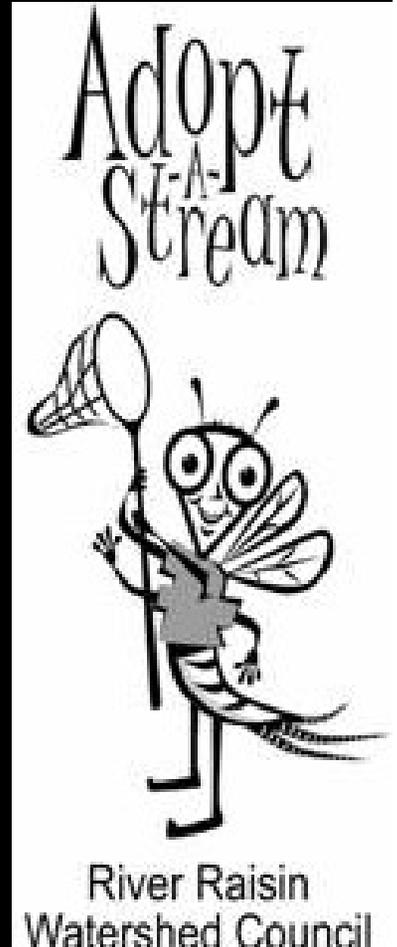




## Comparing Metrics Used to Assess Macroinvertebrate Collections: Ways to Communicate your Results and Avoid Calibration Problems

Jim Martin  
Associate Professor  
Biology Department, Adrian College  
Adopt-A-Stream Director  
River Raisin Watershed





United States Environmental Protection Agency

## Monitoring and Assessing Water Quality – Volunteer Monitoring

Across the country, trained volunteers are monitoring the condition of their local streams, lakes, estuaries and wetlands. EPA encourages all citizens to learn about their water resources and supports volunteer monitoring because of its many benefits. Volunteer water monitors build community awareness of pollution problems, help identify and restore problem sites, become advocates for their watersheds and increase the amount of needed water quality information available on our waters.



- 1) Water quality
- 2) Habitat



**IDENTIFICATION AND ASSESSMENT**

Use letter codes [R (rare) = 1-10, C (common) = 11 or more] to record the approximate numbers of organisms in each taxa found in the stream reach.

**\*\* Do NOT count empty shells, pupae, or terrestrial macroinvertebrates\*\***

**Group 1: Sensitive**

- \_\_\_ Caddisfly larvae (Trichoptera)  
*EXCEPT Net-spinning caddis*
- \_\_\_ Hellgrammites (Megaloptera)
- \_\_\_ Mayfly nymphs (Ephemeroptera)
- \_\_\_ Gilled (right-handed) snails (Gastropoda)
- \_\_\_ Stonefly nymphs (Plecoptera)
- \_\_\_ Water penny (Coleoptera)
- \_\_\_ Water snipe fly (Diptera)

**Group 2: Somewhat-Sensitive**

- \_\_\_ Alderfly larvae (Megaloptera)
- \_\_\_ Beetle adults (Coleoptera)
- \_\_\_ Beetle larvae (Coleoptera)
- \_\_\_ Black fly larvae (Diptera)
- \_\_\_ Clams (Pelecypoda)
- \_\_\_ Crane fly larvae (Diptera)
- \_\_\_ Crayfish (Decapoda)
- \_\_\_ Damselfly nymphs (Odonata)
- \_\_\_ Dragonfly nymphs (Odonata)
- \_\_\_ Net-spinning caddisfly larvae (Hydropsychidae; Trichoptera)
- \_\_\_ Scuds (Amphipoda)
- \_\_\_ Sowbugs (Isopoda)

**Group 3: Tolerant**

- \_\_\_ Aquatic worms (Oligochaeta)
- \_\_\_ Leeches (Hirudinea)
- \_\_\_ Midge larvae (Diptera)
- \_\_\_ Pouch snails (Gastropoda)
- \_\_\_ True bugs (Hemiptera)
- \_\_\_ Other true flies (Diptera)

Identifications made by: \_\_\_\_\_

Rate your confidence in these identifications: Quite confident 5 4 3 2 1 Not very confident

**STREAM QUALITY SCORE**

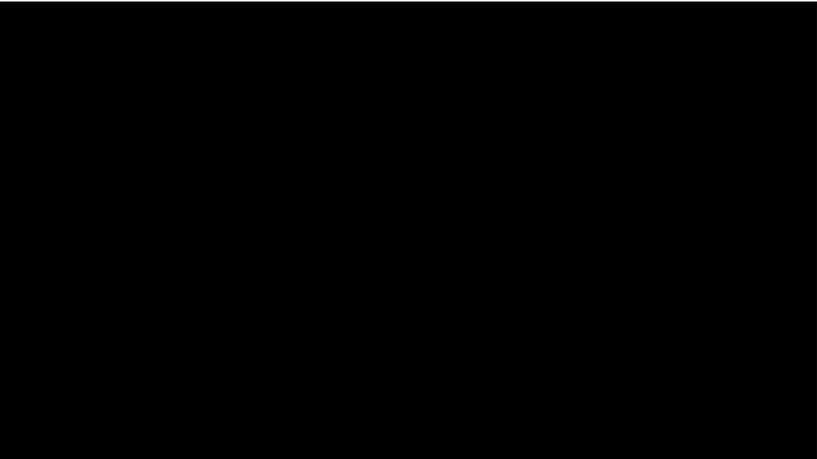
Group 1:  
 \_\_\_ # of R's \* 5.0 = \_\_\_\_  
 \_\_\_ # of C's \* 5.3 = \_\_\_\_  
 Group 1 Total = \_\_\_\_

Group 2:  
 \_\_\_ # of R's \* 3.0 = \_\_\_\_  
 \_\_\_ # of C's \* 3.2 = \_\_\_\_  
 Group 2 Total = \_\_\_\_

Group 3:  
 \_\_\_ # of R's \* 1.1 = \_\_\_\_  
 \_\_\_ # of C's \* 1.0 = \_\_\_\_  
 Group 3 Total = \_\_\_\_

Total Stream Quality Score = \_\_\_\_  
*(Sum of totals for groups 1-3; round to nearest whole number)*

Check one:  
 \_\_\_ Excellent (>48)  
 \_\_\_ Good (34-48)  
 \_\_\_ Fair (19-33)  
 \_\_\_ Poor (<19)



This Page:  
[About the Program](#)  
[Program Contact](#)

**Stream Monitoring**

**Volunteer Stream Monitoring Program**



MiCorps' Volunteer Stream Monitoring Program (VSMP) provides technical assistance, training and grants to volunteer stream monitors in Michigan to ensure that they are collecting reliable, high-quality data.

**Technical Assistance**

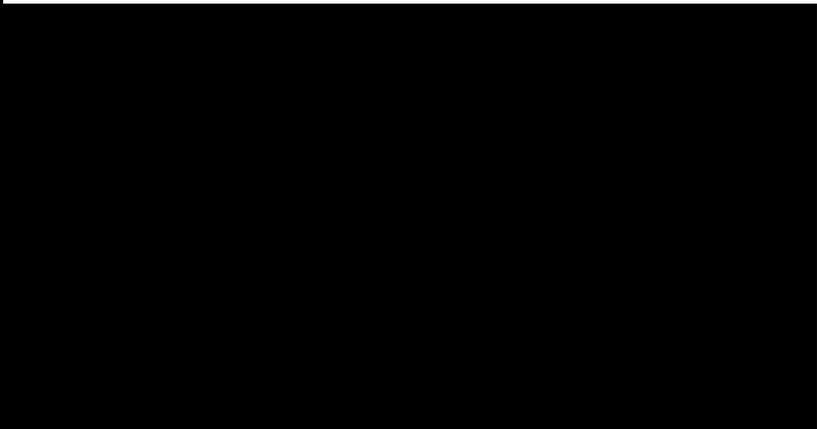
[Stream Monitoring Resources](#): Visit our stream monitoring resources webpage to find everything you need to get started in volunteer monitoring. More resources on volunteer monitoring can be found throughout the site.

[MiCorps listserv](#): The MiCorps listserv is an excellent resource for volunteer monitoring in Michigan. Post your questions and exchange information and ideas between volunteer monitoring program leaders, volunteers, and resource professionals.

[Contact Us](#): MiCorps staff are always available to answer your questions. Feel free to call or email us anytime.

**Education and Training**

[Training events](#): The MiCorps training program offers training opportunities for both current and aspiring MiCorps volunteers. The MiCorps stream volunteer training focuses on monitoring stream habitat and macroinvertebrates.



MI/DNRE/WB-10/011

MICHIGAN DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENT  
WATER BUREAU  
FEBRUARY 2010

A BIOLOGICAL SURVEY OF THE RIVER RAISIN WATERSHED LOCATED IN HILLSDALE,  
JACKSON, LENAWEЕ, MONROE, AND WASHTENAW COUNTIES  
JULY AND AUGUST 2008

Staff of the Surface Water Assessment Section conducted qualitative biological surveys of wadeable and nonwadeable segments in the River Raisin watershed located in Hillsdale, Jackson, Lenawee, Monroe, and Washtenaw Counties in July and August 2008 (Figure 1).

Qualitative macroinvertebrate and habitat surveys were performed according to Great Lakes and Environmental Assessment Section (GLEAS) Procedure 51 (MDEQ, 1990; and Creal et al., 1996), the nonwadeable assessment protocol (MDEQa, In preparation), and the status and trend procedure (MDEQb, In preparation). Visual observations were performed at all locations in Figure 1. Water samples were collected at 10 locations and preserved according to Michigan Department of Environmental Quality (MDEQ) protocol (MDNR, 1994).

Ecoregion: SMNITP

Metric	Stream Width (ft)	Stream Width (ft)		
		+1	0	-1
1. Total Taxa	<7 ≥7	>3.3w >24	1.7w-3.3w 12-24	<1.7w <12
2. Mayfly Taxa	<12 ≥12	>.3w >3	.1w-.3w 2-3	<.1w <2
3. Caddisfly Taxa	<8 ≥8	>.6w >4	.21w-.6w 2-4	<.21w <2
4. Stonefly Taxa	All	>0	--	0
5. % Mayfly	All	>18	18-3	<3
6. % Caddisfly	All	>28	28-4	<4
7. % Dominance	All	<20	20-37	>37
8. % Isopod, Snail, Leech	All	<4	4-10	>10
9. % Surface Dependent	All	<7	7-19	>19



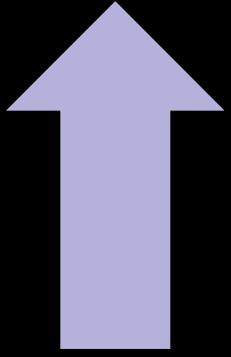
# Guide to Aquatic Invertebrates of the Upper Midwest

Identification Manual for Students, Citizen Monitors, and Aquatic Resource Professionals

R.W. Bouchard, Jr.



UNIVERSITY OF MINNESOTA



## Group 1: Sensitive

- \_\_\_\_\_ Caddisfly larvae (Trichoptera)  
*EXCEPT Net-spinning caddis*
- \_\_\_\_\_ Hellgrammites (Megalopectera)
- \_\_\_\_\_ **Mayfly nymphs (Ephemeroptera)**
- \_\_\_\_\_ Gilled (right-handed) snails (Gastropoda)
- \_\_\_\_\_ Stonefly nymphs (Plecoptera)
- \_\_\_\_\_ Water penny (Coleoptera)
- \_\_\_\_\_ Water snipe fly (Diptera)

### Caenidae

**Common Name:** Small Square-Gill Mayflies  
**Feeding Group:** Collector/Gatherers, Scrapers

**Tolerance Value:** 7 (High)

**Habitat:** Caenid mayfly larvae occur in streams in areas of slow current, at the edges of lakes, and in wetlands.

**Size:** Small (2-8 mm)

**Characteristics:** Gills on abdominal segment 1 vestigial (small and finger-like); gills on abdominal segment 2 square operculate (plate-like) and covering succeeding gills; operculate gills touch or overlap at midline; fringed gills present on abdominal segments 3-6; setae on caudal filaments restricted to apex of each annulation.

**Notes:** The operculate gills do not take up dissolved oxygen, but instead are used to cover and protect the other gills, which absorb dissolved oxygen from the water. Since these mayflies occur in areas where the current is slow, sediment can rapidly settle on the gills and prevent dissolved oxygen uptake. In order to keep their gills free of sediment, caenid mayflies wave their operculate gills.

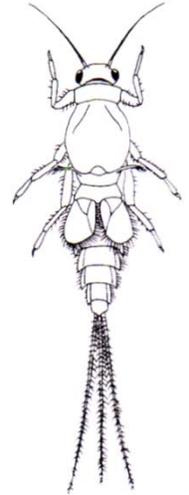
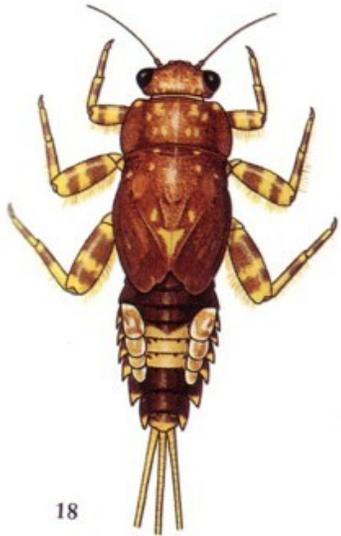


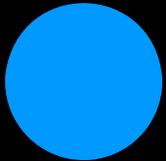
Figure 4.44: *Caenis* sp. (Caenidae) larva, Dorsal View.



## Ephemeroptera (Mayflies)

**Ephemerellidae:**

***Ephemerella subvaria*:**

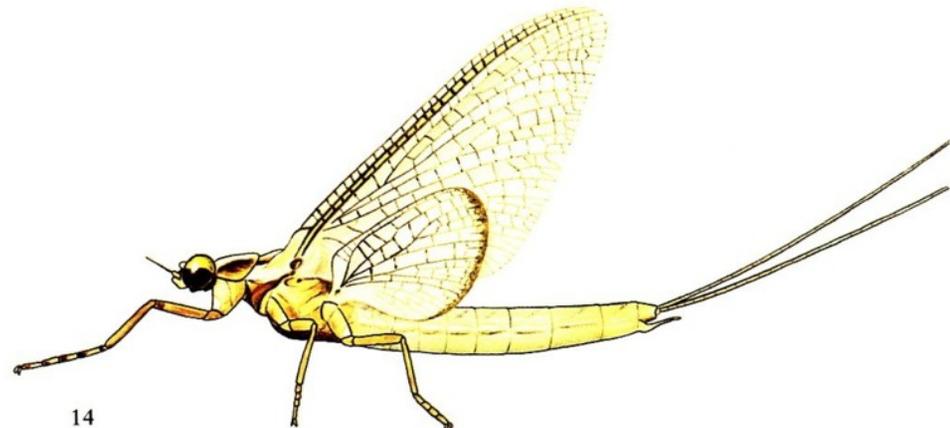
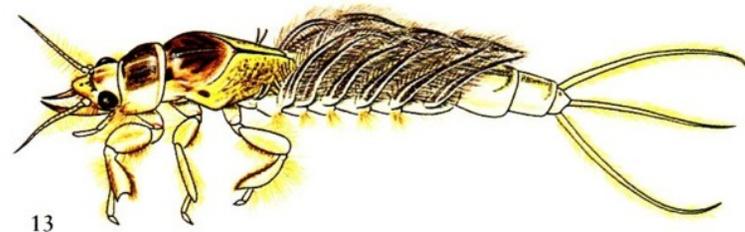
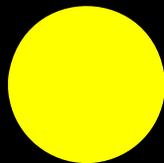


**1 = Excellent**

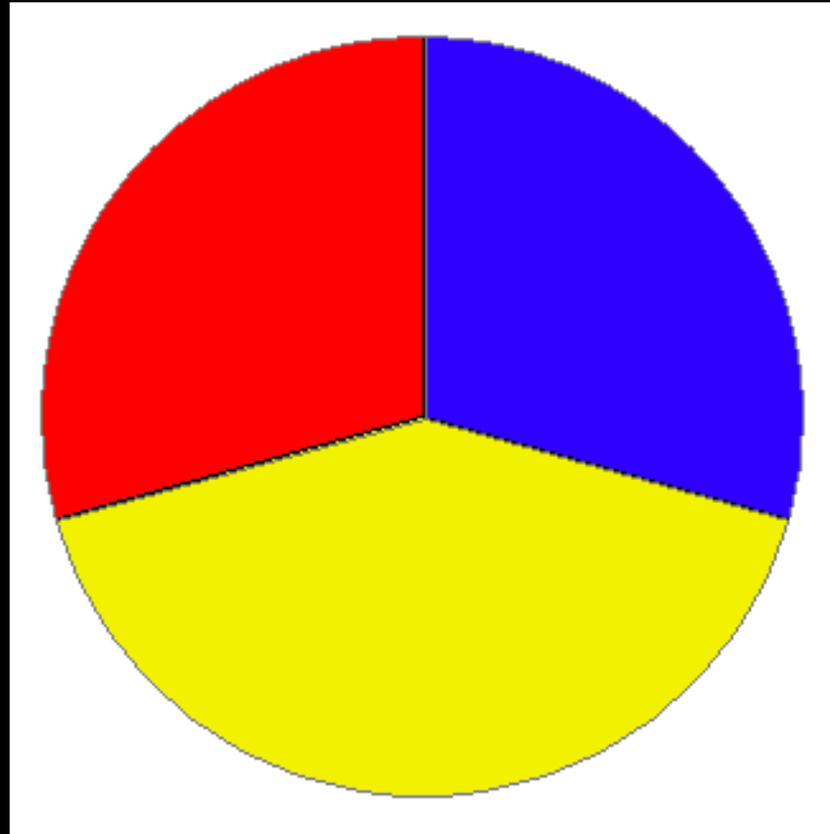
**Ephemeridae:**

***Hexagenia limbata*:**

**6 = Fair**



(example)



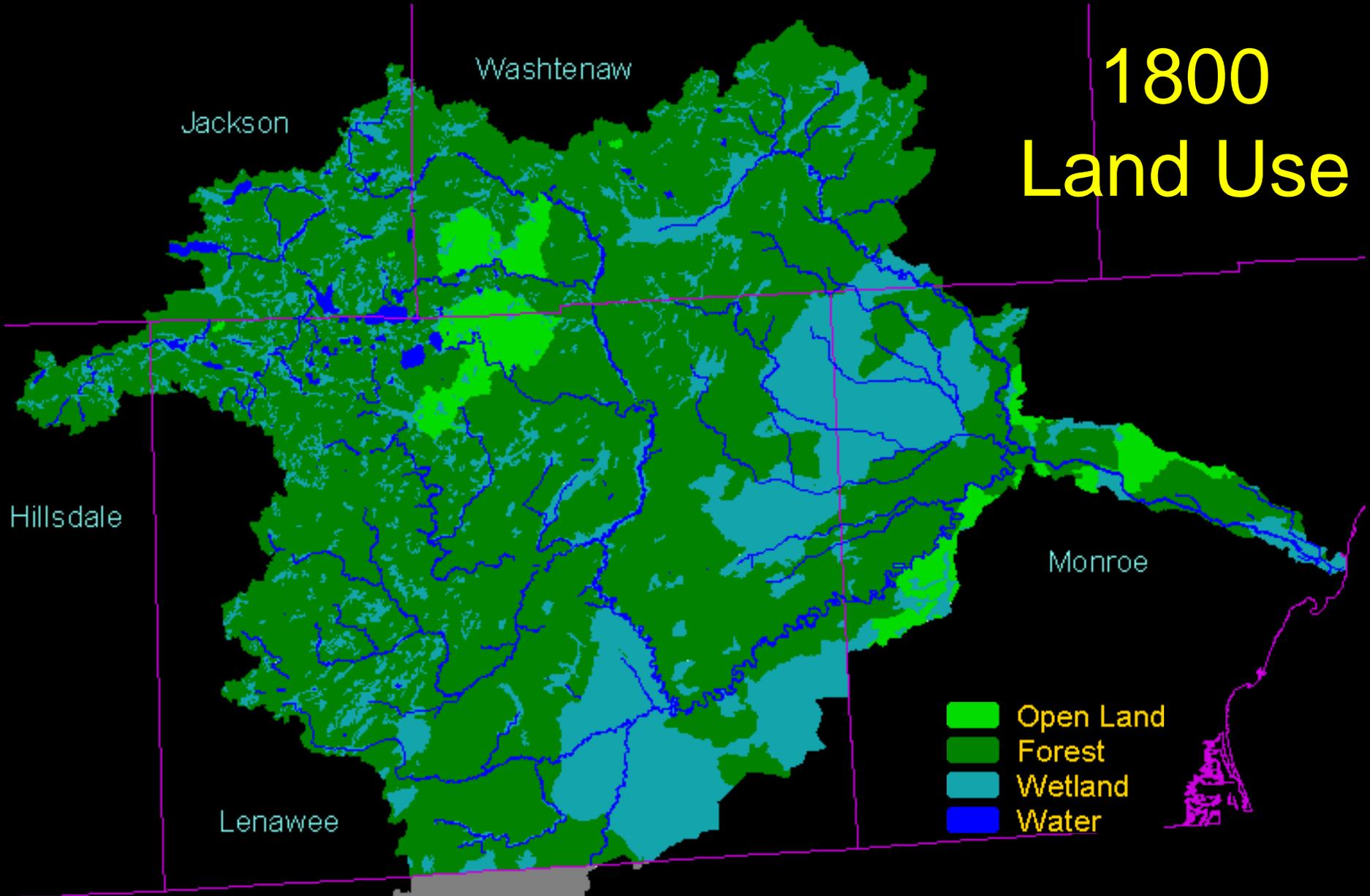
5:17

Ratio of 'sensitive' to total taxa

109

Total number of invertebrates

# 1800 Land Use



Jackson

Washtenaw

Hillsdale

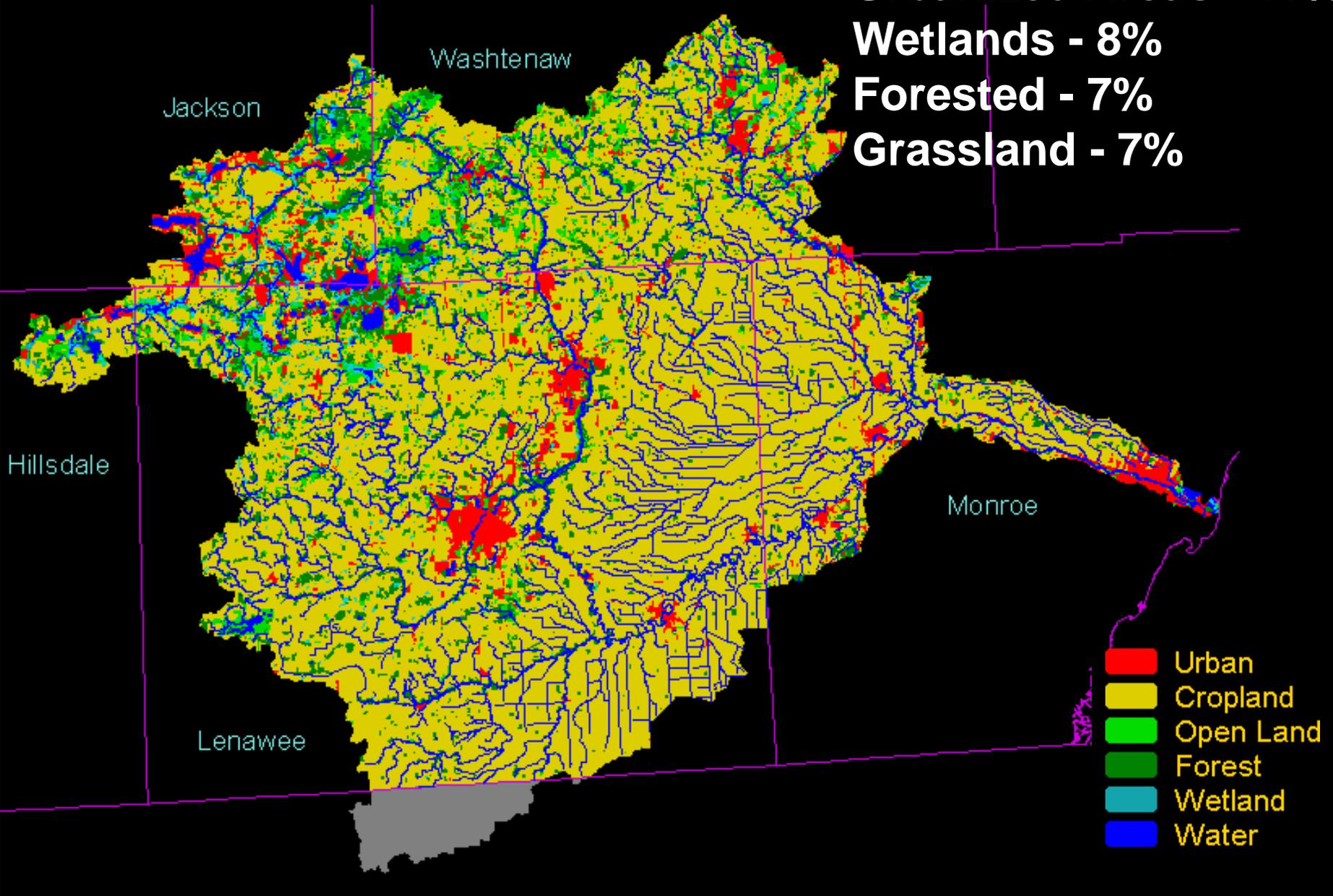
Monroe

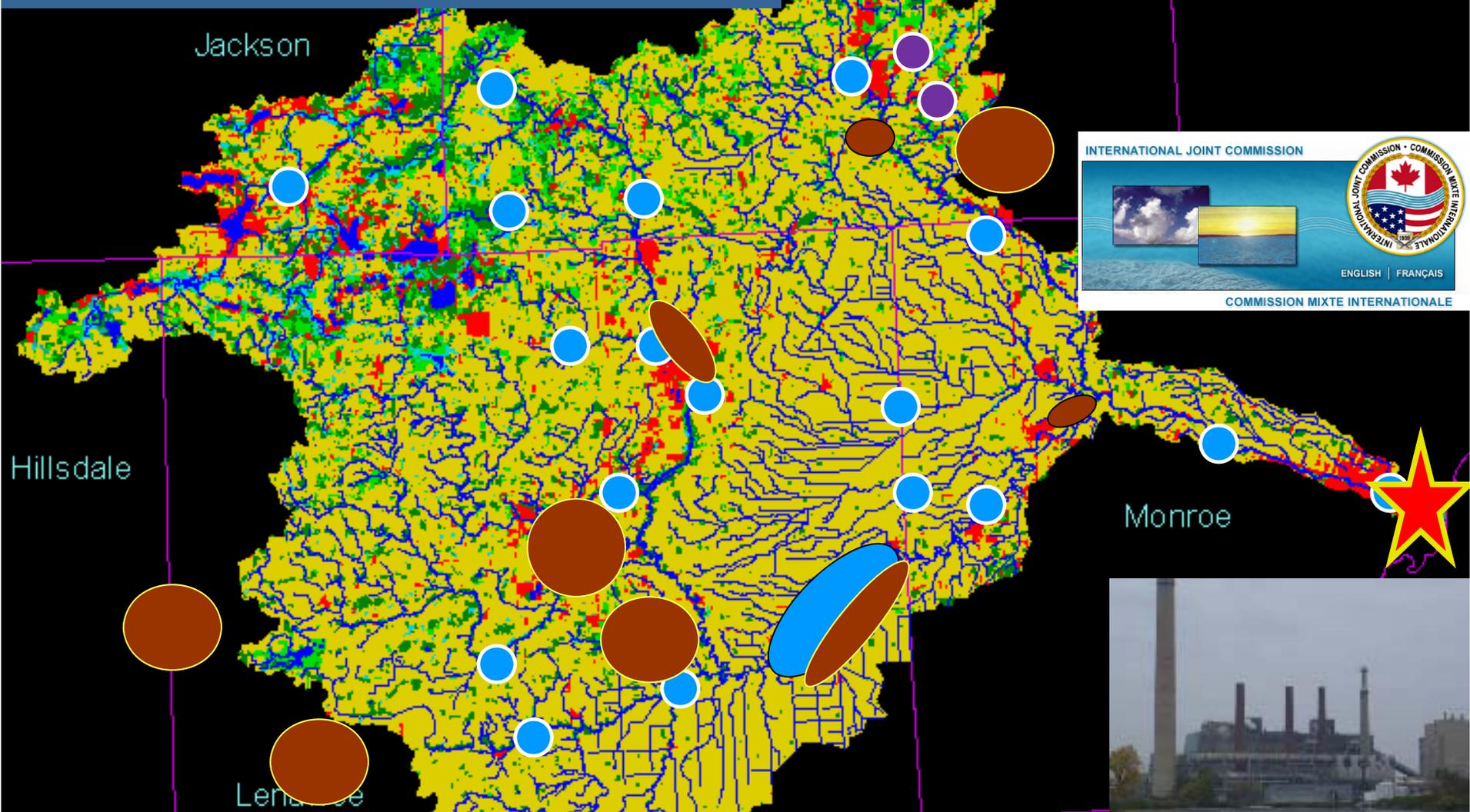
Lenawee

- Open Land
- Forest
- Wetland
- Water

**~140,000 people**

**Agriculture - 65%**  
**Urbanized Areas - 11%**  
**Wetlands - 8%**  
**Forested - 7%**  
**Grassland - 7%**





INTERNATIONAL JOINT COMMISSION



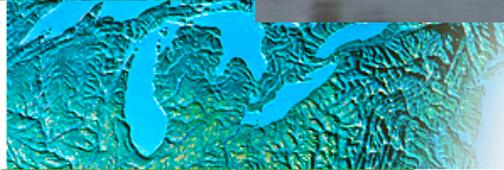
COMMISSION MIXTE INTERNATIONALE

ENGLISH | FRANÇAIS



# TMDLS

 Michigan  
**DNRE** Department of  
**NATURAL RESOURCES**  
and **ENVIRONMENT**

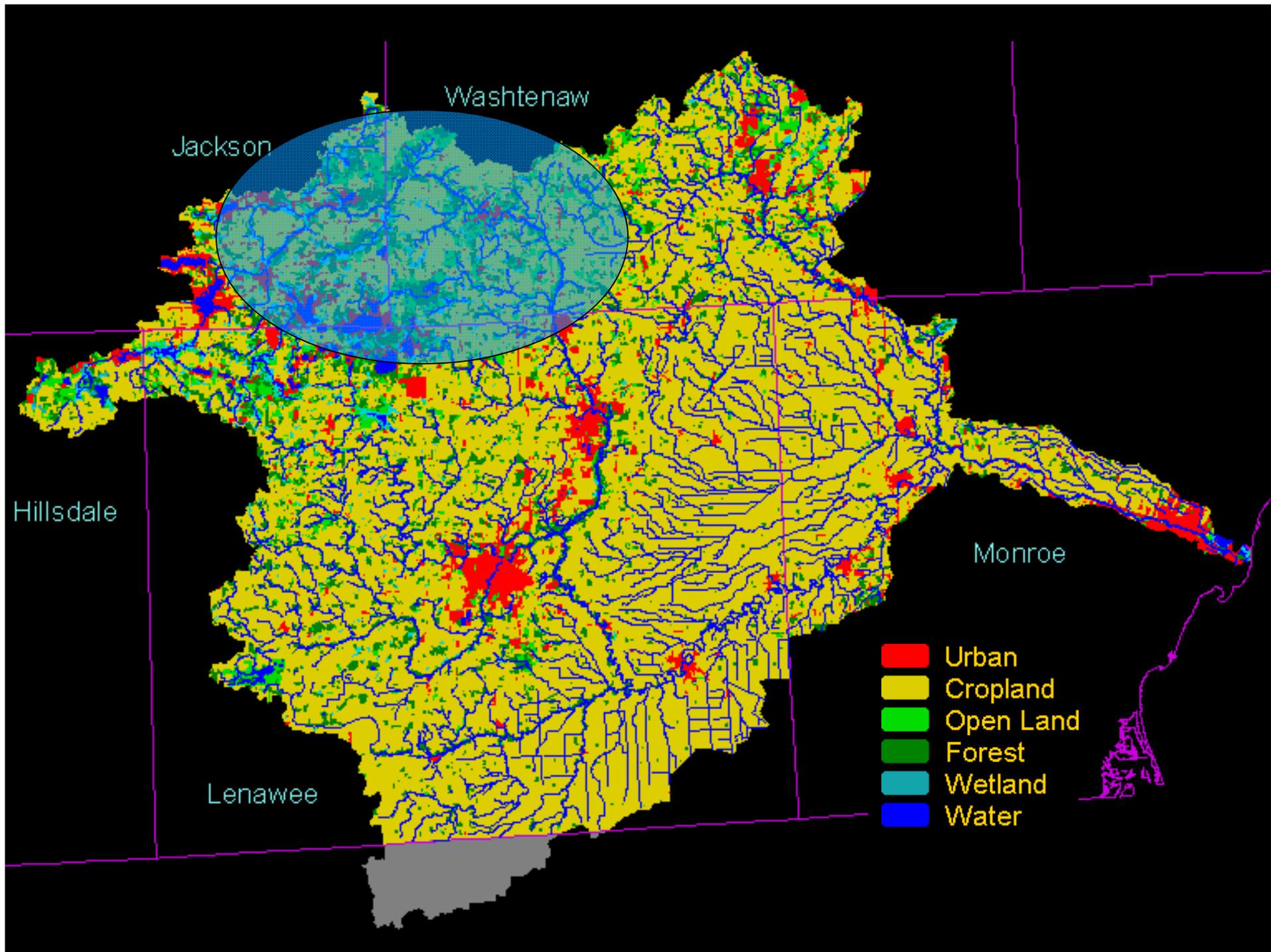
 **MICHIGAN.GOV**  
Michigan's  
Official  
Web Site



toledoBlade.com

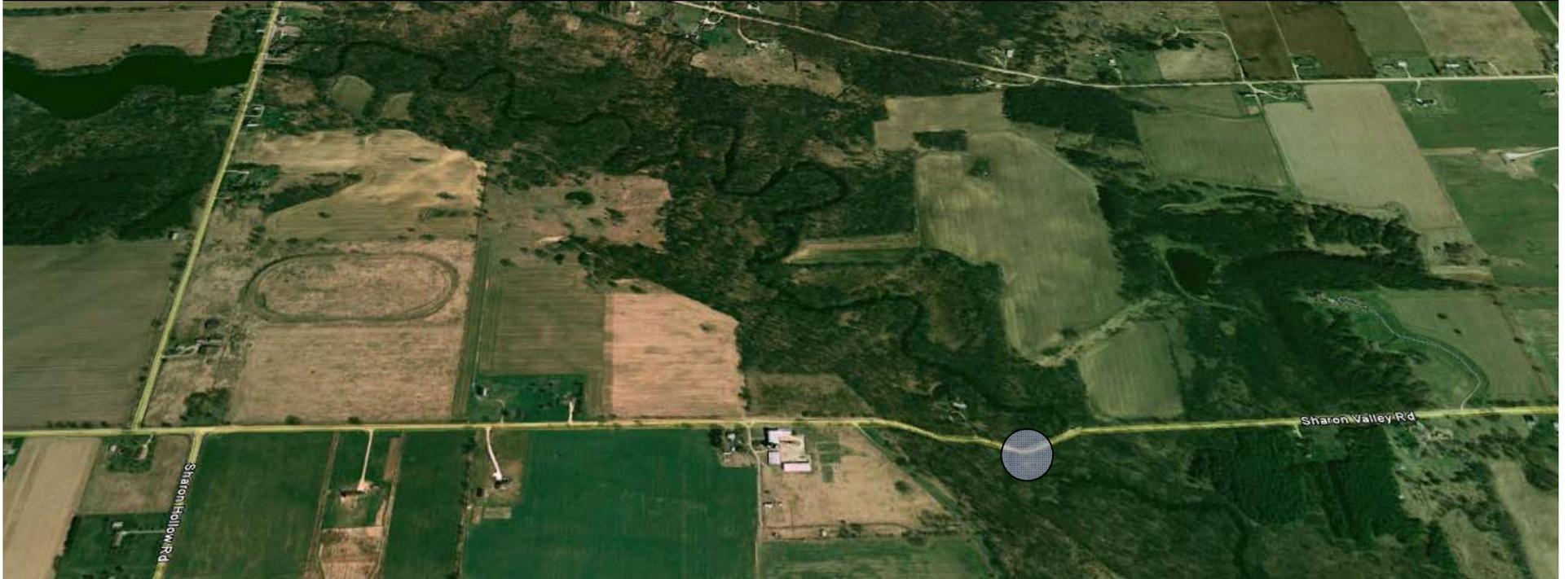
A huge bloom of potentially toxic microcystis algae, which has reared its ugly head almost annually since 1995 after more than a 20-year absence, has been visible from space since at least July 22.

10/17/2011 19:16 GMT





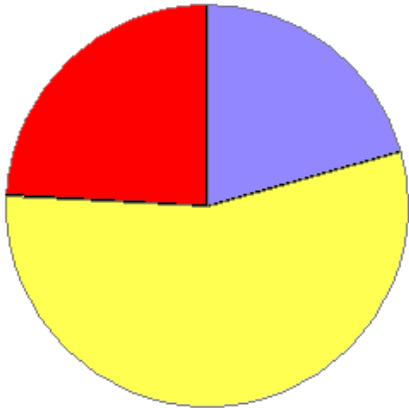
# RR5 – Upper River Raisin (above Manchester)



# RR5 – Upper River Raisin (above Manchester)



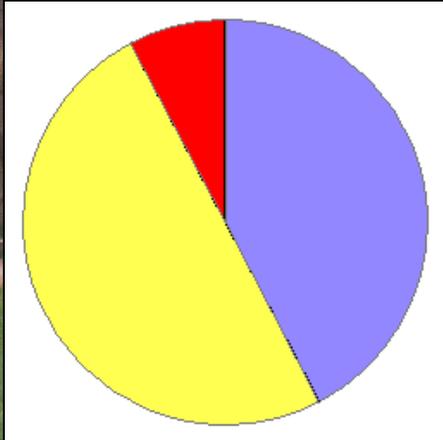
Spring 09



6:29

367

Fall 09



11:36

215

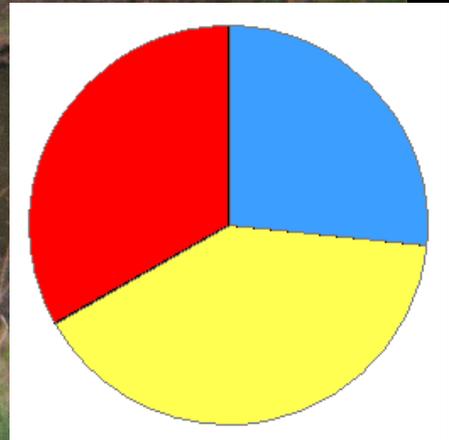
Spring 10



8:18

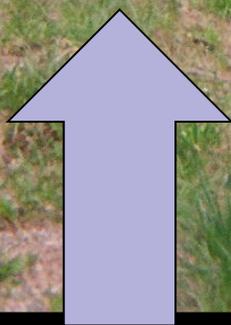
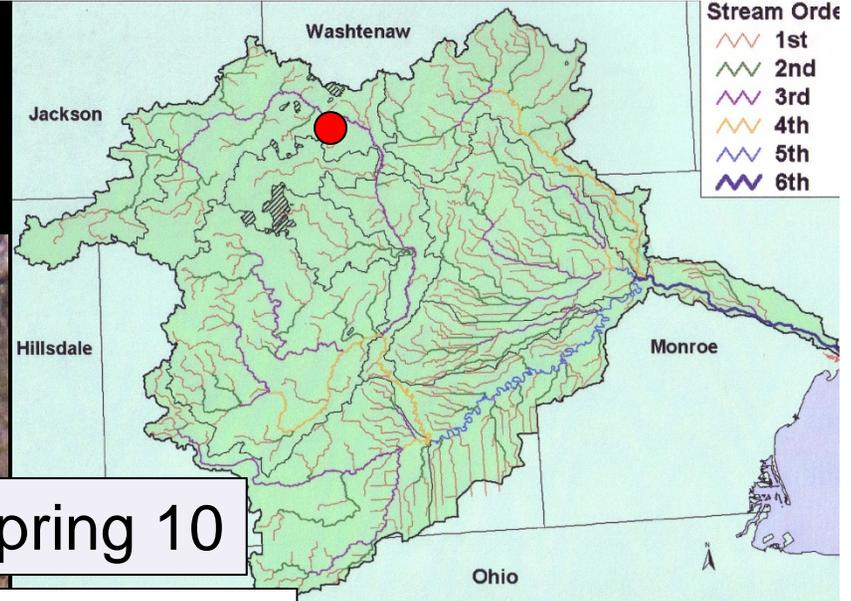
164

Fall 10

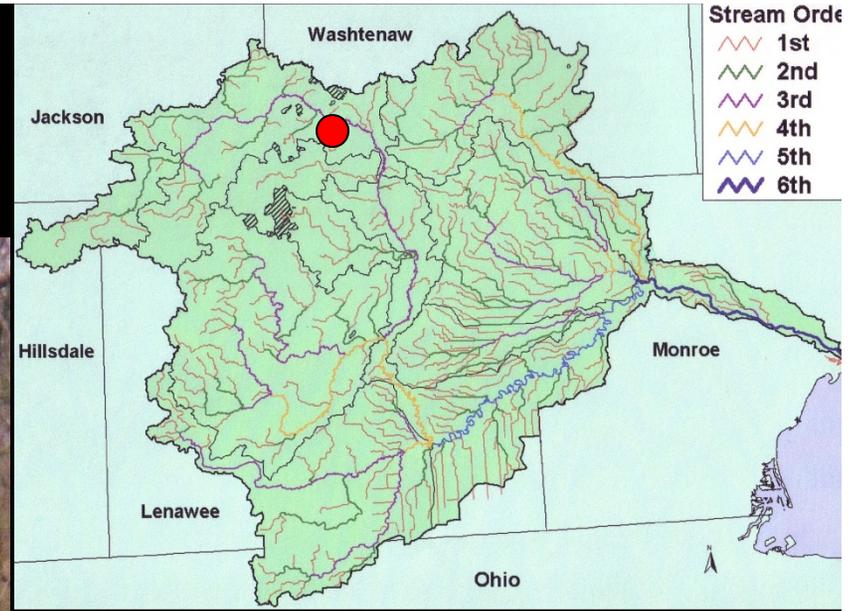


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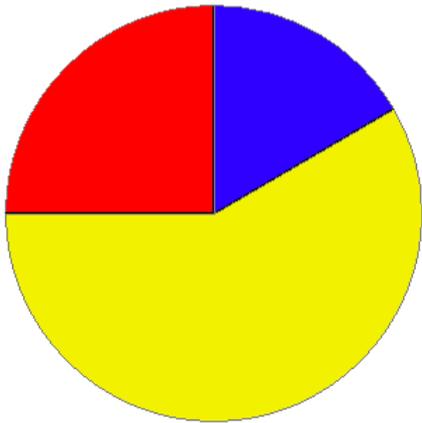
221



# RR5 – Upper River Raisin (above Manchester)



Spring 11

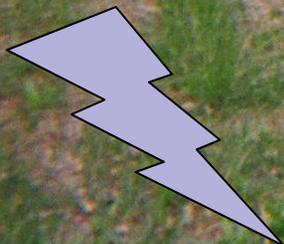


Fall 11



2:12

85



5:24

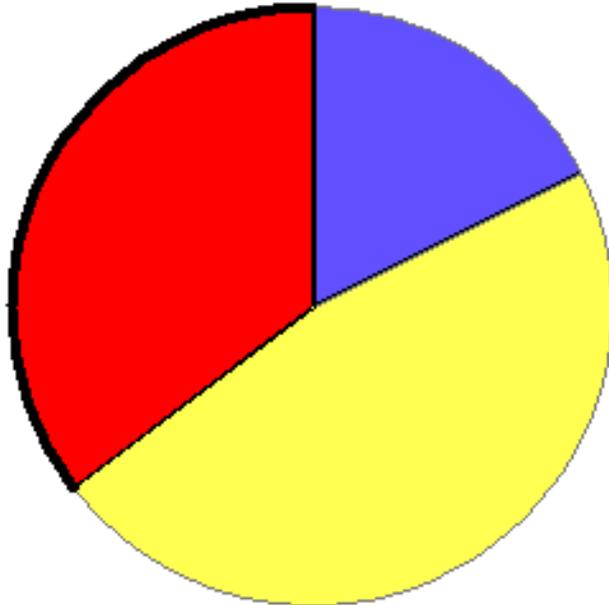
158





Department of  
NATURAL RESOURCES  
and ENVIRONMENT

## Upper River Raisin Austin Road



8:44

384

### METRIC

TOTAL NUMBER OF TAXA  
NUMBER OF MAYFLY TAXA  
NUMBER OF CADDISFLY TAXA  
NUMBER OF STONEFLY TAXA  
PERCENT MAYFLY COMP.  
PERCENT CADDISFLY COMP.  
PERCENT DOMINANT TAXON  
PERCENT ISOPOD, SNAIL, LEECH  
PERCENT SURF. AIR BREATHERS

TOTAL SCORE

MACROINV. COMMUNITY RATING

### STATION S

River Raisin

Austin Road

7/29/2008

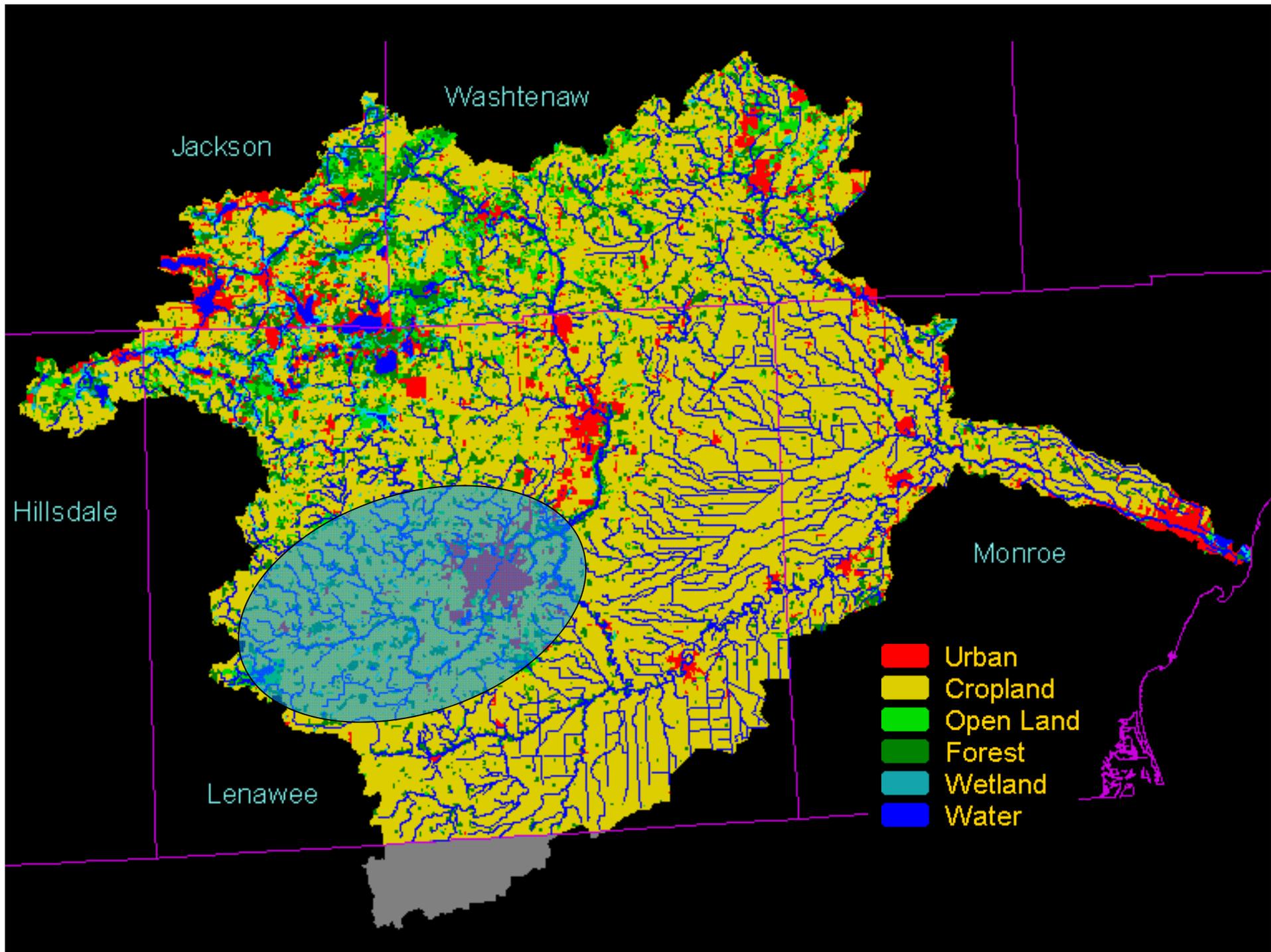
Value Score

44	1
6	1
10	1
1	1
29.39	1
24.85	1
15.76	1
2.42	1
4.24	1

9

EXCELLENT



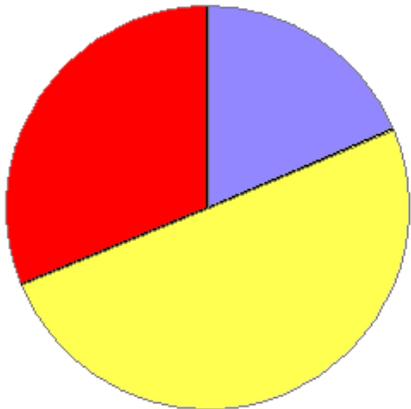


# SBR2 – South Branch River Raisin (above Adrian)

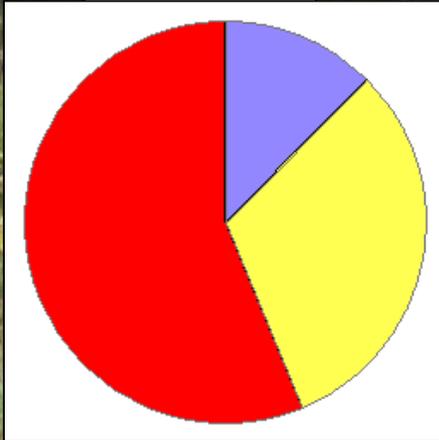


# SBR2 – South Branch River Raisin (above Adrian)

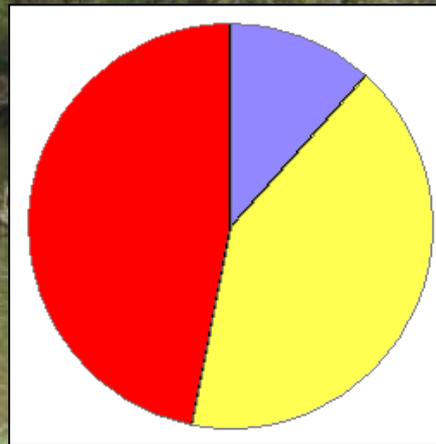
Spring 09



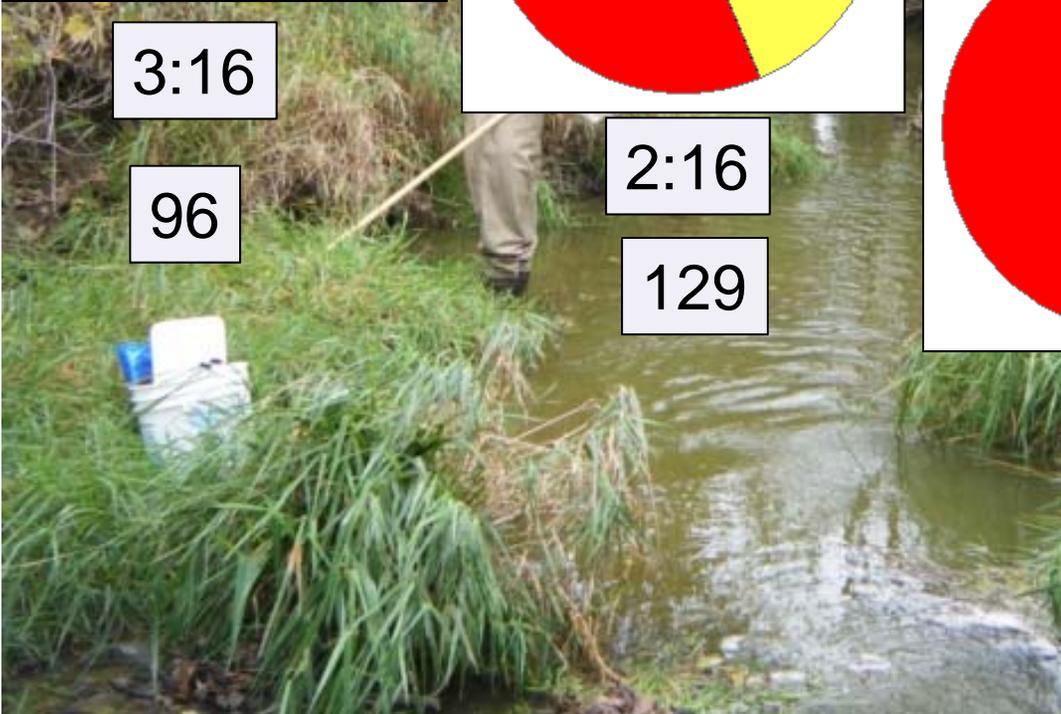
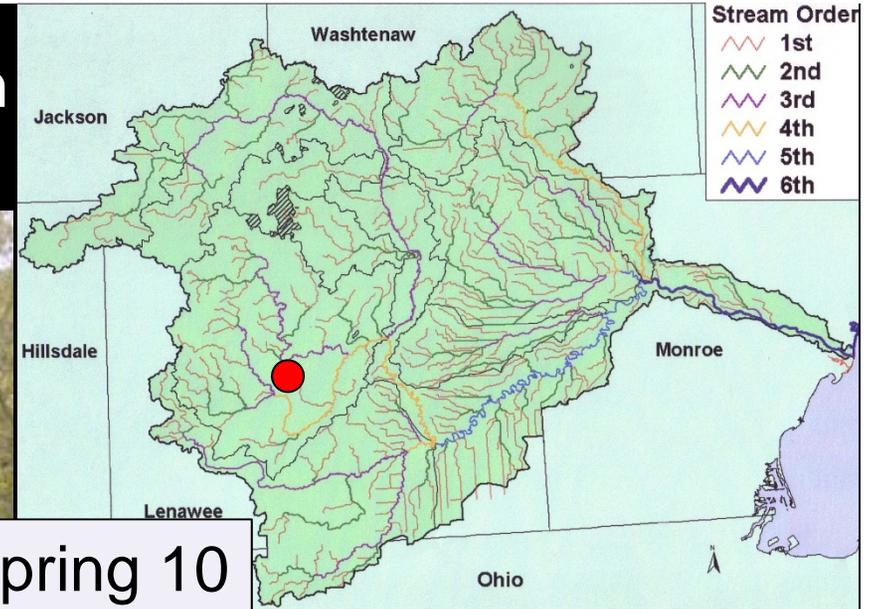
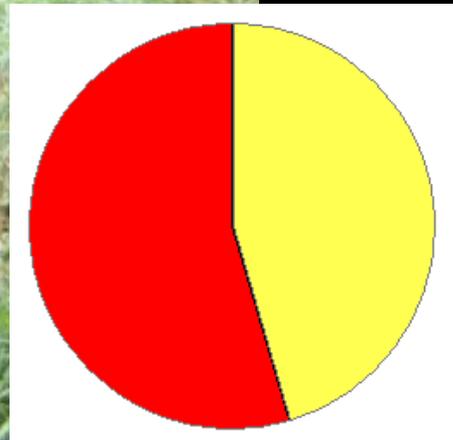
Fall 09



Spring 10



Fall 10



3:16

96

2:16

129

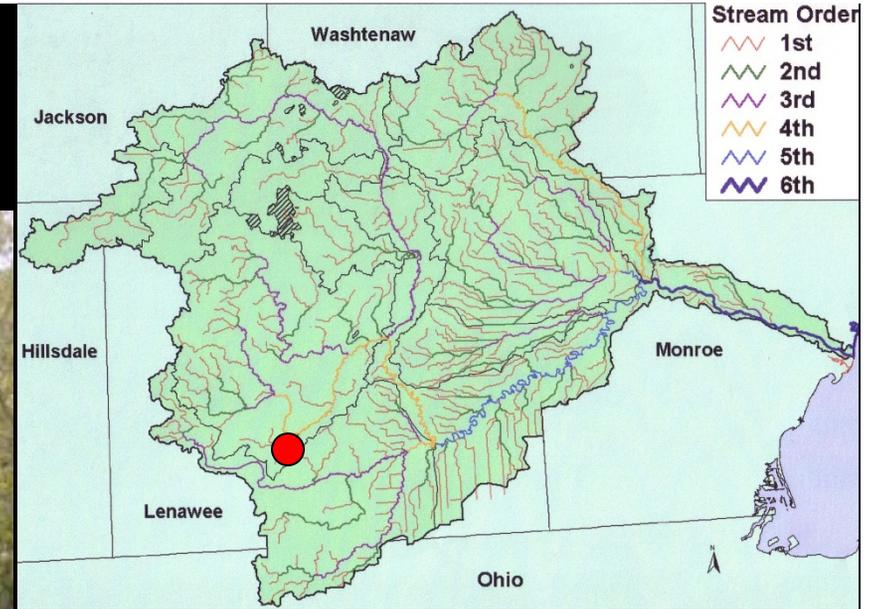
2:17

71

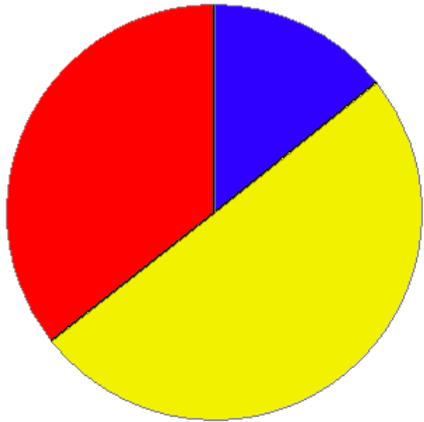
0:12

103

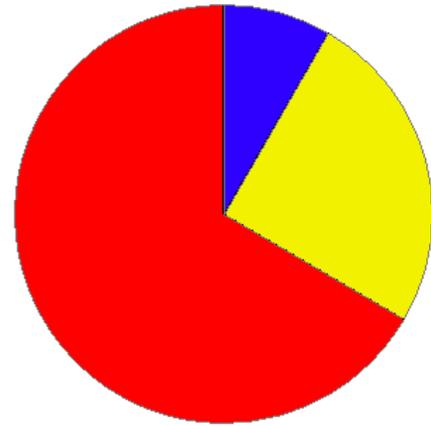
# SBR2 – South Branch River Raisin (above Adrian)



Spring 11



Fall 11

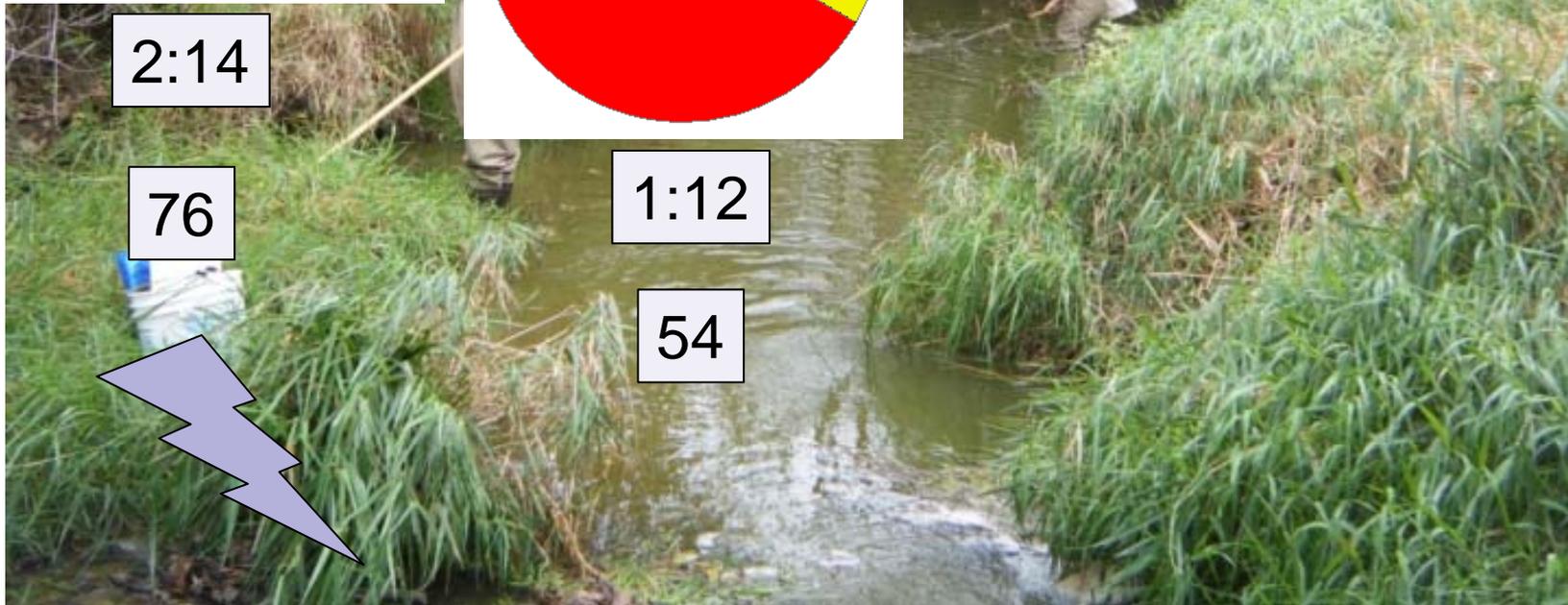
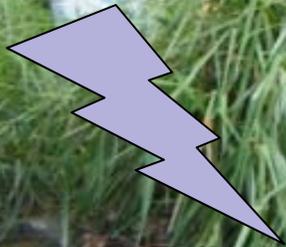


2:14

76

1:12

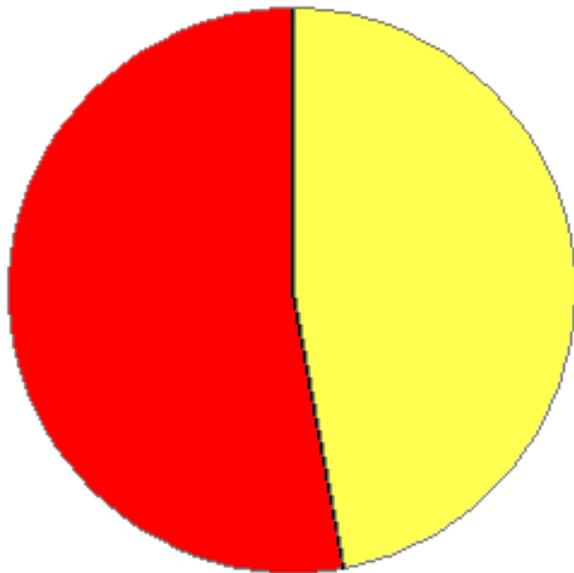
54





Department of  
NATURAL RESOURCES  
and ENVIRONMENT

## South Branch River Raisin Benner/Carleton Hwy



0:18

300

### METRIC

TOTAL NUMBER OF TAXA  
NUMBER OF MAYFLY TAXA  
NUMBER OF CADDISFLY TAXA  
NUMBER OF STONEFLY TAXA  
PERCENT MAYFLY COMP.  
PERCENT CADDISFLY COMP.  
PERCENT DOMINANT TAXON  
PERCENT ISOPOD, SNAIL, LEECH  
PERCENT SURF. AIR BREATHERS

TOTAL SCORE

MACROINV. COMMUNITY RATING

**STATION 27**  
South Branch Raisin River  
Carleton Hwy/Benner Hwy  
7/22/2008

Value Score

18	0
2	1
1	0
0	-1
3.00	0
27.67	1
32.67	1
4.33	0
2.33	1
	3

ACCEPTABLE





ba Hoff Dairy

teline Farm (swine)

20.9 km

Bruinsma Dairy

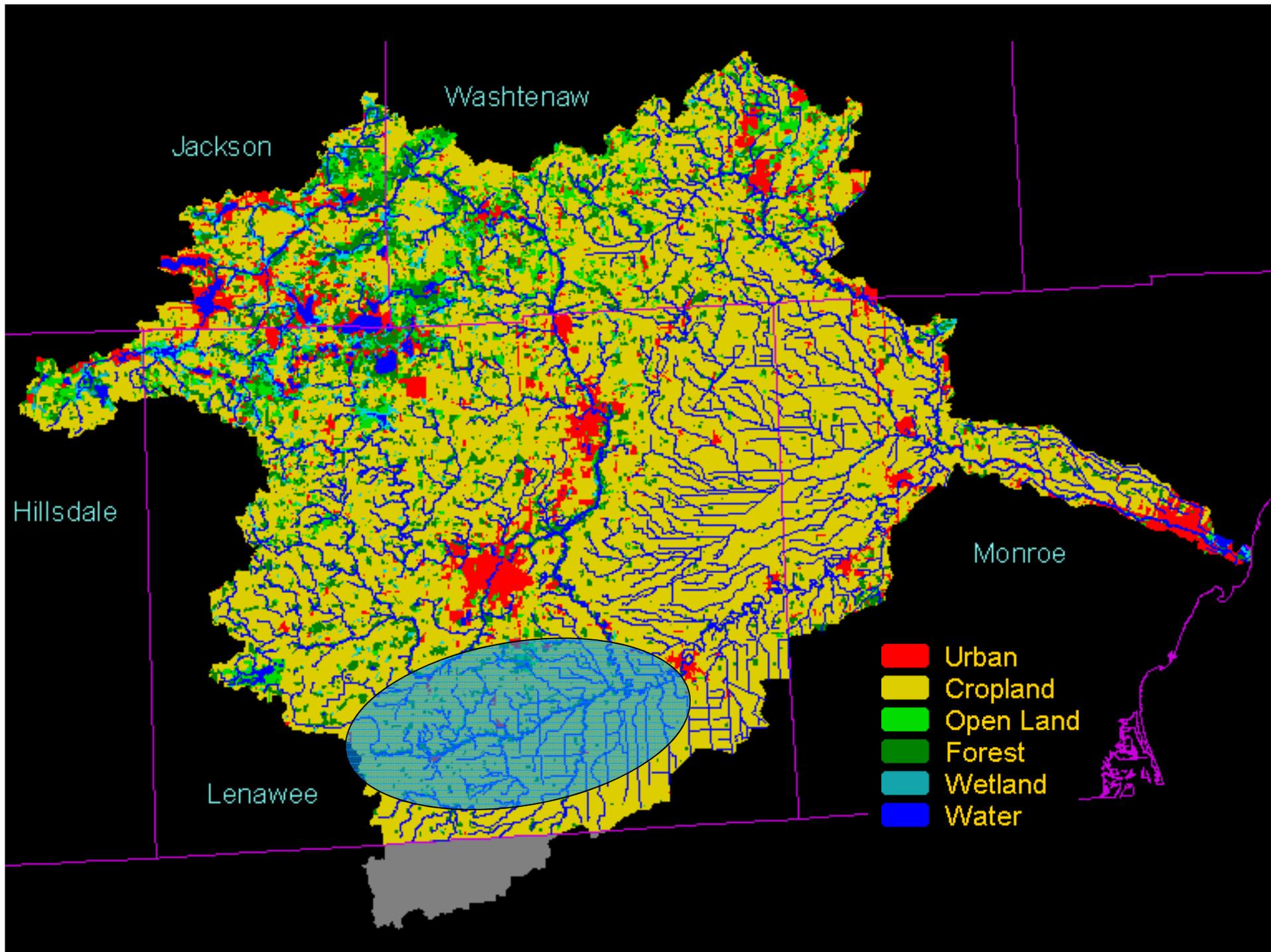
enawee

Raymond and St

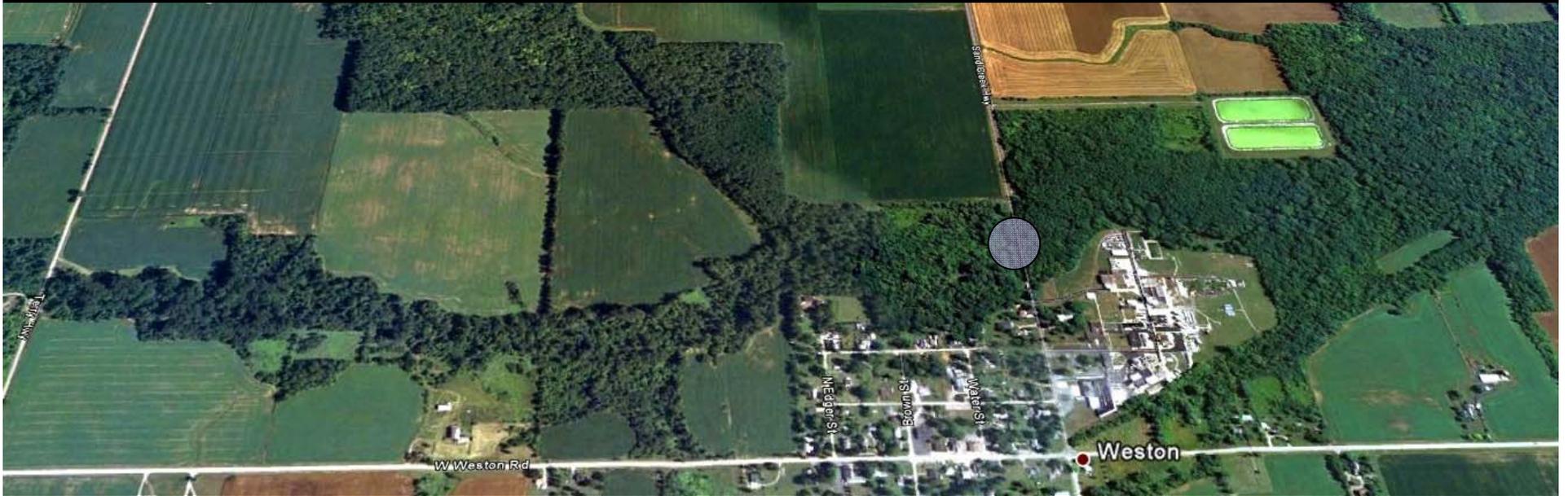
BC © 2008 Europa T

Image © 2008 D

© 2008 Tele

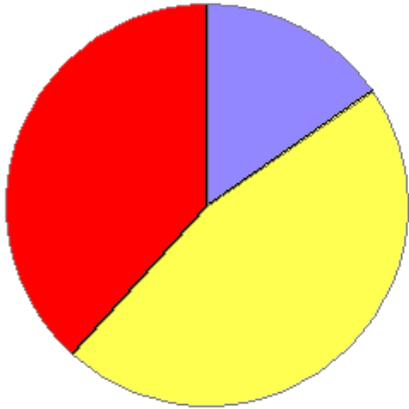


# BC2 – Black Creek (in Weston)

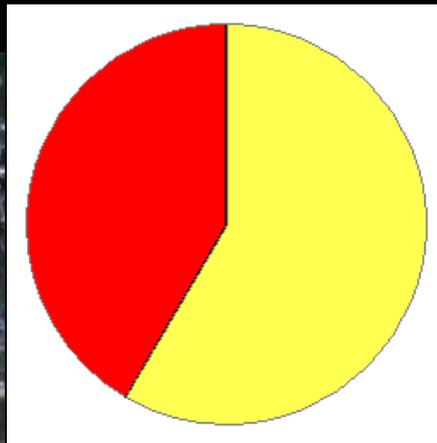


# BC2 – Black Creek (in Weston)

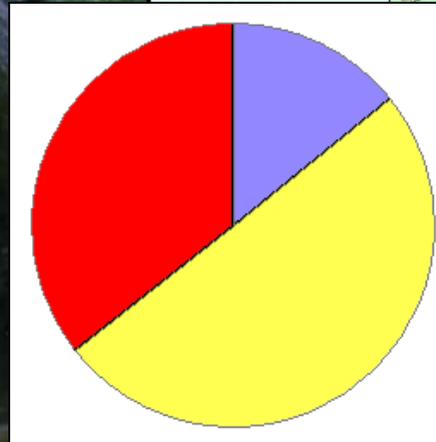
Spring 09



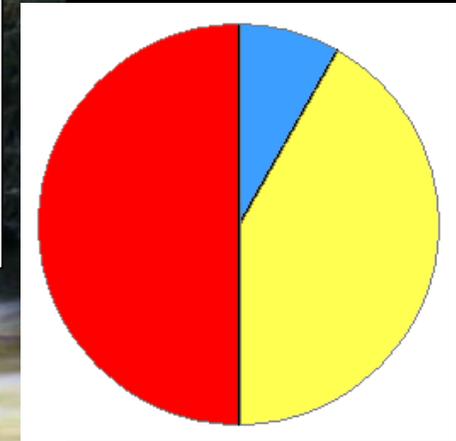
Fall 09



Spring 10



Fall 10



2:13

41

0:12

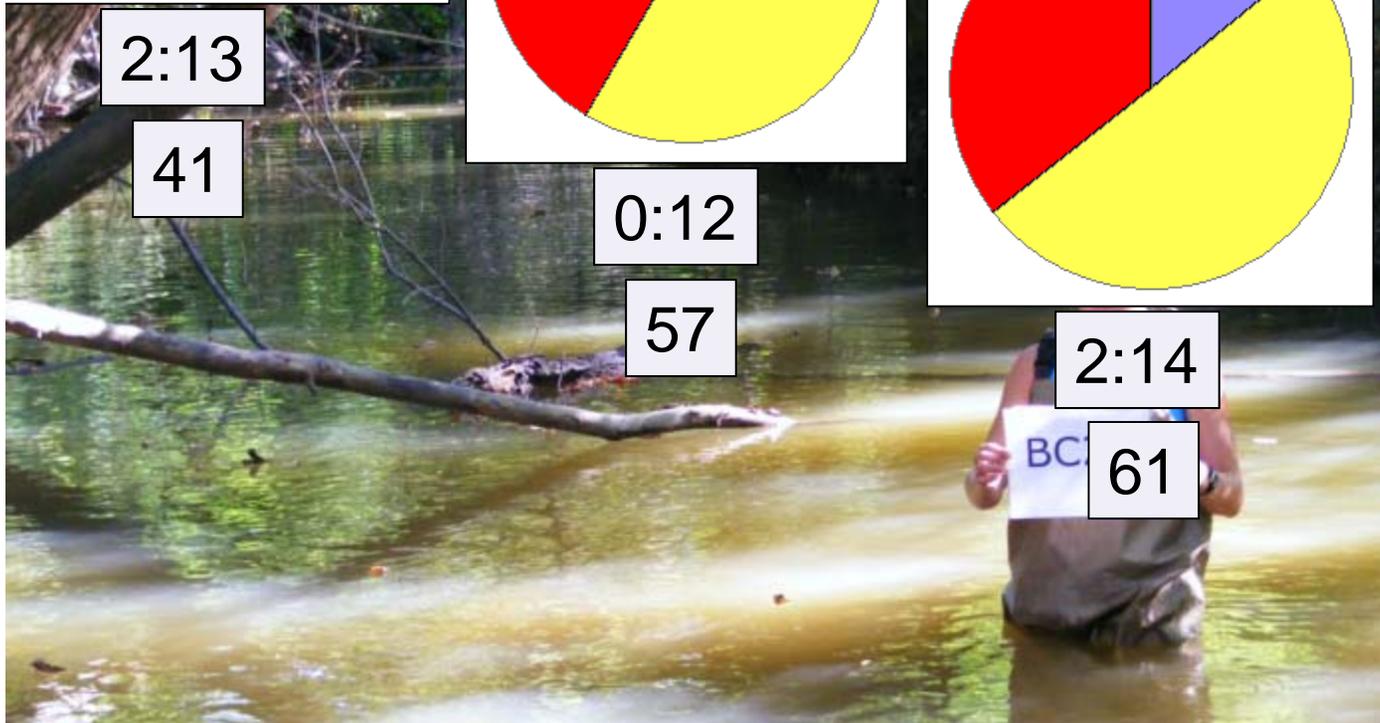
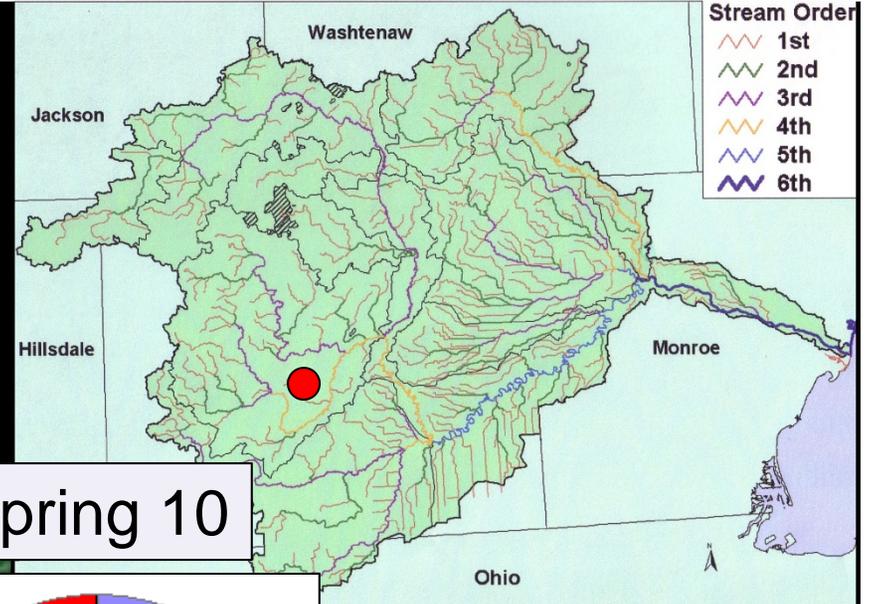
57

2:14

61

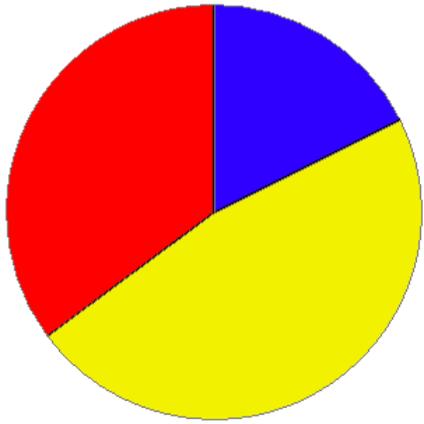
1:11

75

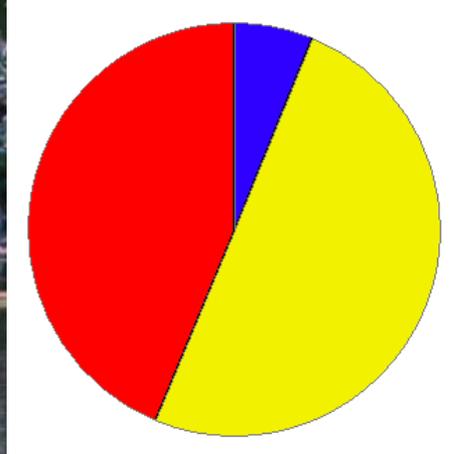


# BC2 – Black Creek (in Weston)

Spring 11



Fall 11

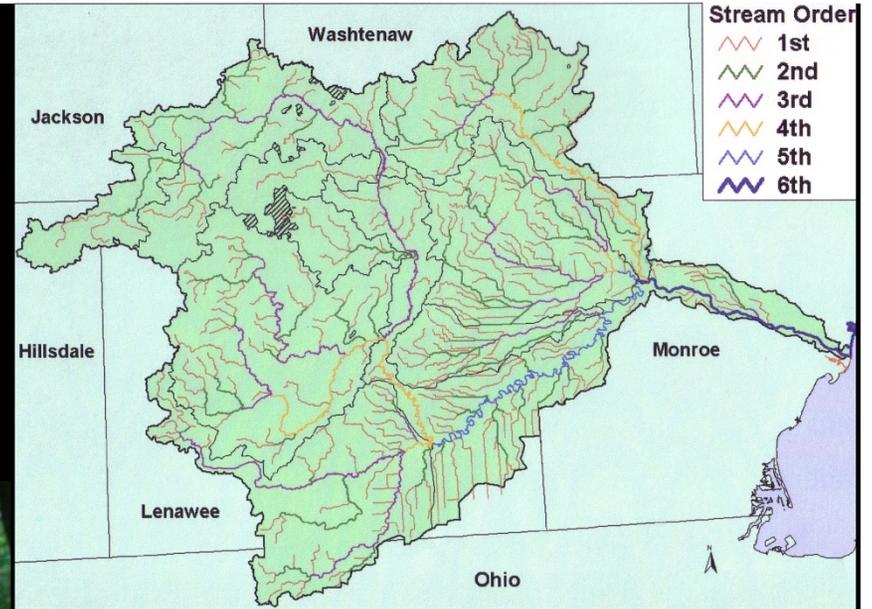


3:17

64

1:16

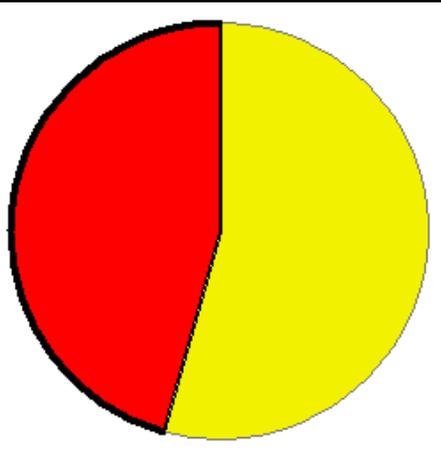
160





Department of  
NATURAL RESOURCES  
and ENVIRONMENT

## Black Creek Horton Road



0:24

256

### METRIC

TOTAL NUMBER OF TAXA  
 NUMBER OF MAYFLY TAXA  
 NUMBER OF CADDISFLY TAXA  
 NUMBER OF STONEFLY TAXA  
 PERCENT MAYFLY COMP.  
 PERCENT CADDISFLY COMP.  
 PERCENT DOMINANT TAXON  
 PERCENT ISOPOD, SNAIL, LEECH  
 PERCENT SURF. AIR BREATHERS  
  
 TOTAL SCORE  
  
 MACROINV. COMMUNITY RATING

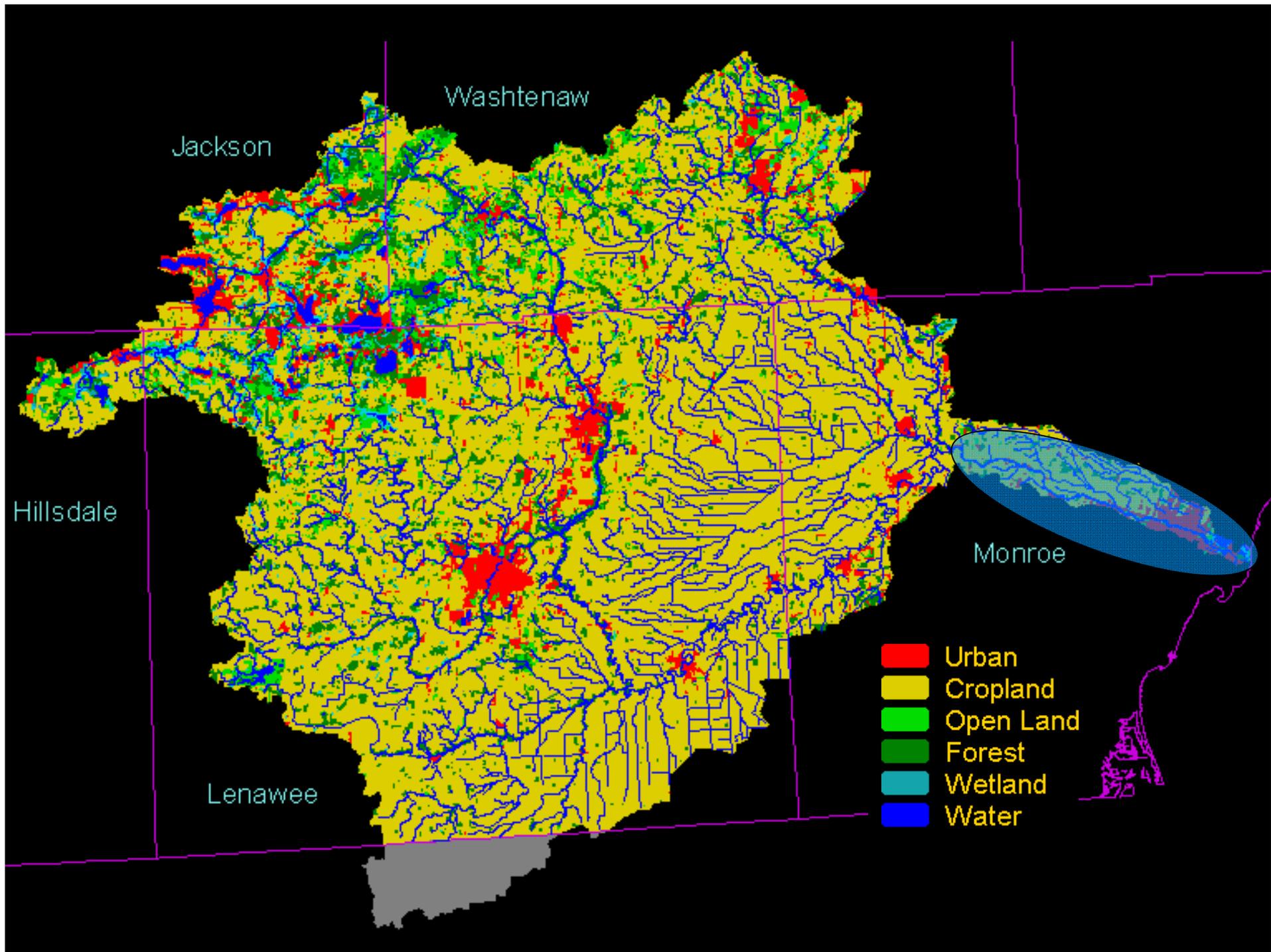
STATION 21  
 Black Creek  
 Horton Road  
 7/25/2008

Value Score

24	0
3	0
4	1
0	-1
34.77	1
5.47	0
33.59	-1
10.55	0
14.84	0
	0

ACCEPTABLE



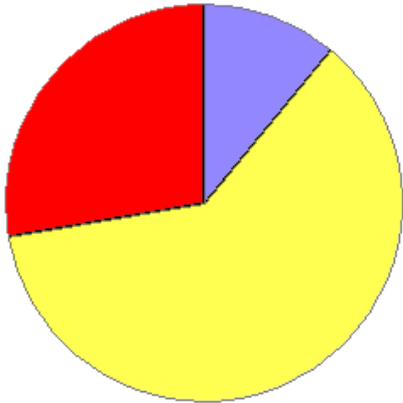


# RR2 – Lower River Raisin (Ida-Maybe Road)



# RR2 – Lower River Raisin (Ida-Maybe Road)

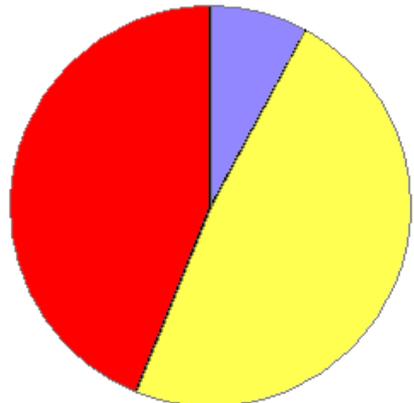
Spring 09



2:18

196

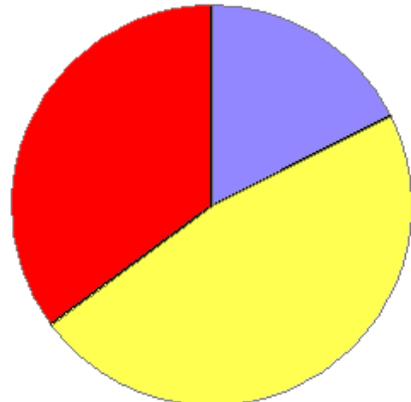
Fall 09



2:25

450

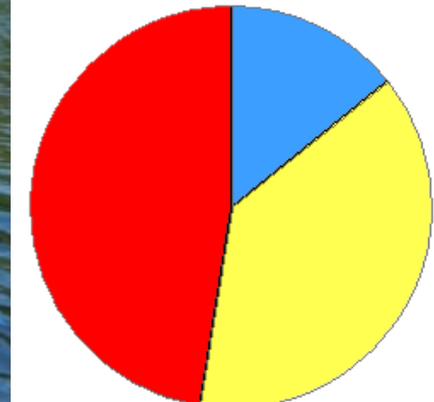
Spring 10



3:17

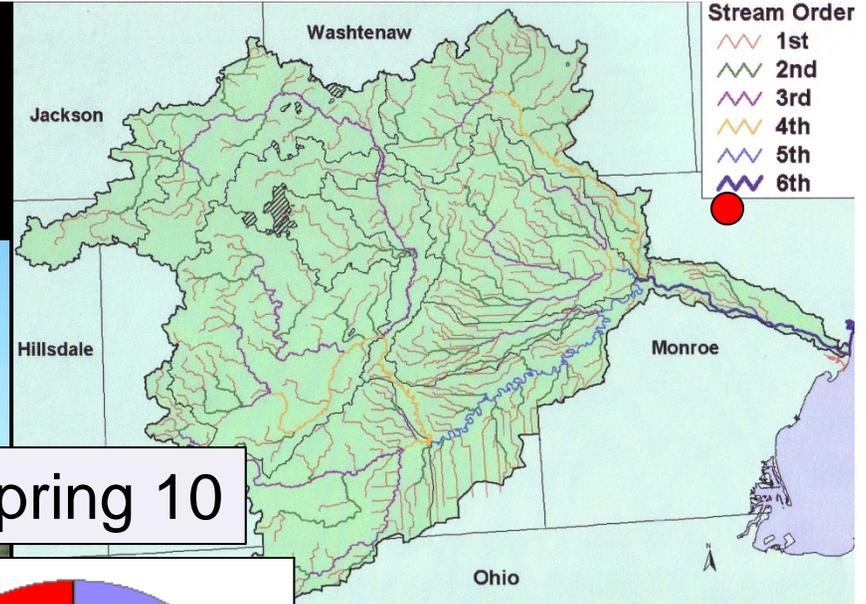
229

Fall 10

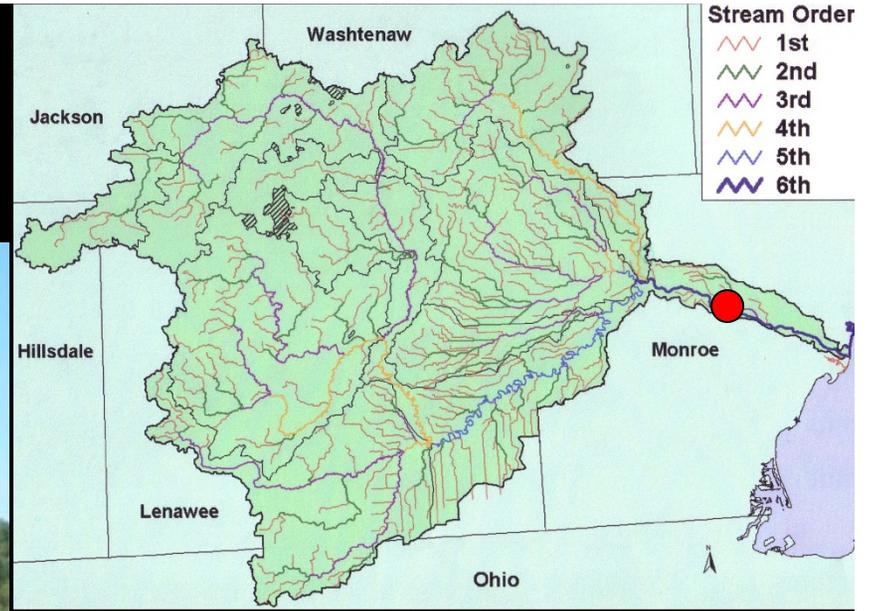


3:21

146



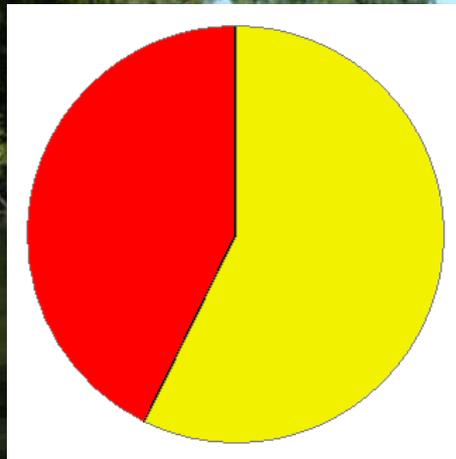
# RR2 – Lower River Raisin (Ida-Maybe Road)



Spring 11

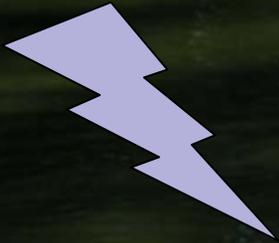
Fall 11

No Data



0:14

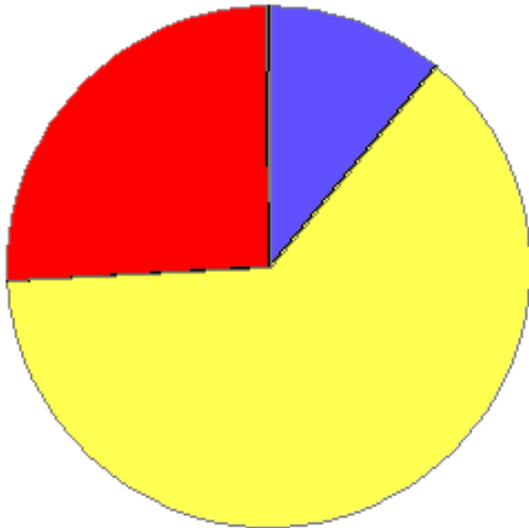
162





Department of  
NATURAL RESOURCES  
and ENVIRONMENT

Ida-Maybee Rd.



3:30

496

METRIC

TOTAL NUMBER OF TAXA  
 NUMBER OF MAYFLY TAXA  
 NUMBER OF CADDISFLY TAXA  
 NUMBER OF STONEFLY TAXA  
 PERCENT MAYFLY COMP.  
 PERCENT CADDISFLY COMP.  
 PERCENT DOMINANT TAXON  
 PERCENT ISOPOD, SNAIL, LEECH  
 PERCENT SURF. AIR BREATHERS  
  
 TOTAL SCORE  
  
 MACROINV. COMMUNITY RATING

STATION 2  
 River Raisin  
 Ida Maybee Road  
 7/30/2008

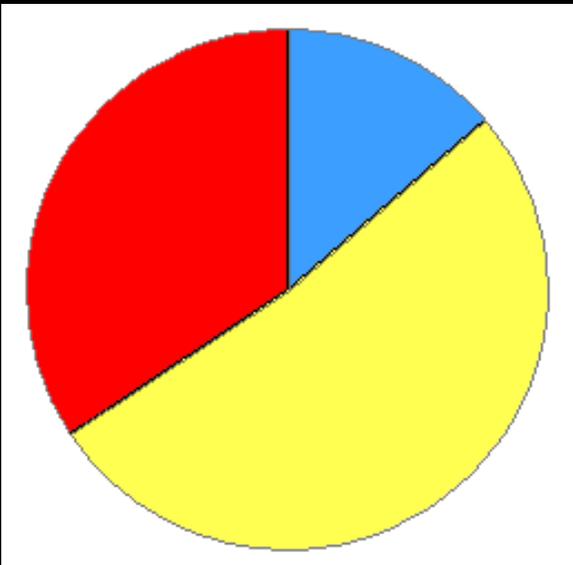
Value	Score
30	0
5	1
5	1
0	-1
40.73	1
8.47	0
30.65	-1
1.41	1
1.01	1
	3

ACCEPTABLE





Dixon Hwy.



4:33

386

STATION 1  
River Raisin  
Off Dixon Road  
8/13/2008

METRIC	Value	Score
TOTAL NUMBER OF TAXA	33	1
NUMBER OF MAYFLY TAXA	5	1
NUMBER OF CADDISFLY TAXA	4	1
NUMBER OF STONEFLY TAXA	0	-1
PERCENT MAYFLY COMP.	57.51	1
PERCENT CADDISFLY COMP.	12.95	0
PERCENT DOMINANT TAXON	19.95	0
PERCENT ISOPOD, SNAIL, LEECH	2.59	1
PERCENT SURF. AIR BREATHERS	2.85	1
TOTAL SCORE		5
MACROINV. COMMUNITY RATING		<b>EXCELLENT</b>



# Conclusions

- Amateur collector versus Professionals:
  - Time in water
  - Number of collectors
- Rating system:
  - Limitation of family level identification
  - false positive & false negative problem
- Goals:
  - Reference collections, better correlations w/ other metrics; development of reliable WQ indicator status for specific taxa within this specific region























RESERVA BIOSFERA  
TAWANKA ASANGNI  
DECRETO No. 157-99  
LIMITE GENERAL DE LA RESERVA  
GRUPO DEL RIO DE SPANISHI  
DEL CONDADO BORGAP

