large CAFO (concentrated animal feeding operation) is located in Blissville Township (see details under Subwatershed 4). Another CAFO within the watershed closed in 1993. This facility was blamed for causing a large fish kill in Rayse Creek prior to closing. The specific location is unknown (IEPA personal communication, 2005). Small livestock facilities and feedlots are spread throughout the entire watershed. The main management concern with these areas is the residual and continuous nutrient inputs of nitrogen and phosphorus into the soil and ultimately the waterways. The lower section (NK01) is a significant livestock area.

SUBWATERSHED RANKING FOR FUTURE BMP ESTABLISHMENT

There are 12 subwatersheds or tributary watersheds within the Rayse Creek watershed (Figure 8). We have chosen to provide "site-specific" BMP recommendations at the scale of the subwatershed because it is a logical unit of management that provides an effective way of subdividing the larger watershed for more targeted placement of future BMPs to improve water quality. We have ranked and listed the subwatersheds in priority order from highest to lowest for future restoration activities. Our ranking scheme was based on a summation of the following potential sources of water quality impairment (Table 34). A higher score indicates more potential for water quality impairment and thus, a higher priority for future restoration activities. The following is a detailed description of how each potential impairment was scored.

Figure 8. Twelve subwatersheds within the Rayse Creek watershed



(MWH, 2003)

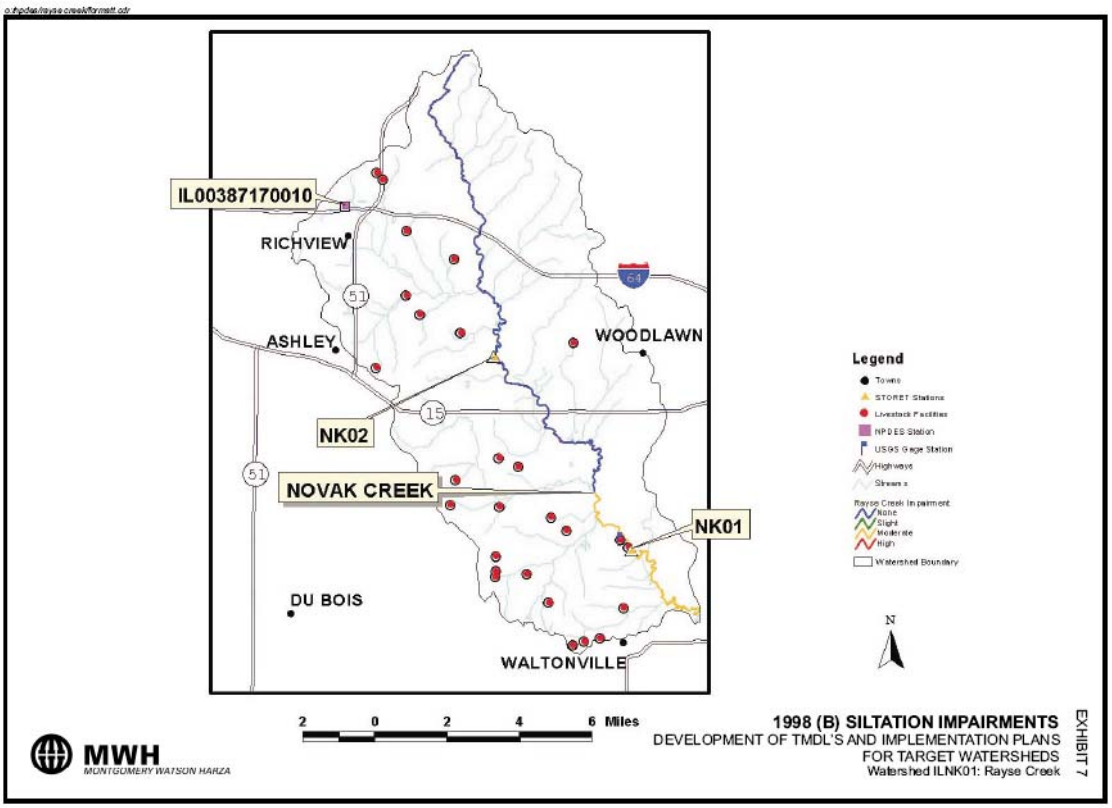
Table 34. Ranking Scheme for Potential Impairment in Subwatersheds

Potential Impairment	Point Scale
Cropland	1-12 points
Livestock facility/feedlots	0-12 points
CAFOs	up to an additional 10 points
Oil brine/sodic damaged land	up to an additional 12 points
Retired landfills	up to an additional 10 points

Livestock facility/feedlots

The twelve subwatersheds were ranked according to the number of livestock facilities/feedlots located within its boundary (Figure 9). The facilities were also weighted with respect to the total acreage of the subwatershed and proximity to a stream. The number of head within each livestock facility/feedlot is unknown.

Figure 9. Location of livestock/feedlot facilities



(MWH, 2003)

Cropland

Cropland can contribute to excess nutrient runoff and increased erosion especially under excess fertilizer applications and conventional tillage. The twelve subwatersheds were ranked 12 to 1 according to the percent of the subwatershed acreage in cropland.

CAFOs

"Large" CAFO's (concentrated animal feeding operation's) are defined by the USEPA as facilities containing more than 1000 animal units (Table 35). These facilities are required to have a NPDES (National Pollutant Discharge Elimination System) permit. An NPDES permit is also required of "medium" CAFO's (Table 36) that discharge pollutants (e.g. manure, wastewater) into any ditch, stream, or other water conveyance system, whether man-made or natural or have animals in contact with surface water in areas where they are confined.

Table 35. "Large" CAFO Animal Units Table: Approximate number of animals equivalent to 1000 animal units

Animal Type	**Number**
Beef cattle or heifers	1,000
Mature dairy cows	700
Swine (55 lbs. or more)	2,500
Sheep or lambs	10,000
Horses	500
Turkeys	55,000
Laying Hens	82,000

(http://www.epa.state.il.us/water/cafo/

Table 36. "Medium" CAFO Animal Units

Animal Type	**Number**
Beef cattle or heifers	300 - 999
Mature dairy cows	200 - 699
Swine (55 lbs. or more)	750 – 2,499
Sheep or lambs	3000 – 9,999
Horses	150 - 499
Turkeys	16,500 – 54,999
Laying Hens	25,000 – 81,999

(http://www.epa.state.il.us/water/cafo/

The Rayse Creek watershed contained one CAFO in subwatershed 4, which resulted in an additional 5 points.

Oil brine/sodic damaged land

Oil brine and sodic damaged land received up to 12 additional points because of the high susceptibility to erosion. Oil brine and sodic areas have an approximate erosion rate of 35 tons/acre/year (www.il.nrcs.usda.gov/features/success/restbrnsls.html, 2004) up to 260 tons/acre/year (Greater Egypt Regional Planning Commission, 1980). These areas were identified using the Jefferson and Washington County Soil Surveys (NRCS 2003 and 1998 respectively) along with recent (2005) field reconnaissance and NRCS witness accounts in the fields and waterways.

The subwatersheds were ranked by the number and relative size of oil brine and sodic damaged areas. Oil brine and sodic damage land were not found in each subwatershed.

Retired landfills

Subwatersheds containing retired landfills received up to 10 additional points because of the potential for toxics and nutrients in landfill leachate being transported to groundwater and adjacent watercourses. Ranking was based on the fill size of the landfill related to the total acreage of the watershed. Landfills were identified using the Resource Management Mapping Service website provided by the University of Illinois at Champaign-Urbana (http://space1.itcs.uiuc.edu/website/rmms/).

BMP RECOMMENDATIONS

Potential BMPs for each subwatershed of Rayse Creek are identified in this report. The detailed description of each BMP is listed in Appendix I. Recommendations for tree plantings are located in Appendices II and III. Tributaries or segments of Rayse Creek can be identified using the website http://space1.itcs.uiuc.edu/website/rmms/ (2005), which is a useful, interactive tool for all stakeholders.

The detailed Land Use/Land Cover summaries for each subwatershed were adapted from the TMDL report (MWH 2003). We condensed the detailed land use tables into the following categories: *Cropland* which includes row crops, small grains, orchards/nurseries; *Urban/suburban* which includes high and medium density housing including roads and other impervious surfaces; *Forest* which includes deciduous closed and open canopy forests; *Pasture* which includes rural grasslands; and *Wetland* which includes shallow marshes/wet meadows, deep marshes, forested wetlands, and shallow water wetlands.

Prioritized List of Subwatersheds for Future Restoration Activities – Highest Priority to Lowest Priority

Table 37. Prioritized List for Future Restoration Activities

Watershed	Total Points
1. Subwatershed 4	29
2. Subwatershed 8	26
3. Subwatershed 3	25
4. Subwatershed 1	25
5. Subwatershed 2	23
6. Subwatershed 11	19
7. Subwatershed 6	19
8. Subwatershed 12	11
9. Subwatershed 10	9
10.Subwatershed 5	5
11.Subwatershed 9	2
12.Subwatershed 7	1

1. Subwatershed 4

Total acreage within this subwatershed is approximately 7,649 acres and is located in the Blissville Township in Jefferson County as well as the Ashley Township in Washington County. This basin is the Novak Creek basin (IEPA code: NKC), a tributary to Rayse Creek. Tributaries (segments) include 1398, 1400, 1401, 1403, 1399.

Monitoring station—NK01

Table 38. Land Use for Subwatershed 4

Land use	% of Subwatershed
Cropland	51%
Urban	0%
Forest	10%
Pasture	36%
Wetland	3%

Table 39. Detailed Land Use/Land Cover for Subwatershed 4

	RC 04			
Land Use/Land Cover	IL006	IL038	IL051	Total
Urban - High Density	3.2	-	-	3.2
Urban - Medium Density	-	-	-	-
Agriculture - Row Crop	1,864.1	1,028.0	36.2	2,928.2
Agriculture - Small Grains	552.3	420.1	7.3	979.8
Agriculture - Orchards/Nurseries	-	-	-	-
Urban Grassland	-	-	-	-
Rural Grassland	1,073.8	1,602.0	40.8	2,716.6
Forested - Deciduous: Closed Canopy	84.7	656.7	18.3	759.7
Forested - Deciduous: Open Canopy	-	-	-	-
Water	-	2.3	-	2.3
Shallow Marsh/Wet Meadow	-	-	-	-
Deep Marsh	-	-	-	-
Forested Wetland	16.7	158.0	74.5	249.1
Shallow Water Wetland	-	9.7	-	9.7
Total	3,594.7	3,876.9	177.0	7,648.7

(MWH, 2003)

Table 40. Ranking Summary for Subwatershed 4

Potential source	Points
Cropland	7
Livestock facility/feedlot	9
CAFO	5
Oil brine/sodic damaged land	8
Retired landfills	0
Total	**29**

Ranking

A large CAFO (confined animal facility operation) exists in the NE ¼ of Section 20, 3 S, R 1 E. The facility was built in 1998 by Maschoff and contains 4500 head of hogs. The facility is managed by the landowner who follows an IEPA approved Waste Management Plan (IEPA 2005). Regardless of the WMP, trampling and wallowing can cause excessive damage to the soil. Odor from the waste is also a concern for local air quality.

There are six livestock/feedlot facilities within the watershed. Four sodic areas exist in section 6. There are seven eroded areas in sections 7 and 8. Cropland accounts for 51% of the land cover within this subwatershed.

Other concerns

There are seven wet spots in the watershed which should be avoided of any mechanical equipment or animal grazing in sections 31 and 5.

BMP Recommendations:

Grassed watercourses
Riparian buffers / filter strips
Avoid mechanical equipment in persistently wet or flooded areas
Rotational grazing
Establish permanent cover on highly erodible land
Soil testing

2. Subwatershed 8

This subwatershed is the largest of all the watersheds located in the Rayse Creek watershed draining 13,937 acres. Approximately 11,277 acres of the area of this watershed are located within the Richview and Ashley Townships in Washington County. In Jefferson County, this subwatershed includes about 2,660 acres in the Casner Township. The major stream is Rayse Creek Tr and its tributaries (or segments)--1377, 1380, 1379, 1391, 1381, 1386, 1388, 1387, 690, 1384, 1385, and 1383.

Monitoring station—NK02

Table 41. Land Use for Subwatershed 8

Land use	% of Subwatershed
Cropland	47%
Urban	0%
Forest	17%
Pasture	32%
Wetland	2%

Table 42. Detailed Land Use/Land Cover for Subwatershed 8

	RC 08			
Land Use/Land Cover	IL006	IL038	IL051	Total
Urban - High Density	31.1	-	-	31.1
Urban - Medium Density	23.7	-	-	23.7
Agriculture - Row Crop	4,006.3	537.2	-	4,543.5
Agriculture - Small Grains	1,578.2	488.1	-	2,066.3
Agriculture - Orchards/Nurseries	-	-	-	-
Urban Grassland	101.5	-	-	101.5
Rural Grassland	2,849.1	1,652.8	-	4,501.9
Forested - Deciduous: Closed Canopy	820.3	1,498.1	-	2,318.3
Forested - Deciduous: Open Canopy	-	-	-	-
Water	16.8	2.2	-	19.1
Shallow Marsh/Wet Meadow	3.7	6.8	-	10.5
Deep Marsh	-	-	-	-
Forested Wetland	60.6	197.3	-	257.9
Shallow Water Wetland	49.8	13.8	-	63.6
Total	9,541.1	4,396.4	-	13,937.5

(MWH, 2003)

Table 43. Ranking Summary for Subwatershed 8

Potential source	Points
Cropland	4
Livestock facility/feedlot	10
CAFO	0
Oil brine/sodic damaged land	12
Retired landfills	0
Total	**26**

Ranking

This subwatershed has seven known livestock facility/feedlots and 47% of the watershed is cropland. There are twenty-two severely eroded spots within the watershed noted in the Washington County soil survey (1998). There are no known CAFOs or landfills within this subwatershed.

Other concerns

Richview oil fields and other scattered oil wells are prominent in this watershed which can contribute to increased soil erosion. There are also dry and abandoned oil wells outside of the Richview oil fields (http://meltwater.isgs.uiuc.edu/website/iloil/viewer.htm, 2005). The village of Richview also maintains a wastewater treatment plant. Discharge from the treatment plant is permitted as a point source by Illinois EPA.

BMP recommendations:

Grassed watercourses
Riparian buffers / filter strips
Brine or sodic area management
Soil testing

3. Subwatershed 3

The total acreage in this subwatershed is approximately 4,531 acres. Rayse Creek is the major stream with its tributaries (segments)—1355, 692, and 691. The watershed lies within the McClellan Township in Jefferson County.

Table 44. Land Use for Subwatershed 3

Land use	% of Subwatershed
Cropland	53%
Urban	0%
Forest	4%
Pasture	22%
Wetland	21%

Table 45. Detailed Land Use/Land Cover for Subwatershed 3

	RC 03			
Land Use/Land Cover	IL006	IL038	IL051	Total
Urban - High Density	-	-	-	-
Urban - Medium Density	-	-	-	-
Agriculture - Row Crop	-	475.0	1,533.9	2,008.9
Agriculture - Small Grains	-	111.6	282.6	394.2
Agriculture - Orchards/Nurseries	-	-	-	-
Urban Grassland	-	-	-	-
Rural Grassland	-	254.2	747.7	1,001.9
Forested - Deciduous: Closed Canopy	-	29.4	165.0	194.4
Forested - Deciduous: Open Canopy	-	-	-	-
Water	-	-	-	-
Shallow Marsh/Wet Meadow	-	-	15.1	15.1
Deep Marsh	-	1.7	1.8	3.5
Forested Wetland	-	8.7	898.9	907.6
Shallow Water Wetland	-	-	5.4	5.4
Total	-	880.6	3,650.4	4,531.0

(MWH, 2003)

Table 46. Ranking Summary for Subwatershed 3

Potential source	Points
Cropland	6
Livestock facility/feedlot	0
CAFO	0
Oil brine/sodic damaged land	9
Retired landfills	10
Total	**25**

Ranking

Cropland accounts for 53% of the watershed and nutrients and erosion can be contributed from these activities. According to the most recent data from the IEPA in

Marion, there are no known livestock facility/feedlots in this subwatershed. There is a retired or closed landfill located in section 36 in the Casner Township. It is 35 acres in size, owner and operator is the City of Mt. Vernon. It is a municipal sewage landfill and was covered/closed on an unknown date. According to the IEPA, this landfill continues to be monitored (http://space1.itcs.uiuc.edu/website/rmms/), 2005).

Other concerns:

This subwatershed has seven severely eroded areas in section 7 and thirteen eroded spots in section 12. There are a few wet spots in the basin. The yearly flooding from Rend Lake most likely affects the southernmost region of this watershed.

BMP Recommendations:

Grassed watercourses
Riparian buffers / filter strips
Avoid mechanical equipment in persistently wet or flooded areas
Rotational grazing
Soil testing

4. Subwatershed 1

This subwatershed drains approximately 3,590 acres. The major stream is Knob Prairie Creek (NKB) and includes tributaries (segments) 1410, 1411, 1413, 1415, 1416, and 1417. It lies in the McClellan and Blissville Townships in Jefferson County.

Monitoring station—NK01

Table 47. Land Use for Subwatershed 1

Land use	% of Subwatershed
Cropland	56%
Urban/Suburban	0%
Forest	4%
Pasture/Grassland	32%
Wetland	8%

Table 48. Detailed Land Use/Land Cover for Subwatershed 1

	RC 01			
Land Use/Land Cover	IL006	IL038	IL051	Total
Urban - High Density	-	0.7	-	0.7
Urban - Medium Density	-	9.2	-	9.2
Agriculture - Row Crop	-	1,031.7	567.4	1,599.1
Agriculture - Small Grains	-	340.6	61.3	401.9
Agriculture - Orchards/Nurseries	-	-	-	-
Urban Grassland	-	12.8	-	12.8
Rural Grassland	-	915.1	225.0	1,140.2
Forested - Deciduous: Closed Canopy	-	119.2	10.3	129.4
Forested - Deciduous: Open Canopy	-	-	-	-
Water	-	-	-	-
Shallow Marsh/Wet Meadow	-	-	-	-
Deep Marsh	-	-	-	-
Forested Wetland	-	12.8	279.4	292.2
Shallow Water Wetland	-	4.0	-	4.0
Total	-	2,446.2	1,143.4	3,589.6

(MWH, 2003)

Table 49. Ranking Summary for Subwatershed 1

Potential source	Points
Cropland	10
Livestock facility/feedlot	12
CAFO	0
Oil brine/sodic damaged land	3
Retired landfills	0
Total	**25**

Ranking

There are six livestock facility/feedlots within this subwatershed. The proximity of these facilities to waterways is critical. Cropland makes up 56% of the watershed.

Other concerns

Wide ephemeral headwaters exist in this watershed as well as intermittent streams. There are many wet areas and dammed waters. The Big Muddy Subimpoundment dam gates are closed every year, 2 weeks before waterfowl hunting season opens to increase water levels to 409 feet of elevation. Elevation at the subimpoundment crest is 412 feet (USACE, 1993). The area north of the dam is filled with rain water and/or water from Rend Lake. The operation of the dam is to create habitat to attract various wildlife for hunting. On March 1, the gates are opened to allow the waters to flow into Rend Lake and in time for the next growing season (USACE, 1993). This flooding affects the natural flow of Rayse Creek as well as degrades the

water quality by decreasing dissolved oxygen, increasing water temperature and saturating the soil. Flooding of the croplands causes concern because of nutrients and erosion carried off when the gates are opened and the water flows into Rend Lake.

There is one severely eroded spot located in section 36. In sections 19 and 30 of the McClellan Township, there is a major alteration of the hydrology with channelization (approximately 4420 ft in length on segment 1411). This causes an increase in streamflow and peak flow discharges. Excessive sediment deposits from erosion can cause channel aggradation which can contribute to flooding. This channelization may eventually lead to channel morphology (change of the shape of the channel) upstream and degradation.

BMP Recommendations:

Avoid mechanical equipment in persistently wet or flooded areas
Grassed watercourses
Riparian buffers / filter strips
Restoration of meanders in channelized stream reach
Rotational grazing
Soil testing

5. Subwatershed 2

Total acreage in this subwatershed is approximately 5,956 acres. The Back Branch (NKD) creek is the major stream in this watershed and includes the following tributaries (segments): 1405, 1404, 701, 1406, 1407, 1409, and 1408. The land and the tributaries lie within the Blissville Township in Jefferson County.

Monitoring station—NK01

Table 50. Land Use for Subwatershed 2

Land use	% of Subwatershed
Cropland	56%
Urban	0%
Forest	5%
Pasture	36%
Wetland	3%

Table 51. Detailed Land Use/Land Cover for Subwatershed 2

	RC 02			
Land Use/Land Cover	IL006	IL038	IL051	Total
Urban - High Density	-	2.2	-	2.2
Urban - Medium Density	-	-	-	-
Agriculture - Row Crop	709.8	1,534.4	244.9	2,489.1
Agriculture - Small Grains	162.5	624.5	42.8	829.8
Agriculture - Orchards/Nurseries	-	-	-	-
Urban Grassland	-	-	-	-
Rural Grassland	347.1	1,577.1	209.1	2,133.3
Forested - Deciduous: Closed Canopy	25.4	278.3	9.7	313.3
Forested - Deciduous: Open Canopy	-	-	-	-
Water	-	-	-	-
Shallow Marsh/Wet Meadow	-	-	-	-
Deep Marsh	-	-	-	-
Forested Wetland	5.9	99.9	58.5	164.3
Shallow Water Wetland	-	14.4	9.8	24.2
Total	1,250.6	4,130.8	574.7	5,956.2

(MWH, 2003)

Table 52. Ranking Summary for Subwatershed 2

Potential source	Points
Cropland	8
Livestock facility/feedlot	11
CAFO	0
Oil brine/sodic damaged land	4
Retired landfills	0
Total	**23**

Ranking

There are seven livestock facility/feedlots within this subwatershed which can contribute to increased nutrients and erosion. Cropland makes up about 56% of the land area within this subwatershed. Oil brine/sodic damaged land is prominent in this watershed. There are approximately twelve oil brine spots and one sodic spot.

BMP Recommendations:

Brine or sodic area management
Soil testing
Rotational grazing
Grassed watercourses
Riparian buffers / filter strips

6. Subwatershed 11

This subwatershed drains approximately 2,271 acres. Its major stream is Rayse Creek and a tributary—segment 1376 (IEPA). Most of this watershed lies in the Grand Prairie Township in Jefferson County with a small area lying west into the Irvington Township in Washington County.

Monitoring station—NK02

Table 53. Land Use for Subwatershed 11

Land use	% of Subwatershed
Cropland	64%
Urban	0%
Forest	12%
Pasture	21%
Wetland	3%

Table 54. Detailed Land Use/Land Cover for Subwatershed 11

	RC 11			
Land Use/Land Cover	IL006	IL038	IL051	Total
Urban - High Density	0.1	-	-	0.1
Urban - Medium Density	-	-	-	-
Agriculture - Row Crop	1,272.0	0.9	-	1,272.9
Agriculture - Small Grains	180.9	-	-	180.9
Agriculture - Orchards/Nurseries	-	-	-	-
Urban Grassland	-	-	-	-
Rural Grassland	473.5	3.7	-	477.2
Forested - Deciduous: Closed Canopy	253.3	19.3	-	272.7
Forested - Deciduous: Open Canopy	-	-	-	-
Water	-	-	-	-
Shallow Marsh/Wet Meadow	0.4	-	-	0.4
Deep Marsh	-	-	-	-
Forested Wetland	41.9	25.3	-	67.3
Shallow Water Wetland	-	-	-	-
Total	2,222.3	49.2	-	2,271.5

(MWH, 2003)

Table 55. Ranking Summary for Subwatershed 11

Potential source	Points
Cropland	12
Livestock facility/feedlot	0
CAFO	0
Oil brine/sodic damaged land	7
Retired landfills	0
Total	**19**

Ranking

Cropland makes up 64% of this subwatershed. There are no recorded livestock facility/feedlots, CAFOs or retired landfills. There are three sodic areas in section 18, two brine spots in section 30 and four wet spots in section 31 and 18.

Other concerns

The Irvington East Oil Fields are located in sections 19, 30, 31 of the Grand Prairie Township in Jefferson County. These oil fields should be monitored for brine damage.

BMP recommendations:

Grassed watercourses
Riparian buffers / filter strips
Brine or sodic area management
Avoid mechanical equipment in persistently wet or flooded areas
Soil testing

7. Subwatershed 6

This subwatershed drains approximately 5,626 acres and lies within the Casner Township in Jefferson County. The tributaries (or segments) of the creek in this watershed are 1360, 1357, 1356, 1359, and 1358.

Monitoring station—NK02

Table 56. Land Use for Subwatershed 6

Land use	% of Subwatershed
Cropland	38%
Urban	0%
Forest	15%
Pasture	40%

Wetland	5%

Table 57. Detailed Land Use/Land Cover for Subwatershed 6

	RC 06			
Land Use/Land Cover	IL006	IL038	IL051	Total
Urban - High Density	-	10.6	-	10.6
Urban - Medium Density	-	19.2	-	19.2
Agriculture - Row Crop	-	1,669.8	-	1,669.8
Agriculture - Small Grains	-	494.8	-	494.8
Agriculture - Orchards/Nurseries	-	-	-	-
Urban Grassland	-	84.8	-	84.8
Rural Grassland	-	2,229.3	-	2,229.3
Forested - Deciduous: Closed Canopy	-	857.0	-	857.0
Forested - Deciduous: Open Canopy	-	-	-	-
Water	-	-	-	-
Shallow Marsh/Wet Meadow	-	3.5	-	3.5
Deep Marsh	-	-	-	-
Forested Wetland	-	245.1	-	245.1
Shallow Water Wetland	-	11.7	-	11.7
Total	-	5,625.9	-	5,625.9

(MWH, 2003)

Table 58. Ranking Summary for Subwatershed 6

Potential source	Points
Cropland	3
Livestock facility/feedlot	8
CAFO	0
Oil brine/sodic damaged land	4
Retired landfills	4
Total	**19**

Ranking

There is one livestock facility/feedlot located within this watershed and no CAFOs. Cropland makes up 38% of the total acreage in this subwatershed. There are six brine areas located within the Woodlawn oil field.

There are 2 known landfills located in this subwatershed. The first, Mt. Vernon Municipal #2, is located in section 35. It is owned by Arthur Shewmake and operated by mayor and council of Mt. Vernon. It is approximately 60 acres in size but only 45 acres was filled. This landfill was closed/covered in 1977. It is located near County Road 450. According to the IEPA, it is monitored (http://space1.itcs.uiuc.edu/website/rmms/, 2005).

The other landfill in the subwatershed is located in section 24 in the Casner Township. Although there is record of this landfill, no detailed information is given (size, open date, close date).

BMP recommendations:

Grassed watercourses
Riparian buffers / filter strips
Brine or sodic area management
Avoid mechanical equipment in persistently wet or flooded areas
Soil testing

8. Subwatershed 12

This watershed drains approximately 2,461 acres and lies within the Grand Prairie Township in Jefferson County. Rayse Creek is the major waterbody and includes tributaries (or segments) 1375, 1373, and 1374 (as identified by the IEPA).

Monitoring station—NK02

Table 59. Land Use for Subwatershed 12

Land use	% of Subwatershed
Cropland	58%
Urban	0%
Forest	16%
Pasture	24%
Wetland	2%

Table 60. Detailed Land Use/Land Cover for Subwatershed 12

	RC 12			
Land Use/Land Cover	IL006	IL038	IL051	Total
Urban - High Density	-	-	-	-
Urban - Medium Density	-	-	-	-
Agriculture - Row Crop	1,264.8	28.7	-	1,293.5
Agriculture - Small Grains	132.5	9.9	-	142.4
Agriculture - Orchards/Nurseries	-	-	-	-
Urban Grassland	-	-	-	-
Rural Grassland	539.5	52.7	-	592.1
Forested - Deciduous: Closed Canopy	224.6	160.7	-	385.4
Forested - Deciduous: Open Canopy	-	-	-	-
Water	-	-	-	-
Shallow Marsh/Wet Meadow	0.7	-	-	0.7
Deep Marsh	-	-	-	-
Forested Wetland	25.9	15.4	-	41.3
Shallow Water Wetland	6.1	-	-	6.1
Total	2,194.1	267.4	-	2,461.5

(MWH, 2003)

Table 61. Ranking Summary for Subwatershed 12

Potential source	Points
Cropland	11
Livestock facility/feedlot	0
CAFO	0
Oil brine/sodic damaged land	0
Retired landfills	0
Total	**11**

Ranking

There are no recorded facility/feedlots in this subwatershed, no CAFOs and no landfills. Cropland makes up 58% of this watershed. There are two wet areas in section 20.

Most of the oil wells are dry and abandoned according to the Illinois State Geological Survey (http://meltwater.isgs.uiuc.edu/website/iloil/viewer.htm). There are some oil wells located in this watershed and they should be monitored for brine damage.

BMP recommendations:

Grassed watercourses
Riparian buffers / filter strips
Soil testing
Avoid mechanical equipment in persistently wet or flooded areas

9. Subwatershed 10

This subwatershed drains approximately 2,649 acres. Its major stream is Rayse Creek and its tributaries are segments 1371, 1372, and 1370 (IEPA). The entire subwatershed lies in Grand Prairie Township in Jefferson County.

Monitoring station—NK02

Table 62. Land Use for Subwatershed 10

Land use	% of subwatershed
Cropland	52%
Urban	0%
Forest	24%
Pasture	20%
Wetland	3%

Table 63. Detailed Land Use/Land Cover for Subwatershed 10

	RC 10			
Land Use/Land Cover	IL006	IL038	IL051	Total
Urban - High Density	-	-	-	-
Urban - Medium Density	-	-	-	-
Agriculture - Row Crop	835.1	384.1	-	1,219.2
Agriculture - Small Grains	119.1	37.3	-	156.5
Agriculture - Orchards/Nurseries	-	-	-	-
Urban Grassland	-	-	-	-
Rural Grassland	230.6	296.2	-	526.8
Forested - Deciduous: Closed Canopy	97.5	549.2	-	646.6
Forested - Deciduous: Open Canopy	-	-	-	-
Water	-	7.9	-	7.9
Shallow Marsh/Wet Meadow	-	-	-	-
Deep Marsh	-	1.9	-	1.9
Forested Wetland	2.2	85.3	-	87.5
Shallow Water Wetland	1.5	1.0	-	2.6
Total	1,286.0	1,362.9	-	2,648.9

(MWH, 2003)

Table 64. Ranking Summary for Subwatershed 10

Potential source	Points
Cropland	9
Livestock facility/feedlot	0
CAFO	0
Oil brine/sodic damaged land	0
Retired landfills	0
Total	**9**

Ranking

Cropland makes up 52% of this subwatershed. There are no known livestock facility/feedlots, CAFOs, oil brine/sodic damaged lands or retired landfills. There are a couple of wet spots in section 33 that should be avoided with heavy machinery and livestock. There are soils within this watershed which have high erosion risks and should be avoided when cultivating.

BMP recommendations:

Grassed waterways
Riparian buffers / filter strips
Establish permanent cover on highly erodible land
Soil testing

10. Subwatershed 5

This subwatershed drains approximately 5,997 acres. Rayse Creek is the main stream with tributaries (or segments) 1397, 1395, 1396, 1394, and 1392. It lies within the Casner Township in Jefferson County.

Monitoring Station—NK02

Table 65. Land Use Table for Subwatershed 5

Land use	% of Subwatershed
Cropland	40%
Urban	0%
Forest	25%
Pasture	29%
Wetland	5%

Table 66. Detailed Land Use/Land Cover for Subwatershed 5

	RC 05			
Land Use/Land Cover	IL006	IL038	IL051	Total
Urban - High Density	-	-	-	-
Urban - Medium Density	-	-	-	-
Agriculture - Row Crop	802.5	978.4	-	1,780.8
Agriculture - Small Grains	265.0	366.4	-	631.4
Agriculture - Orchards/Nurseries	-	-	-	-
Urban Grassland	-	-	-	-
Rural Grassland	335.9	1,429.9	-	1,765.8
Forested - Deciduous: Closed Canopy	120.2	1,373.0	-	1,493.2
Forested - Deciduous: Open Canopy	-	-	-	-
Water	-	-	-	-
Shallow Marsh/Wet Meadow	-	21.0	-	21.0
Deep Marsh	-	7.2	-	7.2
Forested Wetland	-	281.5	-	281.5
Shallow Water Wetland	3.4	12.8	-	16.2
Total	1,527.1	4,470.0	-	5,997.1

(MWH, 2003)

Table 67. Ranking Summary for Subwatershed 5

Potential source	Points
Cropland	5
Livestock facility/feedlot	0
CAFO	0
Oil brine/sodic damaged land	0
Retired landfills	0
Total	**5**

Ranking

Subwatershed 5 is covered by 40% cropland and has many severely eroded areas (sections 30, 31 and 32). There is one oil well active the others are dry and abandoned (http://meltwater.isgs.uiuc.edu/website/iloil/viewer.htm, 2005). Three sodic areas and one severely eroded spot exist in section 32. Section 31 has five severely eroded spots and one oil brine spot. Section 28 has one oil brine spot. These areas lie just south of the Roaches area which has a smaller oil field than Richview or Woodlawn. There are no known livestock facility/feedlots, CAFOs or landfills in this subwatershed.

Other concerns

There is a wet spot in section 30 that heavy equipment and livestock should avoid.

BMP Recommendations:

Grassed watercourses
Riparian buffers / filter strips
Avoid mechanical equipment in persistently wet or flooded areas
Rotational grazing
Brine or sodic area management
Soil testing

11. Subwatershed 9

This subwatershed drains approximately 5,715 acres. Rayse Creek is the major stream that runs through the watershed its tributaries also include segments 1369, 1366, 1367, 1368, 1364, and 1365 as indicated by the IEPA. This watershed is located in the Grand Prairie and Casner Townships in Jefferson County.

Monitoring Station—NK02

Table 68. Land Use for Subwatershed 9

Land use	% of Subwatershed
Cropland	32%
Urban	0%
Forest	32%
Pasture	29%
Wetland	7%

Table 69. Detailed Land Use/Land Cover for Subwatershed 9

	RC 09			
Land Use/Land Cover	IL006	IL038	IL051	Total
Urban - High Density	-	1.0	-	1.0
Urban - Medium Density	-	-	-	-
Agriculture - Row Crop	842.3	797.2	-	1,639.5
Agriculture - Small Grains	30.7	164.2	-	194.9
Agriculture - Orchards/Nurseries	-	-	-	-
Urban Grassland	-	-	-	-
Rural Grassland	259.3	1,410.9	-	1,670.2
Forested - Deciduous: Closed Canopy	132.2	1,690.2	-	1,822.4
Forested - Deciduous: Open Canopy	-	-	-	-
Water	-	3.4	-	3.4
Shallow Marsh/Wet Meadow	-	4.5	-	4.5
Deep Marsh	-	1.1	-	1.1
Forested Wetland	-	362.0	-	362.0
Shallow Water Wetland	1.3	14.9	-	16.1
Total	1,265.7	4,449.3	-	5,715.0

(MWH, 2003)

Table 70. Ranking Summary for Subwatershed 9

Potential source	Points
Cropland	2
Livestock facility/feedlot	0
CAFO	0
Oil brine/sodic damaged land	0
Retired landfills	0
Total	**2**

Ranking

Cropland covers 32% of this subwatershed. There are no known livestock facility/feedlots, CAFOs, oil brine/sodic damaged land or retired landfills.

BMP recommendations:

Grassed watercourses
Riparian buffers / filter strips
Soil testing

12. Subwatershed 7

This subwatershed drains approximately 3,202 acres. Its major drainage is Rayse Creek. Tributaries (or segments) included in this subwatershed include--1363, 1362, and 1361. It lies in the Casner Township of Jefferson County.

Monitoring station—NK02

Table 71. Land Use for Subwatershed 7

Land use	% of Subwatershed
Cropland	25%
Urban	0%
Forest	22%
Pasture	45%
Wetland	8%

Table 72. Detailed Land Use/Land Cover for Subwatershed 7

	RC 07			
Land Use/Land Cover	IL006	IL038	IL051	Total
Urban - High Density	-	-	-	-
Urban - Medium Density	-	-	-	-
Agriculture - Row Crop	-	611.0	-	611.0
Agriculture - Small Grains	-	189.2	-	189.2
Agriculture - Orchards/Nurseries	-	-	-	-
Urban Grassland	-	-	-	-
Rural Grassland	-	1,449.5	-	1,449.5
Forested - Deciduous: Closed Canopy	-	692.6	-	692.6
Forested - Deciduous: Open Canopy	-	-	-	-
Water	-	-	-	-
Shallow Marsh/Wet Meadow	-	2.3	-	2.3
Deep Marsh	-	1.3	-	1.3
Forested Wetland	-	247.2	-	247.2
Shallow Water Wetland	-	8.6	-	8.6
Total	-	3,201.7	-	3,201.7

(MWH, 2003)

Table 73. Ranking Summary for Subwatershed 7

Potential source	Points
Cropland	1
Livestock facility/feedlot	0
CAFO	0
Oil brine/sodic damaged land	0
Retired landfills	0
Total	**1**

Ranking

Cropland makes up 25% of this watershed and pastureland makes up 45% of the watershed. There are no known livestock facility/feedlots, CAFOs, oil brine/sodic damaged land, or landfills in this subwatershed.

Other concerns

Wide, deep ephemerals are present; soil in some of the ephemeral areas are frequently flooded. There are ten wet spots scattered throughout sections 14, 15, 22 and 34. These areas should be avoided with heavy machinery and livestock.

BMP recommendations:

Grassed watercourses
Riparian buffers / filter strips
Avoid mechanical equipment in persistently wet or flooded areas
Soil testing

GOVERNMENT COST-SHARE PROGRAMS

The implementation of best management practices to improve water quality within the watershed can be realized through a suite of different federal and state government cost-share programs to meet the needs and desires of the individual landowner. The best entity to develop a realistic schedule for best management practice implementation is the Rayse Creek Watershed Planning Committee, who is ultimately responsible for plan implementation and revision. A brief synopsis of individual programs is described below. See www.usda.gov for a full description of available federal conservation programs.

FEDERAL PROGRAMS

Conservation Reserve Program (CRP)

The CRP program allows farmers to convert highly erodible and riparian land to vegetative cover through grass filter strips, riparian buffers, native grasses, trees, and wildlife plantings. Farmers receive an annual rental payment based on soil productivity and up to 50% of the cost of establishing the vegetative cover is provided. Voluntary contract lengths are 10 to 15 years in duration. The Conservation Reserve Enhancement Program (CREP) builds upon the successful CRP program, but is only available in certain high priority watersheds. In the state of Illinois, the Illinois River watershed is the only one with a current CREP program. Rayse Creek is part of the larger Big Muddy watershed.

Conservation Securities Program (CSP)

The relatively new CSP program supports ongoing stewardship of private agricultural lands. It provides payments to farmers and ranchers for maintaining and improving natural resources on their lands. CSP is available in selected watersheds throughout the 50 states. Farmers are encouraged to complete a self-assessment that describes existing conservation activities on their land to help determine their eligibility for CSP and in which program tier and enrollment category they can participate. Current contact lengths are from 5 to 10 years.

Wetlands Reserve Program (WRP)

The WRP program works to restore and protect wetlands on private lands. Landowners can establish 30 year or permanent conservation easements or participate in restoration cost-share agreements of a minimum 10 year duration. Permanent easements pay the landowner up to the agricultural value of the land and 100% of wetland restoration costs. Thirty year easements pay the landowner up to 75% of the agricultural value of the land and 75% of the restoration costs. Cost-share agreements pay for 75% of the associated wetland restoration activities. WRP lands provide critical wildlife habitat, especially waterfowl, throughout the state of Illinois.

Environmental Quality Incentives Program (EQIP)

The EQIP program provides technical assistance, cost share (up to 75-90%), incentive payments, and educational assistance to establish conservation practices such as manure management systems, pest management, and erosion control on agricultural land. Contracts are 5 to 10 years in duration and activities are carried out according to a

developed conservation plan. Half of the financial resources under EQIP are dedicated to livestock-related concerns.

Wildlife Habitat Incentives Program (WHIP)

The WHIP program seeks to improve fish and wildlife habitat on private land by providing technical assistance and cost-share payments to landowners for conservation practice establishment. Cost-share agreements are 5 to 10 years in duration and participants agree to prepare and implement a wildlife habitat development plan.

Forestry Incentives Program (FIP)

FIP is a nationwide program that provides up to 65% of the costs of tree planting, timber stand improvements, site preparation for natural regeneration, and related practices on non-industrial private forest land.

Small Watershed Program

The Small Watershed Program provides technical and financial assistance to watersheds for projects including watershed protection, erosion and sedimentation control, water quality, fish and wildlife habitat enhancement, wetland creation and restoration, public recreation, flood prevention, and water supply. Watersheds with 250,000 or fewer acres are eligible to apply, which includes Rayse Creek.

STATE PROGRAMS

Conservation 2000

Conservation 2000 is multi-program, multi-agency initiative with the goal of conserving, restoring, and managing Illinois natural lands and water resources through long-term ecosystem and watershed based management. The Conservation 2000 Program funds programs across 3 agencies including the Illinois Department of Natural Resources' Ecosystems Program, the Illinois Environmental Protection Agency's Illinois Clean Lakes Program, and the Illinois Department of Agriculture's Conservation Practices Cost-Share Program, Sustainable Agriculture Grants Program, and Streambank Stabilization and Restoration Program.

Section 319 NPS Pollution Control Program

The Illinois Environmental Protection Agency administers Section 319(h) funding under the Clean Water Act to implement nonpoint source pollution control projects. Section 319 projects can involve technical and financial assistance, education, training, technology transfer, demonstration activities, planning, and monitoring. Maximum federal costs are 60% of the total project costs.

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LIST OF CONTACTS AND ADDITIONAL SOURCES

CONTACTS

Illinois Department of Agriculture
Wayne Kinney, Fluvial Geomorphologist
cd-aerial video and report

Illinois Department of Natural Resources

Illinois Environmental Protection Agency
Bureau of Water- Greg Good, Amy Walkenbach, Scott Ristau

USDA Service Center, Jefferson County
Soil and Water Conservation District (SWCD)-Stacy Pytlinski
Natural Resources Conservation Service (NRCS)-Art Friederich
Farm Service Agency (FSA)-Sandy Frick

Prairie Rivers Network
Traci Barkley, Watershed Scientist
Glynnis Collins, Watershed Scientist
Kim Erndt, Watershed Organizer

ADDITIONAL SOURCES

Illinois State Geological Survey (Oct 2005)
Illinois Historical Aerial Photography Project (Interactive map)
Washington County only.
http://www.isgs.uiuc.edu/nsdihome/webdocs/ilhap/launchims.html

Illinois Watershed Management Clearinghouse http://www.watershed.uiuc.edu/

Jeffersoncountyinfo.com

APPENDIX I

List of BMP Recommendation Descriptions
in Alphabetical Order

Avoid mechanical equipment in persistently wet or flooded areas to prevent compaction, impermeability, soil erosion, and nutrient runoff.

Brine or sodic areas are considered critical areas. The local NRCS technician uses federal, state and local soil salinity management regulations when ameliorating the problem area(s). NRCS tries to establish vegetation to reduce the erosion from the damaged area. Some of these areas need physical structures to prevent excessive erosion. Areas that will not, under any condition, establish vegetation are known as "hot spots".

Grassed watercourses. The grassed area should run the entire length of the watercourse to the main channel. The width of the plantings should be determined based on the slope and land use of the particular land parcel. An NRCS technician should be consulted for design, plantings and management for tract-specific soil types. Continuous management within these areas is vital to the function and success of the grassed waterway.

Permanent cover should be established on **Highly erodible land** and it should not be cultivated or grazed.

Riparian Buffers/Filter Strips. Establishing vegetation cover of trees (riparian buffers) or grasses (filter strips) in riparian or streamside areas helps protect water quality by filtering sediment and nutrients from surface runoff and enhancing infiltration of runoff which promotes deposition of sediment and sediment bound nutrients. Vegetated riparian zones also help to reduce nutrients in soil water and groundwater via vegetation uptake and microbial processes such as denitrification. Vegetated buffers and filter strips also help stabilize stream banks and serve as important wildlife habitat in agricultural watersheds. NRCS personnel should be consulted for design, plantings, and maintenance of buffers and filter strips.

Rotational grazing should be practiced for maximum use efficiency of forage as well as for minimizing overgrazing of any areas.

Soil testing agricultural field to minimize over-fertilization and ultimately impairments to water quality. NRCS personnel can help producers develop whole-farm nutrient management plans.

APPENDIX II

Tree Recommendations for Plantings in Subwatersheds:
2, 4, 5, 6, 7, 8, 9, 10, 11, 12

Windbreaks	**Woodlands**	**Ephemeral Areas**
Eastern white pine	White oak	White oak
Pin oak	Northern red oak	Green ash
Norway spruce	Tuliptree	Northern red oak
White fir	Black walnut	Bur oak
Blue spruce		
Whitecedar		

A combination can also be used for planting in riparian areas.

APPENDIX III

Tree Recommendations for Plantings in Subwatersheds:
1 and 3

The trees listed here are different species from the other subwatersheds because of the persistent wet areas and flooding regimes. The following trees are more tolerant of these conditions.

Windbreaks	**Woodlands**	**Ephemeral Areas**
Eastern white pine	White oak	Eastern cottonwood
Pin oak	Northern red oak	
Eastern red cedar	Bur oak	
Green ash	Green Ash	
Osage orange		
Wet areas (fields)	**Wet areas (woodland)**	
Pin Oak	Pin oak	
Eastern white pine	Post oak	
Austrian pine	Green ash	
Norway spruce	White oak	
Whitecedar	Tuliptree	
	Cherrybark oak	
	Eastern cottonwood	
	Southern red oak	
	Sweetgum	

These trees or a combination can also be used for planting in riparian areas.