Lowes & Rock Creeks Watershed (LC24-262)
Comprehensive Surface Water Resource Report
Dunn, Eau Claire, and Pepin Counties, Wisconsin
MWBC = 2123900 and 2119000

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Abstract:

The Lower Chippewa River Basin Team participated in an evaluation of the aquatic resources of the Lowes and Rock Creeks Watershed during the 2000 field season. The assessment revealed that throughout the watershed, the overall habitat ratings ranged from fair to excellent, the coldwater fish index representing coldwater fish community health ranged from poor to excellent, and the Hillsenhoff Index representing the degree of organic pollution using macroinvertebrate indicators ranged from very good to excellent. Brown and/or brook trout were captured in 8 of the 12 subsheds in mostly low numbers except for the Fall Creek subshed and the Clear Creek to Lowes subshed. The temperature monitoring conducted throughout the watershed revealed that all streams have the potential to produce coldwater fish communities, with a summer maximum daily average temperature of 22°C or below (Lyons et al 1996). The survey suggests the main detrimental impacts to the aquatic resources of this watershed to be habitat degradation, in-stream sedimentation, salmonid extirpation, and degraded coldwater thermal regimes.

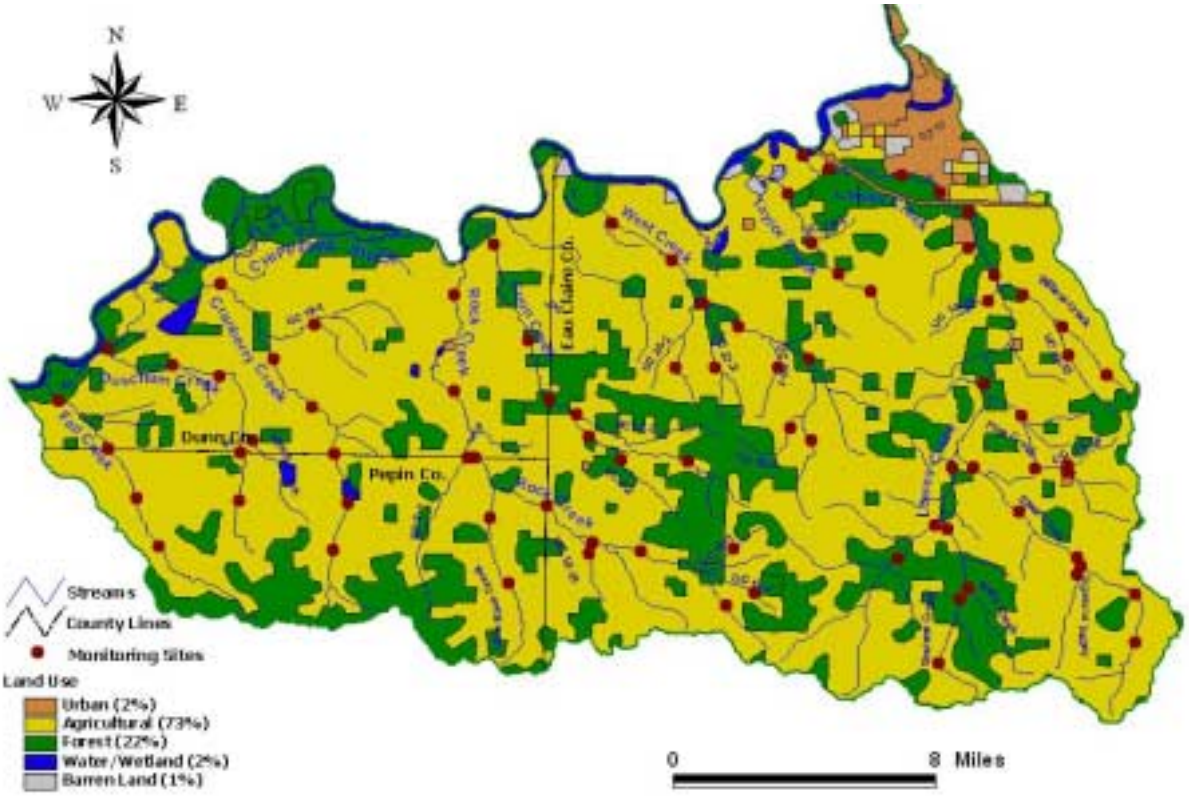
Introduction:

During the survey of the Lowes and Rock Creeks Watershed in the summer of 2000, baseline data was gathered on fish habitat, sport and non-game fish communities, temperature regimes, and macroinvertebrate communities. A total of 84 sites were selected for fish and habitat evaluations, 41 sites for temperature monitoring, and 9 sites for macroinvertebrate sampling (Figure 1). The objectives of this survey include 1) assessing the status of the aquatic resources in this watershed, 2) determine if any stream classification changes are necessary, and 3) decide what fish management goals need to be established or modified based on this information.

Watershed Description

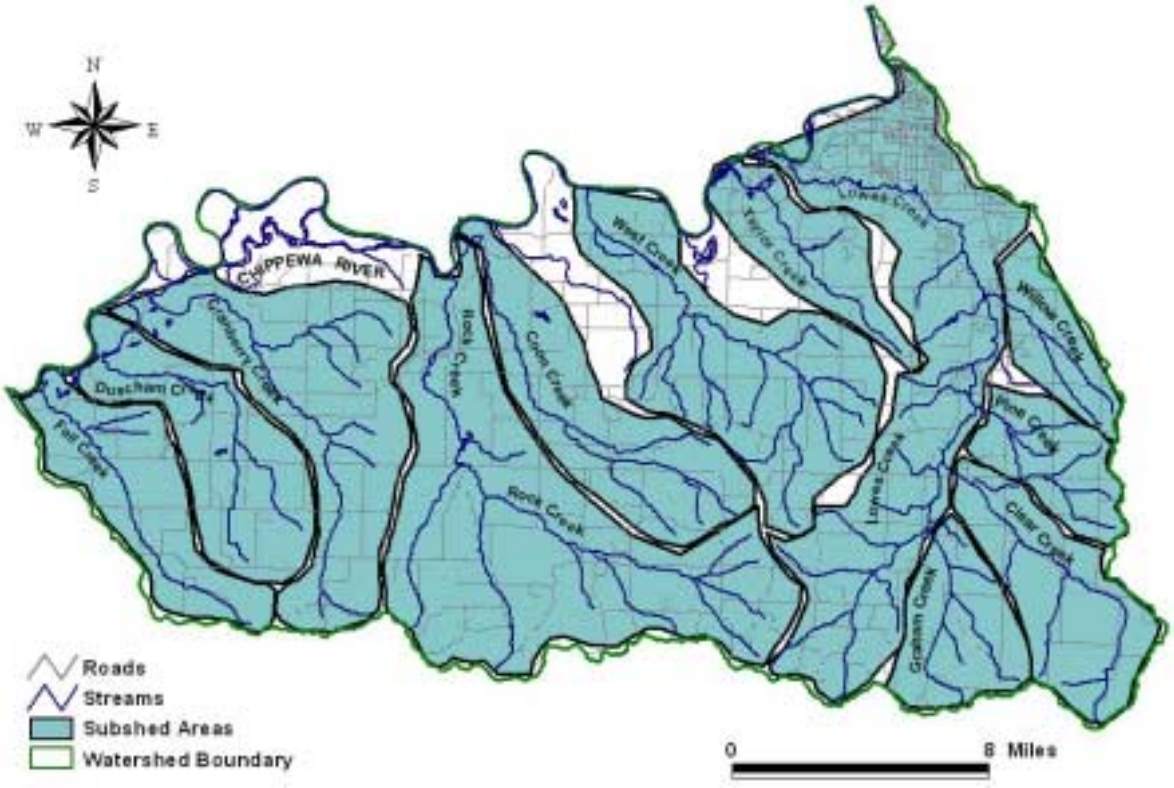
The Lowes and Rock Creeks watershed spans over the three counties of Dunn, Pepin, and Eau Claire. This watershed drains an area of approximately 140,000 acres, or 219 square miles, which eventually drains to the Chippewa River. The land use within this watershed is primarily ¾ agriculture and ¼ forest, with pockets of urban, water-covered, and barren land comprising the remainder (Figure 1).

Figure 1. Lowes and Rock Creeks Watershed Land Use Map (1992 Data).



The watershed was broken into 12 subsheds to better present the data contained in this report (Figure 2). The base flow of the 12 major streams within the watershed varied from about 40 cfs for mainstem of Lowes Creek and Rock Creek subsheds to about 5 cfs for Duscham, Willow, and Pine Creek subsheds (excluding Clear and Graham creeks which had no flow measurements taken). Differences between overall summer minimum and maximum temperatures averaged 11 degrees °C, with the widest fluctuation of 17 degrees in the Taylor Creek subshed. The least fluctuation of 8 or 9 degrees °C was found in the Fall, Rock, and the mainstem of Lowes Creek Subsheds.

Figure 2. Subsheds of the Lowes and Rock Creeks Watershed.



Watershed Problems

Similar to other watersheds within the Lower Chippewa River basin, most of the detrimental impacts to the Lowes and Rock Creeks watershed are related to changes in land use practices from mostly forested in the mid-1800's to mostly agricultural and urban today (Voss and Beaster, 2001; Prey and Simonson, 1993). Examples of common problems are habitat degradation, in-stream sedimentation, and degraded thermal regimes (Voss and Beaster, 2001; Prey and Simonson, 1993). The effects of these problems can be seen by the degradation of stream classifications based on fish assessments in this watershed (Voss and Beaster, 2001). The quality of the fish community for 5 of the 12 major streams surveyed has been reduced when compared to their codified use classification (Table 1).

Table 1. Classifications of the major streams within the Lowes and Rocks Creek Watershed. Data is from the State of the Lower Chippewa River Basin Report (Voss and Beaster, 2001). Classifications in **bold** reflect existing use is less than the stream's codified use.

Stream	Existing Use Classification	Codified Use Classification
Fall Creek	Cold II Trout (5.6 mi)	Cold II Trout (5.6 mi)
Duscham Creek	Cold II Trout (2 mi) Warmwater Forage (6 mi)	Cold II Trout (2 mi) Warmwater Forage (6 mi)
Pinch Creek	Warmwater Forage (2 mi)	Cold II Trout (2 mi)
Cranberry Creek	Warmwater Forage (15 mi)	Warmwater Forage (15 mi)
Rock Creek	Cold III (4 mi), Class II (2.4 mi) Warmwater Forage (5.6 mi)	Cold III (9.0 mi) **Warmwater Sport (3 mi)**
Coon Creek	Cold III (8.1 mi)	Cold III (8.1 mi)
West Creek	Warmwater Forage (12 mi)	**Warmwater Sport (12 mi)**

Taylor Creek	Warmwater Forage (7 mi)	**Warmwater Sport (7 mi)**
*Lowes reek	Cold II (12 mi)	Cold II (12 mi)
Willow Creek	Warmwater Forage (4 mi)	**Warmwater Sport (4 mi)**
Pine Creek	Warmwater Forage (5 mi)	**Warmwater Sport (5 mi)**
*****Clear Creek	Cold I (6.8 mi)	Cold I (6.8 mi)
Graham Creek	Cold II (2.7 mi)	Cold II (2.7 mi)

*****Designated an exceptional resource water (ERW).

Historical Notes

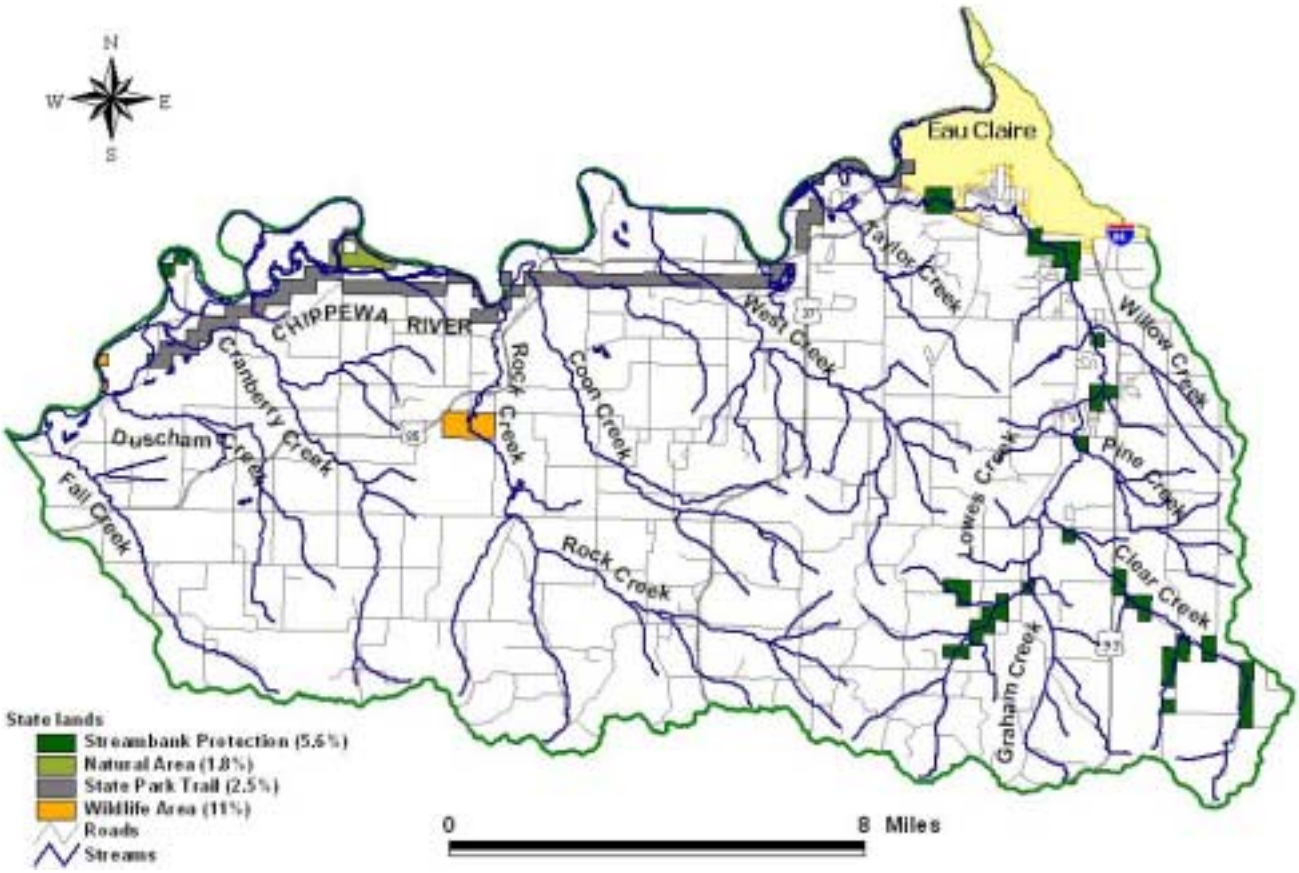
The Coon Creek subshed has been stocked with both brook and brown trout of various sizes since the early 1930s. Stocking was discontinued by 1968 due to the lack of good trout habitat (lack of sufficient spring/groundwater sources and shifting, sandy substrate), but still kept the Class III designation (Apelgren, 1968). As of 2000, Coon Creek still contains low densities of brown trout, but no brook trout. Brown trout are still present even though stocking was discontinued in 1968. The habitat ratings from 2000 are similar to the descriptions found in 1968.

The Rock Creek subshed has a similar stocking record as Coon Creek, except stocked with only brown trout since 1957. A total of 5 brown trout were captured only at the site near the mouth in 2000 even though stocking has been discontinued since 1957. A 35 foot dam exists upstream of this area, and in 1974 as well as in 2000 was found to increase temperatures upstream.

The Fall Creek subshed historically was stocked with domestic brown trout in 1949 and 1957; and domestic brook trout in 1975 and 1976. In addition, will brook trout fingerlings were stocked on an annual basis beginning in 1999 to supplement variable recruitment in an effort to restore the native brook trout fishery.

The Lowes Creek mainstem subshed is currently annually stocked with brown trout, and in 2000 stocked with 7,000 large fingerling brook trout (Appendix A). A Priority Watershed Project was implemented for the lower part of the Lowes Creek watershed in 1993 and scheduled for completion in 2001. According to Eau Claire county, all planned projects and activities identified in this plan have been implemented, including some additional streambank easement aquisitions (pers. comm., Dan Simonson, 2002, Figure 3).

Figure 3. Existing state lands within the Lowes and Rock Creeks watershed as of March 1996.



Despite the efforts made in the lower part of the watershed, overall similar obstacles for fishery improvements such as in-stream sedimentation, lack of trout habitat, and thermal impacts exist today as they did during the early 90s. Also since the early 90's, additional development has occurred within the I-94 storm sewer watershed that accepts much of the southeastern corner of the city's runoff. The addition of impervious areas such as roof tops, roadways, and parking lots may have contributed to thermal impacts. For example, temperatures appear to have increased below the I-94 storm sewer outfall during that same time period, while upstream of the storm sewer the stream had temperatures that are unchanged. (Table 2).

Table 2. Comparisons of summer temperature data in Lowes Creek from 1991 and 2000. The reported temperature value is a result of taking the average daily temperature, and reporting the highest (maximum) average found during the sampling period (~75 days). These are not the highest temperatures attained at these sites.

Site Location	Max Daily Avg (C) 7/3 to 9/18/91	Max Daily Avg (C) 7/3 to 9/18/00
Lowes Creek – Below Storm Sewer/ CTH F (Site 3 in 2000)	17.9	19.5
Lowes Creek – Above Storm Sewer/ S. Lowes Cr Rd (Site 4 in 2000)	21.0	21.0

Methods:

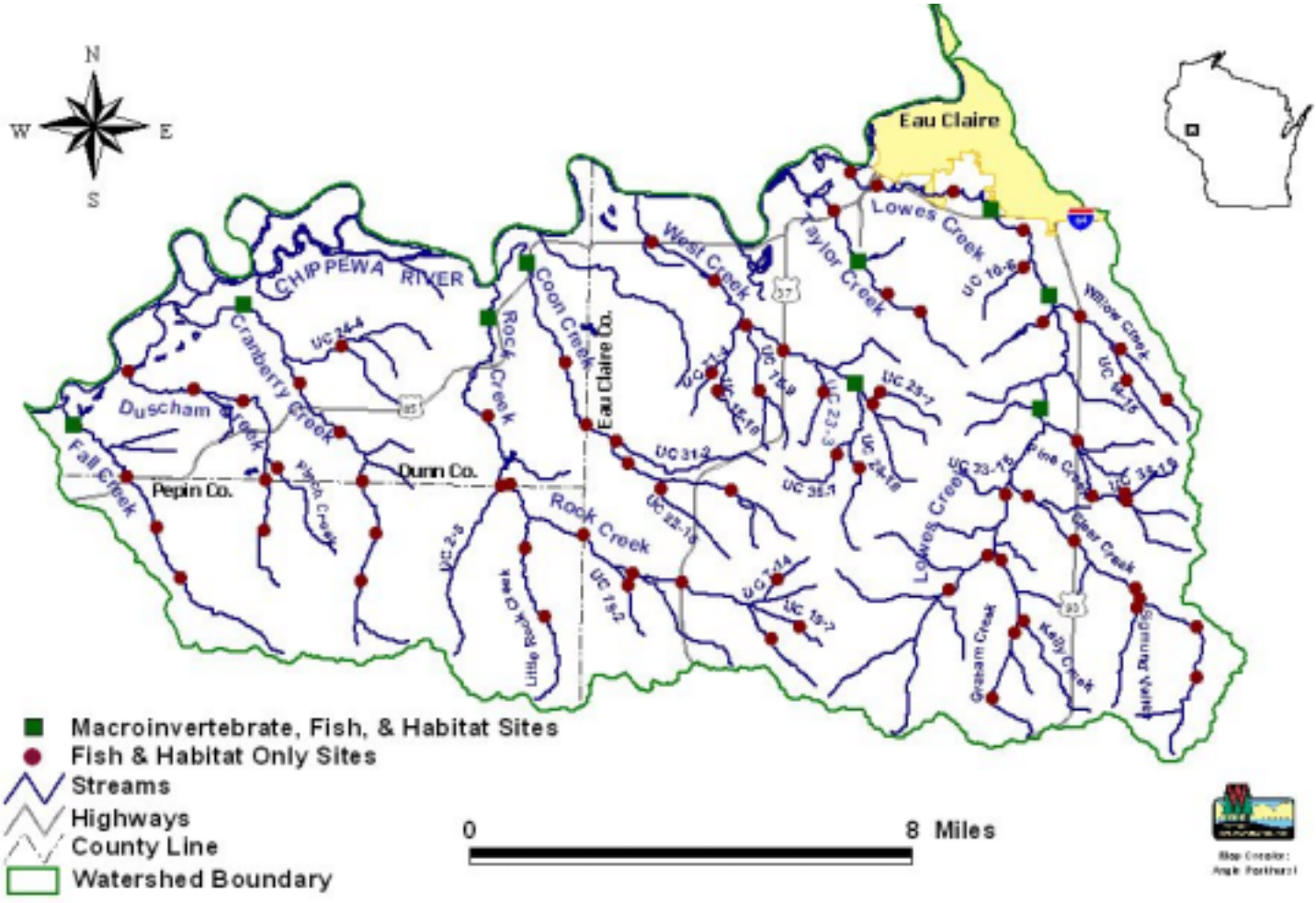
The methods employed during this survey varied according to the type of data collected and habitat differences. The following is a summary of these methods.

Fish Surveys

Electrofishing surveys were conducted during the summer of 2000 at 84 sites on 34 streams in the watershed (Figure 4). Surveys were conducted at approximately one site per mile of permanent stream. Each site was 35 times the mean stream width in length. Single-run electrofishing surveys were conducted at each site to inventory the sport and nongame fish communities. Within each survey site, all fish species were identified and counted to determine the fish assemblage. Then, a coldwater Index of Biotic Integrity (IBI) (Lyons, et al, 1996) was used to assess the quality and health of the fish community. Only the coldwater IBI was used because all of the sites had maximum daily average temperatures below the 22 °C threshold required for this index. In addition, a salmonid relative catch per unit effort (CPUE) was calculated to determine relative abundance within the watershed.

On small streams, fish were collected using either one or two AbP-3 pulse DC backpack shockers. On larger streams, fish were collected using either one or two 235 Volt, 5 Amp DC generator-type stream shockers with1 to 3 electrodes per shocker. All fish collected were identified to species and counted. All game and panfish were measured to the nearest 0.1 inch.

Figure 4. Lowes and Rock Creeks Watershed Survey Sites of 2000.



Habitat Assessment

Habitat assessments were conducted at each fish survey site (Figure 4) following procedures outlined in Simonson et al. (1994). The habitat segments were the same as those used for the fish surveys. The assessments included measurement of stream flow, width, depths, substrate composition, and streambank characteristics. Stream flow was measured with a Swoffer 2100 Flow meter calibrated for each propeller used in the survey. Fish habitat ratings were determined for each site according to guidelines outlined in Simonson et al. (1994).

Macroinvertebrates

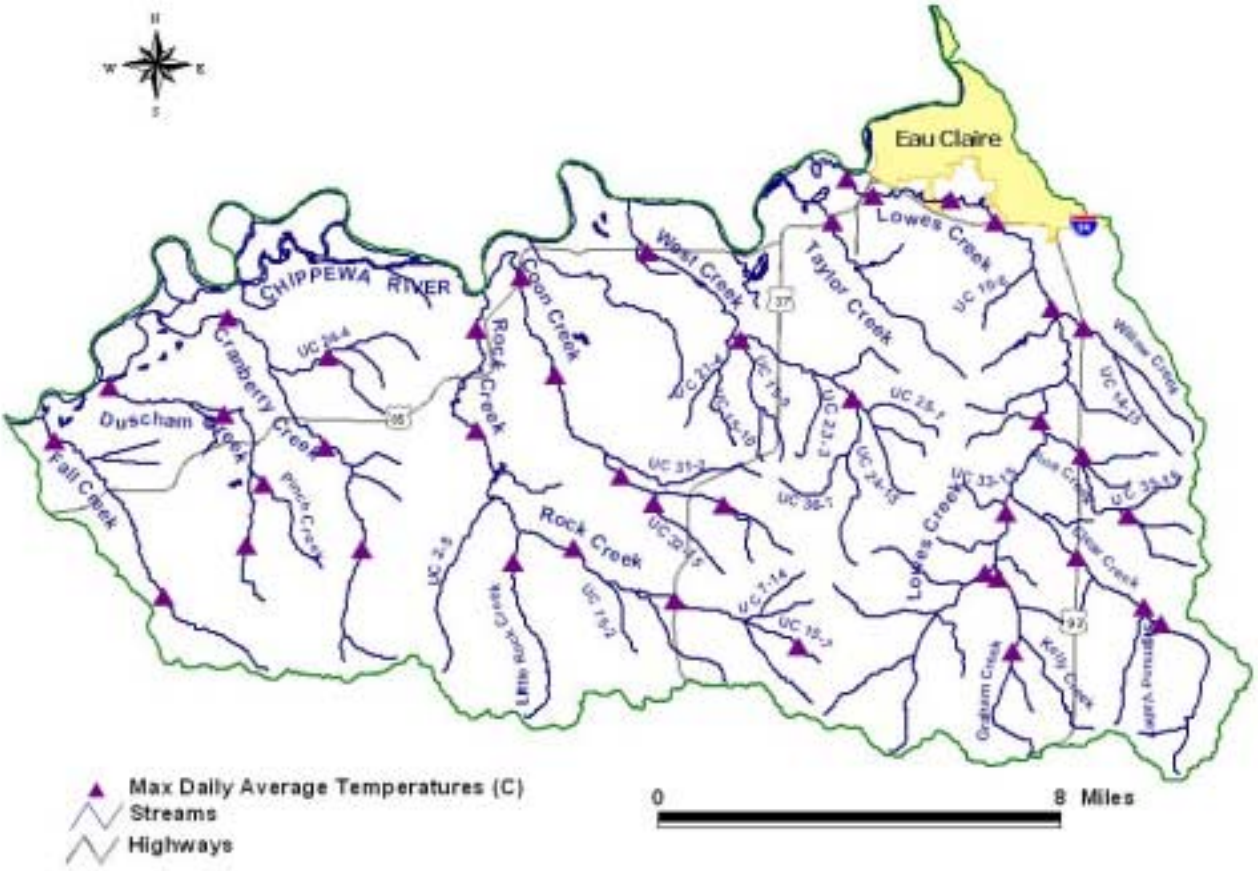
Aquatic macroinvertebrates were collected at nine sites in the watershed, generally near the mouth of the stream of interest (Figure 4). Sites were located on Coon, Cranberry, West, Fall, Taylor, Lowes, and Rock Creeks. Samples were collected with a D-frame net using methods outlined in Hilsenhoff (1982). The samples were preserved with 70% ethanol and sent to UW-Stevens Point for sorting and identification. Results were reported using the Hilsenhoff Biotic Index (HBI) which provides a relative measure of organic loading to a stream.

Temperature

Instantaneous temperatures were taken with each habitat assessment, as well as long term temperature monitoring which was conducted throughout the summer using HOBO units. These HOBO units were placed at 41 sites and recorded temperatures at 15 minute intervals continuously (Figure 5). At all sites, the maximum summer daily average temperatures were calculated using the following steps:

1) Calculate daily average temperatures based on data collected at 15 minute intervals (96 temperature values per day were averaged to produce 1 daily average value)
2) Of the daily averages calculated over the summer sampling period (~90 days = 90 values), the maximum value of those 90 was reported as the "maximum summer daily average".

Figure 5. Lowes and Rock Creeks Watershed Temperature Monitoring Sites of 2000.



Results:

Fish Populations

The fish populations within the watershed were analyzed using the coldwater Index of Biotic Integrity (IBI) which provides a relative measure of coldwater fish community health. Figure 6 shows the resulting scores and serves as a reference map for the charts in this section. Each site on the map has an associated map number, which also reflects the location within the stream. For example, a map number ending with "1" indicates the site is furthest downstream, if it ends with "2", it indicates the site is the second furthest downstream, etc. A fish species listing by subwatershed can be found in Table 3, and more detailed site data can be found in Figures 7 to 20. Comprehensive site data can be found in Appendix B.

Figure 6. Lowes and Rock Creek Watershed Fish IBI Scores of 2000. The numbers in bold print next to each site correspond to the station/map number found in all the figures and appendices in this report. The numbers with a "*" indicate fewer than 25 fish were captured at the site.

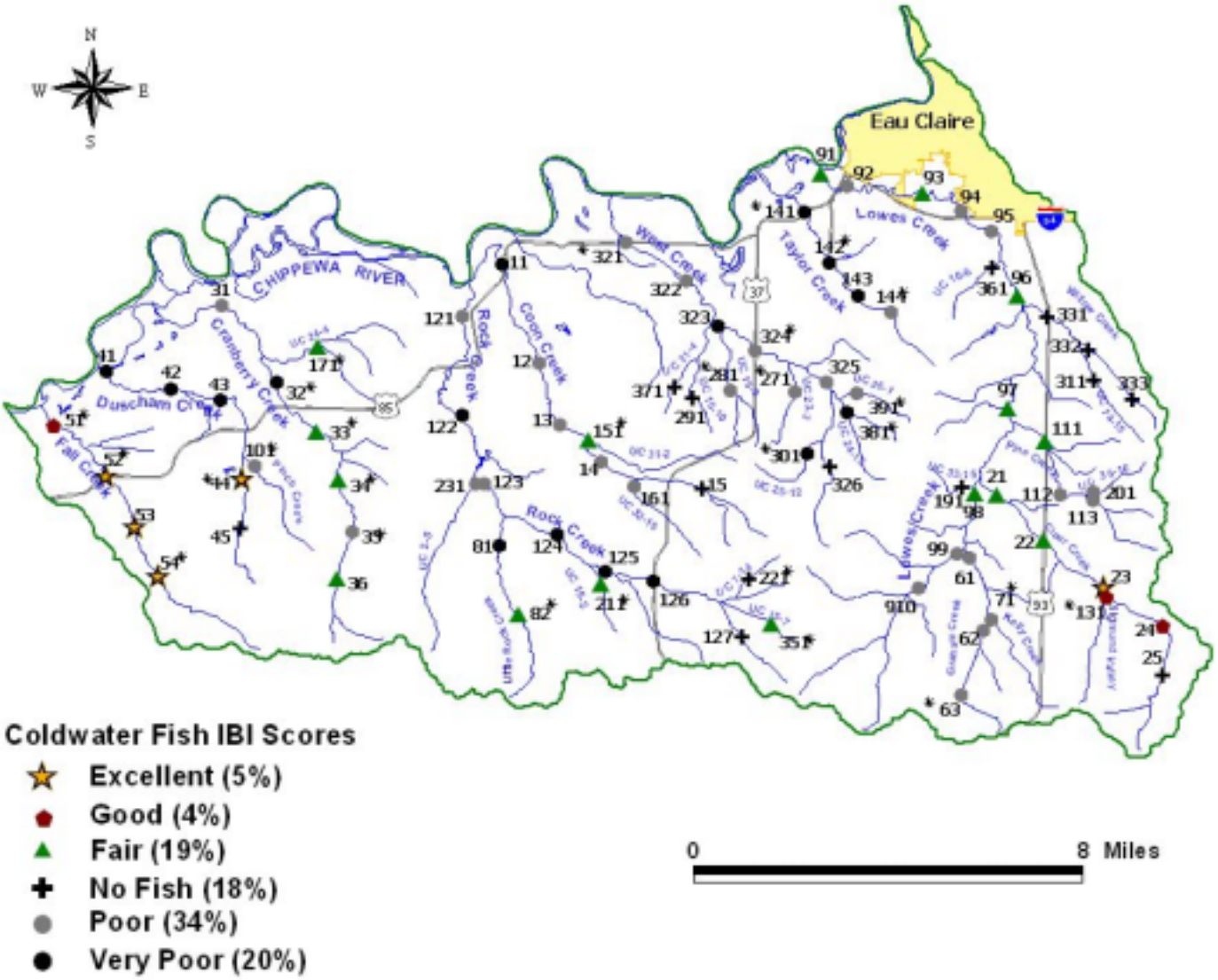


Table 3. Fish species caught in each subwatershed of the Lowes and Rock Creeks watershed in 2000.

*Species	Fall	Duscham	Cranberry	Rock	Coon	West	Taylor	Lowes	Willow (to Lowes)	Pine (to Lowes)	Clear (to Lowes)	Graham (to Lowes)
Am Brook Lamprey			6	3	2	6		147	NO FISH	2	10	5
Black Bullhead				6	2							
Blacknose Dace		2	14	64	28	57	3	79		35	5	47
Blackside Darter		6	4			2						
Bluegill						4		17				
Bluntnose Minnow				5								
Brassy Minnow					4	1		125				
Brook Stickleback	1	5	41	84	176	18	33	11		130	7	193
Brook Trout	84	3						3		1	85	
Brown Trout	4			5	7			83			7	12
Burbot				1		1		3				
Central Mudminnow		14	5	205	44	7		14		18	45	18
Common Shiner				16								
Creek Chub	1	88	27	174	2	52	64	39		15	2	17
Fantail Darter				46	7			43				
Fathead Minnow		1		24	17	10	1	3		102	1	80
Freshwater Drum								1				
Golden Redhorse								1				
Hornyhead Chub				8								
Iowa Darter			1									
Johnny Darter			1	37	15	5		58		30	11	11
Largemouth Bass					1							
Logperch								2				
Longnose Dace		8	1	45	4	10		50				
Mottled Sculpin								162		1	96	
N Hog Sucker								17				
N Redbelly Dace						1						
Pearl Dace				49								
Rock Bass								3				
Shorthead Redhorse						1		3				
Slimy Sculpin										1		
Silver Redhorse								3				
Smallmouth Bass								3				
Spotfin Shiner								1				
Walleye								2				
White Sucker	4	42	9	138	47	78		228				19
Yellow Perch					4							
Totals:	24	169	109	910	360	253	101	1101	0	335	269	402

*No Threatened or Endangered species were found during this survey.

Fall Creek Subshed Fish Communities

The Fall Creek subshed had an average IBI rating of "Good" (n=4). A total of 84 brook trout and 4 brown trout were found in this subshed, making this site the second highest number of brook trout caught in the Lowes and Rock Creeks watershed (Figures 7 & 8). However, it should be noted that 1000 small fingerling brook trout were stocked in 1999 (Appendix A).

Figure 7. Fall Creek Subshed Fish Data. The site farthest downstream has the lowest number.

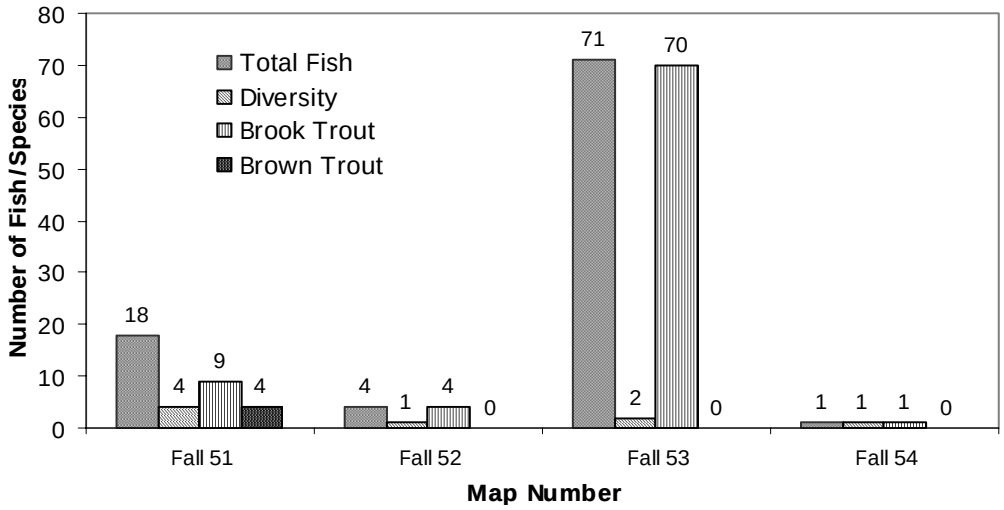
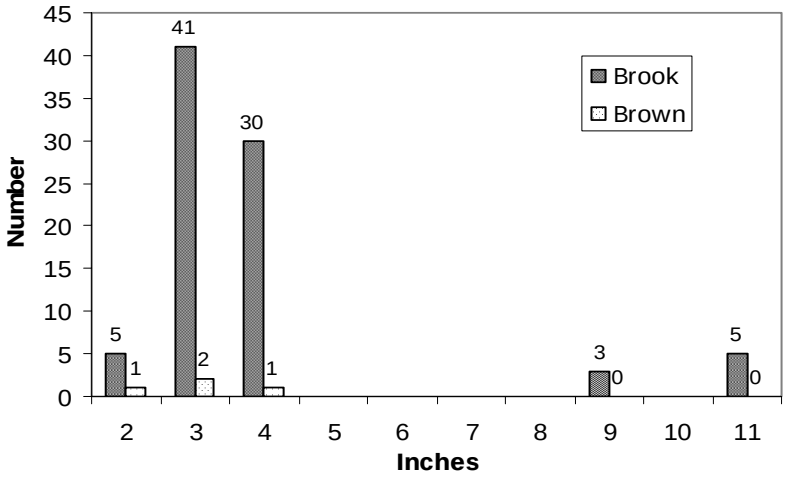


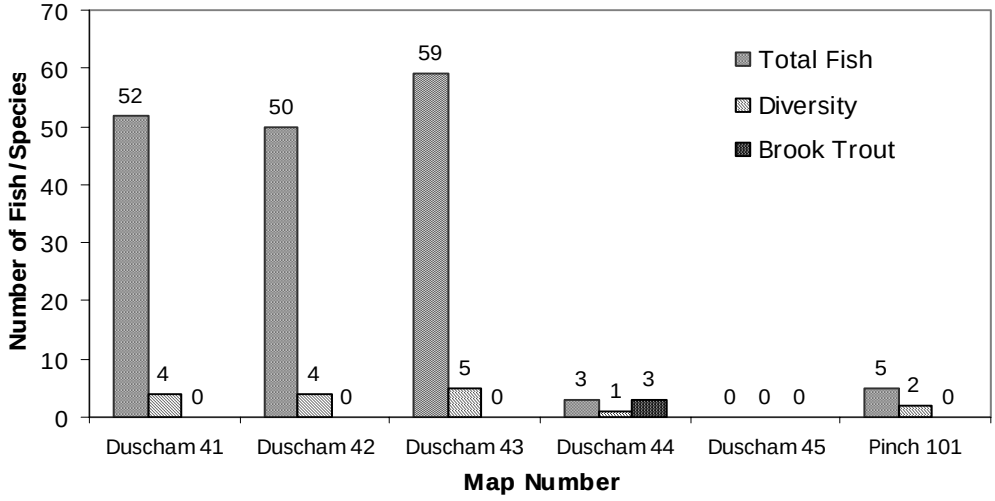
Figure 8. Fall Creek Trout Data.



Duscham Creek Subshed Fish Communities

The Duscham Creek subshed had overall IBI rating of "Poor" for its fish assemblages, with the upper reaches having the worst communities (n=6) (Fig 9). The dominant fish caught in this subshed were creek chubs and white suckers.

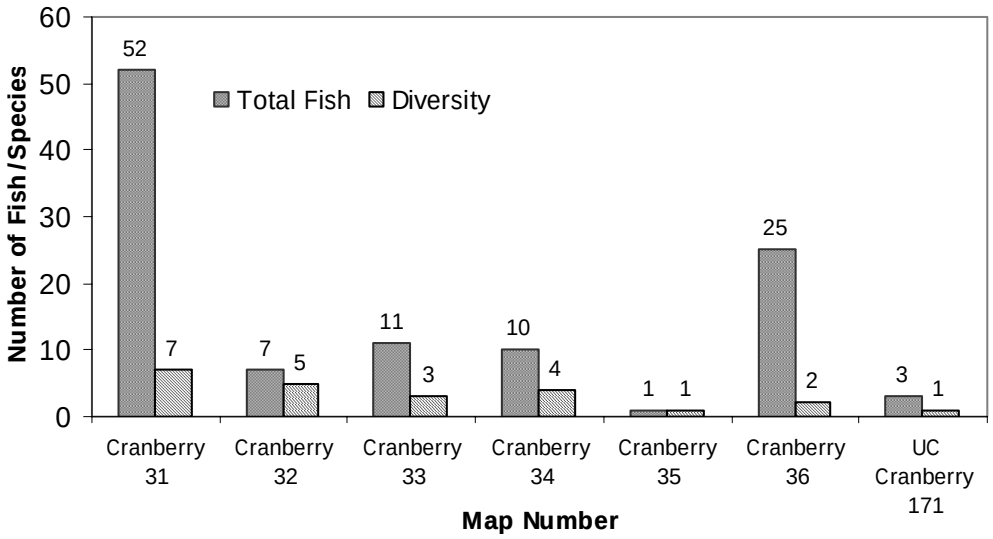
Figure 9. Duscham Creek Subshed Fish Data. The site farthest downstream has the lowest number.



Cranberry Creek Subshed Fish Communities

The Cranberry Creek subshed had an average IBI rating of "Poor" (n=7). Although overall ratings averaged as "Poor", 4 of the 7 sites had ratings of "Fair". No trout were found in this subshed, and the overall counts of fish were low (Fig 10). In addition, most of the fish found in the lower reaches of Cranberry Creek are "tolerant" species as defined in the coldwater IBI such as creek chub and blacknose dace. But in the upper sites that scored "Fair", fewer tolerant species were captured, in addition to the capture of American Brook lampreys which are categorized as a coldwater species.

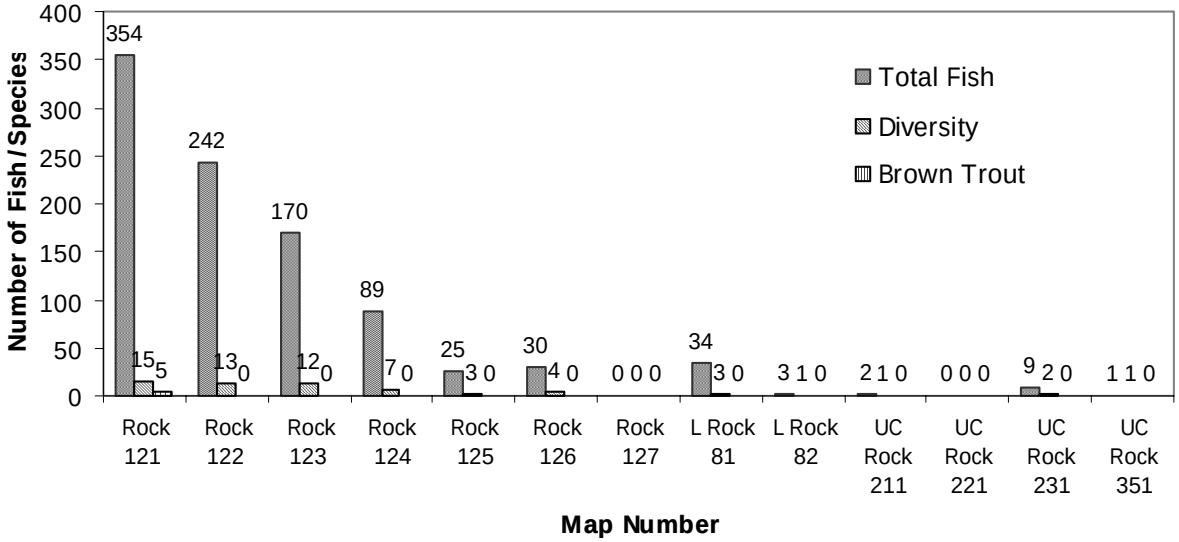
Figure 10. Cranberry Creek Subshed Fish Data. The site farthest downstream has the lowest number.



Rock Creek Subshed Fish Communities

The Rock Creek subshed had an average IBI rating of "Poor" (n=13). Only 5 brown trout were found in this subshed at the site farthest downstream, and ranged in size from 6 to 11 inches. The upper portions including the unnamed creeks had much fewer fish and had mostly brook sticklebacks and central mud minnows, despite cold stream temperatures averaging below 20°C (Fig 11).

Figure 11. Rock Creek Subshed Fish Data. The site farthest downstream has the lowest number.

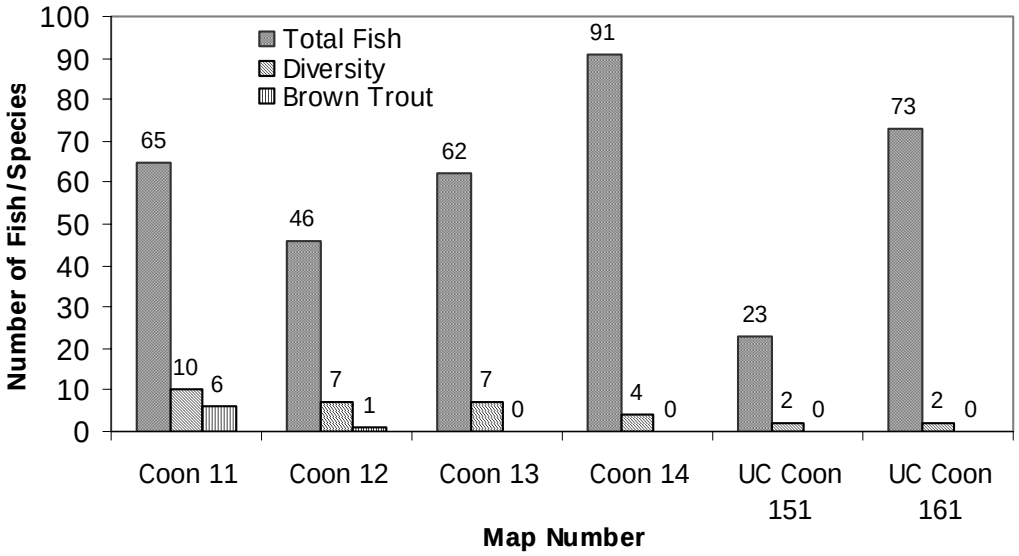


Coon Creek Subshed Fish Communities

The coon creek subshed is similar to Rock Creek with and average IBI score of "Poor" (n=7), and only 7 brown trout caught near the mouth of the mainstem (Fig 12). However, the mainstem rated worse for the IBI than the upper reaches of this subshed (Fig 6). Of the 7 brown trout captured, 4 were young-of the year brown trout and 3 were adults. It is possible some limited reproduction of brown trout is taking place in lower Coon Creek, and this can be further confirmed since stocking has not

occurred since the 1960's. However, coldwater IBI ratings were poorer in the stations where brown trout were captured when compared to upstream reaches which were dominated by brook sticklebacks and central mud minnows (Fig 6).

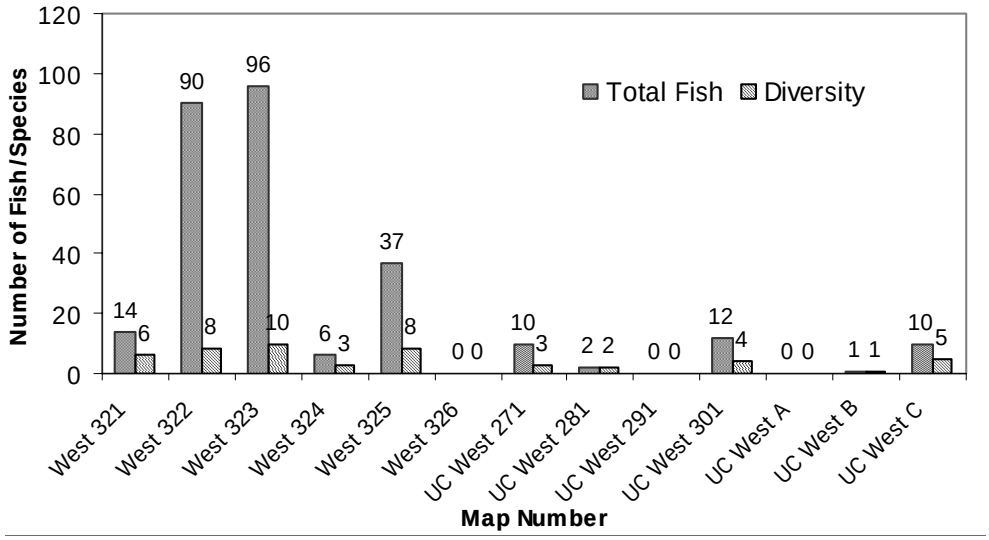
Figure 12. Coon Creek Subshed Fish Data. The site farthest downstream has the lowest number.



West Creek Subshed Fish Communities

The West Creek average IBI score was "Very Poor" (n=13). No trout were found in this subshed, and the quality of the coldwater fish communities rated from poor to very poor (Fig 6). The number and diversity of fish in this subshed were variable, with the dominating species of white suckers, blacknose dace, creek chubs, and brook sticklebacks (Fig 13).

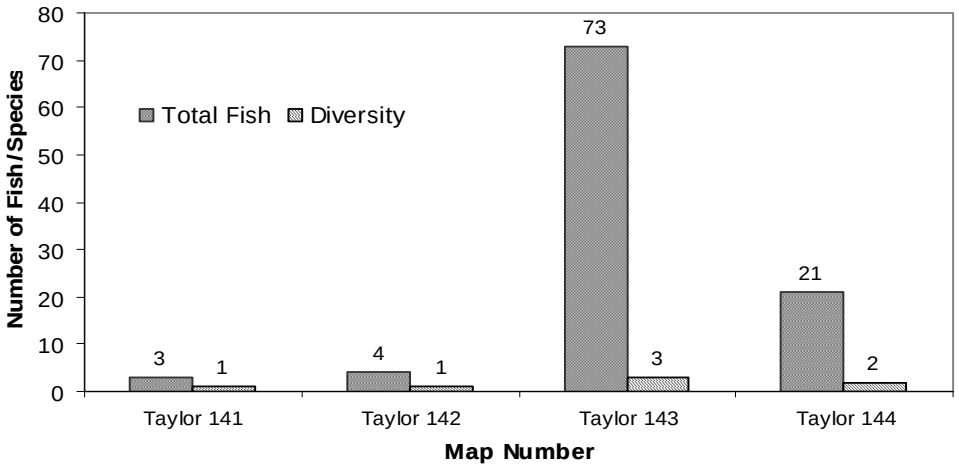
Figure 13. West Creek Subshed Fish Data. The site farthest downstream has the lowest number.



Taylor Creek Subshed Fish Communities

Taylor creek is the smallest of the subsheds, and rated with an average IBI score of "Very Poor" (n=4). The majority of fish caught were brook sticklebacks and creek chubs, with a very low diversity of other fish species (Fig 14).

Figure 14. Taylor Creek Subshed Fish Data. The site farthest downstream has the lowest number.



Lowes Creek Mainstem Fish Communities

The fish community IBI (n=12) on the mainstem rated poor to fair, and had a total of 83 brown trout and 3 brook trout (Fig 15). The overall abundance and diversity were composed of about 50% intolerant and 50% tolerant fish species (Fig 16). The most dominant fish species in the mainstem comprising 60% of the catch were white suckers, mottled sculpin, American brook lamprey, and brassy minnows, respectively.

Figure 15. Lowes Creek Mainstem Trout Length Frequencies.

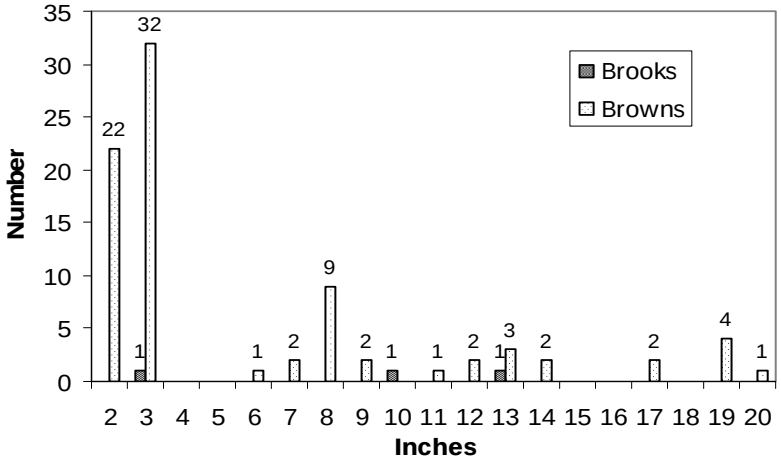
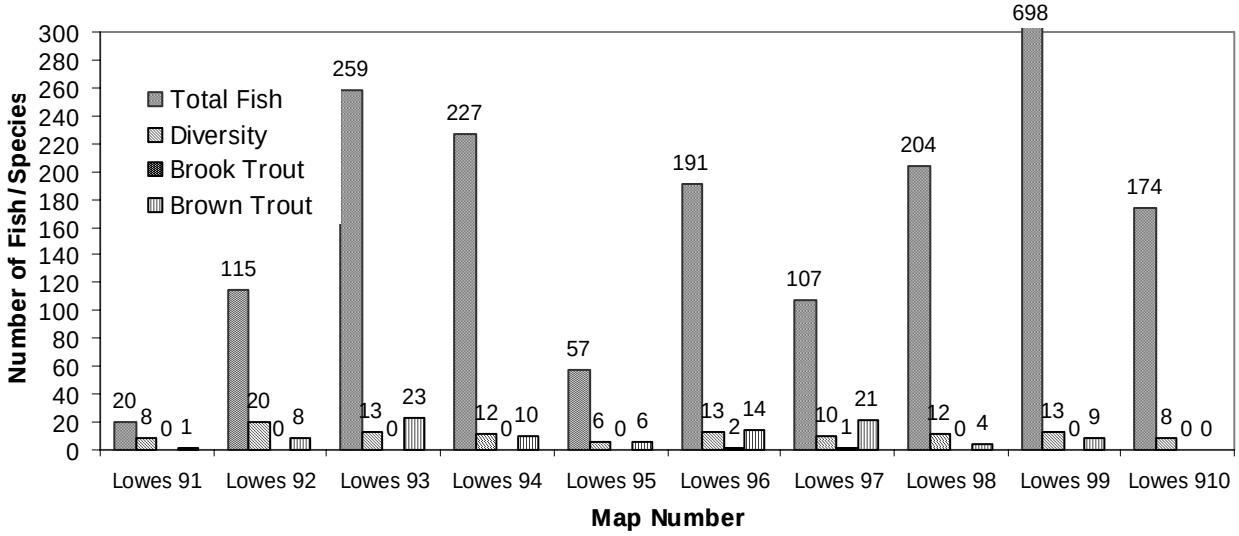


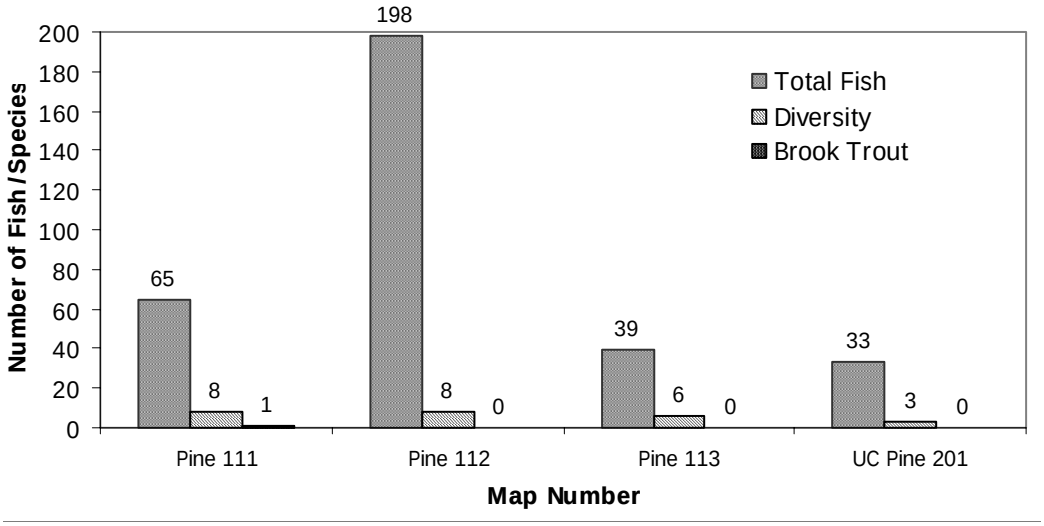
Figure 16. Lowes Creek Mainstem Fish Data. The site farthest downstream has the lowest number.



Willow Creek Subshed of Lowes Creek Fish Communities
No fish were caught at the 4 sites sampled. However it was noted on field sheets that brook trout were present below the first site sampled.

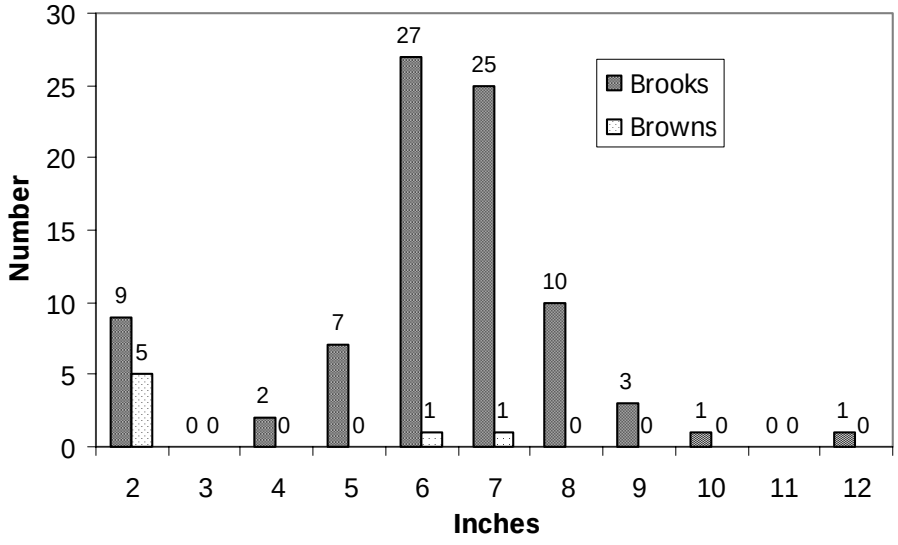
Pine Creek Subshed of Lowes Creek Fish Communities
The Pine Creek subshed was rated an average IBI score of "Poor" (n=4). Only 1 brook trout was caught at the site nearest the mouth, and the rest of the sites in this subshed rated poor on the IBI, with most fish caught being either brook sticklebacks or fathead minnows. The overall fish counts and diversity was mixed (Fig 17).

Figure 17. Pine Creek Subshed of Lowes Creek Fish Data. The site farthest downstream has the lowest number.



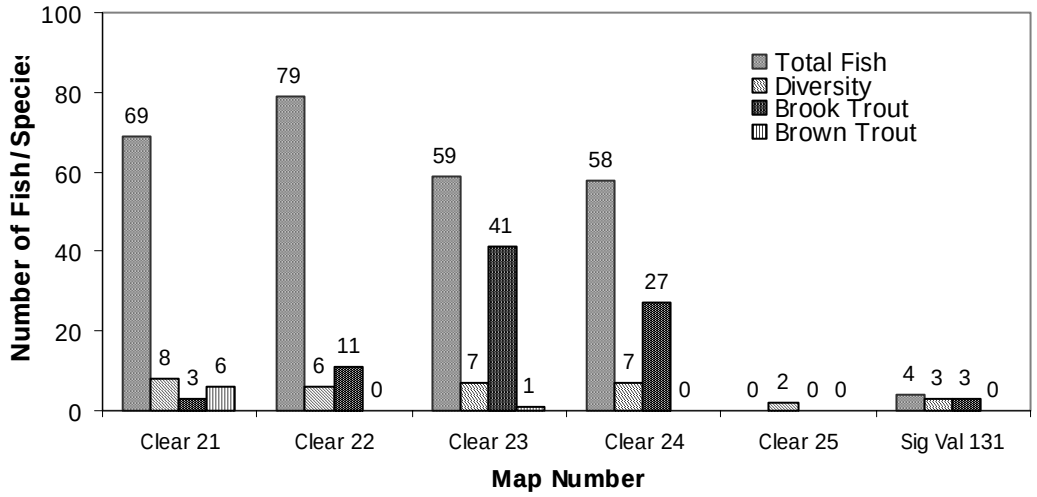
Clear Creek Subshed to Lowes Creek Fish Communities
The Clear Creek subshed had an average IBI rating of "Good" (n=6), ranking it one of the best in the watershed. Both brown and brook trout were captured in this subshed, with brook trout outnumbering browns almost 12 to 1 (Fig 18). The brown trout captured were mostly 2 or 3 inches, whereas the brook trout had a more evenly spread lengths that ranged from 2 – 12 inches.

Figure 18. Clear Creek Subshed to Lowes Trout Length Frequencies.



The overall abundance and diversity of the Clear Creek subshed had better values along the mainstem of Clear Creek than the upper reaches (Fig 19).

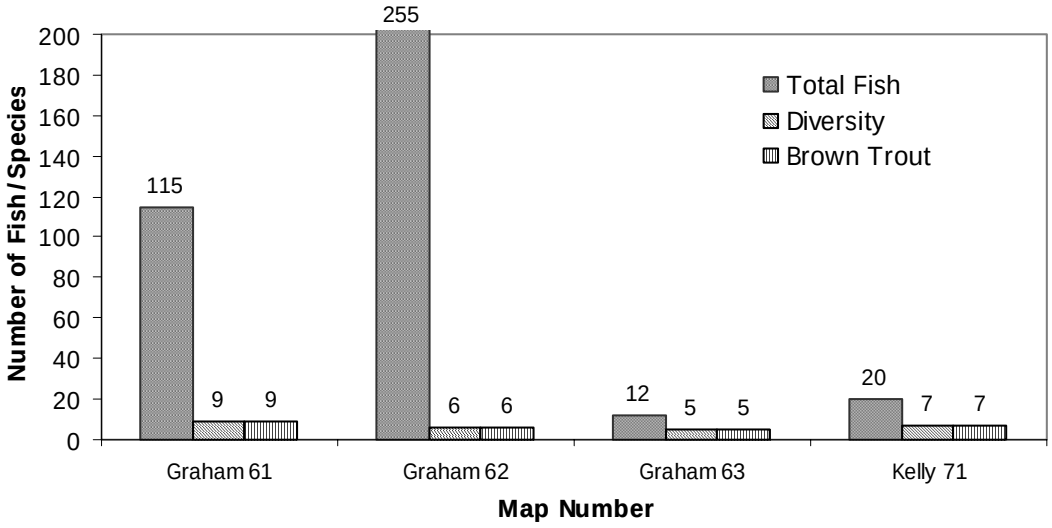
Figure 19. Clear Creek Subshed to Lowes Fish Data. The site farthest downstream has the lowest number.



Graham Creek Subshed to Lowes Creek Fish Communities

The Graham Creek subshed had an average IBI score of "Poor" (n=4). Only brown trout were captured in this subshed, and overall abundance was the greatest at the downstream sites, and diversity was about the same at all sites (Fig 20). The dominant fish species caught throughout all sites were brook sticklebacks and fathead minnows

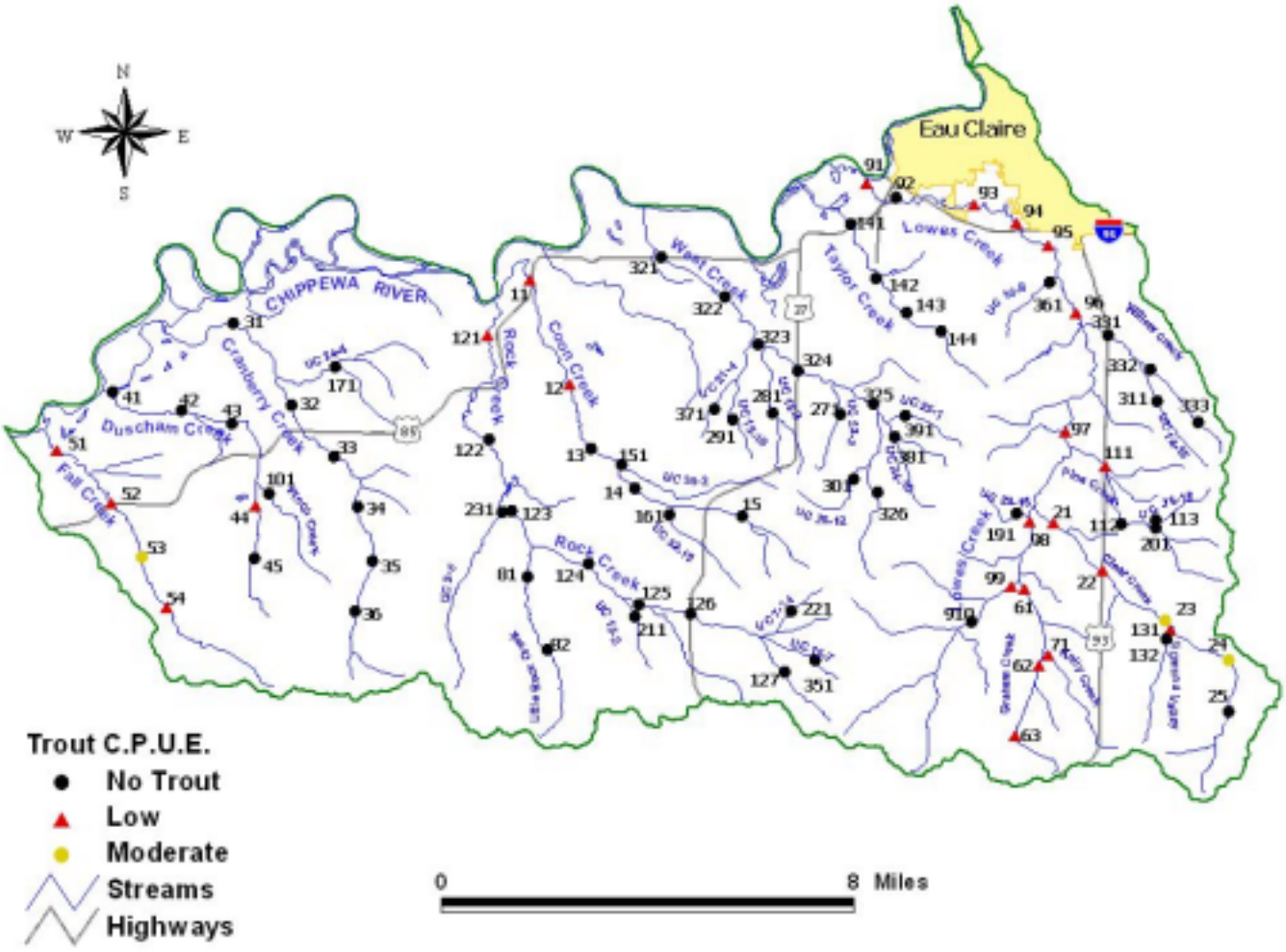
Figure 20. Graham Creek Subshed of Lowes Creek Fish Data. The site farthest downstream has the lowest number.



Trout Abundance

Of the streams where brook and/or brown trout were found, the densities were mostly low (Figure 21, Appendix C).

Figure 21. Trout Catch per Unit Effort (CPUE) ratings for the Lowes and Rock Creeks Watershed. A "Low" rating indicates less than 250 trout per mile, and a "Moderate" rating is from 250-1000 trout per mile. The numbers in bold print next to each site correspond to the station/map number found in all the figures and appendices in this report.



Brown trout were found in all subsheds, and dominated most areas except for the Fall and Clear Creek subsheds where brook trout were more abundant. No brook trout were found in the Coon, Rock, lower mainstem of Lowes (sites 91-95 which are closest to the City of Eau Claire), and the Graham Creek subsheds.

Fish Habitat Ratings

The aquatic habitat conditions of the streams were evaluated based on their overall condition and their suitability to support stream fish. These habitat scores from the 84 sites surveyed were similar throughout the watershed, with about each half of the sites rating either "Fair" or "Good" (Figure 19). However, better distinctions of fish habitat quality can be made when the ratings are divided into 2 main categories (Table 4):

1. Non-aquatic (external) habitat factors (riparian buffer area and bank erosion).
2. Aquatic (internal) habitat factors (amount of fine sediments, pool area, fish cover).

Figure 19. Lowes and Rock Creeks Watershed Habitat Scores for 2000. The numbers in bold print next to each site correspond to the station/map number found in all the figures and appendices in this report.

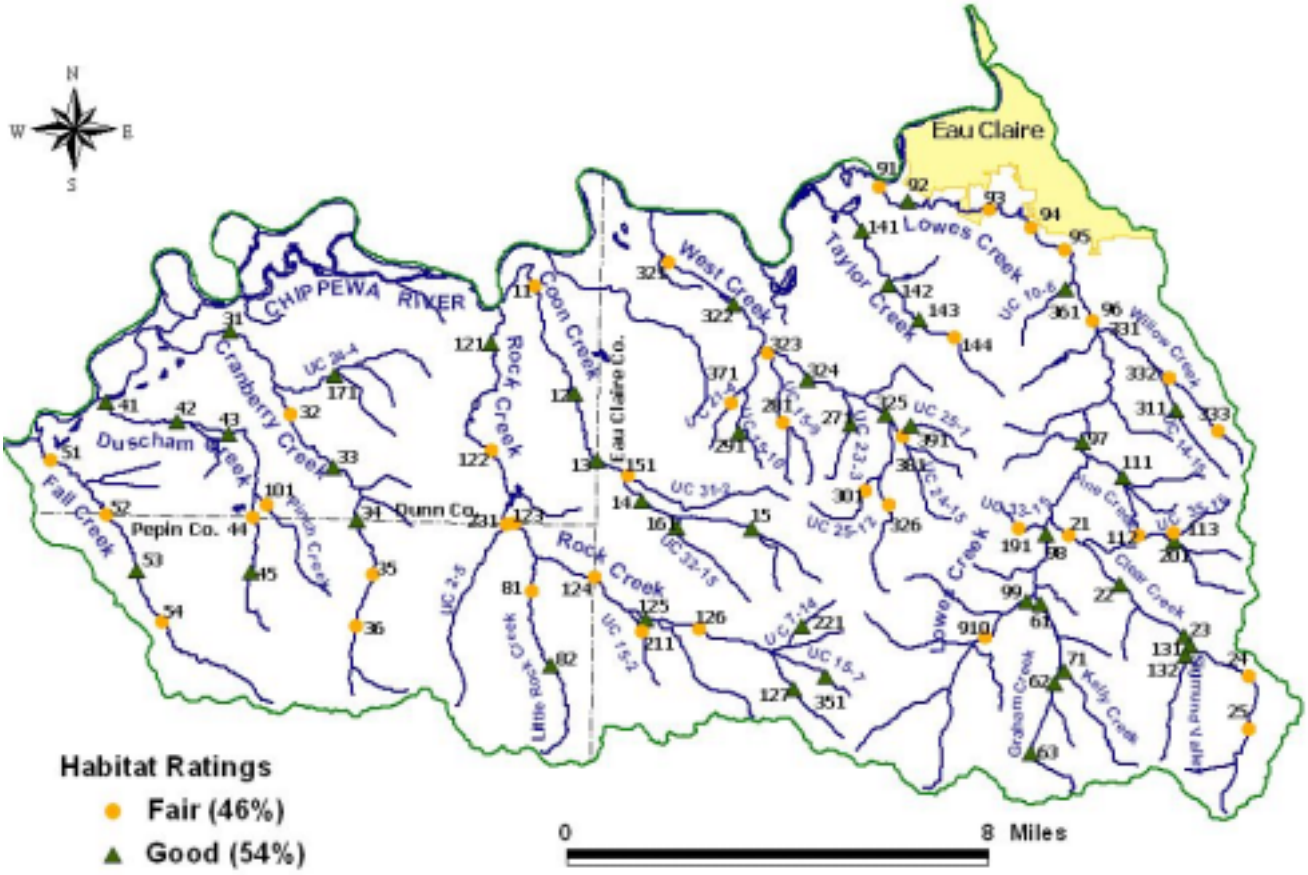


Table 4. Average habitat scores categorized by aquatic and non-aquatic habitat factors and compared to the average coldwater IBI score for each subshed.

Subshed	Average Coldwater IBI	Aquatic Habitat Factors (fine sediments, pools, fish cover)	Non-Aquatic Habitat Factors (riparian buffer area, bank erosion)
Fall Creek	Good	Poor to Fair	Good
Duscham Creek	Poor	Poor	Excellent
Cranberry Creek	Poor	Poor	Good
Rock Creek	Poor	Poor	Good
Coon Creek	Poor	Poor	Excellent
West Creek	Very Poor	Poor	Good
Taylor Creek	Very Poor	Poor	Good
Lowes Creek Mainstem	Poor to Fair	Poor	Good
Willow to Lowes	No Fish	Poor	Good
Pine to Lowes	Poor	Poor to Fair	Good
Clear to Lowes	Good	Poor	Good
Graham to Lowes	Poor	Poor to Fair	Excellent

Macroinvertebrates

Macroinvertebrates were mostly sampled near the mouth of smaller streams, or along the mainstem of larger streams (Figure 20). For this index, macroinvertebrates are used as indicators of organic pollution that relates to potential problems with dissolved oxygen. However, the sites where the macroinvertebrate index score is high, the coldwater fish IBI score is poor (Table 5). Given the size of the watershed, the relatively low number of samples taken, and the limited interpretation of the score, this category of aquatic resource assessment may be less indicative of the true overall status of the watershed. However, these few data points with high ratings do provide the information that the health of the aquatic environment is satisfactory for aquatic insects, if not for more demanding levels of biota such as fish.

Figure 20. Macroinvertebrate HBI Ratings for the Lowes and Rock Creeks Watershed. The numbers in bold print next to each site correspond to the station/map number found in all the figures and appendices in this report.

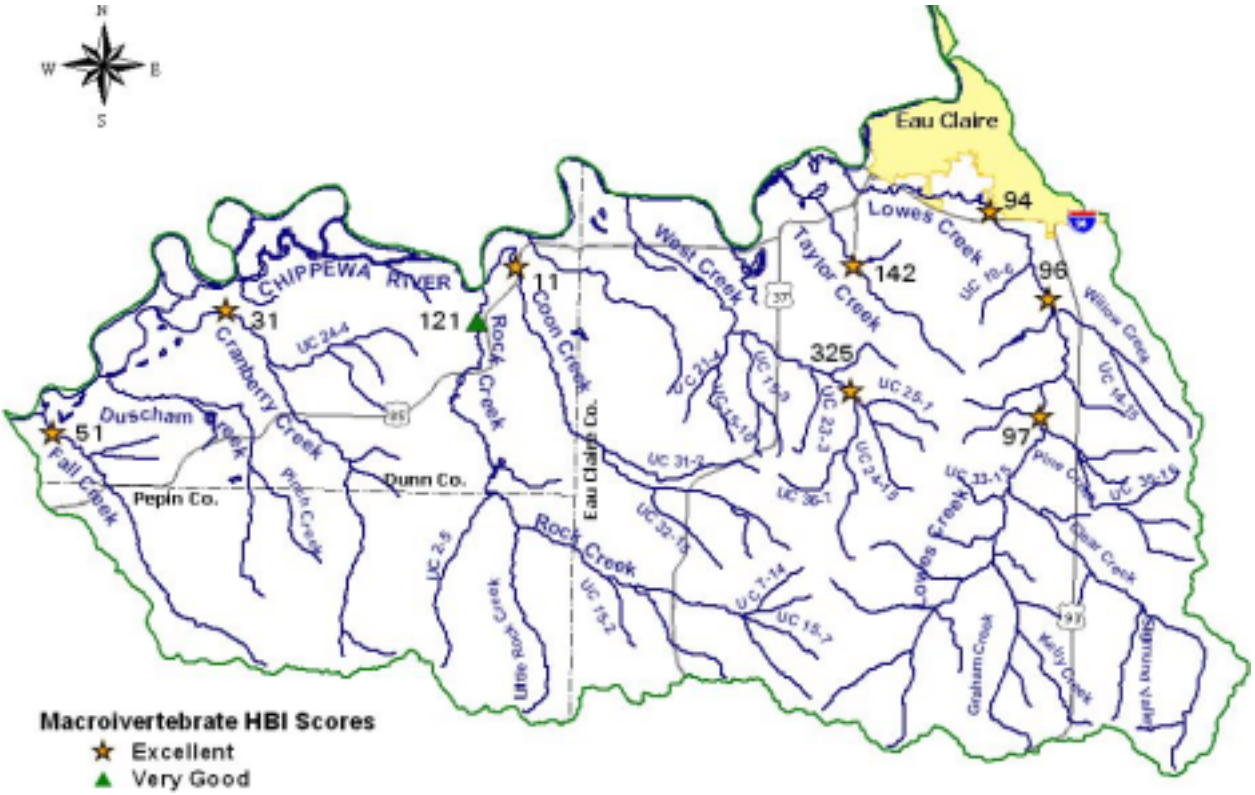


Table 5. Comparison between Macroinvertebrate HBI and Coldwater Fish IBI ratings.

Site	Macroinvertebrate HBI Score	Coldwater Fish IBI Score
Fall 51	Excellent	Good
Cranberry 31	Excellent	Poor
Rock 121	Very Good	Poor
Coon 11	Excellent	Very Poor
West 325	Excellent	Poor
Taylor 142	Excellent	Very Poor
Lowes 94	Excellent	Poor
Lowes 96	Excellent	Fair
Lowes 97	Excellent	Fair

Temperature

Most sites monitored continuously in the summer of 2000 had daily average temperatures that at their peak average, were at or below the coldwater IBI maximum temperature (22°C), except for 3 sites (the Unnamed Creek 32-15 to Coon, and the Duscham Creek sites 1 and 3)(Figure 21). All of the overall summer minimums and maximums had differences that were at least 5 degrees, and 66% of

the sites had differences greater than 10 degrees (Figure 22). The maximum daily average calculation takes the average temperature of each day during the summer, and results in the highest average found. This value is not the highest temperature found, but the highest average.

Figure 21. Maximum daily average temperatures (°C) from Lowes and Rock Creeks Watershed in 2000.

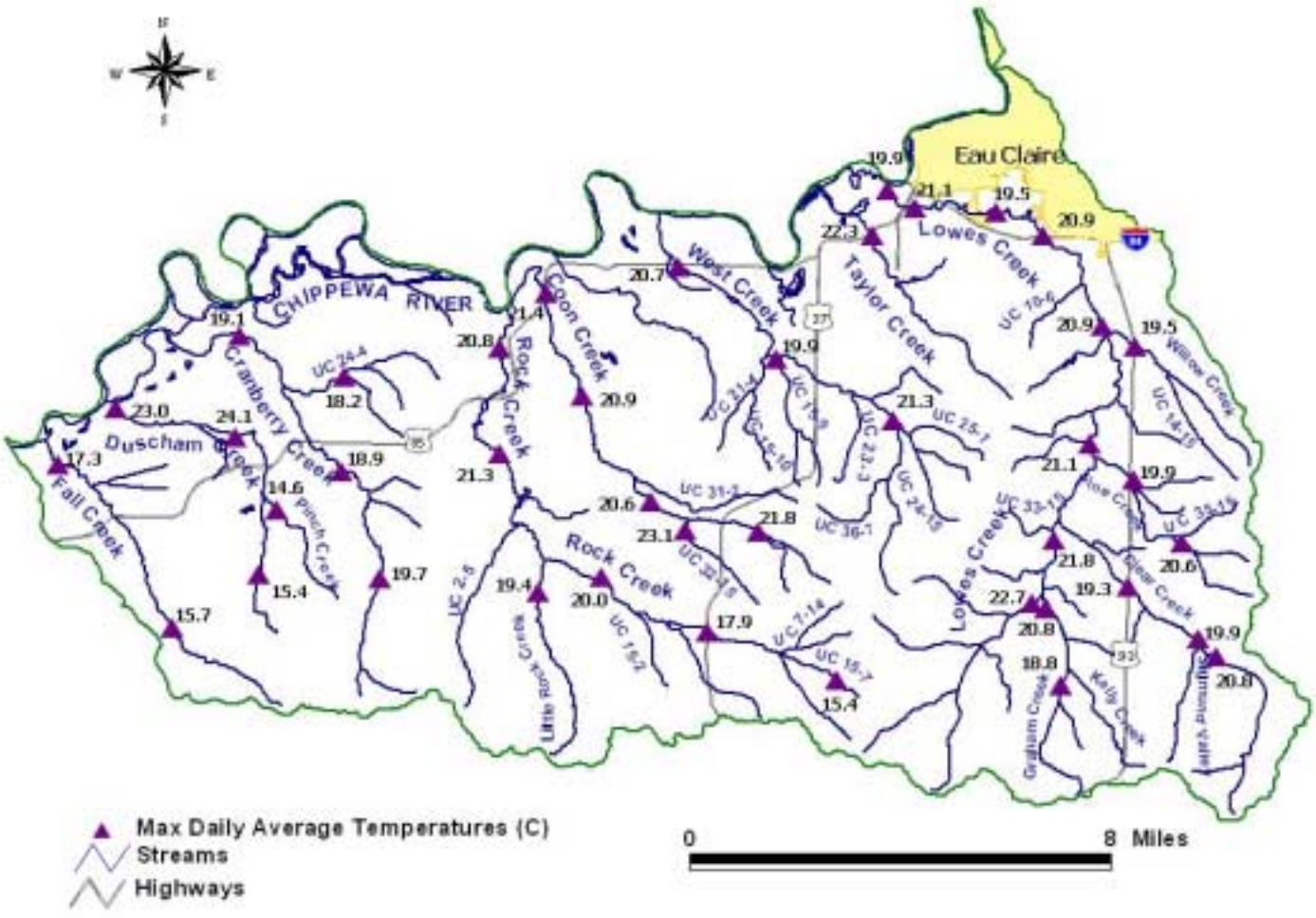
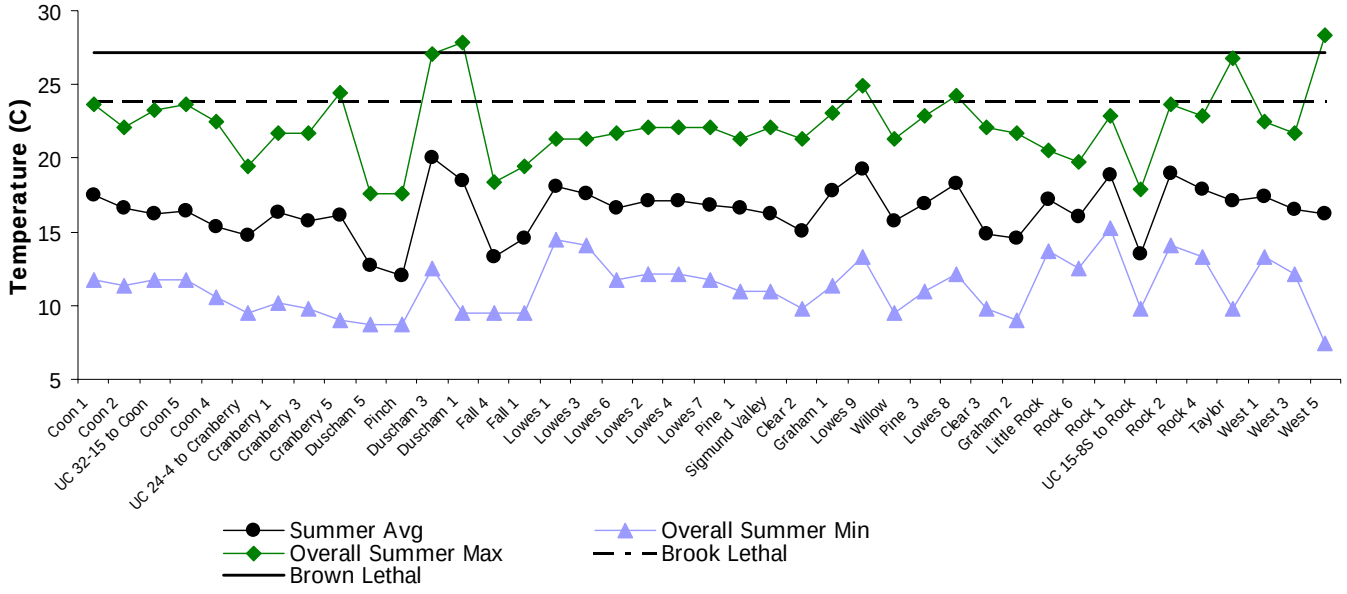
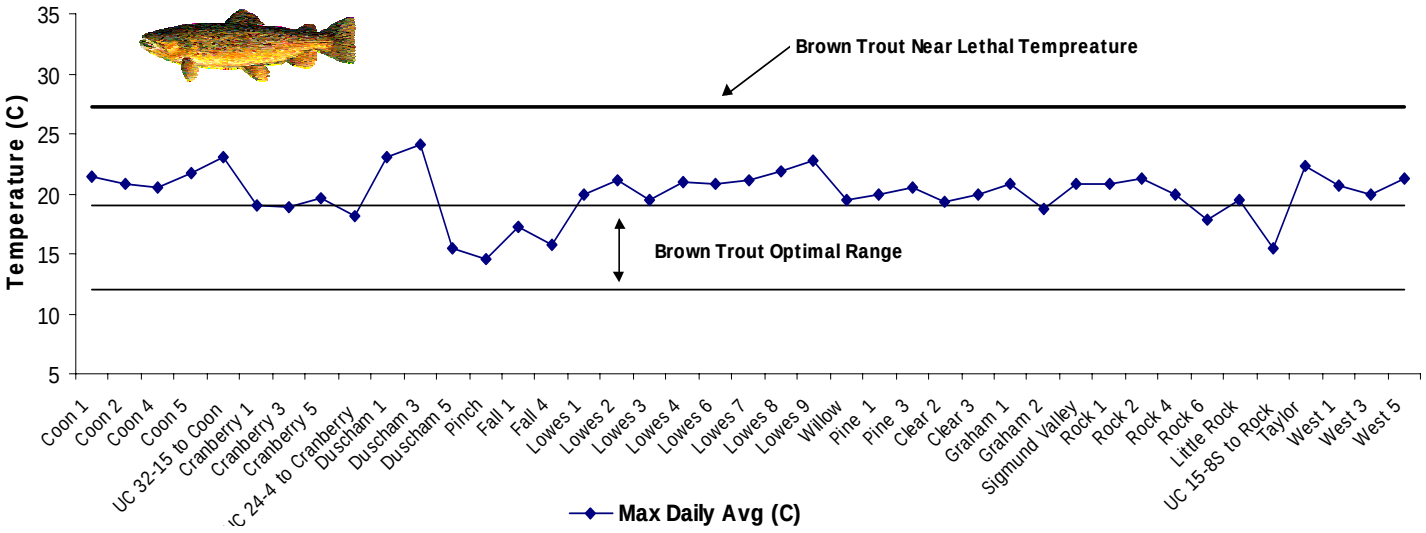


Figure 22. Overall temperature averages, maximums, and minimums during the summer of 2000 compared to near lethal temperatures for brook and brown trout.



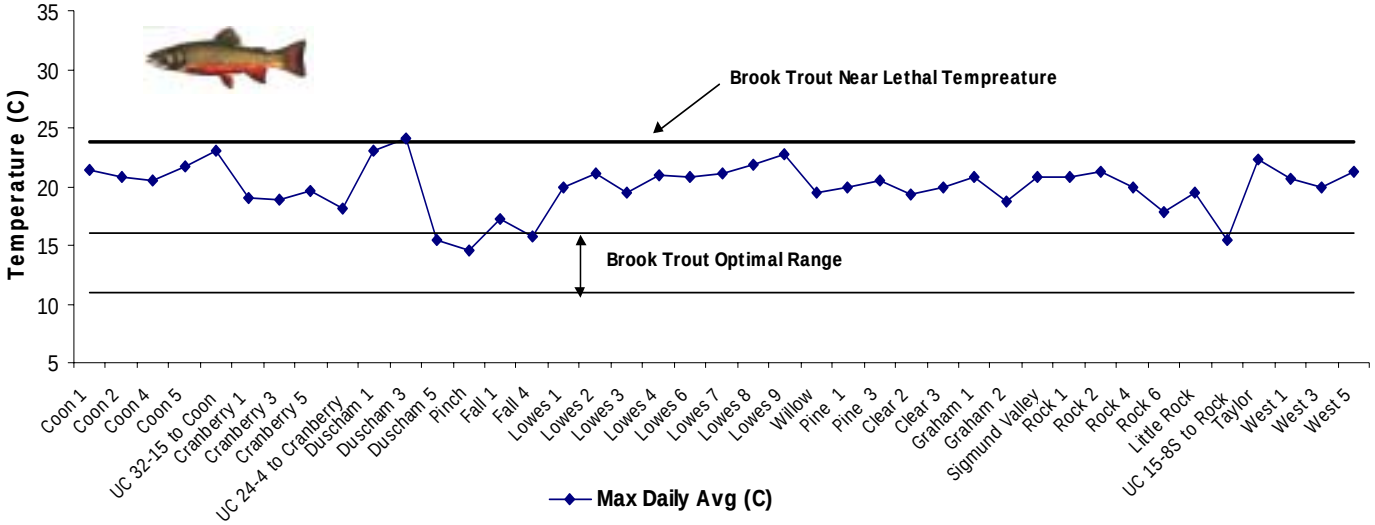
Most sites monitored in 2000 within the watershed did not have maximum daily average temperatures that were within the optimal range for brown trout, except for some sites in the Cranberry, Duscham, Fall, and Rock Creek subsheds (Figure 23). None of the sites had temperatures near the lethal limit for brown trout. However, it should be noted that the temperatures depicted are averages, which means that the streams could have reached both temperatures that are within the optimal ranges of either species, as well as risen into the lethal temperature ranges of either species at some point during the summer.

Figure 23. Near lethal (27.2 °C) and optimal (12-19 °C) temperature range comparisons with the highest daily average found during the summer for brown trout (maximum daily average).



Only 4 out of the 41 sites monitored in 2000 (<10%) have maximum daily average temperatures that are within the optimal range for brook trout and are found in the Fall, upper Duscham, and Rock Creek subsheds (Figure 24). In addition, some sites have average temperatures that are at or near the lethal limit for brook trout such as upper Coon and lower Duscham Creeks subsheds.

Figure 24. Near lethal (23.8 °C) and optimal (11-16 °C) temperature range comparisons with highest daily average found during the summer for brook trout (maximum daily average).



Water Chemistry Data

Water samples were collected on September 20, 2000 at 10 sites, mostly at or near the mouth of the stream except for Lowes Creek samples that were taken along the mid-sections. Summary results are displayed in Table 6 below.

Table 6. Water Chemistry Data collected on 9/20/2000 of the Lowes and Rock Creeks Watershed.

Stream	Site Location	Temp (C)	Dissolved Oxygen (mg/L)	pH (su)	Ammonia (mg/L)	Dissolved Phos. (mg/L)	Total Phos (mg/L)	Total Suspended Solids (mg/L)	Turbidity (NTU)
Fall 51	50th Ave	12	9.1	7.85	0.017	0.113	0.184	20	4.6
Duscham 42	690th Ave	13	8.5	7.8	No Detect	0.112	0.142	2.4	2.0
Cranberry 31	CTH O	12	9.25	7.7	0.014	0.098	0.269	21.3	4.6
Rock 121	150th Ave	13.5	6	7.6	0.056	0.073	0.192	3.67	6.3
Coon 11	190th Ave	12	8.8	7.55	No Detect	0.136	0.245	8	6.2
West 323	CTH Z	11.5	9.3	7.55	0.061	0.099	0.27	29	6.9
Taylor 141	STH 85	11	9.4	7.55	0.037	0.11	0.226	11.3	3.9
Lowes 94	S. Lowes Creek Rd	9	10.2	7.55	0.038	0.12	0.333	11.8	9.0
Lowes 96	CTH II	9.5	9.5	7.75	0.024	0.118	0.32	9.8	6.1
Lowes 97	Cedar Rd	9	9.7	7.5	0.028	0.12	0.29	7.6	8.1

Stream Flows

Flow measurements taken at or near the mouths of most of the streams surveyed within the Lowes and Rock Creeks watershed are displayed below, with the exclusion of the Clear Creek subshed, Graham Creek subshed, and the unnamed tributaries to Rock Creek (Figures 25-27).

Figure 25. Stream flows taken in 2000 within the Cranberry, West, and Taylor Creek subsheds. No trout were found at any of the sites displayed.

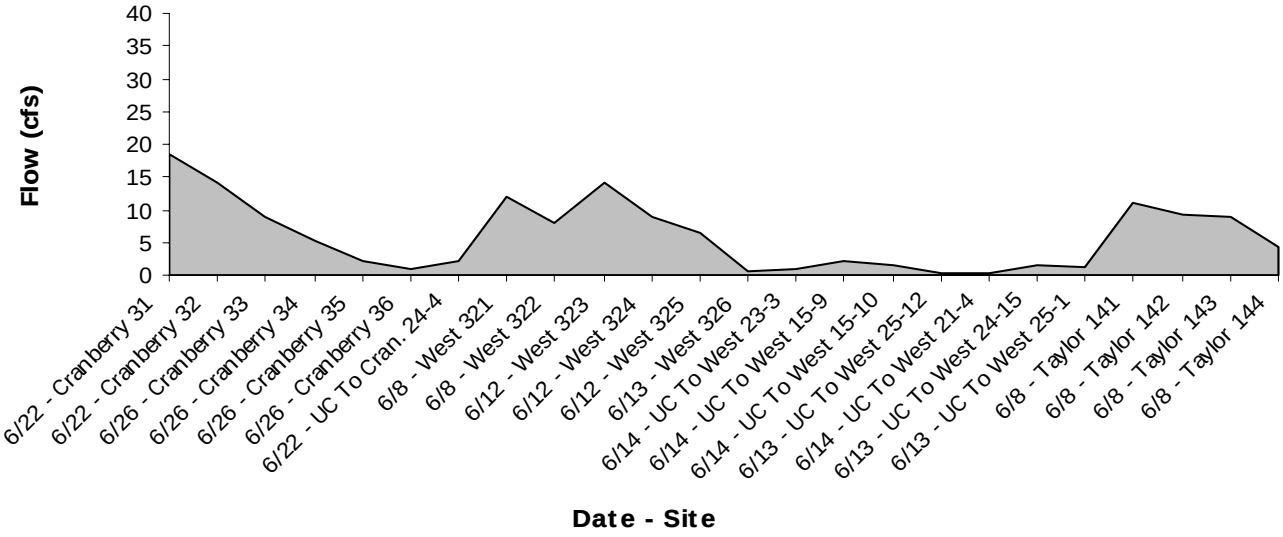


Figure 26. Stream flows taken in 2000 within the Fall, Duscham, Rock and Coon Creek subsheds. Sites prefaced with a "*" indicate presence of trout.

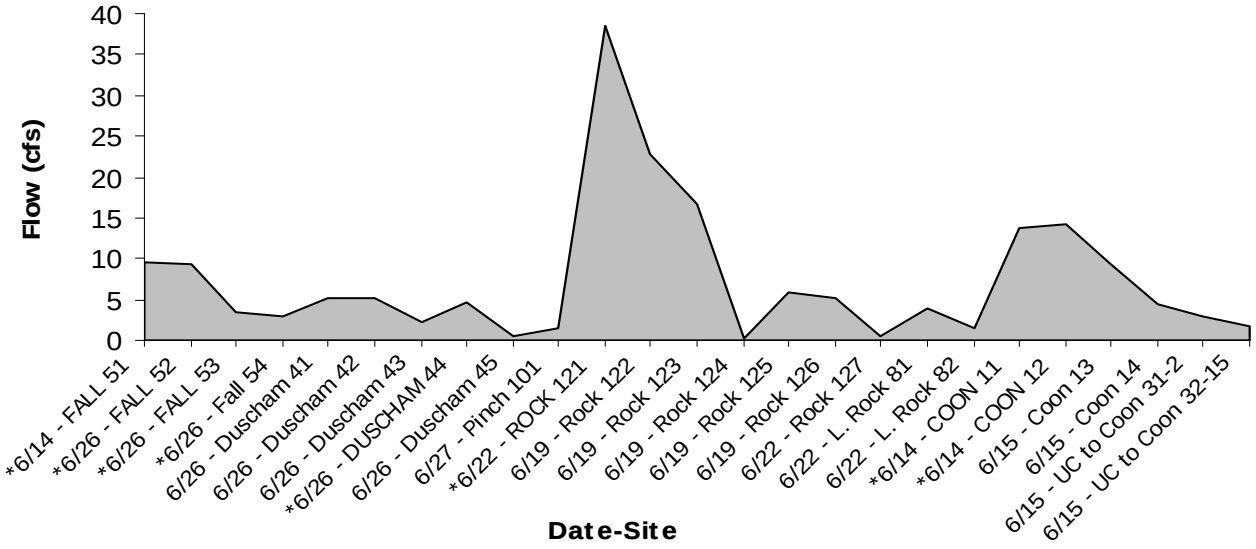
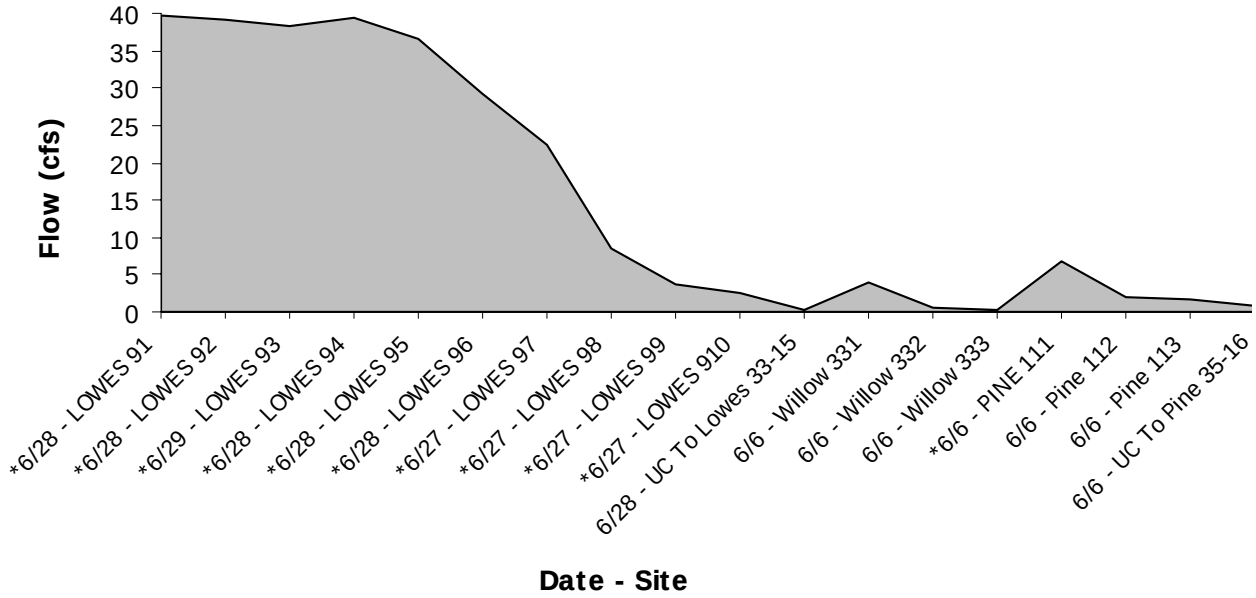


Figure 27. Stream flows taken in 2000 within all of the Lowes Creek Subsheds. Sites prefaced with a "*" indicate presence of trout.



Discussion / Recommendations:

Fall Creek Subshed Summary

The coldwater Index of Biotic Integrety (IBI) rating for this subshed is one of the highest within the entire watershed with an average score of "Good". The applicable interpretations of this score according to Lyons et al (1996) gives evidence for some environmental degradation, with brook trout uncommon and sculpins absent. Also, the top carnivores are abundant and tolerant species do not dominate. Brook trout actually outnumbered the brown trout approximately 20 to 1. The habitat evaluations showed good riparian areas, protected banks, and a fair amount of bends, but abundant fine sediments and only scattered fish cover and pool areas. A clearly visible contributor to the sedimentation problem is at site 3, where the dairy cows have direct and frequent access to the stream. In addition, the sharp differences in elevation throughout this subshed require frequent application of sand during the winter months on roadways, which eventually runs off with spring melt and stormwater. However, temperatures found in this subshed are still within optimal ranges for both brown and brook trout. The differences between summer maximums and minimums do not appear to be great with an average of about 9 degrees.

Major Problem	In-stream sedimentation, variable brook trout recruitment and limited salmonid reproduction.
Probable Cause	Agricultural and stormwater runoff and natural geologic conditions (sandstone falls).
Recommendation	Implement best management practices for controlling agricultural and stormwater runoff, focusing on fencing out cows from along the stream banks. Initiate landowner contacts for stewardship streambank protection easements.
Stocking	Wild brook trout fingerling stocking should be continued on Fall Creek until 2005. Stocking quotas should be increased to 2,000 spring fingerlings. This is the recommended stocking rate on a per acre basis for Fall Creek. An annual evaluation should be done to determine the success of this stocking effort.

Duscham Creek Subshed Summary

The fish community rated an average of "Poor" in this subshed, however 3 brook trout were found in the upper reaches. The most abundant fish were creek chubs, followed by white suckers and were mostly found at the lower sites. The riparian buffer areas and bank erosion habitat score were "Good" to "Excellent" at all sites except site 5, which also had no fish. Fish cover rated either "Fair" or "Good" at all sites except for site 5. However, fine sediments were very abundant at all sites. Maximum summer temperatures were highest near the mouth of this subshed at sites 1, 2, and 3 with and average difference between maximum and minimums of 16 degrees (widest range of all the subsheds). The highest daily average temperatures at these lower sites were also at or near lethal temperatures for brook trout. In fact, the lower reaches have temperatures that even approach the lethal maximums for brown trout. Field notes indicate fresh beaver activity at site 3, which along with high temperatures explains why the brook trout were confined to the upper reaches of this subshed, and contribute to the poor fish IBI rating. Headwater reaches do have adequate thermal regimes for brook trout and a few brook trout were captured in this area of the subshed. Therefore it is recommended that Duscham Creek be classified as Class II trout water from the mouth of Pinch Creek upstream to Pepin County Highway "T".

Major Problem	In-stream sedimentation, high and variable temperatures, in-stream habitat degradation.
Probable Cause	Agricultural and stormwater runoff, beaver dams, historic ditching and natural geologic conditions.
Recommendation	Implement best management practices for controlling agricultural and stormwater runoff, and remove any beaver dams and the inhabitants.

Cranberry Creek Subshed Summary

Despite a good coldwater thermal regime, no trout were found in this subshed, and had an overall IBI rating of "Poor". Riparian buffer areas and bank erosion scored well on the habitat evaluations, but fine sediments, fish cover and pools scored poor which may be a factor explaining the absence of trout. However, all sites had a fair amount of bends and adequate flows ranging from 19.8 cfs at the mouth to 2 cfs in the upper reaches. The highest daily average temperatures were in or very near the optimal ranges for brown trout, and near the optimal ranges for brook trout. The average difference

between summer maximums and minimums was about 12 degrees, which is one of the wider ranges found among all the subsheds. Thermal regimes appear to be acceptable in the upper reaches for salmonid re-introduction efforts in this subshed and should be targeted for brook trout upstream of State Highway 85 and also on Creek 24-4. Headwater reaches of Cranberry Creek and Creek 24-4 appear to have better thermal regimes than the mainstem which is currently classified as a Class I trout fishery and an Exceptional Resource Water. Since Clear Creek has a self-sustaining native brook trout fishery and similar habitat conditions as Cranberry Creek, this provides additional justification for possible salmonid re-introduction efforts.

Major Problem	In-stream sedimentation, in-stream habitat degradation, variable brook trout recruitment, and limited salmonid reproduction.
Probable Cause	Agricultural and stormwater runoff, and natural geologic conditions.
Recommendation	Implement best management practices for controlling agricultural and stormwater runoff. Initiate landowner contacts for stewardship streambank protection easements.
Stocking	Re-introduction efforts should be targeted towards "wild brook trout" starting in 2002 and ending in 2005 within the Cranberry Creek subshed. It recommended that wild brook trout field transfers as well as feral fingerlings be considered for future recovery efforts.

Rock Creek Subshed Summary

The lower reaches of this subshed had brown trout, but no brook trout were found at any of the sites. The average IBI score the mainstem of Rock Creek is very poor, but good to fair for Little Rock and the other creeks in the headwater reaches. These areas also have better habitat scores for riparian buffer area and erosion, but all sites throughout the subshed scored poorly for the amount of fine sediments, fish cover, and pools. The highest daily average temperatures for the Rock Creek subshed are all near or within the optimal ranges for brown trout, and also below the lethal maximums for brook trout (especially in the upper reaches surveyed). The average difference between summer maximums and minimums was only about 8 degrees. Headwater reaches of Rock Creek appear to have better thermal regimes than Clear Creek which currently is Classified as a Class I trout fishery and an Exceptional Resource Water. Clear Creek has a self-sustaining brook trout fishery and similiar habitat conditions as upper Rock Creek. This information provides additional justification for possible salmonid re-introduction efforts.

Major Problem	In-stream sedimentation, high temperatures along mainstem, in-stream habitat degradation, extirpation of native salmonids.
Probable Cause	Agricultural and stormwater runoff natural geologic conditions (sandstone falls).
Recommendation	Implement best management practices for controlling agricultural and stormwater runoff, install habitat improvement structures.
Stocking	Re-introduction efforts should be targeted towards "wild brook trout" starting in 2002 and ending in 2005 within the headwater reaches of Rock Creek. It recommended that wild brook trout field transfers as well as feral fingerlings be considered for future recovery efforts upstream of state highway 37 and Creek 15-7.

Coon Creek Subshed Summary

This subshed was similar to the Rock Creek subshed with brown trout found in the lower reaches and an average IBI score of "Poor", but in addition had its upper reaches that scored poorly. The habitat evaluations revealed excellent scores for riparian buffer areas and lack of erosion, but poor scores for pools, fish cover, and amount of fine sediments. The highest daily average temperatures were all above the optimal range for brown trout, and at or near the lethal range for brook trout. The average difference between summer maximums and minimums was about 11 degrees. There appears to be some limited reproduction of wild brown trout in the lower reaches of Coon Creek. Coon Creek should be-classified as Class II brown trout water and future stocking efforts of wild brown trout could enhance fishing opportunities for local anglers as well as supplement the limited recruitment that is currently occurring. Wild trout fingerlings are preferred over domestic fingerlings due to better survivialship (Avery, Niebur and Vetrano 2001). This stream also has similar thermal conditions to the mainstem of Lowes Creek that is currently receiving feral brown trout fingerlings on an annual basis and provides a put-grow and take trout fishery. At this time it appears thermal conditions do not warrant re-introduction efforts for brook trout on the lower portions of Coon Creek. However, site 4

near Nelson Road had thermal regimes that may support brook trout. It is recommended that no feral brown trout stocking occur until this site is evaluated in greater detail.

Major Problem	In-stream sedimentation, high temperatures throughout the subshed, in-stream habitat degradation, and limited salmonid recruitment.
Probable Cause	Agricultural and stormwater runoff, and natural geologic conditions.
Recommendation	Implement best management practices for controlling agricultural and stormwater runoff, install habitat improvement structures.
Stocking	Conduct further investigation in the headwaters of Coon Creek to better assess the potential for successful brook trout introduction. No feral brown trout stocking shall occur until this is evaluated. Potentially initiate and evaluate feral brown trout stocking in the lower reaches of Coon Creek on a trial basis from 2003-2005 to determine if adult densities can be increased to improve angling opportunities and to supplement what limited natural reproduction is occurring in this subshed.

West Creek Subshed Summary

The average IBI score for this subshed was the lowest possible of "Very Poor". No trout were found at any of the 13 sites surveyed, and the most abundant fish species were white suckers, blacknose dace, and creek chubs. Habitat ratings for riparian buffer area and lack of erosion were good throughout the subshed, whereas the ratings for pools, fish cover, and amount of fine sediments were poor. Similar to the Coon Creek subshed, the highest daily average temperatures were all above the optimal range for brown trout, and at or near the lethal range for brook trout. The average difference between summer maximums and minimums was about 14 degrees, which is a wider range than most subsheds.

Major Problem	In-stream sedimentation, high temperatures throughout the subshed, in-stream habitat degradation.
Probable Cause	Agricultural and stormwater runoff.
Recommendation	Implement best management practices for controlling agricultural and stormwater runoff, install habitat improvement structures.

Taylor Creek Subshed Summary

Taylor Creek was the smallest subshed in the survey and had an average IBI score of "Very Poor". Most fish that were caught were brook sticklebacks and creek chubs. The habitat evaluation of this subshed had good scores for riparian buffer areas and low erosion, but had poor scores for pools, fish cover, and sedimentation. The only site that had temperature monitoring revealed the highest daily average to be above the optimal range for brown and brook trout. The temperature also had a wide range of a summer temperatures with an average maximum of 27 and an average minimum of 8.

Major Problem	In-stream sedimentation, high temperatures throughout the subshed, in-stream habitat degradation.
Probable Cause	Agricultural and stormwater runoff.
Recommendation	Implement best management practices for controlling agricultural and storm sewer runoff, install habitat improvement structures.

Lowes Creek Mainstem Subshed Summary

The mainstem of Lowes Creek is one of the subsheds with the most abundant numbers of trout, but mostly brown trout. The brown trout outnumbered the brook trout 83 to 3, and were caught throughout the mainstem. Small sized brown trout dominated the catch (54 were 2 or 3 inches), indicating successful reproduction for this species. Similar to the adults, the young brown trout were caught throughout the mainstem. One of the 3 brook trout caught was also 3 inches, and caught in the mid-section of the mainstem along with the adults of this species. Since the brown trout are abundant both as adults and young, and that they seem to be successful above and below the locations of where the brook trout were captured, it is likely the brook trout are out-competed in this subshed and need specific management goals to fortify this species.

The overall fish habitat scores scored mostly fair, except for 3 upper sites that scored good but had few or no fish. All sites except for the 2 closest to the confluence with the Chippewa River scored

poor for fine sediments. Bank erosion did not score as well as in other subsheds, with most ratings being fair. But similar to most of the other subsheds, problems of the lack of fish cover and plunge pools occurred throughout the sites. Thermal regimes also seem to be impacted as shown by all sites having highest daily average temperatures that are above both brown and brook trout optimal ranges, indicating that maximum temperatures often rise into lethal ranges for brook trout. In addition, the highest daily average temperature below the I-94 storm sewer has increased since 1991 at site 3 (Table 2).

Major Problem	In-stream sedimentation, habitat degradation, and high temperatures throughout the subshed.
Probable Cause	Urban stormwater runoff.
Recommendation	Implement best management practices for controlling urban stormwater runoff, install habitat improvement structures. Increase stocking of brook trout.

Willow Creek to Lowes Subshed

No fish were captured at this site. The likely reason for this is because of a box culvert under STH 93 has a 3 foot drop off which prevents upstream movement of fish past the start of site 1. Site 1 also had temperature monitoring which showed a highest daily average of 19.5 °C, which could potentially support young trout if the physical barrier was modified.

The Department of Transportation (DOT) is currently working to redo the STH 93 bridge, which is at site 1, and working with the Department of Natural Resources to improve fish passage and environmental quality during this project. The completion date is predicted for 2004.

Major Problem	Unnatural waterfall.
Probable Cause	Drop off from the STH 93 box culvert.
Recommendation	Reconfigure box culvert and stream gradient to minimize the drop off and allow for fish passage.

Pine Creek to Lowes Subshed

The average coldwater IBI score for this subshed was “poor”, and only one 2 inch brook trout was captured at site 1 nearest the confluence with Lowes Creek. The non-aquatic habitat factors such as riparian buffer area and bank erosion rated good, but the aquatic habitat factors such as the amount of fine sediments, fish pools, and cover rated fair to poor. The highest daily average temperatures were shown to be above the optimal range for brook trout, and very close to the optimal range for brown trout.

Major Problem	In-stream sedimentation, potential thermal impacts.
Probable Cause	Agricultural and stormwater runoff.
Recommendation	Implement best management practices for controlling agricultural and storm sewer runoff.

Clear Creek to Lowes Subshed

The largest number of brook trout (85) were captured within this subshed, and ranged in size from 2 to 12 inches. Brown trout were found in fewer numbers, but in only small sizes of 2 to 3 inches. Subsequently, the Clear Creek subshed was one of the best rated for a coldwater IBI in this watershed with an average score of “good”. This is the only subshed where brook trout have a stronger fishery than brown trout and should have a high priority for being protected. The fish habitat evaluations showed adequate riparian buffer areas, but poor in-stream habitat conditions such as abundant fine sediments and a lack of fish cover and pools. The highest daily average temperatures were shown to be above the optimal range for brook trout, and very close to the optimal range for brown trout.

Major Problem	In-stream sedimentation, potential thermal impacts.
Probable Cause	Agricultural and stormwater runoff.
Recommendation	Implement best management practices for controlling agricultural and storm sewer runoff.
Stocking	Stock only brook trout if needed.

Graham Creek to Lowes Subshed

No brook trout were found, but brown trout were found at all 4 sites within this subshed. Most of the brown trout found were between 6 and 8 inches. The average coldwater IBI score was "poor", but the riparian buffer areas, erosion, fish cover, and pools had average scores of "good". Given that adequate fish cover was found sporadically, the potential stocking success of yearling brook trout would be good. Smaller sizes are not recommended due to the presence of 6-8 inch predatory brown trout. However, fine sediments were a problem at all sites and could impact overall spawning success of either species of trout. The highest daily average temperatures were shown to be above the optimal range for brook trout, and very close to the optimal range for brown trout.

Major Problem	In-stream sedimentation, potential thermal impacts.
Probable Cause	Agricultural and stormwater runoff.
Recommendation	Implement best management practices for controlling agricultural and storm sewer runoff. Stock yearling brook trout to re-establish this species in the subshed.

Overall Watershed Outlook

The Lowes and Rock Creeks watershed has three areas of needed improvement in order for it to have significant positive changes in its aquatic communities. First, the problem of aquatic habitat degradation was found throughout most of the streams. Specifically, there were few amounts of fish cover and pool habitat. Habitat restoration activities such as inserting lunker structures for fish cover and creating pools by manipulating stream channels are possible solutions to these types of problems.

Second, degraded thermal regimes resulting from changing land use practices such as increased storm water runoff causes increases and unnatural fluctuations of stream temperatures. This problem is most severe during the summer months when the base flow of streams is low which reduces their capacity to minimize the effects, and coldwater fish are most sensitive to low dissolved oxygen associated with increased temperatures. However, even though thermal conditions are currently borderline on many sites within the watershed for coldwater fish communities, there appears to be several candidate streams for salmonid re-introduction opportunities such the Cranberry, Rock, Coon, and Graham Creek subsheds where thermal regimes are still adequate. These sites also have similar habitat qualities to other sites in the watershed where brook trout and brown trout fisheries are present such as the Fall, Lowes, and Clear Creek subsheds.

Lastly, increased fine sediment loads consisting of silt and clay was found to be another overall problem in this watershed. However, stream sediment loads consisting of mostly sand may be natural and limit the potential classification of a stream even if fine sediments were eventually controlled. For example, all of the streams in the Lowes and Rock Creeks watershed typically originate within a larger marsh complex, as these streams drain towards the Chippewa River they cut through a large formation of sandy soil along the Chippewa River terraces. This geologic condition is likely one reason for the poorer habitat score when considering internal factors such as lack of coarse substrate, little pool habitat and limited cover (Table 3).

But for areas where the abundance of fine sediment such as silt and clay is excessive after being compared to the parent material of the stream, changes in land use practices can have a positive impact and should be pursued. When fine sediments dominate the substrate of these streams, problems for various types of aquatic biota at all stages of development occur. For example, silt and clay can impact the quality of macroinvertebrate habitat by filling in crevices between larger particles of sediment they rely on for protection from predators and shelter from high flows. Also, excessive amounts of silt and clay can impact fish populations by covering fish eggs and limit the oxygen exchange necessary for successful hatching.

The likely sources for these fine sediments are stormwater coming off roads, rooftops, and other impervious areas, and from agricultural areas lacking enough buffer areas to help settle out the small particles before they reach the streams. Geographical areas prone to becoming sources for fine sediments should be targeted for implementing best management practices which could help abate this type of problem. Overall, the solutions to the three major problems identified for this watershed depend on a holistic approach involving not only restoring/improving the aquatic environment itself, but also guiding land use practices that occur outside the stream boundaries in a more environmentally conscious manner.

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APPENDIX A. 2000 Lowes and Rock Creeks Watershed Trout Stocking Summary Data.

Stocking Water	WBIC Code	Year	Species	Strain	Age Class*	No. Fish Stocked
Graham Creek	2124700	2000	Brook Trout	St. Croix	Large Fingerling	1000
Lowes Creek	2123900	2000	Brook Trout	St. Croix	Large Fingerling	7000
Lowes Creek	2123900	1998	Brown Trout	St. Croix	Yearling	3580
Lowes Creek	2123900	1999	Brown Trout	St. Croix	Yearling	4000
Lowes Creek	2123900	1999	Brown Trout	Timber Coulee-Southwest Feral	Fry	24000
Lowes Creek	2123900	2000	Brown Trout	Timber Coulee-Southwest Feral	Small Fingerling	13800
Lowes Creek	2123900	2001	Brown Trout	Timber Coulee-Southwest Feral	Small Fingerling	13800
Fall Creek	2055300	1999	Brook Trout	Feral	Small Fingerling	1000
Fall Creek	2055300	2000	Brook Trout	Feral	Small Fingerling	1300

*Small Fingerling = old "spring fingerling" designation.
*Large Fingerling = old "fall fingerling" designation.
*Yearling = old "holdover" designation.
*Adult = old "brookstock" designation.

APPENDIX B. 2000 Lowes and Rock Creeks Watershed Station Summary Data.

Stream Name	Location	WBIC	Map #	Station	Stream Total Length (miles)	Station Length (miles)	Fish CPUE #/mile	TroutCPUE #/mile	ColdIBI Rating	ColdIBI Score	Habitat Rating	Habitat Score	Flow Cfs	HBI Rating	HBI Score	*Max Daily Avg Temp C
Coon	Caryville (190th)	2120300	11	1	14	0.080	812.5	75.4	V poor	0	Good	50	13.66	Excellent	2.81	21.4
Coon	110th St.	2120300	12	2		0.087	528.7	11.5	Poor	20	Fair	45	14.17			20.9
Coon	1010th St.	2120300	13	3		0.062	1000.0	No Trout	Poor	10	Good	65	9.38			
Coon	Nelson Rd.	2120300	14	4		0.062	1467.7	No Trout	Poor	20	Good	50	4.51			20.6
Coon	STH 37	2120300	15	5		Missing Data		No Trout								21.8
Un. Trib. to Coon 31-2	South Rd.	2120450	151	1	4	0.062	371.0	No Trout	Fair	40	Good	45	2.83			
Un. Trib. to Coon 32-15	Hemlock Rd.	2120500	161	1	2	0.062	1177.4	No Trout	Poor	10	Good	53	1.83			23.1
Cranberry	CTH O (Meridean)	2117000	31	1	15	0.087	597.7	No Trout	Poor	10	Fair	45	18.51	Excellent	3.27	19.1
Cranberry	90th Ave.	2117000	32	2		0.104	67.3	No Trout	V poor	0	Good	55	14.21			
Cranberry	810th Ave.	2117000	33	3		0.062	177.4	No Trout	Fair	30	Fair	45	9.02			18.9
Cranberry	Albany D West	2117000	34	4		0.062	161.3	No Trout	Fair	30	Good	50	5.21			
Cranberry	Cth T	2117000	35	5		0.062	16.1	No Trout	Poor	20	Good	60	2.14			19.7
Cranberry	CTH A	2117000	36	6		0.062	403.2	No Trout	Fair	30	Fair	30	1.03			
Un. Trib. To Cranberry 24-4	810th Ave.	2117800	171	1	3	0.055	54.5	No Trout	Fair	40	Fair	45	2.15			18.2
West	STH 85	2122500	321	1	12	0.080	175.0	No Trout	Poor	10	Good	50	11.98			20.7
West	Jene Rd.	2122500	322	2		0.096	940.4	No Trout	Poor	10	Fair	45	8.08			
West	CTH Z (Town Hall Rd.)	2122500	323	3		0.124	774.2	No Trout	V poor	0	Good	50	14.29			19.9
West	STH 37	2122500	324	4		0.096	83.6	No Trout	Poor	10	Fair	35	8.97			
West	CTH B	2122500	325	5		0.099	101.5	No Trout	Poor	10	Good	55	6.61	Excellent	1.97	21.3
West	Cedar Rd.	2122500	326	6		0.023	No Fish	No Trout	No Fish	No Fish	Good	50	0.51			
Un. Trib. To West 23-3	Cedar Rd.	2122900	271	1	2	0.029	344.8	No Trout	Poor	10	Fair	48	0.78			
Un. Trib. To West 15-9	Langdell Rd.	2122800	281	1	2	0.062	32.3	No Trout	Poor	10	Good	55	2.12			
Un. Trib. To West 15-10	Langdell Rd., Candy Corners	2122600	291	1	2	0.022	No Fish	No Trout	No Fish	No Fish	Fair	45	1.49			
Un. Trib. To West 25-12	CTH B	2123200	301	1	1	0.039	307.7	No Trout	V poor	0	Good	60	0.20			
Un. Trib. To West 21-4	CTH 2, Section 21	2122700	371	1	1	0.034	No Fish	No Trout	No Fish	No Fish	Fair	45	0.37			
Un. Trib. To West 24-15	Cedar Rd.	2123100	381	1	2	0.043	23.3	No Trout	V poor	0	Fair	40	1.64			
Un. Trib. To West 25-1	Cedar Rd.	2123120	391	1	2	0.022	454.5	No Trout	Poor	10	Good	50	1.15			
Fall	50th Ave	2116700	51	1	8	0.071	253.5	181.9	Good	60	Good	50	9.50	Excellent	1.26	17.2
Fall	CTH 85	2116700	52	2		0.065	61.5	61.3	Excellent	90	Fair	25	9.32			
Fall	CTH T	2116700	53	3		0.078	910.3	894.1	Excellent	90	Fair	48	3.42			
Fall	CTH A	2116700	54	4		0.052	19.2	19.4	Excellent	90	Good	50	2.86			15.7
Duscham	650th St.	2117100	41	1	8	0.062	838.7	No Trout	V poor	0	Fair	45	5.24			23.0
Duscham	690th Ave	2117100	42	2		0.070	718.4	No Trout	V poor	0	Good	55	5.24			
Duscham	CTH O	2117100	43	3		0.062	951.6	No Trout	V poor	0	Good	55	2.14			24.1
Duscham	East County Line Rd.	2117100	44	4		0.062	48.4	48.3	Excellent	90	Good	60	4.54			
Duscham	CTH T	2117100	45	5		0.062	No Fish	No Trout	No Fish	No Fish	Fair	30	0.44			15.4
Pinch	760th Ave.	2117300	101	1	2	0.062	80.6	No Trout	Poor	10	Good	57	1.37			14.6

* Max Daily Average Temp = the highest of all daily averages found throughout the summer, NOT the highest temperature found.

APPENDIX B. 2000 Lowes and Rock Creeks Watershed Station Summary Data, Continued.

Stream Name	Location	WBIC	Map #	Station	Stream Total Length (miles)	Station Length (miles)	Fish CPUE #/mile	TroutCPUE #/mile	ColdIBI Rating	ColdIBI Score	Habitat Rating	Habitat Score	Flow Cfs	HBI Rating	HBI Score	*Max Daily Avg Temp C
Taylor	CTH 37/STH 85	2123600	141	1	7	0.060	50.0	No Trout	V poor	0	Fair	45	11.21			22.3
Taylor	CTH B	2123600	142	2		0.076	52.6	No Trout	V poor	0	Good	50	9.18	Excellent	2.45	
Taylor	CTH II	2123600	143	3		0.062	1177.4	No Trout	V poor	0	Good	60	8.82			
Taylor	CTH F	2123600	144	4		0.033	636.4	No Trout	Poor	10	Good	65	4.41			
Lowes	Jopke Rd. to trail bridge	2123900	91	1	26	0.142	140.8	7.1	Fair	30	Fair	45	39.79			19.9
Lowes	Silver Springs Dr.	2123900	92	2		0.187	615.0	42.8	Poor	20	Fair	45	39.26			21.0
Lowes	CTH F (W. Lowes Cr Rd.)	2123900	93	3		0.155	1671.0	148.7	Fair	30	Fair	48	38.21			19.5
Lowes	S. Lowes Creek Rd.	2123900	94	4		0.233	974.2	42.9	Poor	20	Fair	40	39.38	Excellent	2.28	21.0
Lowes	Lowes Creek Park bridge	2123900	95	5		0.159	358.5	37.7	Poor	20	Fair	45	36.53			
Lowes	CTH II (Deerfield Rd.)	2123900	96	6		0.174	1097.7	92.0	Fair	40	Fair	45	29.26	Excellent	3.04	21.0
Lowes	Cedar Rd.	2123900	97	7		0.157	681.5	140.5	Fair	40	Fair	45	22.37	Excellent	2.85	21.1
Lowes	CTH HH	2123900	98	8		0.129	1581.4	31.1	Fair	30	Fair	47	8.55			21.8
Lowes	Lowes Cr Rd., Pl. Valley	2123900	99	9		0.091	7670.3	98.5	Poor	20	Good	53	3.71			22.7
Lowes	CTH F	2123900	910	10		0.050	3480.0	No Trout	Poor	10	Good	65	2.69			
Un. Trib. To Lowes 33-15	S. Lowes Creek Rd.	2124550	191	1	2	0.062	No Fish	No Trout	No Fish	No Fish	Fair	45	0.337			
Un. Trib. To Lowes 10-6	Lowes Creek Rd.	2123950	361	1	2	0.062	No Fish	No Trout	No Fish	No Fish	Good	55				
Willow	STH 93	2124000	331	1	4	0.062	No Fish	No Trout	No Fish	No Fish	Good	55	4.11			19.5
Willow	Walnut Rd.	2124000	332	2		0.031	No Fish	No Trout	No Fish	No Fish	Good	50	0.53			
Willow	Hickory Rd.	2124000	333	3		0.055	No Fish	No Trout	No Fish	No Fish	Fair	45	0.19			
Un. Trib. to Willow 14-15	Peuse Rd.	2124100	311	1	2	0.043	No Fish	No Trout	No Data	No Data	Fair	45				
Pine	STH 93	2124300	111	1	5	0.070	928.6	14.8	Fair	50	Good	55	6.93			19.9
Pine	CTH HH	2124300	112	2		0.035	5657.1	No Trout	Poor	20	Good	53	1.9			
Pine	CTH I (Cleghorn)	2124300	113	3		0.043	907.0	No Trout	Poor	10	Fair	45	1.76			20.6
Un. Trib. To Pine 35-16	CTH I (Cleghorn)	2124340	201	1	2	0.033	1000.0	No Trout	Poor	10	Good	50	0.89			
Clear	CTH FF	2124400	21	1	9	0.071	971.8	126.0	Fair	50	Good	55				
Clear	STH 93	2124400	22	2		0.058	1362.1	190.4	Fair	60	Fair	45				19.3
Clear	CTH I	2124400	23	3		0.061	967.2	689.7	Excellent	90	Good	55				19.9
Clear	CTH U	2124400	24	4		0.043	1348.8	620.8	Good	70	Fair	40				
Clear	CTH U (Anderson Valley)	2124400	25	5		0.028	No Fish	No Trout	No Fish	No Fish	Fair	45				
Sigmund Valley	CTH HH	2124500	131	1	2	0.043	93.0	69.0	Good	80	Good	53				20.8
Graham	Spruce Rd.	2124700	61	1	4	0.096	1197.9	93.4	Poor	20	Good	57				20.8
Graham	Lowes Creek Rd.	2124700	62	2		0.046	5543.5	130.5	Poor	20	Excellent	85				18.8
Graham	Hagness Rd	2124700	63	3		0.062	193.5	80.5	Poor	10	Good	50				
Kelley	Willow Rd.	2124800	71	1	2	0.035	571.4	201.2	Poor	10	Good	73				

* Max Daily Average Temp = the highest of all daily averages found throughout the summer, NOT the highest temperature found.

APPENDIX B. 2000 Lowes and Rock Creeks Watershed Station Summary Data, Continued.

Stream Name	Location	WBIC	Map #	Station	Stream Total Length (miles)	Station Length (miles)	Fish CPUE #/mile	TroutCPUE #/mile	ColdIBI Rating	ColdIBI Score	Habitat Rating	Habitat Score	Flow Cfs	HBI Rating	HBI Score	*Max Daily Avg Temp C
Rock	150th Ave.	2119000	121	1	18	0.191	1853.4	26.1	Poor	10	Good	60	38.53	Very Good	4.14	20.8
Rock	CTH H	2119000	122	2		0.173	1398.8	No Trout	V poor	0	Good	50	22.79			21.3
Rock	CTH Z	2119000	123	3		0.120	1416.7	No Trout	Poor	0	Fair	35	16.64			
Rock	Town Line Rd.	2119000	124	4		0.062	1435.5	No Trout	V poor	0	Fair	40	0.26			20.0
Rock	CTH Z	2119000	125	5		0.070	357.1	No Trout	V poor	0	Fair	45	5.87			
Rock	STH 37	2119000	126	6		0.062	483.9	No Trout	V poor	0	Good	70	5.08			17.9
Rock	Old Town Rd.	2119000	127	7		0.022	No Fish	No Trout	No Fish	No Fish	Fair	40	0.49			
Little Rock	CTH H (J Rd)	2119800	81	1	5	0.062	548.4	No Trout	V poor	0	Good	60	3.96			19.4
Little Rock	CTH H	2119800	82	2		0.062	48.4	No Trout	Fair	40	Fair	40	1.5			
Un. Trib. To Rock 15-8(N)	CTH Z	2120200	211	1	2	0.062	32.3	No Trout	Fair	40	Good	60				
Un. Trib. To Rock 7-14	CTH ZZ	2120100	221	1	2	0.062	No Fish	No Trout	No Fish	No Fish	Good	55				
Un. Trib. To Rock 35-11	CTH T	2119400	231	1	1	0.062	145.2	No Trout	Poor	10	Fair	45				
Un. Trib. To Rock 15-8(S)	CTH B	2120220	351	1	2	0.050	20.0	No Trout	Fair	40	Fair	45				15.5
	Totals:	34 Streams	84	84	177 miles	6 miles	13 no fish	28 w/trout	83	83	83	83	67	9	9	41

* Max Daily Average Temp = the highest of all daily averages found throughout the summer, NOT the highest temperature found.

Appendix C. Site-specific Brook (BK) and Brown (BN) Trout Data for the Lowes and Rock Creeks Watershed

Sample dates ranged from July 6 to August 2, 2000.

Only sites with trout are listed.

Stream-Map #		2"	3"	4"	5"	6"	7"	8"	9"	10"	11"	12"	13"	14"	15"	16+"	Total	Station Length (m)	Station Length (mi)	*Brook CPUE (# / mi)	*Brown CPUE (# / mi)	*Total CPUE (# / mi)
FALL 51	**# BROOK**	5	3						1								9	115	0.071	125.95		181.93
	# BROWN	1	2	1													4				55.98	
FALL 52	**# BROOK**										4						4	105	0.065	61.31		61.31
	NO BROWN																0					
FALL 53	**# BROOK**		38	30					1		1						70	126	0.078	894.08		894.08
	NO BROWN																0					
Fall 54	**# BROOK**								1								1	83	0.052	19.39		19.39
	NO BROWN																0					
DUSCHAM 44	**# BROOK**		1					2									3	100	0.062	48.28		48.28
	NO BROWN																0					
COON 11	NO BROOK																0	128	0.080			75.44
	# BROWN	2	1			2									1		6				75.44	
COON 12	NO BROOK																0	140	0.087			11.50
	# BROWN	1															1				11.50	
ROCK 121	NO BROOK																0	308	0.191			26.13
	# BROWN					3	1				1						5				26.13	
LOWES 91	NO BROOK																0	228	0.142			7.06
	# BROWN						1										1				7.06	
LOWES 92	NO BROOK																0	301	0.187			42.77
	# BROWN	1	6									1					8				42.77	
LOWES 93	NO BROOK																0	249	0.155			148.65
	# BROWN	5	11				1	2	2			1		1			23				148.65	
LOWES 94	NO BROOK																0	375	0.233			47.21
	# BROWN	1	2	1				4					1			2	11				47.21	
LOWES 95	NO BROOK																0	256	0.159			37.72
	# BROWN								2							4	6				37.72	
LOWES 96	**# BROOK**									1			1				2	280	0.174	11.50		91.96
	# BROWN	4	8					2									14				80.47	
LOWES 97	**# BROOK**		1														1	252	0.157	6.39		140.50
	# BROWN	11	4					3			1		1	1			21				134.11	
LOWES 98	NO BROOK																0	207	0.129			31.10
	# BROWN	1	2			1											4				31.10	
LOWES 99	NO BROOK																0	147	0.091			98.53
	# BROWN	7					1	1									9				98.53	
PINE 111	**# BROOK**	1															1	112	0.070	14.37		14.37
	NO BROWN																0					
CLEAR 21	**# BROOK**	1					1		1								3	115	0.071	41.98		125.95
	# BROWN	5					1										6				83.97	
CLEAR 22	**# BROOK**	3		1		1	3	1	1			1					11	100	0.062	177.42		177.42
	NO BROWN																0					
CLEAR 23	**# BROOK**		2		6	13	13	6		1							41	100	0.062	661.29		661.29
	NO BROWN																0					
CLEAR 24	**# BROOK**	5	3		1	9	6	2	1								27	70	0.062	435.48		435.48
	NO BROWN																0					
Sigmund Valley	**# BROOK**			1			2										3	70	0.043	68.97		68.97
	NO BROWN																0					
GRAHAM 61	NO BROOK																0	155	0.096			10.38
	# BROWN	1															1				10.38	
GRAHAM 62	NO BROOK																0	100	0.062			128.75
	# BROWN					4	4										8				128.75	
KELLY 71	NO BROOK																0	56	0.035			86.21
	# BROWN					1	1	1									3				86.21	

***CPUE Score Legend: >250= LOW; 250-1000= MODERATE; 1000-2500 = HIGH; <2500 = VERY HIGH**