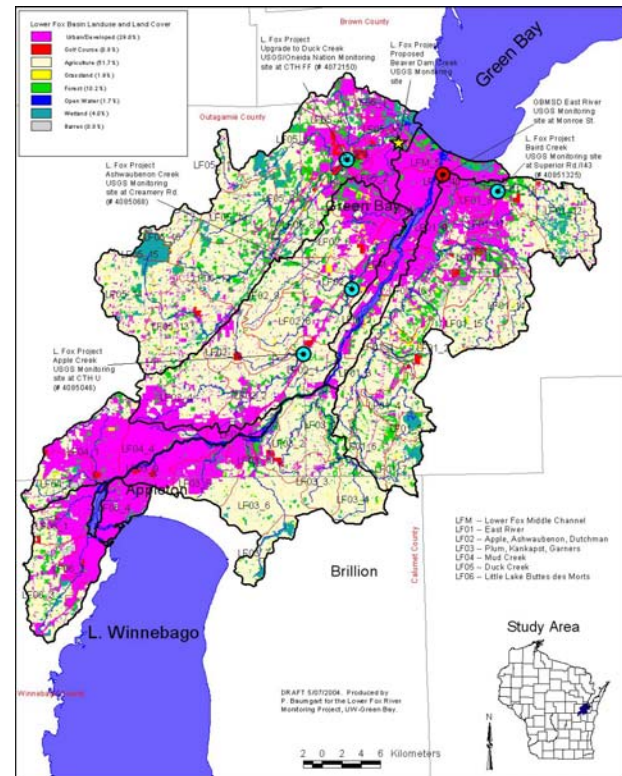


Project Overview – Continuous Monitoring Program

Five USGS continuous monitoring stations within the 1,580 sq. km Lower Fox Basin have been installed directly through the project. These stations will provide 3 years of data beginning in October 2003 and ending September 30, 2006:

- Duck Creek at CTH FF (276 km²) -- upgraded with sampler (co-sponsored by Oneida Tribe)
- Baird Creek at Superior Road (~56 km²)
- Apple Creek at CTH U / Campground (117 km²)
- Ashwaubenon Creek at Creamery Road (~50 km²)
- East River at Monroe St. (374 km²) -- not shown here (co-sponsored by GBMSD)

USGS will compute daily total phosphorus and suspended sediment loads for each stream, and estimate the dissolved phosphorus loads. Suspended sediment concentrations will also be correlated with turbidity data from UW-Milwaukee.



Major Objectives:

1. Better understand cause/effect through event and continuous monitoring.
2. Compare flow, phosphorus, and suspended sediment concentrations and loads from different source areas (e.g. urban, urbanizing, and rural/agriculture).

Preliminary Results

- Good representation from large runoff events early in project.
- High levels of total and dissolved phosphorus found in all streams.
- Maximum total P concentrations ranged from 0.9 mg/L at Duck (without possible outlier) to 4.6 mg/L at Apple; means ranged from 0.4 mg/L at Duck (without possible outlier) to 1.0 mg/L at Baird.
- Mean dissolved P to total P fractions ranged from 51-62%.
- Maximum total suspended solids (TSS) ranged from 430 mg/L at Duck to 2,700 mg/L at Baird; means ranged from 79 mg/L at Duck to 460 mg/L at Baird.
- Need to further investigate whether samples collected by automated station are representative, particularly during high discharge events.
- Baird Creek flow regime different than more flashy systems such as Ashwaubenon and Apple watersheds. However, impervious urban areas may already be impacting the flow regime, particularly peak flows.

Ice-jam just upstream of Apple Creek station 3/3/04



- Apple and Ashwaubenon Creeks respond similarly. Systems are flashy.
- Final snowmelt period was rapid as was ice breakup.
- Very large runoff events captured in fall (Nov. 23-25), and spring snowmelt period (March 1-4).

Downstream of bridge at USGS station 3/1/04



- Baird Creek hydrograph: Much slower response compared to Ashwaubenon which has similar drainage area, presumably due to wetland retention and shallow slopes in upper watershed. Recession is markedly different than Ashwaubenon or Apple.
- However, Baird hydrograph shows initial sharp rise in response to less pervious urban and urbanizing areas - primarily near station and south branch (also steep terrain near station).

Ice-jam at Baird Creek station 3/2/04

Highest level Observed March 2-3/04

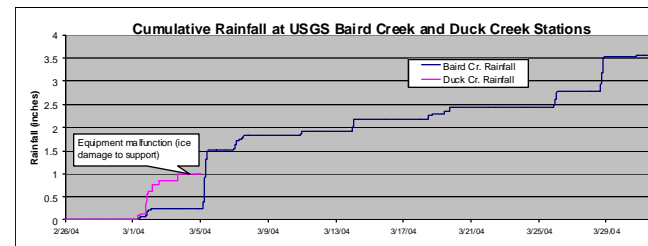
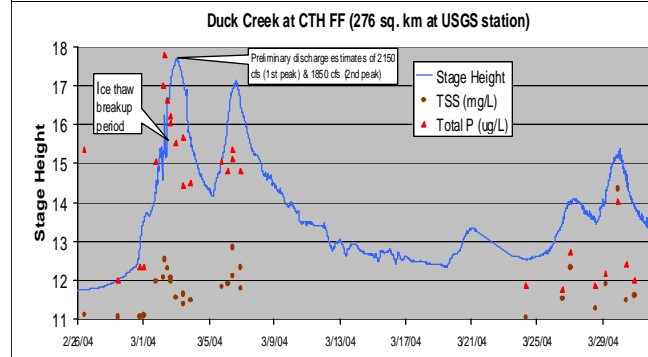
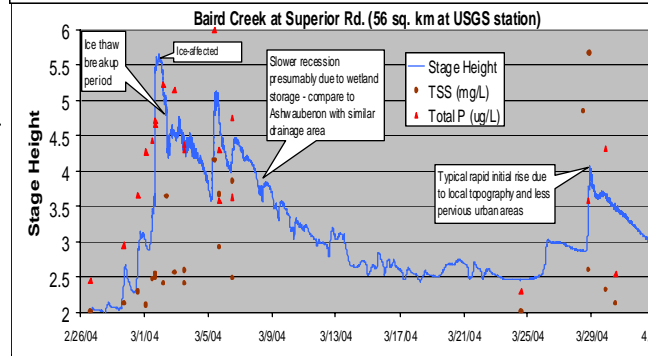
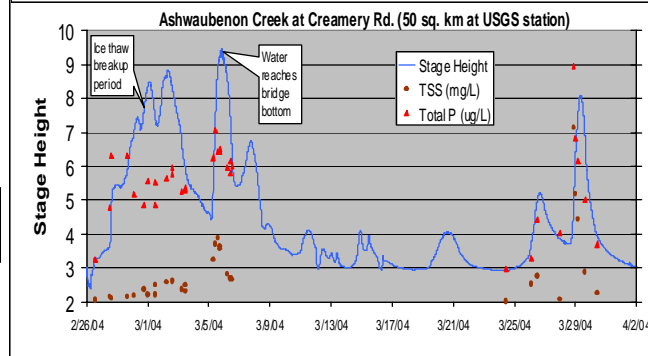
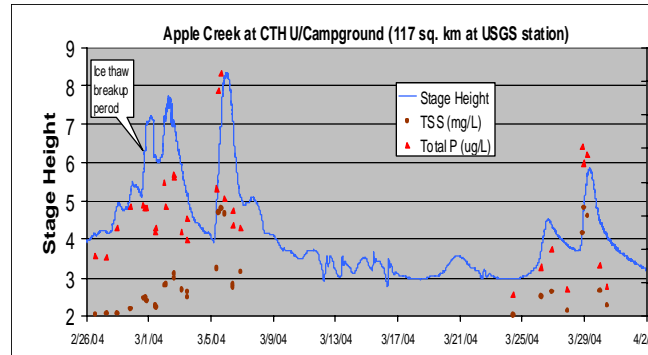


- Preliminary estimated flow exceeded 2000 cfs at Duck Creek station during snowmelt period.

Ice still present at Duck Creek station 3/1/04, but not ice-affected next day

Sample hydrograph: Feb 26 – April 2, 2004

Snowmelt and two major rainfall events



Summary Statistics

	TSS (mg/L)	total P (mg/L)	dis. P (mg/L)	dP/P ratio
* ALL	297	0.78	0.28	51%
Mean	120	0.60	0.26	53%
Median	4	0.08	0.04	14%
Min	2460	4.63	1.00	92%
Max	59	59	34	
N =	15	0.25	0.18	72%
* Low flow samples only				

Highest TSS & P during Nov. 23, 2003 event.

	TSS (mg/L)	total P (mg/L)	dis. P (mg/L)	dP/P ratio
* ALL	157	0.78	0.47	60%
Mean	73	0.76	0.42	61%
Median	4	0.07	0.05	23%
Min	1024	1.68	1.23	92%
Max	61	61	32	
N =	12	0.50	0.38	71%
* Low flow samples only				

Highest TSS during March 28, 2004 event.

	TSS (mg/L)	total P (mg/L)	dis. P (mg/L)	dP/P ratio
* ALL	459	1.01	0.32	51%
Mean	199	0.92	0.34	51%
Median	2	0.06	0.04	12%
Min	2692	2.99	0.64	89%
Max	39	39	22	
N =	10	0.17	0.12	68%
* Low flow samples only				

Highest TSS & P during March 5, 2004 event.

	TSS (mg/L)	total P (mg/L)	dis. P (mg/L)	dP/P ratio
* ALL	79	0.41	0.22	62%
Mean	63	0.43	0.25	57%
Median	2	0.06	0.05	37%
Min	432	1.85	0.44	105%
Max	44	44	20	
N =	6	0.18	0.18	82%
* Low flow samples only				

** possible total phosphorus outlier
Highest TSS during March 29, 2004 event.

Partners:

- UW-Green Bay – Program Lead
- UW-Milwaukee
- U.S. Geological Survey (Contributes costshare for stations)
- 5 Area High Schools
- Green Bay Metropolitan Sewerage District
- Oneida Nation
- Major funding for the program is through a four year grant from Arjo Wiggins Appleton, Inc.

Landuse/Cover Comparisons in Monitored Watersheds

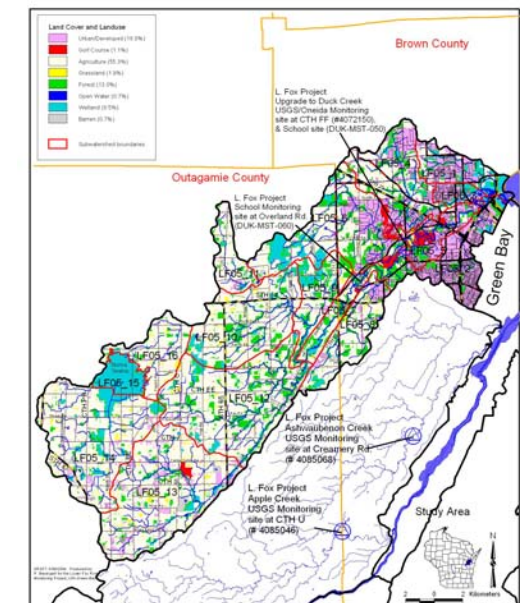
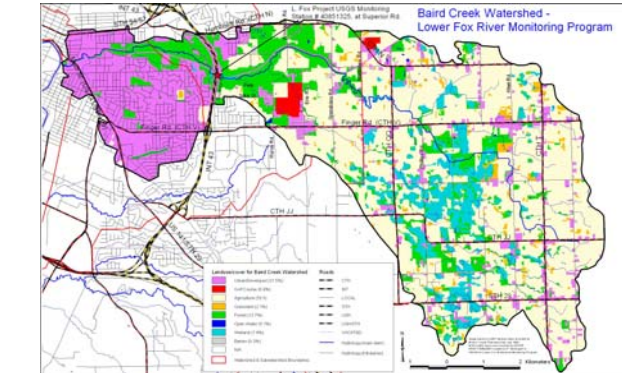
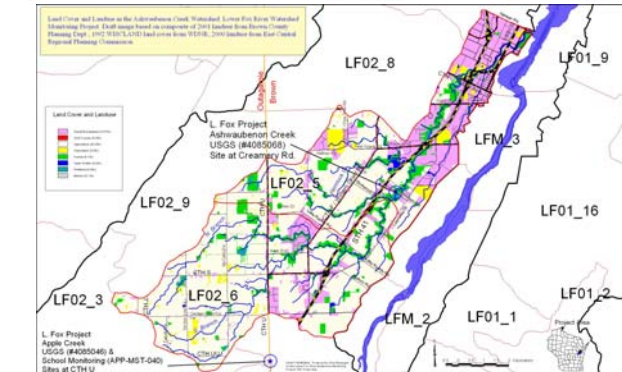
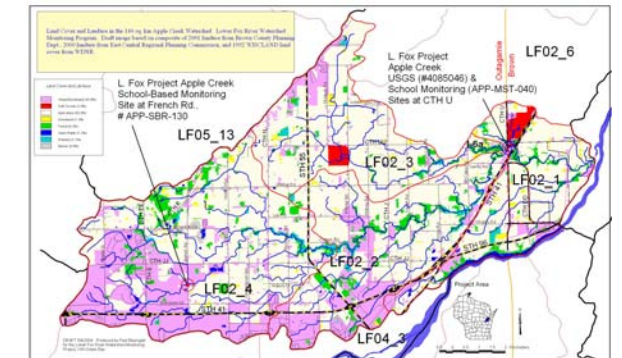


Figure 1. Duck Creek Watershed Landuse/Cover. DRAFT image based on composite of 2001 landuse from Brown County Planning Dept.; 1992 WISCLAND land cover from WDNR; 2000 landuse from East Central Regional Planning Commission.