14. Appendix

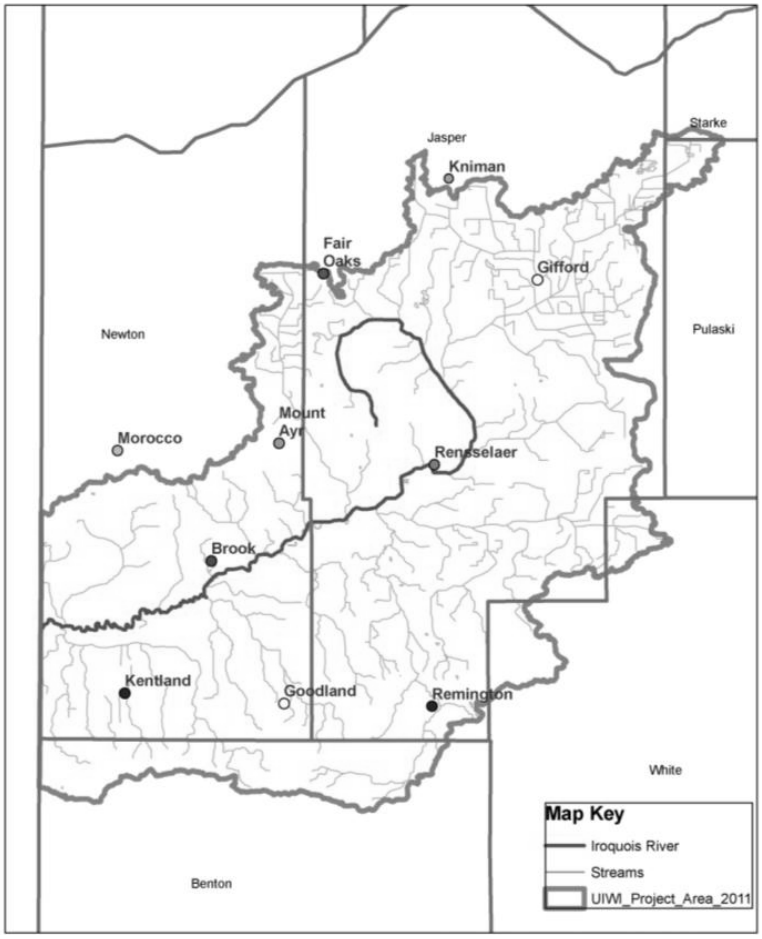
Appendix 1 Corn and Bean Tillage Practices

County	2009 Beans	2011 Beans	Acreage Difference	2009 Corn	2011 Corn	Acreage Difference
No-Till						
Jasper	51,900	38,000	-13,900	12,500	18,700	6,200
Newton	47,800	39,700	-8,100	16,500	8,300	-8,200
Benton	72,400	68,300	-4,100	5,400	16,200	10,800
Pulaski	51,000	49,500	-1,500	28,600	30,700	2,100
White	31,600	31,300	-10,800	6,500	11,200	4,700
Totals	254,700	226,800	-38,400	69,500	85,100	15,600
Mulch-Till						
Jasper	34,000	41,000	7,000	40,600	48,400	7,800
Newton	8,100	18,200	10,100	21,200	57,800	36,600
Benton	17,100	27,100	10,000	17,600	71,600	54,000
Pulaski	22,400	12,400	-10,000	56,200	22,300	-33,900
White	35,400	38,300	2,900	30,000	63,000	33,000
Totals	117,000	137,000	20,000	165,600	263,100	97,500
Reduced-Till						
Jasper	7,000	8,000	1,000	28,100	25,000	-3,100
Newton	7,400	4,000	-3,400	28,300	17,700	-10,600
Benton	8000	3000	-5000	108000	21600	-86400
Pulaski	2,300	11,600	9,300	14,800	33,900	19,100
White	22,000	8,600	-13,400	30,000	31,500	1,500
Totals	46,700	35,200	-11,500	209,200	129,700	-79,500
Conventional-Till						
Jasper	8,000	13,000	5,000	76,400	62,400	-14,000
Newton	4,000	6,100	2,100	51,900	34,200	-17,700
Benton	3,000	2,000	-1,000	4,100	25,700	21,600
Pulaski	800	3,900	3,100	6,400	20,100	13,700
White	6,700	4,800	-1,900	78,000	45,000	-33,000
Totals	22,500	29,800	7,300	216,800	187,400	-29,400

Appendix 2 Agricultural Social Indicators Survey

Your Views on Local Water Resources

The Upper Iroquois Watershed Initiative is a local group of farmers, businesses, and landowners who are conducting this survey in coordination with local partners and Purdue University. The purpose is to identify the concerns you have regarding water quality in the Upper Iroquois Watershed.
We need your help to direct future planning and grant dollar projects. Your opinion will be counted!



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Your voluntary participation in this survey is very important to understanding your needs and concerns. Your answers will be kept confidential and will be released only as summaries. Individual answers cannot be identified.

Please check the circle that corresponds to the answer category that best describes you and your situation or opinion.

The survey should take approximately 25 minutes to complete. Whe
self-addressed envelope. Please read each questior
Thank you!

For more information about the Upper Iroquois Watershed Initiative or this survey, please contact Dan Perkins, Jasper County SWCD Watershed Coordinator at (219-866-8008 ext 115.)

Rating of Water Quality

Overall, how would you rate the quality of the water in your area?

	Poor	Okay	Good	Don't Know
1. For canoeing / kayaking / other boating	( )	( )	( )	( )
2. For eating locally caught fish	( )	( )	( )	( )
3. For swimming	( )	( )	( )	( )
4. For picnicking and family activities	( )	( )	( )	( )
5. For fish habitat	( )	( )	( )	( )
6. For scenic beauty	( )	( )	( )	( )

Your Water Resources

1. Of these activities, which is the most important to you?
( ) For canoeing / kayaking / other boating
( ) For eating locally caught fish
( ) For swimming
( ) For picnicking and family activities
( ) For fish habitat
( ) For scenic beauty

2. Do you know where the rain water goes when it runs off of your property?
( ) No
( ) Yes

3. If you answered 'Yes' above, where does your rain water drain to?

Your Opinions

Please indicate your level of agreement or disagreement with the statements below.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1. Using recommended management practices on farms improves water quality.	( )	( )	( )	( )	( )
2. It is my personal responsibility to help protect water quality.	( )	( )	( )	( )	( )
3. It is important to protect water quality even if it slows economic development.	( )	( )	( )	( )	( )
4. My actions have an impact on water quality.	( )	( )	( )	( )	( )
5. I would be willing to pay more to improve water quality (for example: through local taxes or fees)	( )	( )	( )	( )	( )
6. I would be willing to change management practices to improve water quality.	( )	( )	( )	( )	( )
7. The quality of life in my community depends on good water quality in local streams, rivers and lakes.	( )	( )	( )	( )	( )

Water Impairments

Below is a list of water pollutants and conditions that are generally present in water bodies to some extent. The pollutants and conditions become a problem when present in excessive amounts. In your opinion, how much of a problem are the following water impairments in your area?

	Not a Problem	Slight Problem	Moderate Problem	Severe Problem	Don't Know
1. Sedimentation (dirt and soil) in the water	( )	( )	( )	( )	( )
2. Nitrogen	( )	( )	( )	( )	( )
3. Bacteria and viruses in the water (such as E.coli / coliform)	( )	( )	( )	( )	( )
4. Trash or debris in the water	( )	( )	( )	( )	( )
5. Atrazine	( )	( )	( )	( )	( )
6. Heavy metals	( )	( )	( )	( )	( )
7. Not enough oxygen in the water	( )	( )	( )	( )	( )
8. Habitat alteration harming local fish	( )	( )	( )	( )	( )

9. Pesticides	( )	( )	( )	( )	( )
10. Straightening of stream {channelization}	( )	( )	( )	( )	( )

Sources of Water Pollution

The items listed below are sources of water quality pollution across the country. In your opinion, how much of a problem are the following sources in your area?

	Not a Problem	Slight Problem	Moderate Problem	Severe Problem	Don't Know
1. Discharges from sewage treatment plants	( )	( )	( )	( )	( )
2. Soil erosion from farm fields	( )	( )	( )	( )	( )
3. Improper disposal of used motor oil and/or antifreeze	( )	( )	( )	( )	( )
4. Improperly maintained septic systems	( )	( )	( )	( )	( )
5. Manure from farm animals	( )	( )	( )	( )	( )
6. Stormwater run-off from streets and/or highways	( )	( )	( )	( )	( )
7. Excessive use of fertilizers for crop production	( )	( )	( )	( )	( )
8. Crop production (irrigated)	( )	( )	( )	( )	( )
9. Animal feeding operations	( )	( )	( )	( )	( )
10. Land development or redevelopment	( )	( )	( )	( )	( )
11. Soil loss from stream channels	( )	( )	( )	( )	( )
12. Dredging of streams	( )	( )	( )	( )	( )
13. Drainage/filling of wetlands	( )	( )	( )	( )	( )
14. Combined Sewer Overflow {CSO}	( )	( )	( )	( )	( )
15. Livestock in streams or ditches	( )	( )	( )	( )	( )
16. Failing septic systems	( )	( )	( )	( )	( )
17. Straightening of streams {channelization}	( )	( )	( )	( )	( )
18. Removal of vegetation along a stream-ditch	( )	( )	( )	( )	( )

Consequences of Poor Water Quality

Poor water quality can lead to a variety of consequences for communities. In your opinion, how much of a problem are the following issues in your area?

	Not a Problem	Slight Problem	Moderate Problem	Severe Problem	Don't Know
1. Contaminated drinking water	( )	( )	( )	( )	( )
2. Contaminated fish	( )	( )	( )	( )	( )
3. Loss of desirable fish species	( )	( )	( )	( )	( )

4. Reduced opportunities for water recreation	( )	( )	( )	( )	( )
5. Fish kills	( )	( )	( )	( )	( )
6. Lower property values	( )	( )	( )	( )	( )

Practices to Improve Water Quality

Please indicate which statement most accurately describes your level of experience with each practice listed below.

	Not relevant for my property	Never heard of it	Somewhat familiar with it	Know how to use it; not using it	Currently use it
1. Conduct regular soil tests for pH, phosphorus, nitrogen and potassium	( )	( )	( )	( )	( )
2. Use manure in accordance with its nutrient content	( )	( )	( )	( )	( )
3. Consider the nitrogen contribution from legumes in rotation when establishing nitrogen fertilizer application	( )	( )	( )	( )	( )
4. Adjust crops or fertilization in high risk areas of the field (e.g. sink holes, shallow soils over fractured bedrock)	( )	( )	( )	( )	( )
5. Avoid fall application of manure or nitrogen fertilizer to reduce environmental losses	( )	( )	( )	( )	( )
6. Use variable rate application technology for more precise crop production	( )	( )	( )	( )	( )
7. Maintain the calibration of fertilizer application equipment	( )	( )	( )	( )	( )
8. Use field records of crops, pests and pesticide use to help develop pest control strategies	( )	( )	( )	( )	( )
9. Consider location and soil characteristics to minimize leaching or run-off	( )	( )	( )	( )	( )
10. Apply manure so that nutrients are being applied within university recommendations	( )	( )	( )	( )	( )
11. Restore/enhance wetland	( )	( )	( )	( )	( )
12. Improve stream habitat	( )	( )	( )	( )	( )

Specific Constraints of Practices

Regular Septic System Servicing: Having septic system thoroughly cleaned every 3-5 years to remove all the sludge, effluent and scum from the tank.

1. How familiar are you with this practice?

( ) Not relevant

( ) Never heard of it

( ) Somewhat familiar with it

( ) Know how to use it; not using it

( ) Currently use it

Regular Septic System Servicing continued:

2. If the practice is not relevant, please explain why.

3. Are you willing to try this practice?

( ) Yes or already do

( ) Maybe

( ) No

How much do the following factors limit your ability to implement regular septic servicing?

	Not at all	A little	Some	A lot	Don't Know
4. Don't know how to do it	( )	( )	( )	( )	( )
5. Time required	( )	( )	( )	( )	( )
6. Cost	( )	( )	( )	( )	( )
7. The features of my property make it difficult	( )	( )	( )	( )	( )
8. Not certain of water quality benefit	( )	( )	( )	( )	( )
9. I have not needed to do this in the past	( )	( )	( )	( )	( )
10. Physical or health limitations	( )	( )	( )	( )	( )
11. Hard to use with my farming system	( )	( )	( )	( )	( )
12. Lack of equipment	( )	( )	( )	( )	( )

Cover Crops: Planting cover crops for erosion protection and soil improvement

13. How familiar are you with this practice?

( ) Not relevant

( ) Never heard of it

14. If the practice is not relevant, please explain why.

( ) Somewhat familiar with it
( ) Know how to use it; not using it
( ) Currently use it

15. Are you willing to try this practice?
( ) Yes or already do
( ) Maybe
( ) No

Cover crops continued: How much do the following factors limit your ability to implement cover cropping?

	Not at all	A little	Some	A lot	Don't Know
16. Don't know how to do it	( )	( )	( )	( )	( )
17. Time required	( )	( )	( )	( )	( )
18. Cost	( )	( )	( )	( )	( )
19. The features of my property make it difficult	( )	( )	( )	( )	( )
20. Not certain of soil and water quality benefit	( )	( )	( )	( )	( )
21. Desire to keep things the way they are	( )	( )	( )	( )	( )
22. Hard to use with my farming system	( )	( )	( )	( )	( )
23. Lack of equipment	( )	( )	( )	( )	( )

Riparian (area along a stream or ditch) Fencing: Fencing that excludes animals from stream or ditch water.

24. How familiar are you with this practice?
( ) Not relevant
( ) Never heard of it
( ) Somewhat familiar with it
( ) Know how to use it; not using it
( ) Currently use it

26. Are you willing to try this practice?
( ) Yes or already do

25. If the practice is not relevant, please explain why.

( ) Maybe
( ) No

How much do the following factors limit your ability to implement this practice?

	Not at all	A little	Some	A lot	Don't Know
27. Don't know how to do it	( )	( )	( )	( )	( )
28. Time required	( )	( )	( )	( )	( )
29. Cost	( )	( )	( )	( )	( )
30. The features of my property make it difficult	( )	( )	( )	( )	( )
31. Not certain of water quality benefit	( )	( )	( )	( )	( )
32. Desire to keep things the way they are	( )	( )	( )	( )	( )
33. Hard to use with my farming system	( )	( )	( )	( )	( )
34. Lack of equipment	( )	( )	( )	( )	( )

Conservation Tillage: Establishing crops in the previous crop residues which are purposely left on the soil surface.

35. How familiar are you with this practice?
( ) Not relevant
( ) Never heard of it
( ) Somewhat familiar with it
( ) Know how to use it; not using it
( ) Currently use it

37. Are you willing to try this practice?
( ) Yes or already do
( ) Maybe
( ) No

36. If the practice is not relevant, please explain why.

How much do the following factors limit your ability to implement this practice?

	Not at all	A little	Some	A lot	Don't Know
38. Don't know how to do it	( )	( )	( )	( )	( )
39. Time required	( )	( )	( )	( )	( )
40. Cost	( )	( )	( )	( )	( )
41. The features of my property make it difficult	( )	( )	( )	( )	( )

42. Not sure of soil or water quality benefits	( )	( )	( )	( )	( )
43. Desire to keep things the way they are	( )	( )	( )	( )	( )
44. Hard to use with my farming system	( )	( )	( )	( )	( )
45. Lack of equipment	( )	( )	( )	( )	( )

Other comments regarding conservation tillage and your farm:

Making Decisions for my Property

In general, how much does each issue limit your ability to change your agricultural management practices?

	Not at all	A little	Some	A lot	Don't Know
1. Personal out-of-pocket expense	( )	( )	( )	( )	( )
2. Lack of government funds for cost share	( )	( )	( )	( )	( )
3. Not having access to the equipment that I need	( )	( )	( )	( )	( )
4. Lack of available information about a practice	( )	( )	( )	( )	( )
5. No one else I know is implementing the practice	( )	( )	( )	( )	( )
6. Concerns about reduced yields	( )	( )	( )	( )	( )
7. Approval of my neighbors	( )	( )	( )	( )	( )
8. Don't want to participate in government programs	( )	( )	( )	( )	( )
9. Requirements or restrictions of government programs	( )	( )	( )	( )	( )
10. Possible interference with my flexibility to change land use practices as conditions warrant	( )	( )	( )	( )	( )
11. Environmental damage caused by practice	( )	( )	( )	( )	( )

12. I do not own the property	( )	( )	( )	( )	( )
13. Not being able to see a demonstration of the practice before I decide	( )	( )	( )	( )	( )

About Your Farm Operation

1. Please select the option that best describes who generally makes management decisions for your operation.

( ) Me alone or with my spouse

( ) Me with my family partners (siblings, parents, children)

( ) Me with the landowner

( ) Me with my tenant

( ) Me and my business partners

( ) Someone else makes the decision for the operation

( ) Other

2. Please estimate the total tillable acreage (owned and/or rented) of your farming operation this year.

3. This year, how many acres of corn do you manage? If none, please enter a zero.

4. This year, how many acres of soybeans do you manage? If none, please enter a zero.

5. This year, how many acres of small grains do you manage? If none, please enter a zero.

6. This year, how many acres of pasture do you manage? If none, please enter a zero.

7. How many years have you been farming? (Please enter years)

8. Did any family member own and operate this farm before you did?

( ) No

( ) Yes

9. If you answered 'yes' to the previous question, how many years has the farm been in the family?

10. How likely is it that any family member will continue farm operations when you retire or quit farming?
( ) Definitely will not happen
( ) Probably will not happen
( ) Probably will happen
( ) Definitely will happen

11. Does the property you manage touch a stream, river, lake, or wetland?
( ) Yes
( ) No

12. Five years from now, which statement will best describe your farm operation?
( ) It will be about the same as it is today
( ) It will be larger
( ) It will be smaller
( ) I don't know

13. Do you have a nutrient management plan for your farm operation?
( ) No
( ) Yes

14. Who developed your current nutrient management plan?
( ) My land Conservation District / Department, University Extension, or NRCS office
( ) A private-sector agronomist or crop consultant
( ) I created my own plan
( ) I don't know
( ) Other

15. What is included in your nutrient management plans?
[ ] Commercial nutrients
[ ] Livestock manure
[ ] Septic waste
[ ] Municipal sludge

[ ] Industrial sludge
[ ] Other

About You

1. What is your gender?
( ) Male
( ) Female

2. What is your age?

3. What is the highest grade in school you have completed?
( ) Some formal schooling
( ) High school diploma/GED
( ) Some college
( ) 2 year college degree
( ) 4 year college degree
( ) Post-graduate degree

4. How long have you lived at your current residence (years)?

5. Which of the following best describes where you live?
( ) In a town, village, or city
( ) In an isolated, rural, non-farm residence
( ) Rural subdivision or development
( ) On a farm

6. In addition to your residence, which of the following do you own or manage? (check all that apply)
[ ] An agricultural operation
[ ] Forested land
[ ] Rural recreational property
[ ] None of these

7. How many days, if any, did you work at least 4 hours per day off your farm operation for pay in the past year? (Include work on someone else's farm for pay.)
( ) None
( ) 1 - 49 days
( ) 50 - 99 days
( ) 100 - 199 days
( ) 200 days or more

8. Do you consider yourself retired from your farm operation?
( ) Retired
( ) Partially retired
( ) Not retired

9. Where are you likely to seek information about soil and water conservation issues? (Check all that apply)
[ ] Newsletters/brochure/factsheet
[ ] Internet
[ ] Radio
[ ] Workshops/demonstrations/meetings
[ ] Conversations with others
[ ] Trade publications/magazines
[ ] None of the above

10. Do you regularly read a local newspaper?
( ) Yes
( ) No

Information Sources

People get information about water quality from a number of different sources. To what extent do you trust those listed below as a source of information about soil and water?

	Not at all	Slightly	Moderately	Very much	Am not familiar
1. Soil and Water Conservation District	( )	( )	( )	( )	( )
2. Natural Resources Conservation Service	( )	( )	( )	( )	( )
3. University Extension	( )	( )	( )	( )	( )

4. Farm Bureau	( )	( )	( )	( )	( )
5. Fertilizer representatives	( )	( )	( )	( )	( )
6. Crop consultants	( )	( )	( )	( )	( )
7. Other landowners / friends	( )	( )	( )	( )	( )
8. Farm Service Agency	( )	( )	( )	( )	( )

Septic Systems

1. Do you have a septic system?
( ) No
( ) Don't Know
( ) Yes

2. If you answered 'yes' to the previous question, in what year was it installed?

3. Within the last five years, have you had any of the following problems? (Check all that apply)-
[ ] Slow drains
[ ] Sewage backup in house
[ ] Bad smells near tank or drain field
[ ] Sewage on the surface
[ ] Sewage flowing to ditch
[ ] Frozen septic
[ ] Other
[ ] None
[ ] Don't know

4. In the future, would you like a reminder from your local health department regarding inspection/maintenance of your septic system?
( ) Yes
( ) No
( ) Don't know

5. Does your septic system have an absorption field (finger system)?

( ) Yes
( ) No
( ) Don't know

6. How would you know if your septic system was NOT working properly? (Check all that apply)
[ ] Slow drains
[ ] Sewage backup in house
[ ] Bad smells
[ ] Toilet backs up
[ ] Wet spots in lawn
[ ] Pumping tank monthly or more
[ ] Straight pipe to ditch
[ ] Frozen septic
[ ] Don't know
[ ] Other

7. Is your septic system designed to treat sewage or get rid of waste?
( ) Treat sewage
( ) Get rid of waste
( ) Both
( ) Neither
( ) Don't know

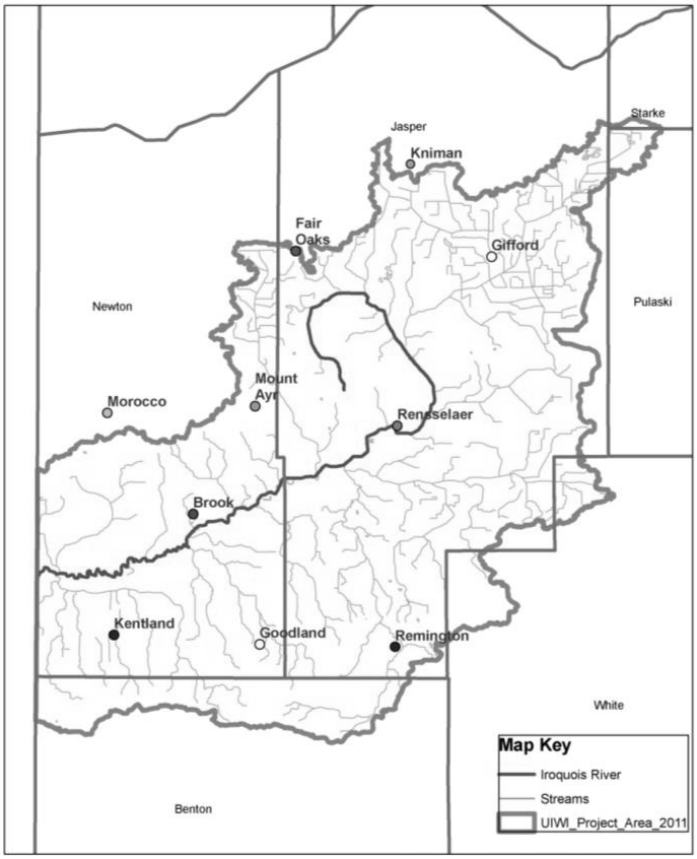
Thank You

1. Please use the space below for any additional comments about this survey or water resources in your community.

Appendix 3 Urban Social Indicators Survey

Your Views on Local Water Resources

The Upper Iroquois Watershed Initiative is a local group of farmers, businesses, and landowners who are conducting this survey in coordination with local partners and Purdue University. The purpose is to identify the concerns you have regarding water quality in the Upper Iroquois Watershed.
We need your help to direct future planning and grant dollar projects. Your opinion will be counted!



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Your voluntary participation in this survey is very important to understanding your needs and concerns. Your answers will be kept confidential and will be released only as summaries. Individual answers cannot be identified.

Please check the circle that corresponds to the answer category that best describes you and your situation or opinion for the residence located within the area shown on the map.

The survey should take approximately 25 minutes to complete. Ple
carefully.
Thank you!

For more information about the Upper Iroquois Watershed Initiativ
contact Dan Perkins, Jasper County SWCD Watershed Coordinator a

Rating of Water Quality

Overall, how would you rate the quality of the water in your area?

	Poor	Okay	Good	Don't Know
1. For canoeing / kayaking / other boating	( )	( )	( )	( )
2. For eating locally caught fish	( )	( )	( )	( )
3. For swimming	( )	( )	( )	( )
4. For picnicking and family activities	( )	( )	( )	( )
5. For fish habitat	( )	( )	( )	( )
6. For scenic beauty	( )	( )	( )	( )

Your Water Resources

1. Of these activities, which is the most important to you?
( ) For canoeing / kayaking / other boating
( ) For eating locally caught fish
( ) For swimming
( ) For picnicking and family activities
( ) For fish habitat
( ) For scenic beauty

2. Do you know where the rain water goes when it runs off of your property?
( ) No
( ) Yes

3. If you answered 'Yes' above, where does your rain water drain to?

Your Opinions

Please indicate your level of agreement or disagreement with the statements below.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1. The way that I care for my lawn and yard can influence water quality in local streams and lakes.	( )	( )	( )	( )	( )
2. It is my personal responsibility to help protect water quality.	( )	( )	( )	( )	( )
3. It is important to protect water quality even if it slows economic development.	( )	( )	( )	( )	( )
4. My actions have an impact on water quality.	( )	( )	( )	( )	( )
5. I would be willing to pay more to improve water quality (for example: through local taxes or fees)	( )	( )	( )	( )	( )
6. I would be willing to change the way I care for my lawn and yard to improve water quality.	( )	( )	( )	( )	( )
7. The quality of life in my community depends on good water quality in local streams, rivers and lakes.	( )	( )	( )	( )	( )

Water Impairments

Below is a list of water pollutants and conditions that are generally present in water bodies to some extent. The pollutants and conditions become a problem when present in excessive amounts. In your opinion, how much of a problem are the following water impairments in your area?

	Not a Problem	Slight Problem	Moderate Problem	Severe Problem	Don't Know
1. Sedimentation (dirt and soil) in the water	( )	( )	( )	( )	( )
2. Nitrogen	( )	( )	( )	( )	( )
3. Phosphorus	( )	( )	( )	( )	( )
4. Bacteria and viruses in the water (such as E.coli / coliform)	( )	( )	( )	( )	( )
5. Toxic materials in the water	( )	( )	( )	( )	( )
6. Arsenic	( )	( )	( )	( )	( )
7. Algae in the water	( )	( )	( )	( )	( )
8. Habitat alteration harming local fish	( )	( )	( )	( )	( )

9. Pesticides	( )	( )	( )	( )	( )
10. Straightening of stream {channelization}	( )	( )	( )	( )	( )

Sources of Water Pollution

The items listed below are sources of water quality pollution across the country. In your opinion, how much of a problem are the following sources in your area?

	Not a Problem	Slight Problem	Moderate Problem	Severe Problem	Don't Know
1. Discharges from sewage treatment plants	( )	( )	( )	( )	( )
2. Soil erosion from farm fields	( )	( )	( )	( )	( )
3. Excessive use of lawn fertilizers and/or pesticides	( )	( )	( )	( )	( )
4. Improperly maintained septic systems	( )	( )	( )	( )	( )
5. Manure from farm animals	( )	( )	( )	( )	( )
6. Stormwater run-off from rooftops and/or parking lots	( )	( )	( )	( )	( )
7. Stormwater run-off from streets and/or highways	( )	( )	( )	( )	( )
8. Waste material from pets	( )	( )	( )	( )	( )
9. Littering/illegal dumping of trash	( )	( )	( )	( )	( )
10. Excessive use of fertilizers for crop production	( )	( )	( )	( )	( )
11. Landfill(s)	( )	( )	( )	( )	( )
12. Inappropriate waste disposal	( )	( )	( )	( )	( )
13. Dredging of streams	( )	( )	( )	( )	( )
14. Failing septic systems	( )	( )	( )	( )	( )
15. Removal of vegetation along a stream-ditch	( )	( )	( )	( )	( )
16. Straightening of streams {channelization}	( )	( )	( )	( )	( )
17. Combined sewer overflows {CSO}	( )	( )	( )	( )	( )

Consequences of Poor Water Quality

Poor water quality can lead to a variety of consequences for communities. In your opinion, how much of a problem are the following issues in your area?

	Not a Problem	Slight Problem	Moderate Problem	Severe Problem	Don't Know
1. Contaminated drinking water	( )	( )	( )	( )	( )

2. Polluted swimming areas	( )	( )	( )	( )	( )
3. Contaminated fish	( )	( )	( )	( )	( )
4. High drinking water treatment costs	( )	( )	( )	( )	( )
5. Loss of desirable fish species	( )	( )	( )	( )	( )
6. Reduced beauty of lakes or streams	( )	( )	( )	( )	( )
7. Reduced opportunities for water recreation	( )	( )	( )	( )	( )
8. Reduced quality of water recreation activities	( )	( )	( )	( )	( )
9. Excessive aquatic plants or algae	( )	( )	( )	( )	( )
10. Fish kills	( )	( )	( )	( )	( )
11. Odor	( )	( )	( )	( )	( )
12. Lower property values	( )	( )	( )	( )	( )

Practices to Improve Water Quality

Please indicate which statement most accurately describes your level of experience with each practice listed below.

	Not relevant for my property	Never heard of it	Somewhat familiar with it	Know how to use it; not using it	Currently use it
1. Following the manufacturer's instructions when fertilizing lawn or garden	( )	( )	( )	( )	( )
2. Create a rain garden	( )	( )	( )	( )	( )
3. Use a mulching lawn mower	( )	( )	( )	( )	( )
4. Follow pesticide application instructions for lawn and garden	( )	( )	( )	( )	( )
5. Use phosphate free fertilizer	( )	( )	( )	( )	( )
6. Recycle automotive oil	( )	( )	( )	( )	( )
7. Properly dispose of pet waste	( )	( )	( )	( )	( )
8. Use rain barrels	( )	( )	( )	( )	( )
9. Add tank additives to a septic system	( )	( )	( )	( )	( )
10. Inspect septic system for size and condition	( )	( )	( )	( )	( )
11. Not planting trees and shrubs over septic system	( )	( )	( )	( )	( )
12. Restore native plant communities	( )	( )	( )	( )	( )

Specific Constraints of Practices

Grass Clipping Management: Keep grass clippings and leaves out of the roads, ditches, and gutters

1. How familiar are you with this practice?
( ) Not relevant
( ) Never heard of it
( ) Somewhat familiar with it
( ) Know how to use it; not using it
( ) Currently use it

2. If the practice is not relevant, please explain why.

3. Are you willing to try this practice?
( ) Yes or already do
( ) Maybe
( ) No

<u>Grass Clipping Management continued:</u>

How much do the following factors limit your ability to implement this practice?

	Not at all	A little	Some	A lot	Don't Know
4. Don't know how to do it	( )	( )	( )	( )	( )
5. Time required	( )	( )	( )	( )	( )
6. Cost	( )	( )	( )	( )	( )
7. The features of my property make it difficult	( )	( )	( )	( )	( )
8. Not certain of water quality benefits	( )	( )	( )	( )	( )
9. Desire to keep things the way they are	( )	( )	( )	( )	( )
10. Physical or health limitations	( )	( )	( )	( )	( )
11. Hard to use with my farming system	( )	( )	( )	( )	( )
12. Lack of equipment	( )	( )	( )	( )	( )

Regular Septic System Servicing: Having septic system thoroughly cleaned every 3-5 years to remove all the sludge, effluent and scum from the tank.

13. How familiar are you with this practice?
( ) Not relevant
( ) Never heard of it

14. If the practice is not relevant, please explain why.

( ) Somewhat familiar with it
( ) Know how to use it; not using it
( ) Currently use it

15. Are you willing to try this practice?
( ) Yes or already do
( ) Maybe
( ) No

Regular septic servicing continued:
How much do the following factors limit your ability to implement this practice?

	Not at all	A little	Some	A lot	Don't Know
16. Don't know how to do it	( )	( )	( )	( )	( )
17. Time required	( )	( )	( )	( )	( )
18. Cost	( )	( )	( )	( )	( )
19. The features of my property make it difficult	( )	( )	( )	( )	( )
20. Not certain of water quality benefit	( )	( )	( )	( )	( )
21. Desire to keep things the way they are	( )	( )	( )	( )	( )
22. Physical or health limitations	( )	( )	( )	( )	( )
23. Hard to use with my farming system	( )	( )	( )	( )	( )
24. Lack of equipment	( )	( )	( )	( )	( )

Porous Pavement: Pervious pavement (porous asphalt, grass pavers) allows rain to enter the soil, recharging the groundwater and filtering environmental contaminants.

25. How familiar are you with this practice?

26. If the practice is not relevant, please explain why.

( ) Not relevant
( ) Never heard of it
( ) Somewhat familiar with it
( ) Know how to use it; not using it
( ) Currently use it

27. Are you willing to try this practice?
( ) Yes or already do
( ) Maybe
( ) No

How much do the following factors limit your ability to implement this practice?

	Not at all	A little	Some	A lot	Don't Know
28. Don't know how to do it	( )	( )	( )	( )	( )
29. Time required	( )	( )	( )	( )	( )
30. Cost	( )	( )	( )	( )	( )
31. The features of my property make it difficult	( )	( )	( )	( )	( )
32. Not certain of water quality benefit	( )	( )	( )	( )	( )
33. Desire to keep things the way they are	( )	( )	( )	( )	( )
34. Physical or health limitations	( )	( )	( )	( )	( )

Roof Run-off Management: Collecting run-off from roofs in a rain barrel or directing it a rain garden so it can infiltrate and not leave your property.

35. How familiar are you with this practice?
( ) Not relevant
( ) Never heard of it
( ) Somewhat familiar with it
( ) Know how to use it; not using it
( ) Currently use it

36. If the practice is not relevant, please explain why.

37. Are you willing to try this practice?
( ) Yes or already do
( ) Maybe
( ) No

How much do the following factors limit your ability to implement this practice?

	Not at all	A little	Some	A lot	Don't Know
38. Don't know how to do it	( )	( )	( )	( )	( )
39. Time required	( )	( )	( )	( )	( )
40. Cost	( )	( )	( )	( )	( )
41. The features of my property make it difficult	( )	( )	( )	( )	( )
42. Not certain of water quality benefit	( )	( )	( )	( )	( )
43. Desire to keep things the way they are	( )	( )	( )	( )	( )
44. Physical or health limitations	( )	( )	( )	( )	( )
45. Hard to use with my farming system	( )	( )	( )	( )	( )
46. Lack of equipment	( )	( )	( )	( )	( )

Making Decisions for my Property

In general, how much does each issue limit your ability to change your agricultural management practices?

	Not at all	A little	Some	A lot	Don't Know
1. Personal out-of-pocket expense	( )	( )	( )	( )	( )
2. My own physical abilities	( )	( )	( )	( )	( )
3. Not having access to the equipment that I need	( )	( )	( )	( )	( )

4. Lack of available information about a practice	( )	( )	( )	( )	( )
5. No one else I know is implementing the practice	( )	( )	( )	( )	( )
6. Approval of my neighbors	( )	( )	( )	( )	( )
7. Don't know where to get information and/or assistance about those practices	( )	( )	( )	( )	( )
8. Environmental damage caused by practice	( )	( )	( )	( )	( )
9. Legal restrictions on my property	( )	( )	( )	( )	( )
10. Concerns about resale value	( )	( )	( )	( )	( )
11. Not being able to see a demonstration of the practice before I decide	( )	( )	( )	( )	( )
12. The need to learn new skills or techniques	( )	( )	( )	( )	( )

About You

1. Do you make the home and lawn care decisions in your household?
( ) Yes
( ) No

2. What is your gender?
( ) Male
( ) Female

3. What is your age?

4. What is the highest grade in school you have completed?
( ) Some formal schooling
( ) High school diploma/GED
( ) Some college
( ) 2 year college degree
( ) 4 year college degree
( ) Post-graduate degree

About you continued:
5. What is your occupation?

6. What is the approximate size of your residential lot?
( ) 1/4 acre or less
( ) More than 1/4 acre but less than 1 acre
( ) 1 acre to less than 5 acres
( ) 5 acres or more

7. Do you own or rent your home?
( ) Own
( ) Rent

8. How long have you lived at your current residence (years)?

9. Which of the following best describes where you live?
( ) In a town, village, or city
( ) In an isolated, rural, non-farm residence
( ) Rural subdivision or development
( ) On a farm

10. In addition to your residence, which of the following do you own or manage? (check all that apply)
[ ] An agricultural operation
[ ] Forested land
[ ] Rural recreational property
[ ] None of these

11. Do you use a professional lawn care service?
( ) Yes, just for mowing
( ) Yes, for mowing and fertilizing
( ) Yes, just for fertilizing and pest control
( ) Yes, for mowing, fertilizing, and pest control
( ) No

About you continued:

12. Where are you likely to seek information about water quality issues?
[ ] Newsletters/brochure/fact sheet
[ ] Internet
[ ] Radio
[ ] Newspapers/magazines
[ ] Workshops/demonstrations/meetings
[ ] Conversations with others
[ ] None of the above

Information Sources

People get information about water quality from a number of different sources. To what extent do you trust those listed below as a source of information about soil and water?

	Not at all	Slightly	Moderately	Very much	Am not familiar
1. Local watershed project	( )	( )	( )	( )	( )
2. Local government	( )	( )	( )	( )	( )
3. U.S. Environmental Protection Agency	( )	( )	( )	( )	( )
4. University Extension	( )	( )	( )	( )	( )
5. Environmental groups	( )	( )	( )	( )	( )
6. Local garden center	( )	( )	( )	( )	( )
7. Lawn care company	( )	( )	( )	( )	( )
8. Local community leader	( )	( )	( )	( )	( )
9. Neighbors / friends	( )	( )	( )	( )	( )
10. State natural resources agency	( )	( )	( )	( )	( )
11. County Health department	( )	( )	( )	( )	( )
12. Land trust	( )	( )	( )	( )	( )

Septic Systems

1. Do you have a septic system? (If no, please proceed to “Thank You” section of survey).
( ) No
( ) Don't Know
( ) Yes

2. If you answered 'yes' to the previous question, in what year was it installed?

Septic Systems continued:

3. Within the last five years, have you had any of the following problems? (Check all that apply)-

[ ] Slow drains
[ ] Sewage backup in house
[ ] Bad smells near tank or drain field
[ ] Sewage on the surface
[ ] Sewage flowing to ditch
[ ] Frozen septic
[ ] Other
[ ] None
[ ] Don't know

4. In the future, would you like a reminder from your local health department regarding inspection/maintenance of your septic system?

( ) Yes
( ) No
( ) Don't know

5. Do you have a garbage disposal?

( ) Yes, I use it daily
( ) Yes, I use it occasionally
( ) Yes, but I don't use it
( ) No

6. Does your septic system have an absorption field (finger system)?

( ) Yes
( ) No
( ) Don't know

7. How would you know if your septic system was NOT working properly? (Check all that apply)

[ ] Slow drains
[ ] Sewage backup in house
[ ] Bad smells
[ ] Toilet backs up
[ ] Wet spots in lawn

[ ] Pumping tank monthly or more
[ ] Straight pipe to ditch
[ ] Frozen septic
[ ] Don't know
[ ] Other

Septic Systems continued:

8. Is your septic system designed to treat sewage or get rid of waste?
( ) Treat sewage
( ) Get rid of waste
( ) Both
( ) Neither
( ) Don't know

9. Do you think a local government agency should handle inspection and maintenance of septic systems?
( ) Yes
( ) No
( ) Don't Know

Thank You

1. Please use the space below for any additional comments about this survey or water resources in your community.

Appendix 4. Windshield Survey Form

Windshield Survey Field Sheet

Watershed _____ Site ID (Taken from Map) _____

Date _____ Field Investigator(s) _____

Time _____

Water Odors	**Water Color/Appearance**	**Algae**
check all that apply	*check all that apply*	*check all that apply*
☐ Normal	☐ Clear	☐ Floating
☐ Sewage	☐ Green	☐ Attached to Substrate
☐ Petroleum	☐ Brown	☐ Thick mats
☐ Chemical	☐ Murky	☐ Limited growth
☐ Other _____	☐ Oily Sheen	☐ Moderate growth
	☐ Other _____	☐ Excessive growth

Stream Buffer		North Side	Y	N
☐ Present		South side	Y	N
☐ Absent		East Side	Y	N
		West Side	Y	N

Stream Buffer Notes:

☐ Natural

☐ Installed

☐ Unknown

Buffer Type

check all that apply Notes:

☐ Trees

☐ Shrubs

☐ Grasses

☐ Other _____

Estimated Width of Buffer

_____ feet

Landuse adjacent to Buffer

Active Erosion	**Pictures Taken**	**Signs of Livestock Access**
☐ Present	☐ Yes	☐ Yes
☐ Absent	☐ No	☐ No

Evidence of Channelization/Cleaning

☐ Yes

☐ No

Brief Description

Land Use - *Check land uses that best apply*

- ☐ Residential
  - ☐ Single Family
  - ☐ Multi-family
  - ☐ Stormdrain marking present
  - ☐ Stormwater management practices
    - ☐ curb and gutter
    - ☐ retention basins
    - ☐ naturalized drainage systems
- ☐ Industrial
- ☐ Commercial (Strip malls, restaurants, etc)
- ☐ Forestry
- ☐ Mining
- ☐ Agricultural
  - ☐ Row Crop
  - ☐ Pasture
    - ☐ Stream access
    - ☐ Fenced from stream
  - ☐ Feedlot
    - ☐ Cattle (dairy)
    - ☐ Cattle (other)
    - ☐ Hogs
    - ☐ Other _____
    - Estimated size of operation _____
  - ☐ Tillage type
    - ☐ no-till
    - ☐ reduced till
    - ☐ conventional

Explain any opportunities you see at this site for a BMP:

Is there anything else about this site worth recording?

Appendix 5: Potential Source Summary Data HUC 10

Item Code	Watershed (Count/%) miles/sq miles	Oliver Ditch	Carpenter-Denton Creeks	Upper Iroquois-Ryan Creek	Curtis-Hunter Creek	Montgomery- Strole Creek
0	Size (Sq Miles)	82	145	136	162	127
1	Size (Acres)	52,685	92,875	86,768	103,490	81,048
2	Artificial Drainage Length (mi.)	230	136	242	111	104
3	Natural Stream (mi.)	124	160	136	153	106
4	Total Natural + Artificial Drain (mi.)	354	296	378	264	210
5	Artificial Drain as % of Total Drain(mi.)	65%	46%	64%	42%	50%
6	Livestock Access Sites	2	12	7	19	2
7	# of Active CSO	0	?	9+	?	?
8	Number of CFO facilities	4	10	10	10	2
9	Number of NPDES Facilities	0	2	3	6	2
10	100 ft Stream Buffer % class as Buffered	18	20	18	23	20
11	% of Land Area in Wetland	6.5	1	2.5	1.4	0.8
12	Active Erosion Sites	1	2	19	11	0
13	Channelization Sites	40	72	56	62	12
14	% of Windshield Sites 100% Buffer	22	61	30	48	38
15	% of Windshield Sites 75% Buffer	14	5	9	1	0
16	% of Windshield Sites 50% Buffer	18	15	22	20	19
17	% of Windshield Sites 25% Buffer	23	3	22	5	19
18	% of Windshield Sites 0% Buffer	23	16	16	26	25
19	Sediment Exceedance target (10.4 NTU)	10	34	8	53	3
20	E.coli Samples					
21	E.coli exceedance 5 yr target (576u/100ml)	1	4	3	15	12
22	E.coli exceedance 10 yr target (235u/100ml)	1	19	14	23	13
23	Nitrate-Nitrogen Samples	16				
24	Nitrate-Nitrogen exceedance 5 yr target (10 mg/L)	1	4	1	2	2
25	Nitrate-Nitrogen exceedance 20 yr target (1.5 mg/L)	6	28	4	33	7
26	Orthophosphate Samples					
27	Orthophosphate Exceedance target (0.005 mg/L)	12	47	4	63	16
28	Sites with MIBI Score < 10 Poor			1		2
29	Sites CQHEI<60 Unhealthy	1	2	4	5	5

30	Site MIBI Score < 16 Fair	1	3	2	6	1
31	Sites CQHEI<99 Healthy		1			
32	Sites MIBI Score <22 Good			1		
33	Sites CQHE >100 High Quality					
34	Sites MIBI Score >23 Excellent		1			
35	Tillage Transect % Corn Acres No-till Decline 2000-20011	8	8	8	13	13
36	Tillage Transect % Soybean Acres No-till Decline 2000-2011	3	3	3	12	12
37	Nitrate Load Reduction Needed	55	68	68	61	74
38	TSS Load Reduction Needed	44	91	63	66	73
39	Orthophosphate Reduction Needed	?	?	?	?	?
40	E.coli Reduction Needed	-60	24	-4	1	45
41	% land in Wetland Acres (NWI)	6.5	1	2.5	1.4	0.8
42	303(d) 2010 Impairment Rank (higher # worse)	0	4	2	4	3
43	303(d) 2008 Impairment Rank (higher # worse)	0	5	2	6	4
44	Impervious Surface (%)	?	?	?	?	?
45	Nitrate Leaching High Concerns Acres (%)	44%	23%	14%	31%	4%
46	Nitrate Leaching Concerns Acres (%)	24%	42%	52%	26%	67%

Appendix 6 HUC 10 Ranking Scores

Item Code	Watershed Rank (1 is lowest, 5 is most)	Oliver Ditch	Carpenter-Denton Creeks	Upper Iroquois-Ryan Creek	Curtis-Hunter Creek	Montgomery- Strole Creek
0	Size (Sq Miles)	1	4	3	5	2
1	Size (Acres)	1	4	3	5	2
2	Artificial Drainage Length (mi.)	4	3	5	2	1
3	Natural Stream (mi.)	2	5	3	4	1
4	Total Natural + Artificial Drain (mi.)	4	3	5	2	1
5	Artificial Drain as % of Total Drain(mi.)	5	2	4	1	3
6	Livestock Access Sites	1	4	3	5	2
7	# of Active CSO	1	4	5	3	2
8	Number of CFO facilities	2	5	5	5	1
9	Number of NPDES Facilities	1	3	4	5	2
10	100 ft Stream Buffer % class as Buffered	5	2	4	1	3
11	% of Land Area in Wetland	1	5	2	3	5
12	Active Erosion Sites	2	3	5	4	1
13	Channelization Sites	2	5	3	4	1
14	% of Windshield Sites 100% Buffer	5	1	4	2	3
15	% of Windshield Sites 75% Buffer					
16	% of Windshield Sites 50% Buffer					
17	% of Windshield Sites 25% Buffer					
18	% of Windshield Sites 0% Buffer	3	2	1	5	4
19	Sediment Exceedance target (10.4 NTU)	3	4	2	5	1
20	E.coli Samples					
21	E.coli exceedance 5 yr target (576u/100ml)	1	3	2	5	4
22	E.coli exceedance 10 yr target (235u/100ml)	3	4	2	5	1
23	Nitrate-Nitrogen Samples					
24	Nitrate-Nitrogen exceedance 5 yr target (10 mg/L)	1	5	2	4	3
25	Nitrate-Nitrogen exceedance 20 yr target (1.5 mg/L)	2	4	1	5	3
26	Orthophosphate Samples					
27	Orthophosphate Exceedance target (0.005 mg/L)	2	4	1	5	3

28	Sites with MIBI Score < 10 Poor			5		4
29	Sites CQHEI<60 Unhealthy	1	2	3	5	4
30	Site MIBI Score < 16 Fair	3	2	5	1	4
31	Sites CQHEI<99 Healthy					
32	Sites MIBI Score <22 Good					
33	Sites CQHE >100 High Quality					
34	Sites MIBI Score >23 Excellent					
35	Tillage Transect % Corn Acres No-till Decline 2000-20011	1	3	2	5	4
36	Tillage Transect % Soybean Acres No-till Decline 2000-2011	1	3	2	5	4
37	Nitrate Load Reduction Needed	1	4	3	2	5
38	TSS Load Reduction Needed	1	5	2	3	4
39	Orthophosphate Reduction Needed					
40	E.coli Reduction Needed	1	4	2	3	5
41	% land in Wetland Acres (NWI)	1	4	2	3	5
42	303(d) 2010 Impairment Rank (higher # worse)	0	5	1	5	2
43	303(d) 2008 Impairment Rank (higher # worse)	0	4	1	5	2
44	Impervious Surface (%)					
45	Nitrate Leaching High Concerns Acres (%)	1	3	4	2	5
46	Nitrate Leaching Concerns Acres (%)	5	3	2	4	1

Appendix 7 HUC 12 Ranking Scores

		HUC 10	Carpenter Denton Creeks						Curtis-Hunter Creeks				
Item Code	Watershed (Count/%) miles/sq miles	HUC 12	Keefe Ditch	Jordan-Slough Creek	Nessius-Bice Ditch	Headwaters Carpenter Cree	Carpenter Creek	Bice-Slough Ditch	Heawaters Curtis Creek	Turner Ditch - Iroquois Rive	Hunter Ditch	Bower Ditch - Darroch Ditch	Hickory Branch - Iroquois R
0	Size (Sq Miles)		1	8	4	6	7	3	9	5	11	2	10
1	Size (Acres)		1	8	4	6	7	3	9	5	11	2	10
2	Artifical Drainage Length (mi.)		2	11	5	1	9	10	6	4	3	7	8
3	Natural Stream (mi.)		1	11	4	5	8	6	9	3	7	2	10
4	Total Natural+Artifical Drain (mi.)		1	11	5	2	10	7	8	3	6	4	9
5	Regulated stream miles as % of Total Drain(mi.)		10	8	6	1	5	9	3	7	2	11	4
6	Livestock Access Sites		2	6	1	3	7	4	10	1	9	1	5
7	# of Active CSO												
8	Number of CFO facilities			3	1	1	2	1	3	1	1		2
9	Number of NPDES Facilities					2			1		2		3
10	100 ft Stream Buffer % class as Buffered		3	5	11	8	6	1	7	2	10	7	4
11	% of Land Area in Wetland		3	7	5	4	6	8	9	11	1	2	10
12	Active Erosion Sites		1	0	1	2	0	0	3	0	0	0	0
13	Channelization Sites		3	9	4	6	6	5	7	2	1	1	8
14	% of Windshield Sites 100% Buffer		10	6	1	2	4	5	7	3	11	8	9
15	% of Windshield Sites 75% Buffer		0	0	0	0	0	0	0	0	0	0	0
16	% of Windshield Sites 50% Buffer		1	2	0	0	6	4	3	0	7	0	7
17	% of Windshield Sites 25% Buffer		1	0	0	0	0	0	0	0	0	0	0
18	% of Windshield Sites 0% Buffer		7	5	0	1	2	6	8	4	11	10	9
	# of WQ Sample Sites (UIWI Data)		0	0	0	1	2	1	3	0	1	0	2
19	Sediment Exceedance target (10.4 NTU)					1	4	2	5		3		7
20	e.coli Samples												
21	e.coli exceedance 5 yr target (576u/100ml)					1	2	0	4		3		5
22	e.coli exceedance 10 yr target (235u/100ml)					1	5	2	4		3		6
23	Nitrate-Nitrogen Samples												
24	Nitrate-Nitrogen exceedance 5 yr target (10 mg/L)					2	2	1	1		1		2
25	Nitrate-Nitrogen exceedance 20 yr target (1.5 mg/L)					1	4	2	6		3		5
26	Orthophosphate Samples												
27	Orthophosphate Exceedance target (0.005 mg/L)					2	5	1	6		3		4
28	# Sites with MIBI Score < 10 Poor					0	0	0	0		0		0
29	# Sites CQHEI<60 Unhealthy					9	9		11		9		10
30	Site MIBI Score < 16 Fair					1	1	1	1		1		1
31	Sites CQHEI<99 Healthy					1	1		0		1		0
32	Sites MIBI Score <22 Good					1	1	1	0		1		0
33	Sites CQHE >100 High Quality					0	0		0		0		0
34	Sites MIBI Score >23 Excellent					1	0	1	1		1		1
35	Tillage Transect % Corn No-till Decline 2000-20011												
36	Tillage Transect % SoybeanNo-till Decline 2000-2011												
37	% Nitrate Load Reduction Needed					6	2	5	1		4		3
38	TSS Load Reduction Needed					5	6	2	1		4		3
39	% Orthophosphate Reduction Needed					2	3	1	4		5		5
40	E.coli Reduction Needed					0	1	0	0		2		0
41	% land in Wetland Acres (NWI)		9	5	7	8	6	4	3	1	11	10	2
42	303d 2010 Impairment Rank # of		0	0	0	10	11	0	10	10	9	0	8
43	303d 2008 Impairment Rank # of		0	0	0	10	11	8	9	8	9	0	9
44	Impervious Survace (%)												
45	Nitrate Leaching High Concern Acres (%)		7	11	9	1	6	10	8	5	3	2	4
46	Nitrate Leaching Concern Acres (%)		3	1	6	9	5	2	4	8	10	7	11
47	Wind Erodibility Group Acres (%)												

Appendix 8 Problem Statement Critical Areas HUC 10

Table 78 Problem Statement Variables and Ranking.

The Iroquois River has undesirable high and low levels and flows of water that threaten our towns, agricultural land, and health of the river.		Subwatershed				
		Oliver Ditch	Carpenter-Denton Creeks	Upper Iroquois-Ryan Creek	Curtis-Hunter Creek	Montgomery- Strole Creek
Code	**Ranking Variable**	Ranking (1-5, 5 most contributing)				
1	Size (Acres)	1	4	3	5	2
2	Artificial Drainage Length (mi.)	4	3	5	2	1
3	Natural Stream (mi.)	2	5	3	4	1
4	Total Natural + Artificial Drain (mi.)	4	3	5	2	1
5	Artificial Drain as % of Total Drain(mi.)	5	2	4	1	3
10	100 ft Stream Buffer % class as Buffered	5	2	4	1	3
11	% of Land Area in Wetland	1	4	2	3	5
12	Active Erosion Sites	2	3	5	4	1
13	Channelization Sites	2	5	3	4	1
18	% of Windshield Sites 0% Buffer	3	2	1	5	4
21	Sediment Exceedance target (10.4 NTU)	3	4	2	5	1
31	Sites CQHEI<60 Unhealthy	1	2	3	5	4
37	Tillage Transect % Corn No-till Decline 2000-20011	1	3	2	5	4
38	Tillage Transect % Soybean No-till Decline 2000-2011	1	3	2	5	4
43	% land in Wetland Acres (NWI)	1	4	2	3	5
46	Impervious Survace (%)					
	Total Score	36	49	46	54	40
	Overall Rank	5	2	3	1	4

1 is most contributing

The desirable native fish populations in the Iroquois River and surrounding waterways are suspected to be in decline.		Subwatershed				
		Oliver Ditch	Carpenter-Denton Creeks	Upper Iroquois-Ry Creek	Curtis-Hunter Cree	Montgomery- Stro Creek
Code	**Ranking Variable**	Ranking (1-5, 5 most contributing)				
1	Size (Acres)	1	4	3	5	2
3	Natural Stream (mi.)	2	5	3	4	1
5	Artifical Drain as % of Total Drain(mi.)	5	2	4	1	3
6	Livestock Access Sites	1	4	3	5	2
7	# of Active CSO	1	4	5	3	2
8	Number of CFO facilities	2	5	5	5	1
9	Number of NPDES Facilities	1	3	4	5	2
10	100 ft Stream Buffer % class as Buffered	5	2	4	1	3
11	% of Land Area in Wetland	1	5	2	3	5
12	Active Erosion Sites	2	3	5	4	1
14	% of Windshield Sites 100% Buffer	5	1	4	2	3
15	% of Windshield Sites 75% Buffer					
16	% of Windshield Sites 50% Buffer					
17	% of Windshield Sites 25% Buffer					
18	% of Windshield Sites 0% Buffer	3	2	1	5	4
21	Sediment Exceedance target (10.4 NTU)	3	4	2	5	1
26	Nitrate-Nitrogen exceedance 5 yr target (10 mg/L)	1	5	2	4	3
27	Nitrate-Nitrogen exceedance 20 yr target (1.5 mg/L)	2	4	1	5	3
29	Orthophosphate Exceedance target (0.005 mg/L)	2	4	1	5	3
30	Sites with MIBI Score < 10 Poor			5		4
31	Sites CQHEI<60 Unhealthy	1	2	3	5	4
32	Site MIBI Score < 16 Fair	3	2	5	1	4
33	Sites CQHEI<99 Healthy					
34	Sites MIBI Score <22 Good					
35	Sites CQHE >100 High Quality					
36	Sites MIBI Score >23 Excellent					
39	Nitrate Load Reduction Needed	1	4	3	2	5
40	TSS Load Reduction Needed	1	5	2	3	4
41	Orthophosphate Reduction Needed					
42	E.coli Reduction Needed	1	4	2	3	5
43	% land in Wetland Acres (NWI)	1	4	2	3	5
44	303d 2010 Impairment Rank (higher # worse)	0	5	1	5	2
45	303d 2008 Impairment Rank (higher # worse)	0	4	1	5	2
	Total Score	45	87	73	89	74
	Overall Rank	5	2	4	1	3
		1 is most contributing				

Area streams within the watershed are very cloudy and turbid.

Code	Ranking Variable	Subwatershed: Oliver Ditch	Carpenter-Denton Creeks	Upper Iroquois-Ryan Creek	Curtis Hamer Creek	Montgomery-Strole Creek
		Ranking (1-5, 5 most contributing)				
1	Size (Acres)	1	4	3	5	2
6	Livestock Access Sites	1	4	3	5	2
7	# of Active CSO	1	4	5	3	2
8	Number of CFO facilities	2	5	5	5	1
9	Number of NPDES Facilities	1	3	4	5	2
10	100 ft Stream Buffer % class as Buffered	5	2	4	1	3
12	Active Erosion Sites	2	3	5	4	1
14	% of Windshield Sites 100% Buffer	5	1	4	2	3
15	% of Windshield Sites 75% Buffer	5	4	3	2	1
16	% of Windshield Sites 50% Buffer	4	1	5	3	2
17	% of Windshield Sites 25% Buffer	5	1	4	2	3
18	% of Windshield Sites 0% Buffer	3	2	1	5	4
21	E.coli exceedance 5 yr target (576u/100ml)	1	3	2	5	4
29	Sites CQHEI<60 Unhealthy	1	2	3	5	4
31	Sites CQHEI<99 Healthy					
33	Sites CQHE >100 High Quality					
35	Tillage Transect % Corn Acres No-till Decline 2000-20011	1	3	2	5	4
38	TSS Load Reduction Needed	1	5	2	3	4
39	Orthophosphate Reduction Needed					
41	% land in Wetland Acres (NWI)	1	4	2	3	5
44	Impervious Surface (%)					
	Total Score	40	51	57	63	47
	Overall Rank	5	3	2	1	4
		1 is most contributing				

Widespread recreational use is prevented.		Subwatershed				
		Oliver Ditch	Carpenter-Denton Creeks	Upper Iroquois-Ryan Creek	Curtis-Hunter Creek	Montgomery-Strole Creek
Code	**Ranking Variable**	Ranking (1-5, 5 most contributing)				
1	Size (Acres)	1	4	3	5	2
6	Livestock Access Sites	1	4	3	5	2
7	# of Active CSO	1	4	5	3	2
8	Number of CFO facilities	2	5	5	5	1
9	Number of NPDES Facilities	1	3	4	5	2
10	100 ft Stream Buffer % class as Buffered	5	2	4	1	3
12	Active Erosion Sites	2	3	5	4	1
14	% of Windshield Sites 100% Buffer	5	1	4	2	3
15	% of Windshield Sites 75% Buffer					
16	% of Windshield Sites 50% Buffer					
17	% of Windshield Sites 25% Buffer					
18	% of Windshield Sites 0% Buffer	3	2	1	5	4
21	E.coli exceedance 5 yr target (576u/100ml)	1	3	2	5	4
29	Sites CQHEI<60 Unhealthy	1	2	3	5	4
37	Nitrate Load Reduction Needed	1	4	3	2	5
38	TSS Load Reduction Needed	1	5	2	3	4
39	Orthophosphate Reduction Needed					
	Total Score	25	42	44	50	37
	Overall Rank	5	3	2	1	4

1 is most contributing

The Iroquois River and its tributaries are listed on IDEM's 303(d) list for "excessive nitrate."		Subwatershed				
		Oliver Ditch	Carpenter-Denton Creeks	Upper Iroquois-Ryan Creek	Curtis-Hunter Creek	Montgomery- Strole Creek
Code	**Ranking Variable**	Ranking (1-5, 5 most contributing)				
1	Size (Acres)	1	4	3	5	2
2	Artificial Drainage Length (mi.)	4	3	5	2	1
4	Total Natural + Artificial Drain (mi.)	4	3	5	2	1
5	Artificial Drain as % of Total Drain(mi.)	5	2	4	1	3
6	Livestock Access Sites	1	4	3	5	2
7	# of Active CSO	1	4	5	3	2
8	Number of CFO facilities	2	5	5	5	1
9	Number of NPDES Facilities	1	3	4	5	2
10	100 ft Stream Buffer % class as Buffered	5	2	4	1	3
11	% of Land Area in Wetland	1	5	2	3	5
12	Active Erosion Sites	2	3	5	4	1
14	% of Windshield Sites 100% Buffer	5	1	4	2	3
15	% of Windshield Sites 75% Buffer					
16	% of Windshield Sites 50% Buffer					
17	% of Windshield Sites 25% Buffer					
18	% of Windshield Sites 0% Buffer	3	2	1	5	4
19	Sediment Exceedance target (10.4 NTU)	3	4	2	5	1
24	Nitrate-Nitrogen exceedance 5 yr target (10 mg/L)	1	5	2	4	3
25	Nitrate-Nitrogen exceedance 20 yr target (1.5 mg/L)	2	4	1	5	3
35	Tillage Transect % Corn No-till Decline 2000-20011	1	3	2	5	4
36	Tillage Transect % Soybean No-till Decline 2000-2011	1	3	2	5	4
37	Nitrate Load Reduction Needed	1	4	3	2	5
41	% land in Wetland Acres (NWI)	1	4	2	3	5
42	303(d) 2010 Impairment Rank (higher # worse)	0	5	1	5	2
43	303(d) 2008 Impairment Rank (higher # worse)	0	4	1	5	2
45	Nitrate Leaching High Concerns Acres (%)	1	3	4	2	5
46	Nitrate Leaching Concerns Acres (%)	5	3	2	4	1
	Total Score	51	83	72	88	65
	Overall Rank	5	2	3	1	4

1 is most contributing

The Iroquois River and its tributaries are listed on IDEM's 303(d) list for "E.coli."		Subwatershed				
		Oliver Ditch	Carpenter-Benton Creeks	Upper Iroquois-Ryan Creek	Curtis-Hunter Creek	Montgomery- Strole Creek
Code	**Ranking Variable**	Ranking (1-5, 5 most contributing)				
1	Size (Acres)	1	4	3	5	2
6	Livestock Access Sites	1	4	3	5	2
7	# of Active CSO	1	4	5	3	2
8	Number of CFO facilities	2	5	5	5	1
9	Number of NPDES Facilities	1	3	4	5	2
10	100 ft Stream Buffer % class as Buffered	5	2	4	1	3
11	% of Land Area in Wetland	1	5	2	3	5
12	Active Erosion Sites	2	3	5	4	1
21	E.coli exceedance 5 yr target (576u/100ml)	1	3	2	5	4
22	E.coli exceedance 10 yr target (235u/100ml)	3	4	2	5	1
35	Tillage Transect % Corn No-till Decline 2000-20011	1	3	2	5	4
36	Tillage Transect % Soybean No-till Decline 2000-2011	1	3	2	5	4
40	E.coli Reduction Needed	1	4	2	3	5
41	% land in Wetland Acres (NWI)	1	4	2	3	5
42	303(d) 2010 Impairment Rank (higher # worse)	0	5	1	5	2
43	303(d) 2008 Impairment Rank (higher # worse)	0	4	1	5	2
	Total Score	22	60	45	67	45
	Overall Rank	5	2	3	1	4

1 is most contributing

The Iroquois River and its tributaries are listed on IDEM's 303(d) list for "orthophosphate."

Code	Ranking Variable	Subwatershed: Oliver Ditch	Carpenter-Denton Creeks	Upper Iroquois-Ryan Creek	Curtis-Hunter Creek	Montgomery- Strole Creek
		Ranking (1-5, 5 most contributing)				
1	Size (Acres)	1	4	3	5	2
2	Artificial Drainage Length (mi.)	4	3	5	2	1
3	Natural Stream (mi.)	2	5	3	4	1
4	Total Natural + Artificial Drain (mi.)	4	3	5	2	1
5	Artificial Drain as % of Total Drain(mi.)	5	2	4	1	3
7	# of Active CSO	1	4	5	3	2
8	Number of CFO facilities	2	5	5	5	1
9	Number of NPDES Facilities	1	3	4	5	2
10	100 ft Stream Buffer % class as Buffered	5	2	4	1	3
11	% of Land Area in Wetland	1	5	2	3	5
12	Active Erosion Sites	2	3	5	4	1
14	% of Windshield Sites 100% Buffer	5	1	4	2	3
18	% of Windshield Sites 0% Buffer	3	2	1	5	4
19	Sediment Exceedance target (10.4 NTU)	3	4	2	5	1
27	Orthophosphate Exceedance target (0.005 mg/L)	2	4	1	5	3
35	Tillage Transect % Corn No-till Decline 2000-20011	1	3	2	5	4
36	Tillage Transect % Soybean No-till Decline 2000-2011	1	3	2	5	4
38	TSS Load Reduction Needed	1	5	2	3	4
39	Orthophosphate Reduction Needed					
41	% land in Wetland Acres (NWI)	1	4	2	3	5
42	303(d) 2010 Impairment Rank (higher # worse)	0	5	1	5	2
43	303(d) 2008 Impairment Rank (higher # worse)	0	4	1	5	2
44	Impervious Surface (%)					
	Total Score	45	74	63	78	54
	Overall Rank	5	2	3	1	4

1 is most contributing

The Iroquois River and its tributaries are listed on IDEM's 303(d) list for "impaired biological communities (IBI)."		Subwatershed				
		Oliver Ditch	Carpenter-Denton Creeks	Upper Iroquois-Ryan Creek	Curtis-Hunter Creek	Montgomery- Strole Creek
Code	**Ranking Variable**	Ranking (1-5, 5 most contributing)				
1	Size (Acres)	1	4	3	5	2
3	Natural Stream (mi.)	2	5	3	4	1
5	Artificial Drain as % of Total Drain(mi.)	5	2	4	1	3
6	Livestock Access Sites	1	4	3	5	2
7	# of Active CSO	1	4	5	3	2
8	Number of CFO facilities	2	5	5	5	1
9	Number of NPDES Facilities	1	3	4	5	2
10	100 ft Stream Buffer % class as Buffered	5	2	4	1	3
11	% of Land Area in Wetland	1	5	2	3	5
12	Active Erosion Sites	2	3	5	4	1
13	Channelization Sites	2	5	3	4	1
14	% of Windshield Sites 100% Buffer	5	1	4	2	3
18	% of Windshield Sites 0% Buffer	3	2	1	5	4
19	Sediment Exceedance target (10.4 NTU)	3	4	2	5	1
24	Nitrate-Nitrogen exceedance 5 yr target (10 mg/L)	1	5	2	4	3
25	Nitrate-Nitrogen exceedance 20 yr target (1.5 mg/L)	2	4	1	5	3
27	Orthophosphate Exceedance target (0.005 mg/L)	2	4	1	5	3
28	Sites with MIBI Score < 10 Poor			5		4
29	Sites CQHEI<60 Unhealthy	1	2	3	5	4
30	Site MIBI Score < 16 Fair	3	2	5	1	4
31	Sites CQHEI<99 Healthy					
32	Sites MIBI Score <22 Good					
33	Sites CQHE >100 High Quality					
34	Sites MIBI Score >23 Excellent					
37	Nitrate Load Reduction Needed	1	4	3	2	5
38	TSS Load Reduction Needed	1	5	2	3	4
39	Orthophosphate Reduction Needed					
40	E.coli Reduction Needed	1	4	2	3	5
41	% land in Wetland Acres (NWI)	1	4	2	3	5
	Total Score	47	83	74	83	71
	Overall Rank	5	2	3	1	4
		1 is most contributing				

Appendix 9 Problem Statement Critical Areas by HUC 12

Table 79 Flashiness and Flooding HUC 12 Variables and Rank

The Iroquois River has undesirable high and low levels and flows of water that threaten our towns, agricultural land, and health of the river.		Subwatershed										
		Keefe Ditch	Jordan-Slough Creek	Nessius-Bice Ditch	Headwaters Carpenter Creek	Carpenter Creek	Bice-Slough Ditch	Heawaters Curtis Creek	Turner Ditch - Iroquois River	Hunte Ditch	Bower Ditch - Darroch Ditch	Hickory Branch - Iroquois River
Code	**Ranking Variable**	Ranking (1-11),11 most contributing)										
1	Size (Acres)	1	8	4	6	7	3	9	5	11	2	10
2	Artifical Drainage Length (mi.)	2	11	5	1	9	10	6	4	3	7	8
3	Natural Stream (mi.)	1	11	4	5	8	6	9	3	7	2	10
4	Total Natural+Artifical Drain (mi.)	1	11	5	2	10	7	8	3	6	4	9
5	Regulated stream miles as % of Total Drain(mi.)	10	8	6	1	5	9	3	7	2	11	4
10	100 ft Stream Buffer % class as Buffered	3	5	11	8	6	1	7	2	10	7	4
11	% of Land Area in Wetland	3	7	5	4	6	8	9	11	1	2	10
12	Active Erosion Sites	1	0	1	2	0	0	3	0	0	0	0
13	Channelization Sites	3	9	4	6	6	5	7	2	1	1	8
18	% of Windshield Sites 0% Buffer	7	5	0	1	2	6	8	4	11	10	9
19	Sediment Exceedance target (10.4 NTU)				1	4	2	5		3		7
29	# Sites CQHEI<60 Unhealthy				9	9		11		9		10
35	Tillage Transect % Corn Acres No-till Decline 2000-20011											
36	Tillage Transect % Soybean Acres No-till Decline 2000-2011											
38	TSS Load Reduction Needed				5	6	2	1		4		3
41	% land in Wetland Acres (NWI)	9	5	7	8	6	4	3	1	11	10	2
44	Impervious Survace (%)											
45	Nitrate Leaching High Concern Acres (%)	7	11	9	1	6	10	8	5	3	2	4
46	Nitrate Leaching Concern Acres (%)	3	1	6	9	5	2	4	8	10	7	11
	Total Score	51	92	67	69	95	75	101	55	92	65	109
	Overall Rank	10	4	9	6	3	5	2	8	4	7	1
		1 is most contributing										

Table 80 Fish and Wildlife Habitat Variables and Ranking by HUC 12

The desirable native fish populations in the Iroquois River and surrounding waterways are suspected to be in decline.		Subwatershed										
		Keefe Ditch	Jordan-Slough Creek	Nessius-Bice Ditch	Headwaters Carpenter Creek	Carpenter Creek	Bice-Slough Ditch	Heawaters Curtis Creek	Turner Ditch - Iroquois River	Hunte Ditch	Bower Ditch - Darroch Ditch	Hickory Branch - Iroquois River
Code	**Ranking Variable**	Ranking (1-11),11 most contributing)										
1	Size (Acres)	1	8	4	6	7	3	9	5	11	2	10
3	Natural Stream (mi.)	1	11	4	5	8	6	9	3	7	2	10
4	Total Natural+Artifical Drain (mi.)	1	11	5	2	10	7	8	3	6	4	9
6	Livestock Access Sites	2	6	1	3	7	4	10	1	9	1	5
7	# of Active CSO											
8	Number of CFO facilities		3	1	1	2	1	3	1	1		2
9	Number of NPDES Facilities				2			1		2		3
10	100 ft Stream Buffer % class as Buffered	3	5	11	8	6	1	7	2	10	7	4
11	% of Land Area in Wetland	3	7	5	4	6	8	9	11	1	2	10
12	Active Erosion Sites	1	0	1	2	0	0	3	0	0	0	0
14	% of Windshield Sites 100% Buffer	10	6	1	2	4	5	7	3	11	8	9
15	% of Windshield Sites 75% Buffer	0	0	0	0	0	0	0	0	0	0	0
16	% of Windshield Sites 50% Buffer	1	2	0	0	6	4	3	0	7	0	7
17	% of Windshield Sites 25% Buffer	1	0	0	0	0	0	0	0	0	0	0
18	% of Windshield Sites 0% Buffer	7	5	0	1	2	6	8	4	11	10	9
19	Sediment Exceedance target (10.4 NTU)				1	4	2	5		3		7
24	Nitrate-Nitrogen exceedance 5 yr target (10 mg/L)				2	2	1	1		1		2
25	Nitrate-Nitrogen exceedance 20 yr target (1.5 mg/L)				1	4	2	6		3		5
27	Orthophosphate Exceedance target (0.005 mg/L)				2	5	1	6		3		4
28	# Sites with MIBI Score < 10 Poor				0	0	0	0		0		0
29	# Sites CQHEI<60 Unhealthy				9	9		11		9		10
30	Site MIBI Score < 16 Fair				1	1	1	1		1		1
31	Sites CQHEI<99 Healthy				1	1		0		1		0
32	Sites MIBI Score <22 Good				1	1	1	0		1		0
33	Sites CQHE >100 High Quality				0	0		0		0		0
34	Sites MIBI Score >23 Excellent				1	0	1	1		1		1
37	% Nitrate Load Reduction Needed				6	2	5	1		4		3
38	TSS Load Reduction Needed				5	6	2	1		4		3
39	% Orthophosphate Reduction Needed				2	3	1	4		5		5
41	% land in Wetland Acres (NWI)	9	5	7	8	6	4	3	1	11	10	2
42	303d 2010 Impairment Rank # of	0	0	0	10	11	0	10	10	9	0	8
43	303d 2008 Impairment Rank # of	0	0	0	10	11	8	9	8	9	0	9
	Total Score	31	64	33	42	73	51	95	33	86	36	96
	Overall Rank	10	5	9	7	4	6	2	9	3	8	1
		1 is most contributing										

Table 81 Cloudy and Turbid Variables and Ranking by HUC 12

Area streams within the watershed are very cloudy and turbid.		Subwatershed										
		Keefe Ditch	Jordan-Slough Creek	Nessius-Bice Ditch	Headwaters Carpenter Creek	Carpenter Creek	Bice-Slough Ditch	Heawaters Curtis Creek	Turner Ditch - Iroquois River	Hunte Ditch	Bower Ditch - Darroch Ditch	Hickory Branch - Iroquois River
Code	**Ranking Variable**	Ranking (1-11),11 most contributing)										
1	Size (Acres)	1	8	4	6	7	3	9	5	11	2	10
6	Livestock Access Sites	2	6	1	3	7	4	10	1	9	1	5
7	# of Active CSO											
8	Number of CFO facilities		3	1	1	2	1	3	1	1		2
9	Number of NPDES Facilities				2			1		2		3
10	100 ft Stream Buffer % class as Buffered	3	5	11	8	6	1	7	2	10	7	4
12	Active Erosion Sites	1	0	1	2	0	0	3	0	0	0	0
14	% of Windshield Sites 100% Buffer	10	6	1	2	4	5	7	3	11	8	9
15	% of Windshield Sites 75% Buffer	0	0	0	0	0	0	0	0	0	0	0
16	% of Windshield Sites 50% Buffer	1	2	0	0	6	4	3	0	7	0	7
17	% of Windshield Sites 25% Buffer	1	0	0	0	0	0	0	0	0	0	0
18	% of Windshield Sites 0% Buffer	7	5	0	1	2	6	8	4	11	10	9
19	Sediment Exceedance target (10.4 NTU)				1	4	2	5		3		7
27	Orthophosphate Exceedance target (0.005 mg/L)				2	5	1	6		3		4
29	# Sites CQHEI<60 Unhealthy				9	9		11		9		10
31	Sites CQHEI<99 Healthy				1	1		0		1		0
33	Sites CQHE >100 High Quality				0	0		0		0		0
35	Tillage Transect % Corn Acres No-till Decline 2000-20011											
36	Tillage Transect % Soybean Acres No-till Decline 2000-2011											
38	TSS Load Reduction Needed				5	6	2	1		4		3
39	% Orthophosphate Reduction Needed				2	3	1	4		5		5
41	% land in Wetland Acres (NWI)	9	5	7	8	6	4	3	1	11	10	2
44	Impervious Survace (%)											
47	Wind Erodibility Group Acres (%)											
	Total Score	35	40	26	53	68	34	81	17	98	38	80
	Overall Rank	8	6	10	5	4	9	2	11	1	7	3
		1 is most contributing										

Table 82 Widespread Recreational Use Variables and Ranking by HUC 12

Widespread recreational use is prevented.		Subwatershed										
		Keefe Ditch	Jordan-Slough Creek	Nessius-Bice Ditch	Headwaters Carpenter Creek	Carpenter Creek	Bice-Slough Ditch	Heawaters Curtis Creek	Turner Ditch - Iroquois River	Hunte Ditch	Bower Ditch - Darroch Ditch	Hickory Branch - Iroquois River
Code	**Ranking Variable**	Ranking (1-11),11 most contributing)										
1	Size (Acres)	1	8	4	6	7	3	9	5	11	2	10
6	Livestock Access Sites	2	6	1	3	7	4	10	1	9	1	5
7	# of Active CSO											
8	Number of CFO facilities		3	1	1	2	1	3	1	1		2
9	Number of NPDES Facilities				2			1		2		3
10	100 ft Stream Buffer % class as Buffered	3	5	11	8	6	1	7	2	10	7	4
12	Active Erosion Sites	1	0	1	2	0	0	3	0	0	0	0
14	% of Windshield Sites 100% Buffer	10	6	1	2	4	5	7	3	11	8	9
15	% of Windshield Sites 75% Buffer	0	0	0	0	0	0	0	0	0	0	0
16	% of Windshield Sites 50% Buffer	1	2	0	0	6	4	3	0	7	0	7
17	% of Windshield Sites 25% Buffer	1	0	0	0	0	0	0	0	0	0	0
18	% of Windshield Sites 0% Buffer	7	5	0	1	2	6	8	4	11	10	9
21	e.coli exceedance 5 yr target (576u/100ml)				1	2	0	4		3		5
22	e.coli exceedance 10 yr target (235u/100ml)				1	5	2	4		3		6
29	# Sites CQHEI<60 Unhealthy				9	9		11		9		10
37	% Nitrate Load Reduction Needed				6	2	5	1		4		3
38	TSS Load Reduction Needed				5	6	2	1		4		3
39	% Orthophosphate Reduction Needed				2	3	1	4		5		5
40	E.coli Reduction Needed				0	1	0	0		2		0
	Total Score	26	35	19	49	62	34	76	16	92	28	81
	Overall Rank	9	6	10	5	4	7	3	11	1	8	2
		1 is most contributing										

Table 83 Nitrates are Excessive Variables and Ranking by HUC 12

The Iroquois River and its tributaries are listed on IDEM's 303(d) list for "excessive nitrate."		Subwatershed										
		Keefe Ditch	Jordan-Slough Creek	Nessius-Bice Ditch	Headwaters Carpenter Creek	Carpenter Creek	Bice-Slough Ditch	Heawaters Curtis Creek	Turner Ditch - Iroquois River	Hunte Ditch	Bower Ditch - Darroch Ditch	Hickory Branch - Iroquois River
Code	**Ranking Variable**	Ranking (1-11),11 most contributing)										
1	Size (Acres)	1	8	4	6	7	3	9	5	11	2	10
2	Artifical Drainage Length (mi.)	2	11	5	1	9	10	6	4	3	7	8
4	Total Natural+Artifical Drain (mi.)	1	11	5	2	10	7	8	3	6	4	9
5	Regulated stream miles as % of Total Drain(mi.)	10	8	6	1	5	9	3	7	2	11	4
6	Livestock Access Sites	2	6	1	3	7	4	10	1	9	1	5
7	# of Active CSO											
8	Number of CFO facilities		3	1	1	2	1	3	1	1		2
9	Number of NPDES Facilities				2			1		2		3
10	100 ft Stream Buffer % class as Buffered	3	5	11	8	6	1	7	2	10	7	4
11	% of Land Area in Wetland	3	7	5	4	6	8	9	11	1	2	10
12	Active Erosion Sites	1	0	1	2	0	0	3	0	0	0	0
14	% of Windshield Sites 100% Buffer	10	6	1	2	4	5	7	3	11	8	9
15	% of Windshield Sites 75% Buffer	0	0	0	0	0	0	0	0	0	0	0
16	% of Windshield Sites 50% Buffer	1	2	0	0	6	4	3	0	7	0	7
17	% of Windshield Sites 25% Buffer	1	0	0	0	0	0	0	0	0	0	0
18	% of Windshield Sites 0% Buffer	7	5	0	1	2	6	8	4	11	10	9
19	Sediment Exceedance target (10.4 NTU)				1	4	2	5		3		7
24	Nitrate-Nitrogen exceedance 5 yr target (10 mg/L)				2	2	1	1		1		2
25	Nitrate-Nitrogen exceedance 20 yr target (1.5 mg/L)				1	4	2	6		3		5
35	Tillage Transect % Corn Acres No-till Decline 2000-20011											
36	Tillage Transect % Soybean Acres No-till Decline 2000-2011											
37	% Nitrate Load Reduction Needed				6	2	5	1		4		3
41	% land in Wetland Acres (NWI)	9	5	7	8	6	4	3	1	11	10	2
42	303d 2010 Impairment Rank # of	0	0	0	10	11	0	10	10	9	0	8
43	303d 2008 Impairment Rank # of	0	0	0	10	11	8	9	8	9	0	9
45	Nitrate Leaching High Concern Acres (%)	7	11	9	1	6	10	8	5	3	2	4
46	Nitrate Leaching Concern Acres (%)	3	1	6	9	5	2	4	8	10	7	11
47	Wind Erodibility Group Acres (%)											
	Total Score	42	72	40	37	74	63	89	41	81	52	94
	Overall Rank	8	5	10	11	4	6	2	9	3	7	1
		1 is most contributing										

Table 84 E.coli is Excessive Variables and Ranking by HUC 12

The Iroquois River and its tributaries are listed on IDEM's 303(d) list for "e.coli."		Subwatershed										
		Keefe Ditch	Jordan-Slough Creek	Nessius-Bice Ditch	Headwaters Carpenter Creek	Carpenter Creek	Bice-Slough Ditch	Heawaters Curtis Creek	Turner Ditch - Iroquois River	Hunte Ditch	Bower Ditch - Darroch Ditch	Hickory Branch - Iroquois River
Code	**Ranking Variable**	Ranking (1-11),11 most contributing)										
1	Size (Acres)	1	8	4	6	7	3	9	5	11	2	10
6	Livestock Access Sites	2	6	1	3	7	4	10	1	9	1	5
7	# of Active CSO											
8	Number of CFO facilities		3	1	1	2	1	3	1	1		2
9	Number of NPDES Facilities				2			1		2		3
10	100 ft Stream Buffer % class as Buffered	3	5	11	8	6	1	7	2	10	7	4
11	% of Land Area in Wetland	3	7	5	4	6	8	9	11	1	2	10
12	Active Erosion Sites	1	0	1	2	0	0	3	0	0	0	0
21	e.coli exceedance 5 yr target (576u/100ml)				1	2	0	4		3		5
22	e.coli exceedance 10 yr target (235u/100ml)				1	5	2	4		3		6
35	Tillage Transect % Corn Acres No-till Decline 2000-20011											
36	Tillage Transect % Soybean Acres No-till Decline 2000-2011											
40	E.coli Reduction Needed				0	1	0	0		2		0
41	% land in Wetland Acres (NWI)	9	5	7	8	6	4	3	1	11	10	2
42	303d 2010 Impairment Rank # of	0	0	0	10	11	0	10	10	9	0	8
43	303d 2008 Impairment Rank # of	0	0	0	10	11	8	9	8	9	0	9
44	Impervious Survace (%)											
47	Wind Erodibility Group Acres (%)											
	Total Score	19	34	30	56	64	31	72	39	71	22	64
	Overall Rank	10	6	8	4	3	7	1	5	2	9	3

Table 85 Orthophosphates are Excessive Variables and Ranking by HUC 12

The Iroquois River and its tributaries are listed on IDEM's 303(d) list for "orthophosphate."		Subwatershed										
		Keefe Ditch	Jordan-Slough Creek	Nessius-Bice Ditch	Headwaters Carpenter Creek	Carpenter Creek	Bice-Slough Ditch	Heawaters Curtis Creek	Turner Ditch - Iroquois River	Hunte Ditch	Bower Ditch - Darroch Ditch	Hickory Branch - Iroquois River
Code	**Ranking Variable**	Ranking (1-11),11 most contributing)										
1	Size (Acres)	1	8	4	6	7	3	9	5	11	2	10
2	Artifical Drainage Length (mi.)	2	11	5	1	9	10	6	4	3	7	8
3	Natural Stream (mi.)	1	11	4	5	8	6	9	3	7	2	10
4	Total Natural+Artifical Drain (mi.)	1	11	5	2	10	7	8	3	6	4	9
5	Regulated stream miles as % of Total Drain(mi.)	10	8	6	1	5	9	3	7	2	11	4
7	# of Active CSO											
8	Number of CFO facilities		3	1	1	2	1	3	1	1		2
9	Number of NPDES Facilities				2			1		2		3
10	100 ft Stream Buffer % class as Buffered	3	5	11	8	6	1	7	2	10	7	4
11	% of Land Area in Wetland	3	7	5	4	6	8	9	11	1	2	10
12	Active Erosion Sites	1	0	1	2	0	0	3	0	0	0	0
14	% of Windshield Sites 100% Buffer	10	6	1	2	4	5	7	3	11	8	9
18	% of Windshield Sites 0% Buffer	7	5	0	1	2	6	8	4	11	10	9
19	Sediment Exceedance target (10.4 NTU)				1	4	2	5		3		7
27	Orthophosphate Exceedance target (0.005 mg/L)				2	5	1	6		3		4
35	Tillage Transect % Corn Acres No-till Decline 2000-20011											
36	Tillage Transect % Soybean Acres No-till Decline 2000-2011											
38	TSS Load Reduction Needed				5	6	2	1		4		3
39	% Orthophosphate Reduction Needed				2	3	1	4		5		5
41	% land in Wetland Acres (NWI)	9	5	7	8	6	4	3	1	11	10	2
42	303d 2010 Impairment Rank # of	0	0	0	10	11	0	10	10	9	0	8
43	303d 2008 Impairment Rank # of	0	0	0	10	11	8	9	8	9	0	9
44	Impervious Survace (%)											
47	Wind Erodibility Group Acres (%)											
	Total Score	48	80	50	73	105	74	111	62	109	63	116
	Overall Rank	11	5	10	7	4	6	2	9	3	8	1
		1 is most contributing										

Table 86 Impaired Biological Communities Variables and Ranking by HUC 12

The Iroquois River and its tributaries are listed on IDEM's 303(d) list for "impaired biological communities (IBI)."		Subwatershed										
		Keefe Ditch	Jordan-Slough Creek	Nessius-Bice Ditch	Headwaters Carpenter Creek	Carpenter Creek	Bice-Slough Ditch	Heawaters Curtis Creek	Turner Ditch - Iroquois River	Hunte Ditch	Bower Ditch - Darroch Ditch	Hickory Branch - Iroquois River
Code	**Ranking Variable**	Ranking (1-11),11 most contributing)										
1	Size (Acres)	1	8	4	6	7	3	9	5	11	2	10
3	Natural Stream (mi.)	1	11	4	5	8	6	9	3	7	2	10
5	Regulated stream miles as % of Total Drain(mi.)	10	8	6	1	5	9	3	7	2	11	4
6	Livestock Access Sites	2	6	1	3	7	4	10	1	9	1	5
7	# of Active CSO											
8	Number of CFO facilities		3	1	1	2	1	3	1	1		2
9	Number of NPDES Facilities				2			1		2		3
10	100 ft Stream Buffer % class as Buffered	3	5	11	8	6	1	7	2	10	7	4
11	% of Land Area in Wetland	3	7	5	4	6	8	9	11	1	2	10
12	Active Erosion Sites	1	0	1	2	0	0	3	0	0	0	0
13	Channelization Sites	3	9	4	6	6	5	7	2	1	1	8
14	% of Windshield Sites 100% Buffer	10	6	1	2	4	5	7	3	11	8	9
18	% of Windshield Sites 0% Buffer	7	5	0	1	2	6	8	4	11	10	9
19	Sediment Exceedance target (10.4 NTU)				1	4	2	5		3		7
24	Nitrate-Nitrogen exceedance 5 yr target (10 mg/L)				2	2	1	1		1		2
25	Nitrate-Nitrogen exceedance 20 yr target (1.5 mg/L)				1	4	2	6		3		5
27	Orthophosphate Exceedance target (0.005 mg/L)				2	5	1	6		3		4
28	# Sites with MIBI Score < 10 Poor				0	0	0	0		0		0
29	# Sites CQHEI<60 Unhealthy				9	9		11		9		10
30	Site MIBI Score < 16 Fair				1	1	1	1		1		1
31	Sites CQHEI<99 Healthy				1	1		0		1		0
32	Sites MIBI Score <22 Good				1	1	1	0		1		0
33	Sites CQHE >100 High Quality				0	0		0		0		0
34	Sites MIBI Score >23 Excellent				1	0	1	1		1		1
37	% Nitrate Load Reduction Needed				6	2	5	1		4		3
38	TSS Load Reduction Needed				5	6	2	1		4		3
39	% Orthophosphate Reduction Needed				2	3	1	4		5		5
40	E.coli Reduction Needed				0	1	0	0		2		0
41	% land in Wetland Acres (NWI)	9	5	7	8	6	4	3	1	11	10	2
45	Nitrate Leaching High Concern Acres (%)	7	11	9	1	6	10	8	5	3	2	4
46	Nitrate Leaching Concern Acres (%)	3	1	6	9	5	2	4	8	10	7	11
47	Wind Erodibility Group Acres (%)											
	Total Score	60	85	60	91	109	81	128	53	128	63	132
	Overall Rank	8	5	8	4	3	6	2	9	2	7	1
		1 is most contributing										

Appendix 10 BMP Definitions (WREC, 2010)

Appendix 10.1 Agricultural BMPs

Agricultural best management practices are implemented on agricultural lands,

- Alternate Watering Systems
- Bioreactors
- Buffer Strip (Shrub/Tree)
- Conservation Tillage (No till end goal)
- Cover Crop
- Drainage Water Management
- Filter Strip (grass)
- Livestock Restriction or Rotational Grazing
- Manure Management Planning
- Nutrient/Pest Management Planning
- Prairie Restoration
- Reforestation
- Two Stage Ditch
- Septic System Upgrades
- Streambank Stabilization
- Wetland Construction or Restoration

Alternate Watering Systems

Alternative watering systems provide an alternate location for livestock to seek water rather than using a surface water source. This removes the negative impacts of livestock access to streams including direct deposit of manure and bank erosion and destabilization, while improving the health of livestock by providing a clean water source and better footing while drinking. This results in less *E. coli*, phosphorus, nitrogen, and sediment entering a surface waterbody. Two main types of alternative watering systems are used including pump systems and gravity systems.

Bioreactors

Bioreactors use bacteria to digest organic materials including manure, remnant plant material, and woody debris. Bioreactors typically generate energy, water, and fertilizer. Bioreactors use a series of tanks and treatment processes to separate cellulose-based materials from oils and gases. Materials are then broken down into carbon dioxide or methane gas and ethanol.

Buffer Strip / Filter Strip

Installing natural buffers or filters along major and minor drainage ways in the watershed helps reduce the nutrient and sediment loads reaching surface waterbodies. These practices are used throughout the Upper Iroquois River watershed with nearly 47% of agricultural survey respondents indicating that they currently use filter or buffer strips on their agricultural operation. Buffers provide many benefits including restoring hydrologic connectivity, reducing nutrient and sediment transport, improving recreational opportunities and aesthetics, and providing wildlife habitat. Sediment, phosphorus, nitrogen, and *E. coli* are at least partly removed from water passing through a naturally vegetated buffer. The

percentage of pollutants removed depends on the pollutant load, the type of vegetation, the amount of run-off, and the character of the buffer area. The most effective buffer width can vary along the length of a channel. Adjacent land uses, topography, run-off velocity, and soil and vegetation types are all factors used to determine the optimum buffer width.

Many researchers have verified the effectiveness of filter strips in removing sediment from run-off with reductions ranging from 56-97% (Arora et al., 1996; Mickelson and Baker, 1993; Schmitt et al., 1999; Lee et al, 2000; Lee et al., 2003). Most of the reduction in sediment load occurs within the first 15 feet of installed buffer. Smaller additional amounts of sediment are retained and infiltration is increased by increasing the width of the strip (Dillaha et al., 1989). Filter strips have been found to reduce sediment-bound nutrients like total phosphorus but to a lesser extent than they reduce sediment load itself. Phosphorus predominately associates with finer particles like silt and clay that remain suspended longer and are more likely to reach the strip's outfall (Hayes et al., 1984). Filter strips are least effective at reducing dissolved nutrients like those of nitrate and phosphorus, and atrazine and alachlor, although reductions of dissolved phosphorus, atrazine, and alachlor of up to 50% have been documented (Conservation Technology Information Center, 2000). Simpkins et al. (2003) demonstrated 20-93% nitrate-nitrogen removal in multispecies riparian buffers. Short groundwater flow paths, long residence times, and contact with fine-textured sediments favorably increased nitrate-nitrogen removal rates. Additionally, up to 60% of pathogens contained in run-off may be effectively removed. Computer modeling also indicates that over the long run (30 years), filter strips significantly reduce amounts of pollutants entering waterways.

Both filter strips and buffer strips should be designed as permanent plantings to treat run-off and should not be considered part of the annual rotation of adjacent cropland. Filter strips should receive only sheet flow and should be installed on stable banks. A mixture of grasses, forbs, and herbaceous plants should be used. In more permanent plantings, shrubs and trees should be intermingled to form a stable riparian community.

Conservation Tillage

Conservation tillage refers to several different tillage methods or systems that leave at least 30% of the soil covered with crop residue after planting (Holdren et al., 2001). Tillage methods encompassed by conservation tillage include no-till, mulch-till, ridge-till, zero till, slot plant, row till, direct seeding, or strip till. The purpose of conservation tillage is to reduce sheet and rill erosion, maintain or improve soil organic matter content, conserve soil moisture, increase available moisture, reduce plant damage, and provide habitat and cover for wildlife. The remaining crop residue helps reduce soil erosion and run-off volume.

Several researchers have demonstrated the benefits of conservation tillage in reducing pollutant loading to streams and lakes. A comprehensive comparison of tillage systems showed that no-till results in 70% less herbicide run-off, 93% less erosion, and 69% less water run-off volume when compared to conventional tillage

(Conservation Technology Information Center, 2000). Reductions in pesticide loading have also been reported (Olem and Flock, 1990). Conservation tillage is widely used throughout the watershed with 70% of agricultural survey respondents indicating that they currently use conservation tillage. Only 3% of respondents indicate that they are unfamiliar with conservation tillage.

Cover Crop

Cover crops include legumes, such as clover, hairy vetch, field peas, alfalfa, and soybean, and non-legumes, such as rye, oats, wheat, radishes, turnips, and buckwheat which are planted prior to or following crop harvest. Cover crops typically grow for one season to one year and are typically grown in non-cropping seasons. Cover crops are used to improve soil quality and future crop harvest by improving soil tilth, reducing wind and water erosion, increasing available nitrogen, suppressing weed cover, and encouraging beneficial insect growth. Cover crops reduce phosphorus transport by reducing soil erosion and run-off. Both wind and water erosion move soil particles that have phosphorus attached. Sediment that reaches water bodies may release phosphorus into the water. The cover crop vegetation recovers plant-available phosphorus in the soil and recycles it through the plant biomass for succeeding crops. Run-off water can wash soluble phosphorus from the surface soil and crop residue and carry it off the field. Cover crops are a familiar conservation practice throughout the watershed; however, only 40% of agricultural survey respondents indicate that they are currently using cover crops. Nearly equal percentages of agricultural land owners indicate limited and full knowledge of cover crops.

Drainage Water Management

Subsurface tile drainage is an essential water management practice on highly productive fields. As a result of tile drainage, nitrate carried in drainage water enters adjacent surface waterbodies. Drainage water management is necessary to reduce nitrate loads entering adjacent surface waterbodies from tile drainage networks. Drainage water management uses water control structures within lateral drains to vary the depth of tile outlets. Typically, the outlet is raised after harvest to limit outflow from the tile and reduce nitrate transport to adjacent waterbodies; lowered in the spring and fall to allow tile water to flow freely from the field to adjacent waterbodies; and raised in the summer to help store water making it available for crops (Frankenberger et al., 2006). Drainage water management can be used in concert with a suite of other conservation practices including cover crops and conservation tillage.

Grassed Waterway

Grassed waterways are natural or constructed channels established for transport of concentrated flow at safe velocities using adequate channel dimensions and proper vegetation. They are generally broad and shallow by design to move surface water across farmland without causing soil erosion. Grassed waterways are used as outlets to prevent rill and gully formation. The vegetative cover slows the water flow, minimizing channel surface erosion. When properly constructed, grassed waterways can safely transport large water flows downslope. These waterways can also be used as outlets for water released from contoured and terraced systems and from diverted channels. This BMP can reduce pollutants in runoff and deposition of sediment in nearby waterbodies. The vegetation improves the soil aeration and water quality due to its nutrient removal through plant uptake and absorption by soil. The waterways can also provide wildlife corridors and allows more land to be natural areas.

Livestock Restriction or Rotational Grazing

Livestock that have unrestricted access to a stream or wetland have the potential to degrade the waterbody's water quality and biotic integrity. Only 30% of agricultural landowners responding to the social indicator survey indicate that the y have livestock. Of those agricultural landowners that own livestock, nearly 30% use grazing management plans. Livestock can deliver nutrients and pathogens directly to a wate rbody through defecation. Livestock also degrade stream ecosystems indirectly. Trampling and removal of vegetation through grazing of riparian zones can weaken banks and increase the potential for bank erosion. Trampling can also compact soils in a wetland or riparian zone decreasing the area's ability to infiltrate water run-off. Removal of vegetation in a wetland or riparian zone also limits the area's ability to filter pollutants in run-off. The degradation of a waterbody's water quality and habitat typically results in the impairment of the biota living in the waterbody.

Restoring areas impacting by livestock grazing often involves several steps. First, the livestock in these areas should be restricted from the wetland or stream to which they currently have access. If necessary an alternate source of water should be created for the livestock. Second, the wetland or riparian zone where the livestock have grazed should be restored. This may include stabilizing or reconstructing the banks using bioengineering techniques. Minimally, it involves installing filter strips along banks or wetland edge and re planting any denuded areas. Finally, if possible, drainage from the land where the livestock are pastured should be directed to flow through a constructed wetland to reduce pollutant loading, particularly nitrate-nitrogen loading, to the adjacent waterbody. Complete restoration of aquatic areas impacted by livestock will help reduce pollutant loading, particularly nitrate-nitrogen, sediment, and pathogens.

A livestock exclusion system is a system of permanent fencing (board, barbed, etc.) installed to exclude livestock from streams and areas, not intended for grazing. This will reduce erosion, sediment, and nutrient loading, and improve the quality of surface water. Education and outreach programs focusing on rotational grazing and exclusionary fencing are important in the success of this BMP.

Nutrient/Pest Management Planning

Nutrient management is the management of the amount, source, placement, form, and timing of the application of plant nutrients and soil amendments to minimize the transport of applied nutrients into surface water or groundwater. This practice is used on roughly half of agricultural lands within the watershed. Of those agricultural producers not currently using nutrient or pest management planning, nearly 80% indicate a general unfamiliarity with the practice. Nutrient management seeks to supply adequate nutrients for optimum crop yield and quantity, while also helping to sustain the physical, biological, and chemical properties of the soil. A nutrient budget for nitrogen, phosphorus, and potassium is developed considering all potential sources of nutrients including, but not limited to, animal manure, commercial fertilizer, crop residue, and legume credits. Realistic yields are based on soil productivity information, potential yield, or historical yield data based on a 5-year average. Nutrient management plans specify the form, source, amount, timing, and method of application of nutrients on each field in order to achieve realistic production levels while minimizing transport of nutrients to surface and/or groundwater.

Manure Management Planning

Large volumes of manure are generated by both small, unregulated animal operations and by confined feeding operations located throughout the Upper Iroquois Watershed. Many entities have manure management plans in place and are currently using these plans to manage the volume of manure produced on their facility. Manure management planning includes consideration of the volume and type of manure produced annually, crop rotations by field, the volume of manure and nutrients needed for each crop, field slope, soil type, and manure collection, transportation, storage, and distribution methods. Manure management planning uses similar techniques to nutrient management planning with regards to nutrient budgets.

Animal waste is a major source of pollution to waterbodies. To protect the health of aquatic ecosystems and meet water quality standards, manure must be safely managed. Good management of manure keeps livestock healthy, returns nutrients to the soil, improves pastures and g ardens, and pro tects the environment, specifically water quality. Poor manure management may lead to sick livestock, unsanitary and unhealthy conditions for humans and other organisms, and increased insect and parasite populations. Proper management of animal waste can be done by implementing BMPs, through safe storage, by application as a fertilizer, and through composting. Proper manure management can effectively reduce *E.coli* concentrations, nutrient levels and sedimentation. Manure management can also be addressed in education and outreach to encourage farmers to participate in this BMP.

Prairie Restoration

Restoration of prairies within the northern portion of the watershed is a viable way to restore historic habitat. Prairies provide deep soils which have historically been used to aid in crop production, reduce sediment and nutrient transport, and restore

nutrient and organic carbon to soils. Prairie restoration typically includes planting of grasses and forbs with deep roots. Restoration of permanent vegetation is used on 44% of retired agricultural land of the Iroquois River watershed. Not all of this vegetation is prairie plants and this is indicated by the fact that 15% of agricultural producers indicate that they are restoring native plant communities.

Reforestation

Reforestation is the restocking of existing forests and woodlands which have been depleted. Reforestation can be used to improve the quality of human life by reducing pollution and dust from the air and rebuild natural habitats and ecosystems.

Two-Stage Ditch

When water is confined to a stream or ditch channel it has the potential to cause bank erosion and channel down-cutting. Current ditch design generates narrow channels with steep sides. Water flowing through these systems often result in bank erosion, channel scour and flooding. A relatively new technique focuses on mitigating these issues through an in-stream restoration called a two-stage ditch. The design of a two-stage ditch incorporates a floodplain zone, called benches, into the ditch by removing the ditch banks roughly 2-3 feet above the bottom for a width of about 10 feet on each side. This allows the water to have more area to spread out on and decreases the velocity of the water. This not only improves the water quality, but also improves the biological conditions of the ditches where this is located.

The benefits of a two-stage ditch over the typical agricultural ditch include both improved drainage function and ecological function. The two-stage design improves ditch stability by reducing water flow and the need for maintenance, saving both labor and money. It also has the potential to create and maintain better habitat conditions. Better habitats for both terrestrial and marine species are a great plus when it comes to the two-stage ditch design. The transportation of sediment and nutrients is decreased considerably because the design allows the sorting of sediment, with finer silt depositing on the benches and courser material forming the bed.

Wetland Construction or Restoration

Visual observation and historical records indicate at least a portion of the Upper Iroquois River watersheds been altered to increase its drainage capacity. Riser tiles in low spots on the landscape and tile outlets along the waterways in the watershed confirm the fact that the landscape has been hydrologically altered. This hydrological alteration and subsequent loss of wetlands has implications for the watershed's water quality. With nearly 60% of agricultural land owners indicating a lack of knowledge about wetland restoration, this practice offers a high potential to improve water quality within the watershed. Wetlands serve a vital role in storing water and recharging the groundwater. When wetlands are drained with tiles, the stormwater reaching these wetlands is directed immediately to nearby ditches and streams. This increases the peak flow velocities and volumes in the ditch. The increase in flow velocities and volumes can in turn lead to increased stream bed

and bank erosion, ultimately increasing sediment delivery to downstream water bodies. Wetlands also serve as nutrient sinks at times. The loss of wetlands can increase pollutant loads reaching nearby streams and downstream water bodies.

Restoring wetlands in the watershed could return many of the functions that were lost when these wetlands were drained. Through this process, a historic wetland site is restored to its historic status. These restored systems store nutrients, sediment, and *E. coli* while also increasing water storage and reducing flooding. Wetlands also provide additional habitat, storm water mitigation, and recreational opportunities.

Appendix 10.2 Urban Best Management Practices

Urban best management practices are as follows:

- Bio retention Practices
- Concrete Grid Pavement
- Detention Basin Retrofit
- Grass Swale
- Green Roof
- Infrastructure Retrofit
- Pet Waste Control
- Phosphorus-free Fertilizers
- Porous Pavement
- Rain Barrel
- Rain Garden
- Street Sweeping
- Trash Control and Removal
- Urban Wildlife Population Control

Bio retention Practices

Bio retention practices use bio filtration or bio infiltration to filter run-off by storing it in shallow depressions. Bio retention uses plant uptake and soil permeability mechanisms in a variety of manners typically in combination. Potential practices include sand beds, pea gravel overflow structures, organic mulch layers, plant materials, gravel underdrains, and an overflow system to promote infiltration. Bio infiltration can also be used to treat run-off from parking lots, roads, driveways and other areas in the urban environment. Bio retention should not be used in highly urbanized areas rather; it should be used in areas where on-site storage space is available.

Detention Basin Retrofit

Traditionally, detention basins are large, open, un-vegetated basins designed to hold water for short periods of time following a rain event (dry detention basin) or continuously (wet detention basin). Retrofits of detention basins consist of a basin redesign allowing for longer periods of storm water runoff retention. Longer retention time results in increased time for pollutants to precipitate out of storm water runoff and in the case of dry detention basins increased storm water

infiltration rates. Where space permits, basin/pond buffers can also be used to increase storm water infiltration rates and pollutant removal.

Grass Swale

Grass swales are used in urban areas and are often considered landscape features. Swales are graded to be linear with a shallow, open channel of a trapezoidal or parabolic shape. Vegetation which is water tolerant is planted within the channel which promotes the slowing of water flow through the system. Swales reduce sediment and nutrients as water moves through the swale and water infiltrates into the groundwater. Based on social indicator data, nearly 60% of urban residents are unfamiliar with grass swales, while 8% are currently using this practice to reduce storm water run-off impacts.

Green Roof

A green roof is a building who's roof is partially or completely covered with vegetation and a growing medium planted on top of a waterproof membrane. Irrigation and drainage systems move water through the plant mater and growing medium and discharge it into the building's drainage system. Green roofs absorb rainwater, provide installation, reduce air temperatures, and pro vide habitat for wildlife. Green roofs can retain up to 75% of rainwater gradually releasing it via condensation and transpiration while retaining sediment and nutrients. Green roofs can be installed on any type of roof – slanting to flat – with an ideal slope of 25%. Nearly 45% of urban residents indicate unfamiliarity with the use of a green roof; <1% of urban residents responding to the social indicator survey indicate that they are currently using a green roof.

Infrastructure Retrofit

Typical storm water infrastructure includes pipe and storm drains, or hard infrastructure, to convey water away from hard surfaces and into the storm water system. Retrofitting these structures to implement low impact development techniques, use green practices, and introduce plants and filters to reduce sediment and nutrient concentrations contained in storm water. Many of the treatments listed in this section can be utilized to retrofit infrastructure including pervious pavement, green roofs, constructed wetlands, rain gardens, and more. In order for the installation to meet a "retrofit" requirement, existing infrastructure must already be in place, subsequently removed, and replaced with green infrastructure.

Porous Pavement Systems

Porous pavement systems come in many forms including porous pavement and porous paver/modular block pavement. Both types of pervious pavement can be installed on most any travel surface with a slope of 5% or less. Urban residents of the Upper Iroquois River watershed indicate a general lack of knowledge with regards to pervious pavement. Only 13% indicated that they know how to use pervious pavement with 1.2% of respondents indicating current use of pervious pavement.

Pervious pavement systems are specially designed pavement systems that allow rain and snowmelt to infiltrate through the pavement material and discharge into an underlying stone reservoir where the water is either allowed to infiltrate into the

underlying soil material, discharge into an auxiliary drainage system, or discharge in a secondary storm water treatment device. Porous pavement systems have the approximate strength and characteristics of traditional pavement. The primary difference is that they lack the "fine" aggregate materials found in traditional pavements. This allows for larger interconnected voids which allow for the storm water infiltration.

A typically pervious concrete system consists of a geotextile fabric overlying the soil subgrade, a stone/gravel substrate reservoir, and the overlying pervious pavement. The paving material consists of a mixture of Portland cement, coarse aggregate, and water.

Porous asphalt is a type of pervious pavement consisting of bituminous asphalt in which the "fines" have been screened and reduced, creating 16 to 18 percent void space thus making it permeable to water. The void space in conventional asphalt is typically 2 to 3 percent. This system consists of the underlying soil, a stone reservoir surrounded by a gravel filter layer, and the overlying porous asphalt.

Porous paver/modular pavement systems consist of modular concrete paving blocks, modular plastic lattice that can be stretched or expanded, or cast in place concrete grids. These systems typically overly a sand or gravel substrate and are structurally engineered to provide a load-bearing surface that is adequate to support personal vehicles, while allowing infiltration of surface water into the underlying soil. This type of system is usually used in low-volume traffic areas such as overflow parking lots and lightly used access roads. Many of these systems are constructed with voids that can be filled with soil material and vegetated.

Pet Waste Control

Pet waste cannot be considered the predominant waste product within a watershed nor the one that produces the greatest impact. Nonetheless, the cumulative impact of pet waste within a watershed can produce a major impact on water quality. Pet waste contains bacteria and parasites, organic matter, phosphorus, nitrogen, and *E. coli* and can carry diseases including *Campylobacteriosis*, *Slamonellosis*, and *Toxocarisis*. Studies indicate that the average dog produces 13 pounds of nitrogen, 2 pounds of phosphorus, and 1,200 pounds of sediment annually (Miles, 2007).

Many options for managing pet waste are available with most efforts focusing on educational options to turn pet waste from an 'out of sight, out of mind' issue to one that every pet owner considers for their pet. Pet waste can be flushed, resulting in waste traveling to the wastewater treatment plant or through the septic system for treatment, buried, where it gradually breaks down over time with nutrients entering the soil and microorganisms converting diseases and bacteria into less benign forms, or trashed, resulting in potential landfill issues. Ordinances, signage, and public education are needed to inform the community about options for treating pet waste issues.

Phosphorus-free Fertilizers

Phosphorus-free fertilizers are those fertilizers that supply nitrogen and minor nutrients without the addition of phosphorus. Phosphorus increases algae and plant growth which can cause negative impacts on water quality within aquatic systems. The Clear Choices, Clean Water (2010) program estimates that a one acre lawn fertilized with traditional fertilizer supplies 7.8 pounds of phosphorus to local water bodies annually. Given that 75% of urban residents within the Upper Iroquois River watershed indicate either limited knowledge or that they don't use phosphorus free fertilizers, there is great potential for reducing urban sources of phosphorus by targeting this practice. Established lawns take their nutrients from the soil in which they grow and need little additional nutrients to continue plant growth. Fertilizers are manufactured in a variety of forms including that without phosphorus. Phosphorus-free fertilizer should be considered for use in areas where grass is already established.

Protecting Open Space and Natural Areas

Several techniques can be used for protecting natural areas and open space in both public and private ownership. Several entities throughout the watershed assist with the transfer of lands into protective status. Other open space can be protected using conservation design development techniques, and is more likely to be managed by homeowner associations.

Rain Barrel

A rain barrel is a container that collects and stores rainwater from your rooftop (via your home's disconnected downspouts) for later use on your lawn, garden, or other outdoor uses. Rainwater stored in rain barrels can be useful for watering landscapes, gardens, lawns, and trees. Rain is a naturally soft water and devoid of minerals, chlorine, fluoride, and other chemicals. In addition, rain barrels help to reduce peak volume and velocity of storm water run-off to streams and storm sewer systems. Although rain barrels don't specific reduce nutrient or sediment loading to water bodies, their presence can reduce the first flush of water reaching storm drains. This impact is great especially in portions of the watershed where combined sewers are still in operation. Although a high percentage of urban residents indicated a general knowledge of rain barrels, only 3% of survey respondents indicate that they have installed a rain barrel. Furthermore, 75% of respondents indicate a willingness to consider installing a rain barrel.

Rain Garden

Rain gardens are small-scale bio retention systems that be can be used as landscape features and small-scale storm water management systems for single-family homes, townhouse units, some small commercial development, and to treat parking lot or building run-off. Rain gardens provide a landscape feature for the site and reduce the need for irrigation, and can be used to provide storm water depression storage and treatment near the point of generation. These systems can be integrated into the storm water management system since the components can be optimized to maximize depression storage, pretreatment of the storm water run-off, promote evapotranspiration, and facilitate groundwater recharge. The combination of these benefits can result in decreased flooding due to a decrease in

the peak flow and total volume of run-off generated by a storm event. Additionally, rain gardens can be designed to provide a significant improvement in the quality of the storm water run-off. Within the Iroquois River watershed, there is a general lack of knowledge about rain gardens and their cost, installation efforts needed, and water quality benefit. Nearly 60% of urban residents that responded to the social indicator survey stated that they had never heard of rain gardens. Less than 10% indicated familiarity with rain gardens or that they had rain garden installed on their property.

Street Sweeping

Street sweeping removes accumulated pollutants including debris, sediment, salt, trash, trace metals, and more while improving aesthetics, controlling dust, and decreasing the volume of materials accumulating in storm drains. Street sweeping is currently practices in Rensselaer, but it is unclear if other towns do. Additional arterial streets within the cities or sweeping of streets within smaller municipalities throughout the watershed could benefit water quality in the Iroquois River.

Trash Control and Removal

Trash and debris located throughout urban areas indicate that these materials can have a significant negative impact on water quality within the Iroquois River. A majority of trash observed occurs adjacent to streets, road right of ways, and sidewalks throughout the urban portions of the watershed. Surveys in larger urban areas indicate that plastic bottles, Styrofoam cups, and paper are the most common trash items found in or adjacent to storm drains. It is necessary to quantify the impacts of trash on the Iroquois River and the cities' wastewater treatment facilities to determine if it is necessary to address trash in ways currently not occurring within the watershed.

Urban Wildlife Population Control

Wildlife populations located within urban areas can negatively impact water quality. Deer, Canada geese, raccoons, squirrels, and other animals can reach nuisance levels within urban areas. To control the population, a survey of the types of animals present, the volume of each species, the health and wellness of the populations, and habitat availability must be surveyed. Control of the goose population by habitat modification and relocation are the most likely scenarios for control.

Fish Passage Improvement

Fish passage issues are typically considered of utmost importance for salmonid and trout species. Although the Iroquois River does not support a cold-water fishery, restriction of fish passage is still of concern. Existing highway culverts are the primary source of fish passage restriction. Many of these structures were installed prior to the consideration of impacts of barriers to fish passage or the needs of fish species. Specific locations where fish passage barriers exist were mapped as part of the Watershed Inventory. As these bridges are slated for improvement or repair, discussion of fish passage mitigation will be included.

Greenways and Trails

Greenways can provide a large number of functions and benefits to nature and the public. For plants and animals, greenways provide habitat, a buffer from development, and a corridor for migration. Greenways located along streams include riparian buffers that protect water quality by filtering sediments and nutrients from surface run-off and stabilizing stream banks. By buffering the stream from adjacent developed land use, riparian greenways offset some of the impacts associated with increased impervious surface in a watershed. Maintaining a good riparian buffer can mitigate the negative impacts of approximately 5% additional impervious surface in the watershed.

Habitat Corridor Identification and Improvement

Protection of habitat corridors requires a multi-phase program including identification of appropriate habitat corridors, development of a corridor management plan, and creation of an improvement plan. Most long-term corridor protection will require land transfer into protected status. There are several options for land transfer ranging from donation to fee simple land purchase. Donations can be solicited and encouraged through incentive programs. Outright purchase of property offers a secondary option and is frequently the least complicated and most permanent protection technique, but is also the most costly. A conservation easement is a less expensive technique than outright purchase and does not require the transfer of land ownership but rather a transfer of use rights. Conservation easements might be attractive to property owners who do not want to sell their land at the present time, but would support perpetual protection from further development. Conservation easements can be donated or purchased.

Several techniques can be used for protecting natural areas and open space in both public and private ownership. The first step in the process is to identify and prioritize properties for protection. The highest priority natural areas should be permanently protected by the ownership or under the management of public agencies or private organizations dedicated to land conservation. Other open space can be protected using conservation design development techniques, and is more likely to be managed by homeowner associations.

Low Impact Development

Low Impact Development (LID) is a land development or re-development process that works in concert with nature to manage stormwater at the source, or as close as possible to the source. Preservation of open space, recreation of natural landscape features, reduction of impervious surface coverage, and utilization of on-site drainage to treat stormwater are the key features of low impact development. This technique uses a suite of practices highlighted above including bioretention, rain gardens, green or vegetated roofs, rain barrels, pervious pavement, and more. LID can be used anywhere as part of a new development, redevelopment, or retrofit of existing development or infrastructure. If used correctly, LID can restore a watershed's hydrologic and ecological function.

Point Source Discharge Reduction

Several point source permitted discharges are located in the Iroquois River watershed. These include large wastewater treatment plants, like those that service Rensselaer; small wastewater treatment and package plants. A majority of the facilities permitted throughout the watershed operate within their permitted requirements with regards to water discharges. 9 combined sewer overflows are located within the watershed and are controlled by the City of Rensselaer. The city are in the process of implementing long-term control plans focused on reducing combined sewer overflow impacts to the Iroquois River and although we cannot assist them with infrastructure changes, we can lead the charge to reduce the volume of water entering the stormwater system, promote successes to improve water quality leaving any NPDES-permitted facility, and highlight efforts to reduce impacts to the Iroquois River.

Septic System Care and Maintenance

Septic, or on-site waste disposal systems, are the primary means of sanitary flow treatment outside of incorporated areas. Because of the prohibitive cost of providing centralized sewer systems to many areas, septic tank systems will remain the primary means of treatment into the future. Annual maintenance of septic systems is crucial for their operation, particularly the annual removal of accumulated sludge. The cost of replacing failed septic tanks is about $5,000-$15,000 per unit based on industry standards.

Property owners are responsible for their septic systems under the regulation of the County Health Department. When septic systems fail, untreated sanitary flows are discharged into open watercourses that pollute the water and pose a potential public health risk. Septic systems discharging to the ground surface are a risk to public health directly through body contact or contamination of drinking water sources. Additionally, septic systems can contribute significant amounts of nitrogen and phosphorus to the watershed. Therefore, it is imperative for homeowners not to ignore septic failures. If plumbing fixtures back up or will not drain, the system is failing. Funding for this practice is limited.

Smart Growth/Livable Communities Practices

Like low impact development, smart growth or livable communities preserves natural lands and natural features and protects water quality. However, smart growth goes farther focusing on improving resident's everyday lives through their home, health, local schools, tax structure, daily commute, economic growth potential, and natural environment. Smart growth communities are new developments or revitalized communities focused on neighborhoods with shops, offices, schools, businesses, churches, parks, and infrastructure within walking or biking distance or providing public transportation to facilitate community use. Smart growth practices can be used in existing communities by highlighting walkability, preserving or recreating open space, encouraging community stakeholder involvement, providing an opportunity of housing options, and making use of compact building structures.

Stream bank Stabilization

Stream bank stabilization or stream restoration techniques are used to improve stream conditions so they more closely mimic natural conditions. The most feasible restoration options return the stream to natural stream conditions without restoring the stream to its original condition. Restoration and stabilization options are limited by available floodplain, modifications to natural flows, and development structure locations. Reestablishment of riparian buffers, restoration of stream channels, stabilization of eroding stream banks, installation of riffle-pool complexes, and general maintenance can all improve stream function while reducing sediment and nutrient transport into and within the system.

Threatened and Endangered Species Protection

Threatened and endangered species are those plant and animal species whose survival is in peril. Federally and state listed species identified within the Upper Iroquois River watershed are highlighted in the Watershed Inventory. Threatened species are those that are likely to become endangered in the foreseeable future. Federally endangered species are those that are in danger of extinction throughout all or a significant portion of their range. A state-endangered species is any species that is in danger of extinction as a breeding species in Indiana.

Protecting threatened and endangered species requires consideration of their habitat including food, water, and nesting and roosting living space for animals and preferred substrate for plants and m ussels. Corridors for species movement are also necessary for long-term protection of these species. Protection of habitat can include providing clean water and available food but likely requires protection of the physical living space and associated corridor. Conservation management plans should be developed for each species, if they are not already in place. Such plans should consider habitat needs including purchase or protection of adjacent properties to current habitat locations, hydrologic needs, pollution reduction, outside impacts, and other techniques necessary to protect threatened and endangered species.

Appendix 11. CFO Compliance/Enforcement Tally

FarmID	OperationN	Permit Compliance/ Enforcement issues since existence	HUC10	County	PermitProg	PermType	ConstruAp	NurseryPig	Finishers	Sows	BeefCattle	BeefCalves	DairyCattl	DairyCalve	Layers	Pullets
6207	SEVEN HILLS DAIRY LLC	3	Carpenter_Denton	BENTON	CAFO	GENERAL PERMIT	4/8/2010	-	-	-	-	-	3,250	16	-	-
4390	RONALD HATHAWAY	0	Carpenter_Denton	JASPER	CFO	CFO APPROVAL	5/29/1998	-	2,120	-	-	-	-	-	-	-
745	FREY FARM	0	Carpenter_Denton	JASPER	CFO	CFO APPROVAL	4/8/1997	1,250	-	-	-	-	-	-	-	-
2689	TIP TOP PIGS INCORPORATED 1	0	Carpenter_Denton	JASPER	CAFO	GENERAL PERMIT	8/12/1991	3,060	3,060	530	-	-	-	-	-	-
3423	WHITE COUNTY PULLETS	0	Carpenter_Denton	WHITE	CFO	NPDES EXEMPTION	2/13/1985	-	-	-	-	-	-	-	-	480,000
3506	ROSE ACRE FARMS JASPER COUNTY PULLETS	0	Carpenter_Denton	JASPER	CFO	NPDES EXEMPTION	3/17/1988	-	-	-	-	-	-	-	-	520,000
3422	WHITE COUNTY EGG FARM	10	Carpenter_Denton	WHITE	CAFO	GENERAL PERMIT	8/24/2004	-	-	-	-	-	-	-	2,120,000	-
2891	MARK & REBECCA STREITMATTER	0	Carpenter_Denton	WHITE	CFO	CFO APPROVAL	3/1/2002	-	2,440	20	-	-	-	-	-	-
516	JACK RODIBAUGH & SONS INCORPORATED	0	Carpenter_Denton	JASPER	CFO	CFO APPROVAL	1/17/1995	200	1,056	296	-	-	-	-	-	-
4260	KEITH STREITMATTER	0	Carpenter_Denton	JASPER	CFO	CFO APPROVAL	12/29/1994	-	1,100	-	-	-	-	-	-	-
3279	OINKER ACRES	0	Curtis_Hunter	JASPER	CFO	CFO APPROVAL	5/17/1994	600	1,200	200	-	-	-	-	-	-
3182	FOX HILL HOG FARM	0	Curtis_Hunter	JASPER	CFO	CFO APPROVAL	6/2/1980	600	600	-	-	-	-	-	-	-
3372	NEWTON COUNTY EGG FARM	7	Curtis_Hunter	NEWTON	CAFO	GENERAL PERMIT	10/27/2010	-	-	-	-	-	-	-	1,830,000	-
651	KORNIAK FARM	0	Curtis_Hunter	JASPER	CFO	CFO APPROVAL	12/22/1998	-	720	-	-	-	-	-	-	-
2399	NURSERY FINISHING SITE	0	Curtis_Hunter	NEWTON	CFO	NPDES EXEMPTION	11/27/2001	4,000	9,600	-	-	-	-	-	-	-
3535	CAMBALOT SWINE BREEDERS	0	Curtis_Hunter	NEWTON	CAFO	GENERAL PERMIT	2/22/2008	1,500	-	5,894	-	-	-	-	-	-
6036	FAIR OAKS DAIRY FARM SOUTH SITE 2	7	Curtis_Hunter	NEWTON	CAFO	GENERAL PERMIT	6/17/2010	-	-	-	-	-	3,000	-	-	-
3732	CALF LAND LLC	0	Curtis_Hunter	JASPER	CAFO	GENERAL PERMIT	10/21/2002	-	-	-	-	-	-	5,000	-	-
6064	FAIR OAKS DAIRY FARM CENTRAL 3	0	Curtis_Hunter	NEWTON	CAFO	GENERAL PERMIT	10/8/1999	-	-	-	-	-	3,000	-	-	-
6341	FAIR OAKS DAIRY FARM LLC NORTH CENTRAL 5	-	Curtis_Hunter	NEWTON	CAFO	GENERAL PERMIT	10/29/2008	-	-	-	-	-	10,560	-	-	-
6065	FAIR OAKS DAIRY FARM WEST 4	0	Curtis_Hunter	NEWTON	CAFO	GENERAL PERMIT	2/18/2003	-	-	-	-	-	3,000	-	-	-
1680	HAROLD & DON GRETENCORD	0	Mont_Strole	BENTON	CFO	CFO APPROVAL	3/30/1995	1,800	-	-	-	-	-	-	-	-
669	GARY A CLARK	0	Mont_Strole	NEWTON	CFO	CFO APPROVAL	7/20/1993	-	2,000	-	-	-	-	-	-	-
6380	HIDDEN VIEW DAIRY	1	Oliver	JASPER	CAFO	GENERAL PERMIT	2/23/2007	-	-	-	-	-	4,000	-	-	-
6083	NEWBERRY FARMS LLC	0	Oliver	JASPER	CAFO	GENERAL PERMIT	9/14/2006	-	-	-	-	-	3,000	-	-	-
6383	PEMBROKE OAKS FARM LLC	0	Oliver	JASPER	CFO	CFO APPROVAL	10/20/2005	-	-	2,496	-	-	-	-	-	-
4656	GOP FARMS	0	Upper_Ir_Ryan	JASPER	CFO	CFO APPROVAL	10/9/2001	-	1,485	-	65	-	-	-	-	-
4337	MOORE FARMS	0	Upper_Ir_Ryan	JASPER	CFO	CFO APPROVAL	12/29/1994	-	-	-	600	-	-	-	-	-
4235	PARKINSON & RODIBAUGH	0	Upper_Ir_Ryan	JASPER	CFO	CFO APPROVAL	1/17/1995	160	435	80	-	-	-	-	-	-
4056	HURLEY SWINE ENTERPRISES 1	0	Upper_Ir_Ryan	JASPER	CAFO	GENERAL PERMIT	12/2/2010	-	7,600	-	-	-	-	-	-	-
4991	NORTHWIND PORK LLC	0	Upper_Ir_Ryan	JASPER	CFO	CFO APPROVAL	10/19/1998	8,000	-	3,208	-	-	-	-	-	-
652	PULLIN FARMS INCORPORATED	0	Upper_Ir_Ryan	JASPER	CFO	CFO APPROVAL	9/18/1972	780	1,546	315	-	-	-	-	-	-
2542	MAX L FARMS LLC	0	Upper_Ir_Ryan	JASPER	CFO	NPDES EXEMPTION	8/16/2002	-	3,600	-	-	-	-	-	-	-
876	GROW FARM & FEEDLOTS INC	2	Upper_Ir_Ryan	JASPER	CAFO	GENERAL PERMIT	6/25/2007	-	-	-	2,000	-	-	-	-	-
6604	DE JONG FAMILY FARMS LLC	0	Upper_Ir_Ryan	JASPER	CAFO	GENERAL PERMIT	6/17/2010	-	-	-	-	-	3,800	-	-	-
6045	WINDY RIDGE DAIRY LLC	1	Upper_Ir_Ryan	JASPER	CAFO	GENERAL PERMIT	12/3/2009	-	-	-	-	-	6,500	-	-	-
3700	IROQUOIS VALLEY SWINE	0	Upper_Ir_Ryan	JASPER	CFO	NPDES EXEMPTION	9/13/1991	2,160	7,200	1,010	-	-	-	-	-	-

Appendix 12. NPDES Permit Compliance Tally

Site Map #	NPDES Facility Name	Permit Compliance Violations in last 5 years	Location	County	Receiving Waters	Primary Discharge
5	REMINGTON WWTP	5	REMINGTON	Jasper	CARPENTER CREEK	Sewerage Systems
9	KENTLAND WWTP	8	KENTLAND	Newton	MONTGOMERY Ditch	Sewerage Systems
4	FAIR OAKS BOTTLING CO	0	FAIR OAKS	Newton	CURTIS CREEK	Dairy Products, Except Dried Or Canned
1	RENSSELAER WWTP	16	RENSSELAER	Jasper	IROQUOIS RIVER	Water Supply and Sewerage System
7	GOODLAND WWTP	2	GOODLAND	Newton	HUNTER DITCH TRIB	Sewerage Systems
6	IROQUOIS BIO-ENERGY	16	RENSSELAER	Jasper	PINKAMINK DITCH	Industrial Organic Chemicals
3	GEORGE ADE HEALTH CARE	2	BROOK	Newton	IROQUOIS RIVER	Skilled Nursing Care Facilities
0	BROOK WWTP	1	BROOK	Newton	IROQUOIS RIVER	Sewerage Systems
10	NEWTON WATER/SEWER DISTRICT	0	BROOK	Newton	BATTLEDAY DITCH	Sewerage Systems
2	REMINGTON I69 PLAZA	0	REMINGTON	Jasper	BICE DITCH	Gasoline Service Stations

Appendix 12: Urban Areas Data Used For Ranking

Urban Areas Ranking Data							
Towns	# of NPDES	Permit Compliance Issues	population	land area (sq miles)	Number of CSOs	Promixity to Streams (miles)	2012 303d listing downstream of town	303d Counts Downstream
Gifford	0	0	42	0.1	0	0.15	E.coli	2
Mount Ayr	0	0	122	0.15	0	1.50	E.coli,Chloride	2
Goodland	1	2	1043	0.78	0	2.00	E.coli, IBC	2
Rensselaer	2	16	5,928	3.8	9	0.00	Nutrients, E.coli, Choloride	3
Brook	1	1	997	0.66	0	0.24	Nutrients, E.coli, IBC	3
Fair Oaks	1	0	842	0.65	0	0.50	DO, Nutrients, E.coli	3
Kentland	1	8	1,822	1.53	0	0.13	DO, Nutrients, E.coli, IBC	4
Remington	2	5	1,185	1.03	0	0.36	DO, Nutrients, E.coli, IBC, Chloride	5

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