

US EPA ARCHIVE DOCUMENT

Life in a Conduit

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A photograph of the Park River in Hartford, Connecticut. The river flows through the foreground, with a concrete dam structure featuring two large, dark, arched openings. Behind the dam, a grassy embankment rises, topped by a multi-lane highway with several cars. In the background, a modern office building with a distinctive red and white circular architectural feature is visible, along with other city buildings under a clear blue sky.

PARK RIVER, HARTFORD CT

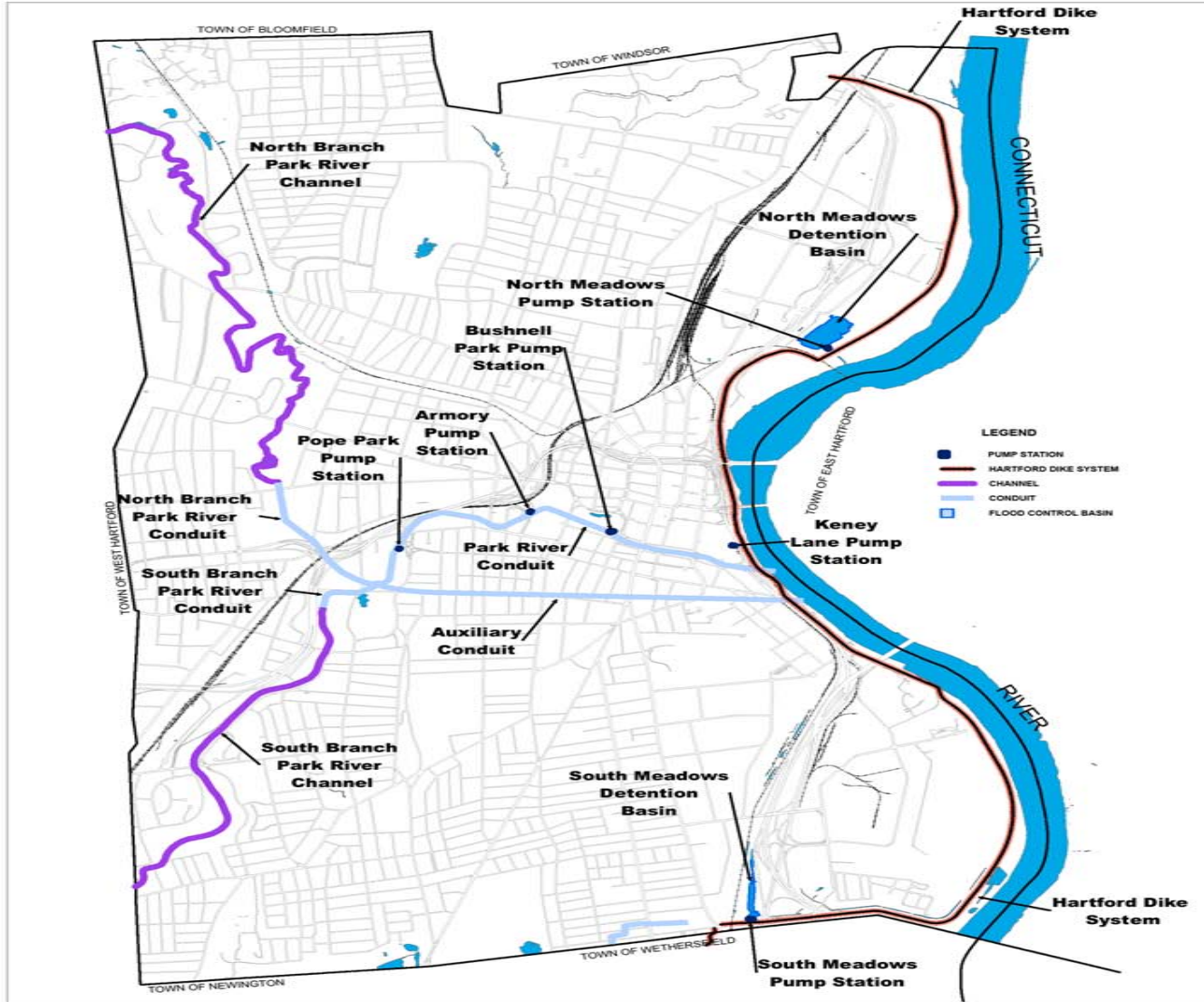
Or Life in a Conduit



CITY OF HARTFORD FLOOD CONTROL

CITY OF HARTFORD FLOOD PROTECTION STRUCTURES

Scale 1" = 800'





Flood control

The Army Corps of Engineers came up with a plan that would contain the main branch of the Park River in a huge underground conduit or tunnel. During much of the 1940s, they literally changed the course of the river, burying it in a huge concrete box-shaped tunnel, 30 feet high and 45 feet wide. The conduit runs straight as an arrow through the center of the park underneath the pump house, Pulaski Circle and Main Street, under the Hartford Public Library and the Corland-Whitehead Highway, finally arriving at the Connecticut River.

The Bushnell Park section of the flood control project was completed in 1949. Later sections were completed after the major flood of 1955, with the entire project ultimately completed in the early 1980s. In all, the conduit system, which encloses both the North and South branches of the Park River, is more than nine miles long and cost more than \$100 million.

But part of the Park River still remains above ground. The North Branch enters Hartford in the city's West End, running through the University of Hartford campus. It's possible to launch your kayak or canoe there and paddle through a wooded wilderness for about six miles, as the gently flowing river passes behind public housing projects and private estates fronting on Scarborough Street. Here, the river is shaded by giant oak, elm, maple and other trees. Red-tailed hawks and dozens of varieties of birds have been spotted in this area, as well as deer, raccoons, skunks, and rats, foraging for food along the bank. As you approach Farmington Avenue, your journey will come to an end because this is where the river enters the tunnel—just a few hundred feet from the Mark Twain house.

Conduit Facts

- The Bushnell Park section of the flood control project was completed in 1949. Later sections were completed after the major flood of 1955, with the entire project ultimately completed in the early 1980s. In all, the conduit system, which encloses both the North and South branches of the Park River, is more than nine miles long

Study Area:

- Covered Portion of the conduit is 2 miles long
- Consist of twin 30' wide x 19.5' high x 40" long channels
- The discharge is approximately 1400' upstream in the North Conduit
- Conduit bottom were concrete with little deposited sediments
- Park river sediments thin substrate of consolidated organic –like material
- Appreciable amounts of soft tube material constructed by invertebrates to trap small amounts of organic detrius and inorganic sand grains
- Low summer time velocity < 0.3 ft per sec South conduit. Twigs and debris did not flow downstream and th eSouth conduit was reminiscent of a pond
- Velocity was noticable immediately downstream of the discharge and apparent at the mouth

Study Objectives

- Does the discharge from Hartford Steam impact the Park River?
- Does the discharge from Hartford Steam impact the Connecticut River?

Bring your "A" game.
IT'S ALL ABOUT THE BEER.



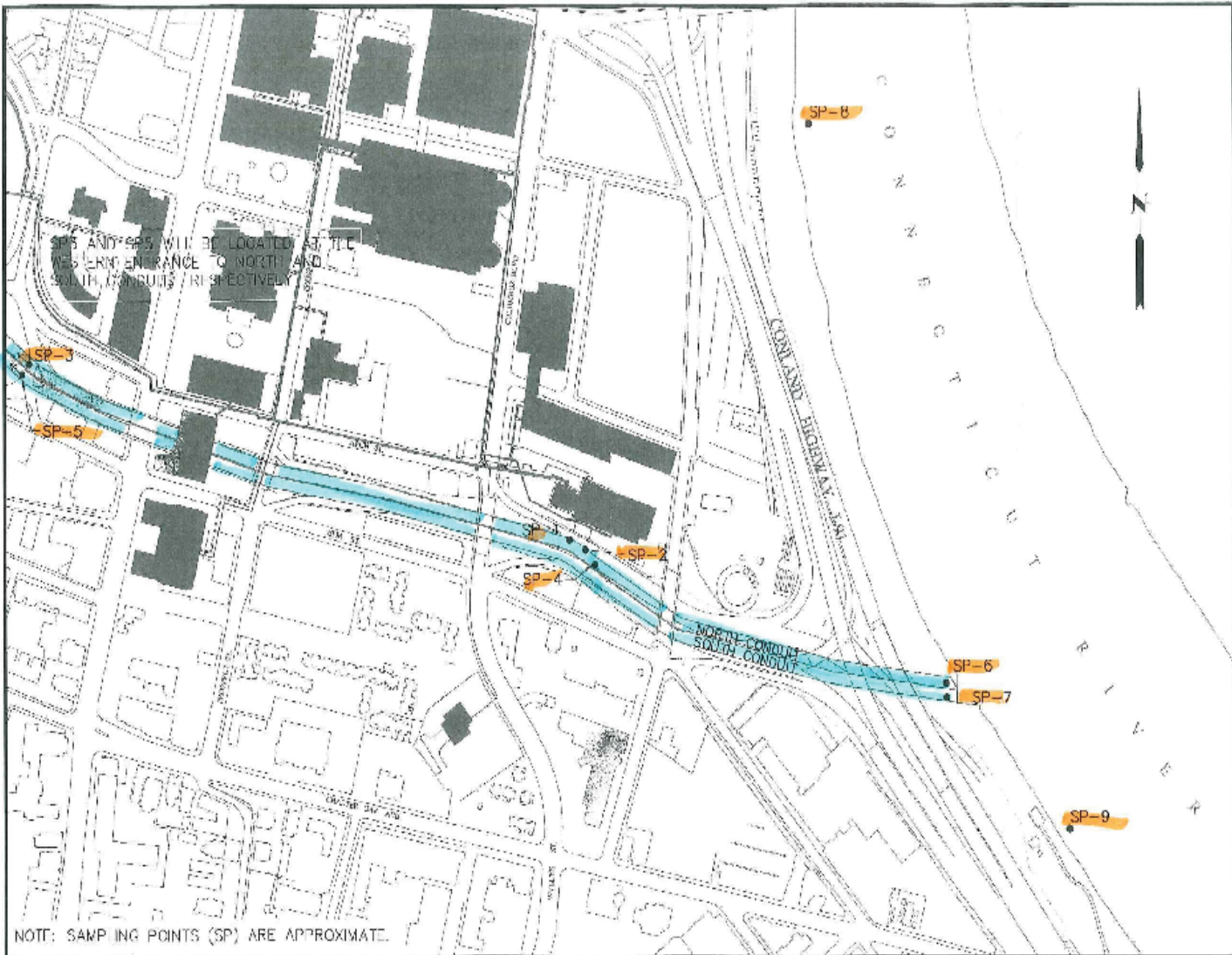
Study Design

- North and South Conduits Park River
 - Above just entering the underground portion
 - Below discharge about 1000 ft from the mouth
 - At the mouth about 40 ft in to avoid “backwater from Connecticut River
- Upstream/Downstream Connecticut River
- Discharges 001A and 001B

Study Design

- Chemistry - 9 sites Monthly from May to October
- Chronic Toxicity-8 sites May, July and Sept
- Benthic community- 6 sites
 - Baseline Park River
 - Baseline CT River
 - Down stream of discharge(s)
- Fish community 4- sites
 - Lower spring, summer fall and winter
 - + DEP data –Lower spring summer and fall
 - Upper summer, fall winter

PROJECT: WASTE WATER TREATMENT PLANT (WWTAP) IMPROVEMENTS AND EXPANSION
 DRAWING NO.: 2004-014
 DATE: 03/04/04
 SHEET NO.: 1 OF 1
 SCALE: AS SHOWN
 DRAWN BY: J. J. O'NEILL
 CHECKED BY: J. J. O'NEILL
 APPROVED BY: J. J. O'NEILL



DATE:	03/04/04
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SCALE:	AS SHOWN


FUSS & O'NEILL
Discipline to Deliver

145 HARTFORD RD. 2004-014 03/04/04 302.046.2469

HARTFORD STEAM
WATER QUALITY SAMPLING LOCATIONS
 NPDES WATER QUALITY EVALUATION - ENGINEERING REPORT

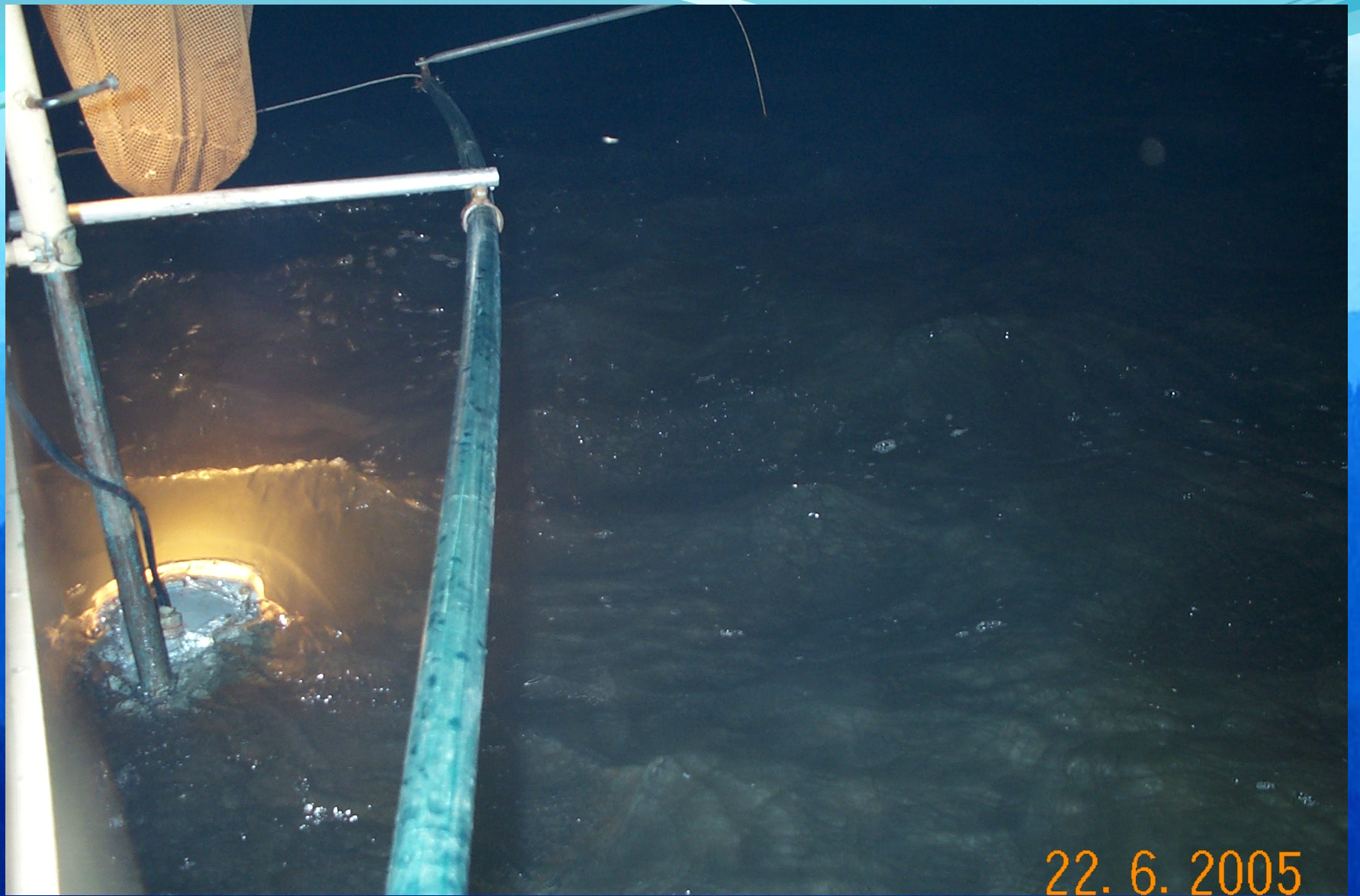
HARTFORD CONNECTICUT

SHEET NO.: 001 OF 014
 DATE: 03/04/04
FIG. 1



22. 6. 2005





22. 6. 2005



NORTH CONDUIT

HARTFORD STEAM DISCHARGE

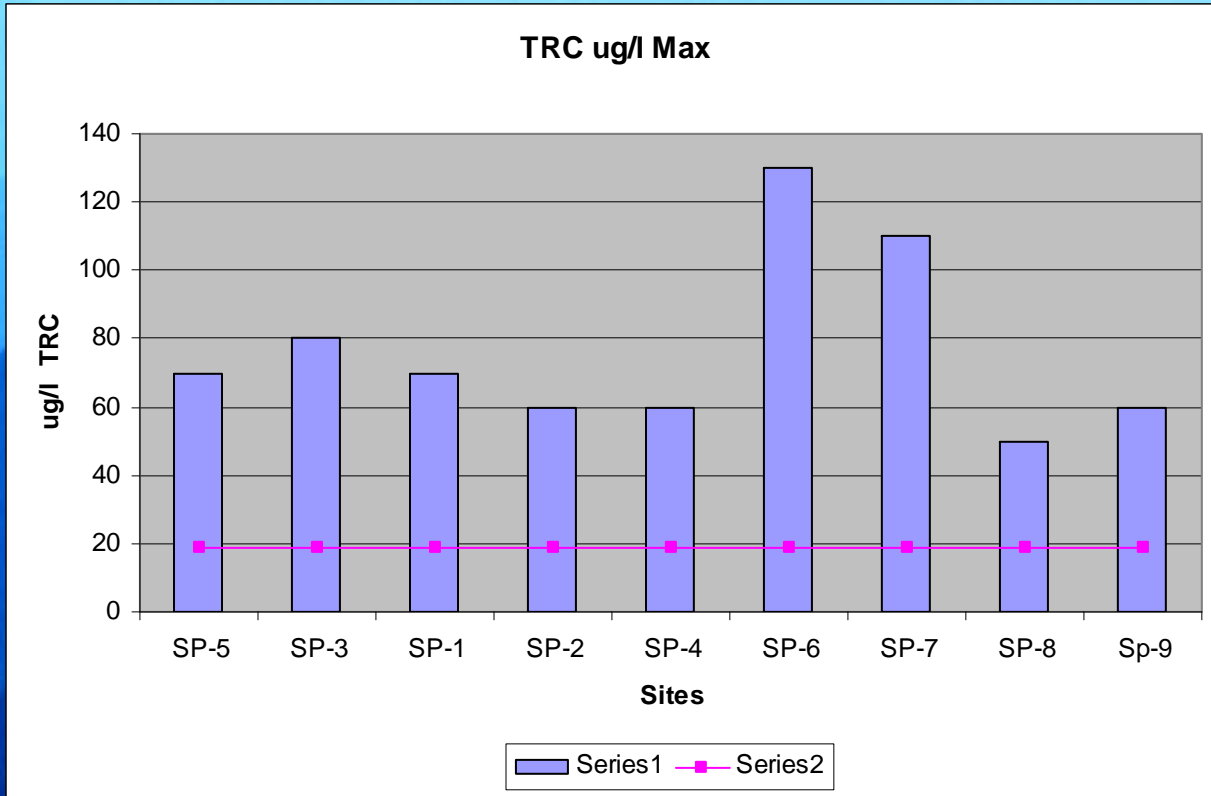


Results: General Chemistry:

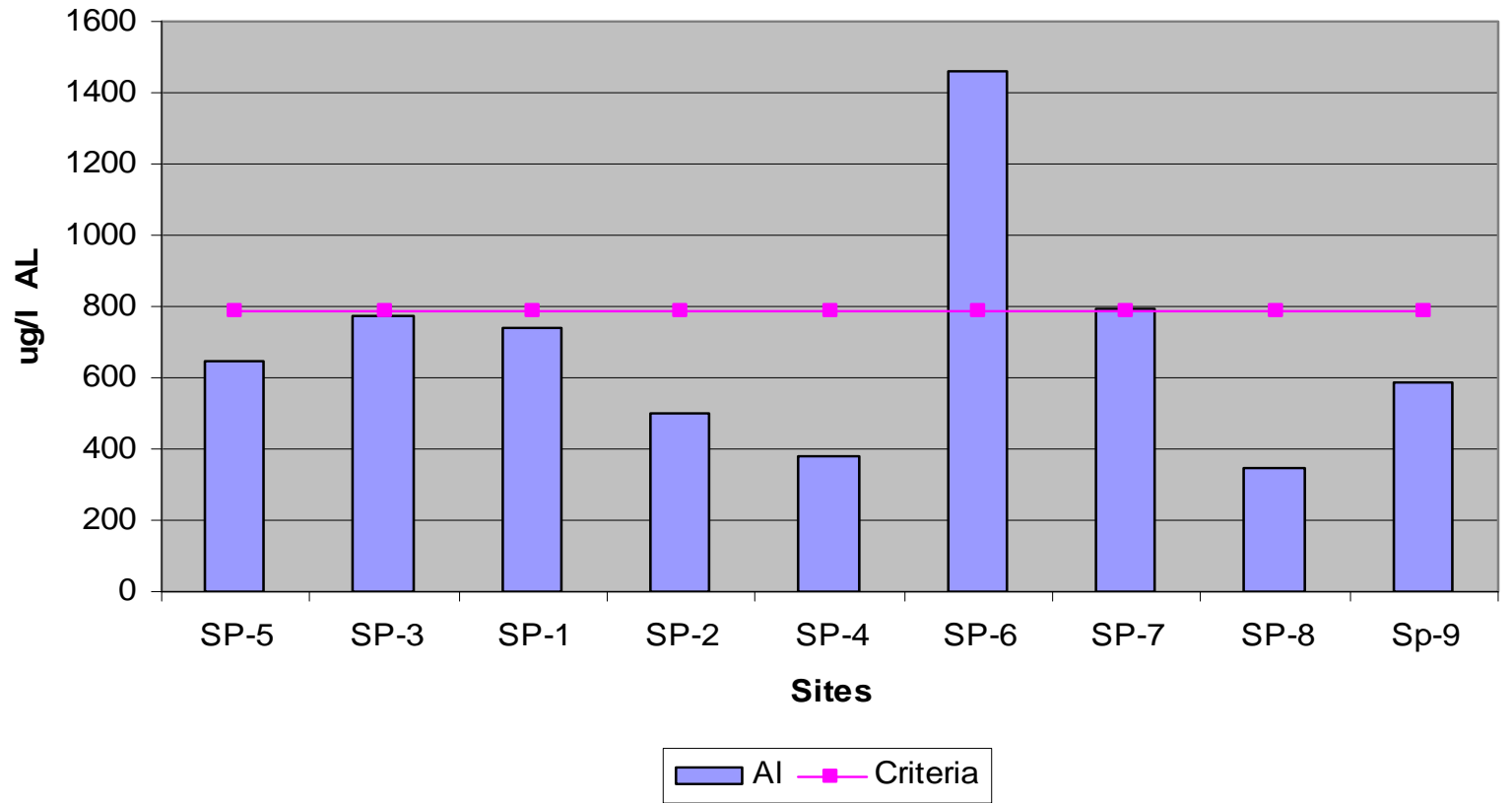
- pH - all location 6.9 to 7.5 su
- Dissolved Oxygen 8.8 to 11.0 mg/l
- Specific Conductance: umhos
 - Upper Park River-314-494
 - Lower Park River-North 165-179
 - -South 232-319
 - CT River-139-176
- Hardness: mg/l
 - Upper Park 116-164
 - Lower Park-North and CT River: 44-52
 - -South 70-100

Metals and TRC

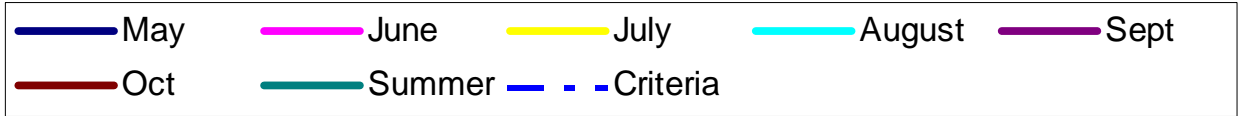
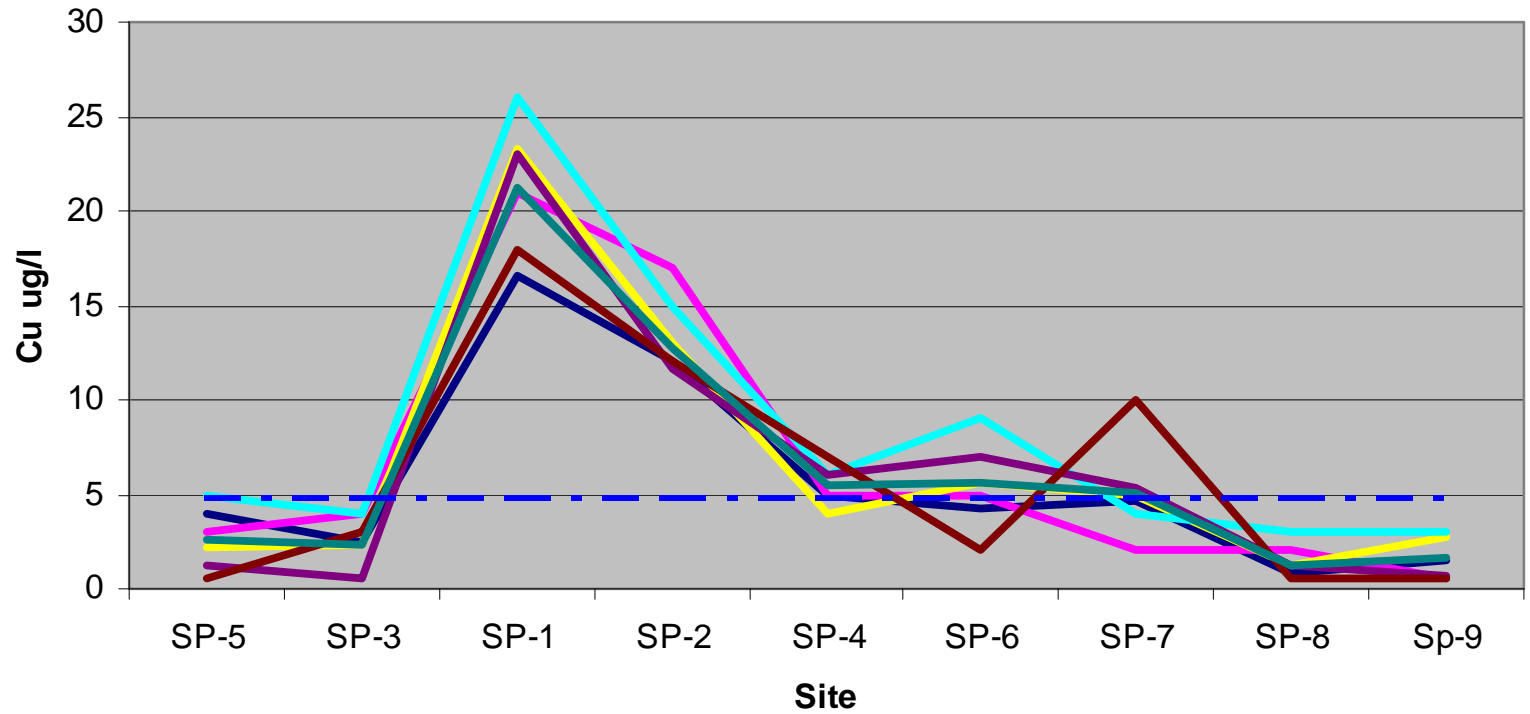
Site	SP-5	SP-3	SP-1	SP-2	SP-4	SP-6	SP-7	SP-8	SP-9	Criteria
Al-T	MJS O	M-O	MJJO	MJJ	MJJO	MJJO	MjlO	MJJO	MJJO	>87
Cu-T		O				M-O	MS			
Cu-D			M-O	M-O	AO	JIS	S			>14.3/ >4.8
Pb-D			M,Jl	M,Jl					M	>1.3
Zn-D										>65
Fe-T	M	MJlO	MJl		MJlA SO	M		MJl	M	>500
Mn-T	M	MJlA	Mjl				M			>100
TRC	MJlS	M	MS* O	MS* O	O	MJS	MS	S	MO	>19/ >11
TSS			M	M		M	M			>20



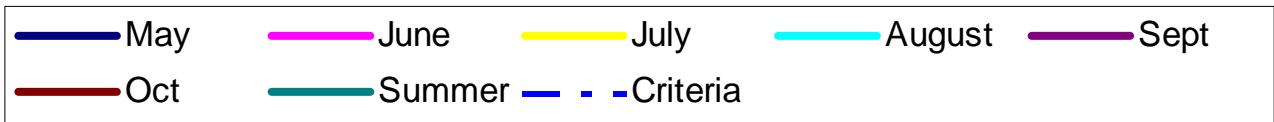
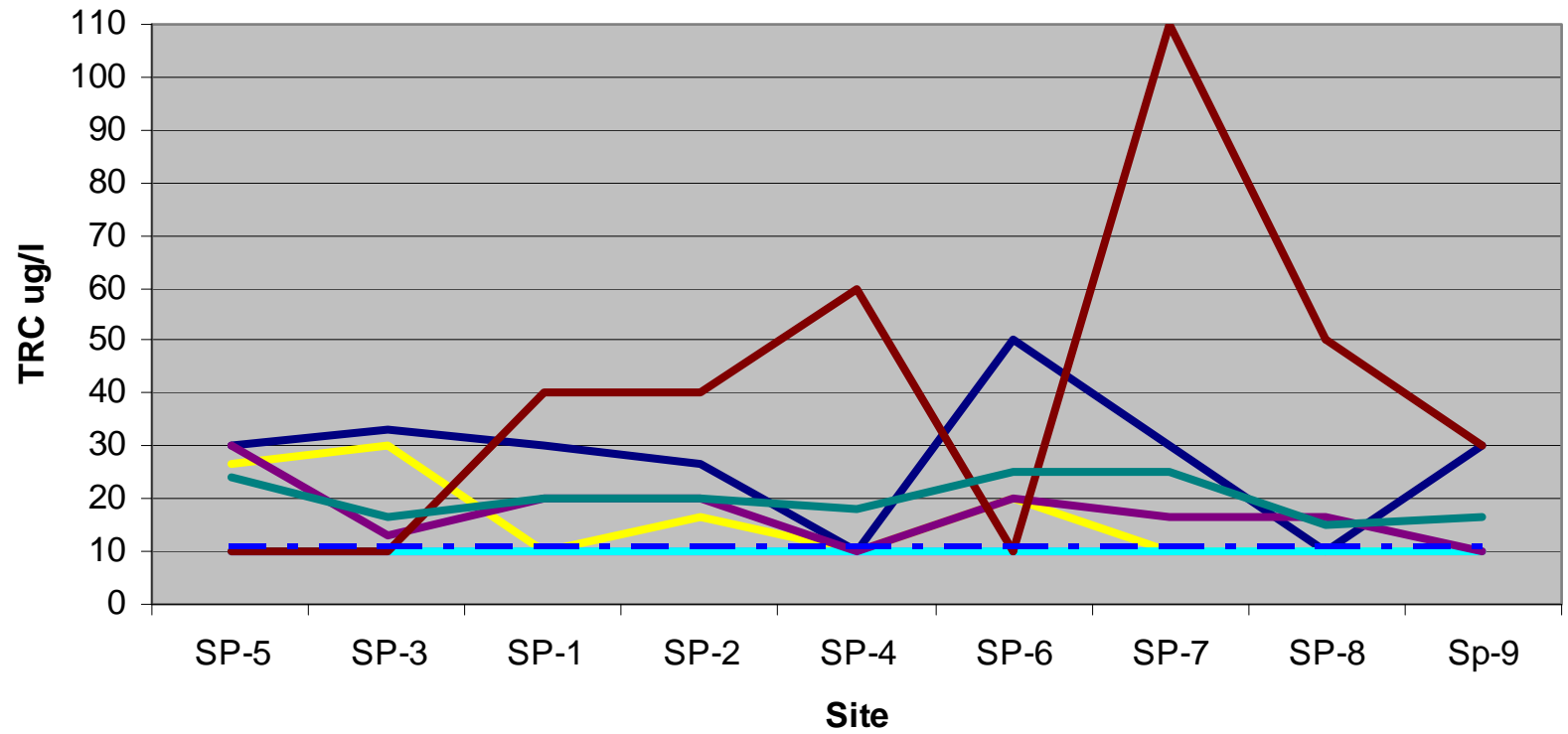
AL ug/l Max



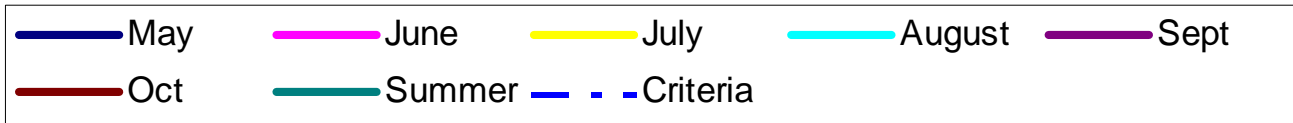
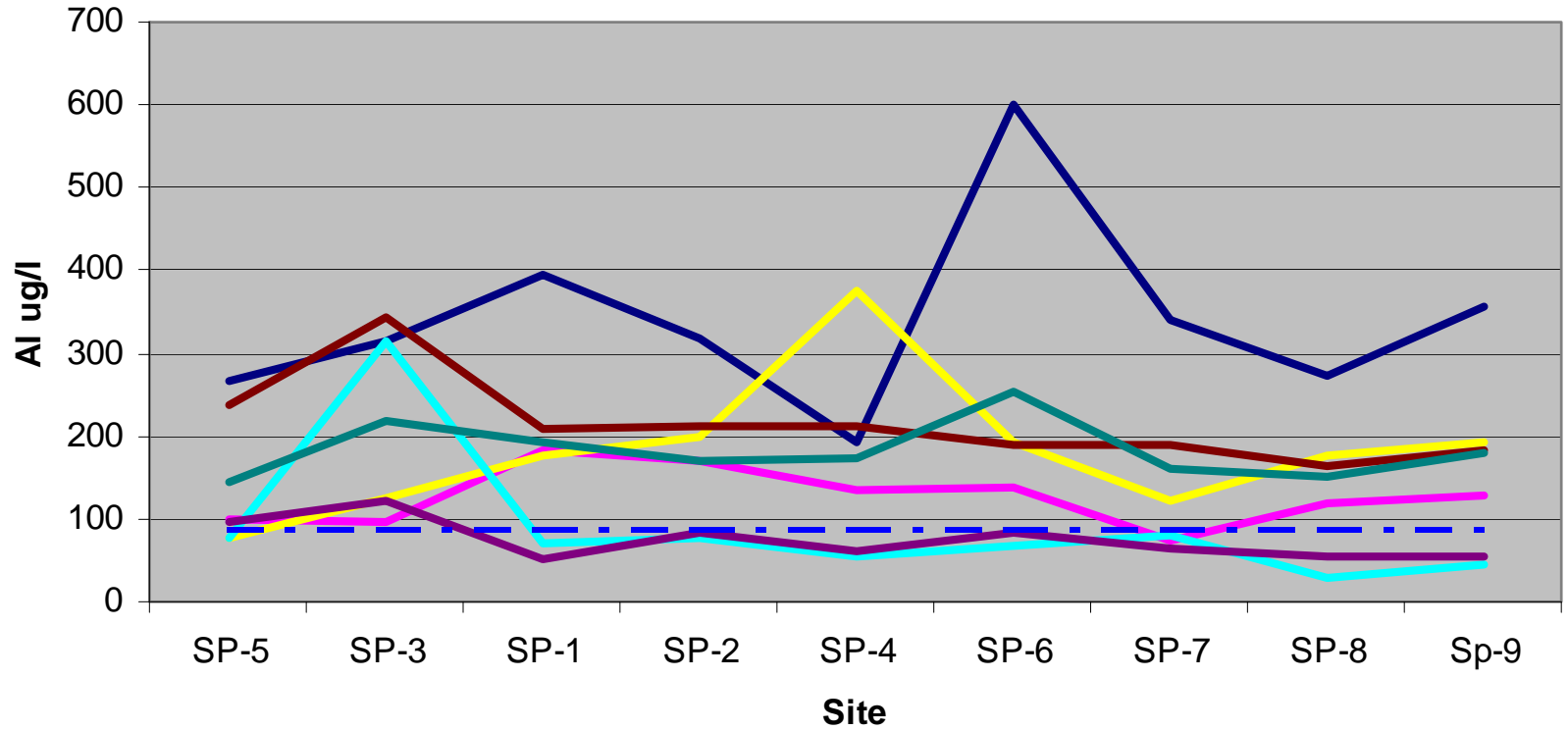
Dissolved Copper



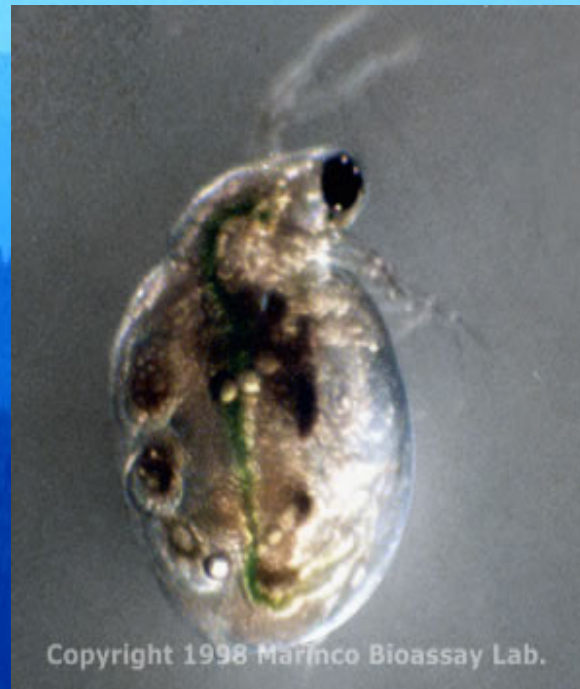
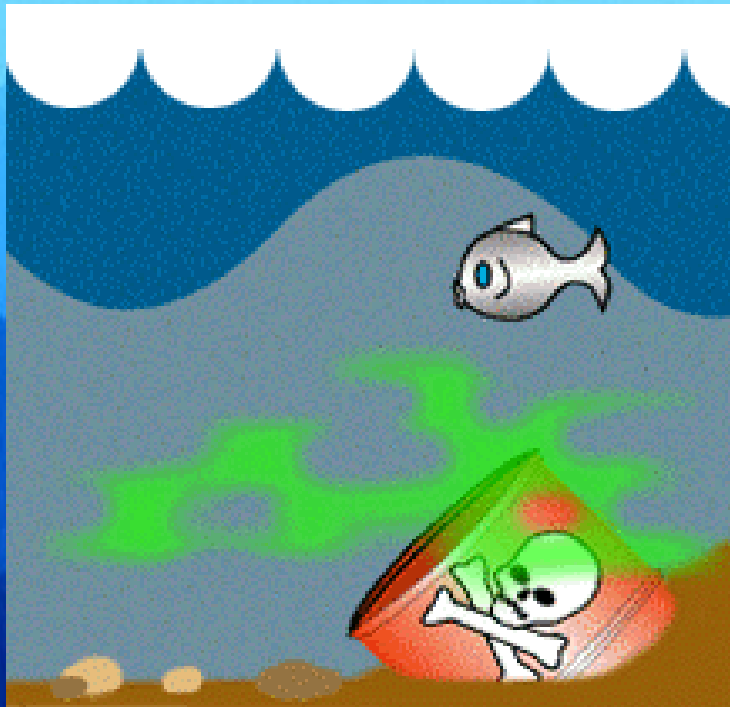
TRC



Total Aluminum



Toxicity Testing



Ceriodaphnia dubia

- No chronic toxicity observed between the Lab control and all sites and the CT River (upstream) and all site for *Ceriodaphnia dubia* for all three sampling events

Results: *Pimephales promelas*

Sites Date	Chronic 7 day Endpoint	SP-8 CT- UP	SP-3 PR- NU	SP-5 PR- SU	SP-1 DSN 001A	SP-2 DSN 001B	SP-6 PR- NM	SP-7 PR- SM	SP-9 CT- DS
May	Survival %	82	65*L	55*L	82	55*L	68	58*L	78
	Growth mg	.454	.411	.362	.547	.384	.446	.383	0.439
July	Survival %	85	60	70	100	98	32*LU	88	60
	Growth mg	.503	.409	.488	0.570	.599	.343* L	.487	.377* L
Sept	Survival %	88	22*L U	35*L U	98	90	82	28*L U	60*L
	Growth mg	.378* L	.209* L	.270* L	.426	.414	.452	.171*L U	.308

Sampling Conditions

South Conduit

- Low velocity
- Thin substrate of consolidated organic like material (upstream)
- soft tube material constructed by invertebrates
- Coarse sandy material (down stream)

North Conduit

- Higher velocity due to discharge
- No organic substrate (200m downstream)
- CT River – upstream coarse
- Downstream fine

Benthic Invertebrates

- Sampling techniques
- 9" ponar dredge for silt sand/ small gravel substrate (CT River)
- Dipnet scraping (Park River bottom of conduit)
- 100 organism sub sample
- In many instances the entire sample was analyzed

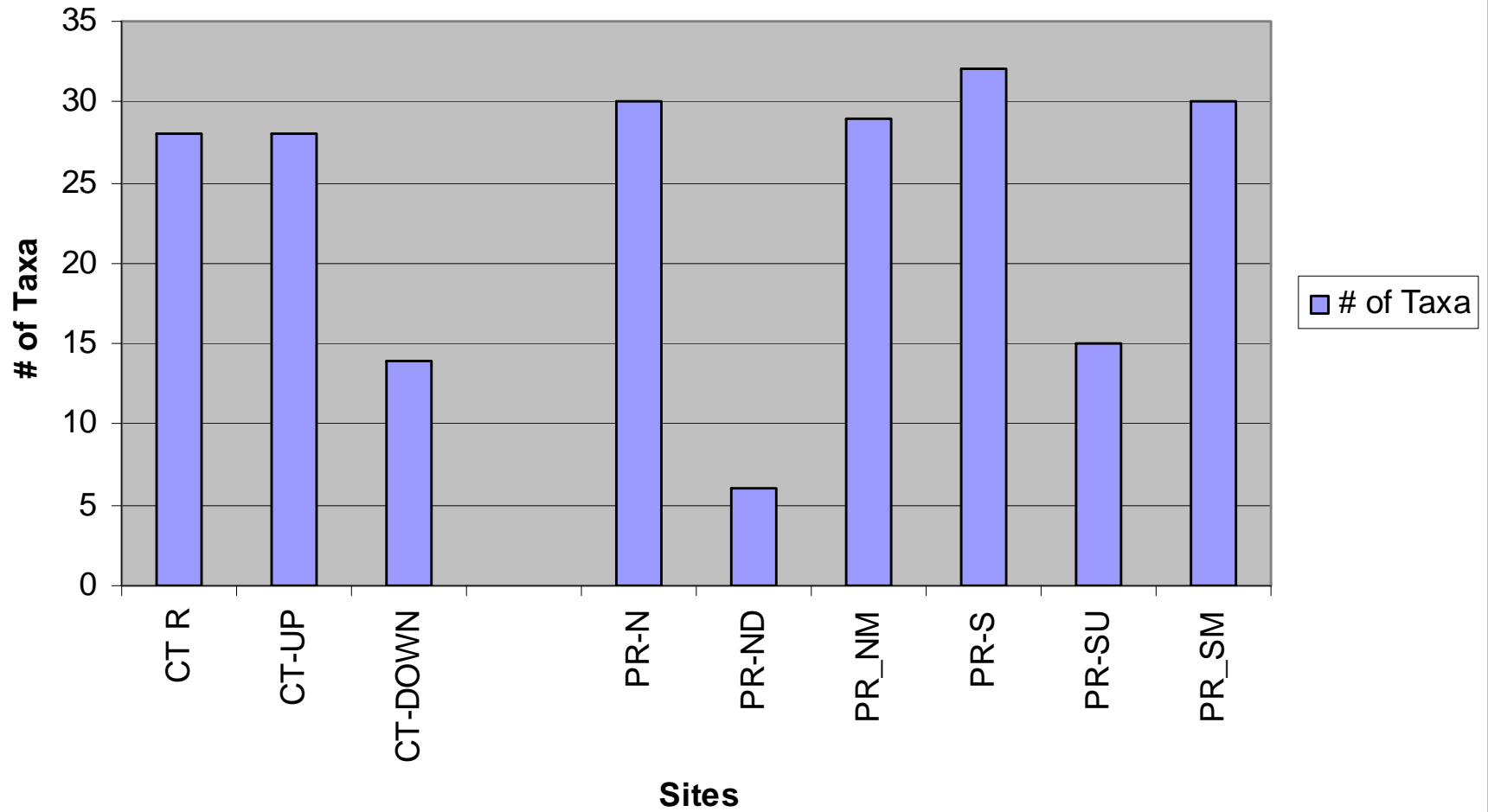
Dipnet: Collecting Benthic Organisms



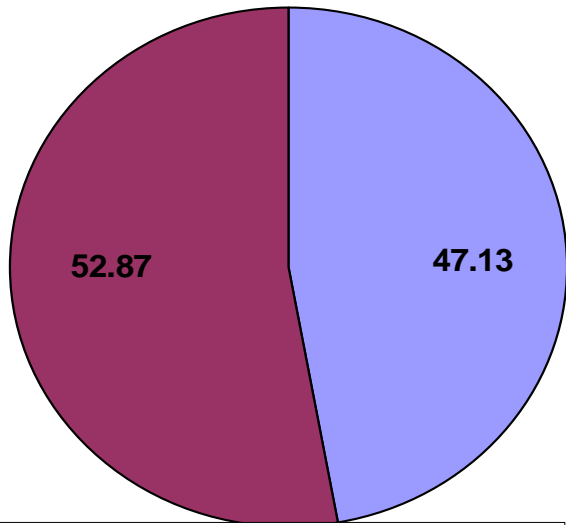
Benthic Community Measures

- Species Richness
- Relative Abundance
- Biotic Index (Pollution Tolerance)
- Functional Groups
 - Scrapers (most sensitive)
 - Predators
 - Shredders
 - Gatherers
 - Filterers(least sensitive)

Species Richness

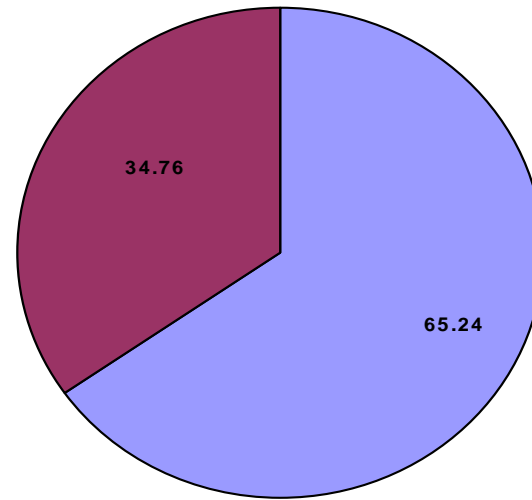


CT River Upstream Distribution

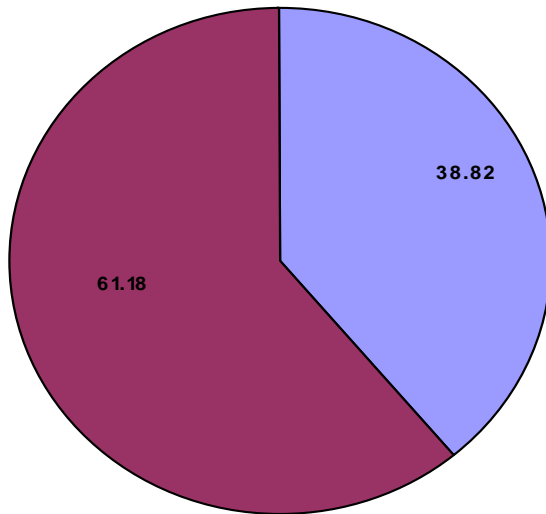


■ Non Insect invertebrates ■ Insect

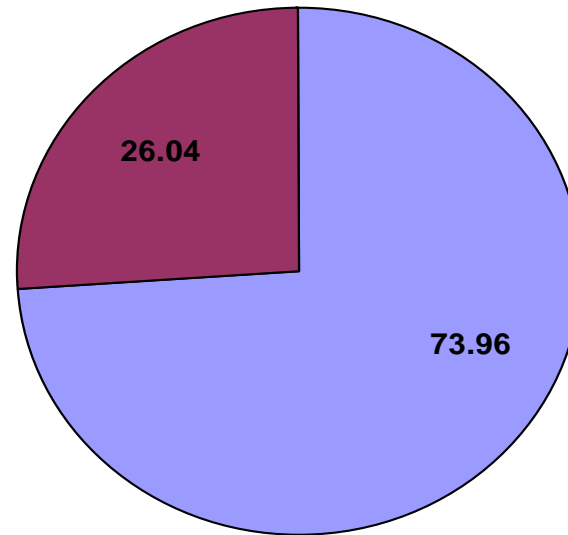
Park River North at Mouth



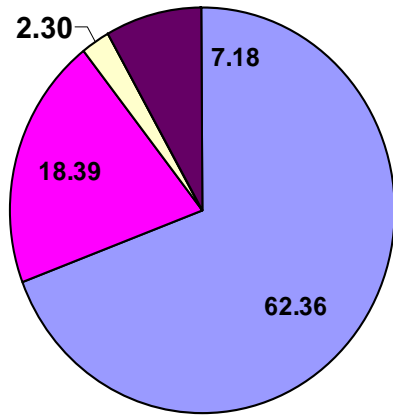
Park River South at Mouth



Connecticut River Downstream Distribution

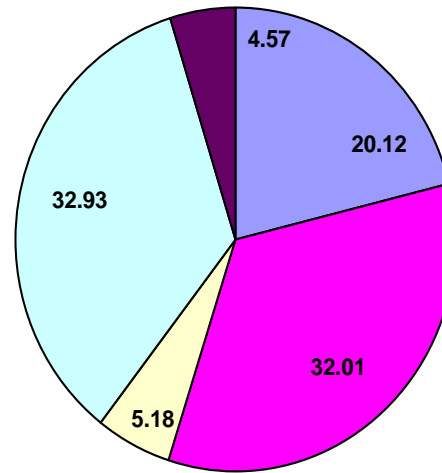


CT River UP Functional groups

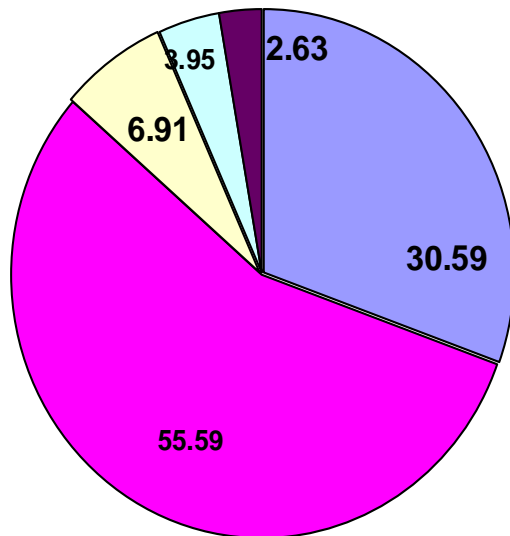


FC GC PRD SC SH

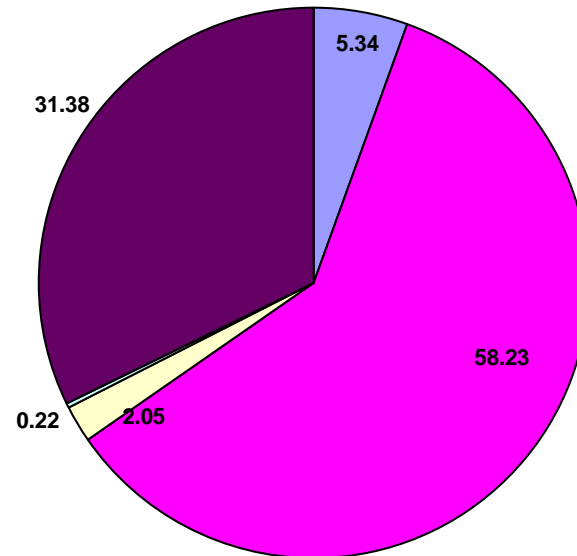
PR-NM Functional groups



PR-SM Functional groups



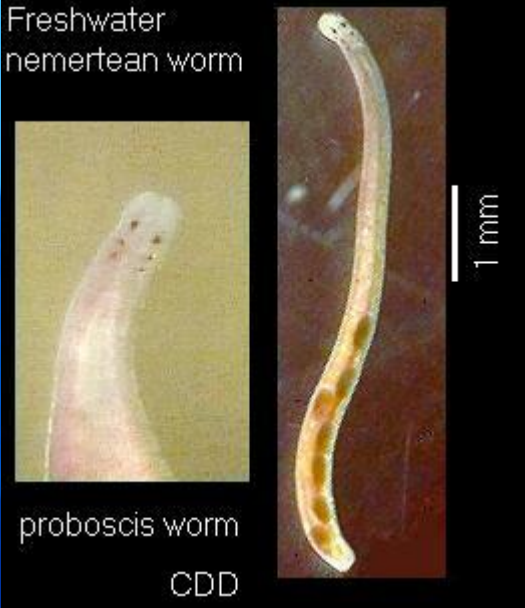
CT River Down



Oligochaetes:



Tubifex



Freshwater
nemertean worm



proboscis worm
CDD



1 mm



Naididae

Gastropoda



Gyraulus sp. Park North

Pelecypoda



Corbicula CT River

Amphipods



Gammarus sp.

Diptera



Chironomidae

LOOKING FOR FISH

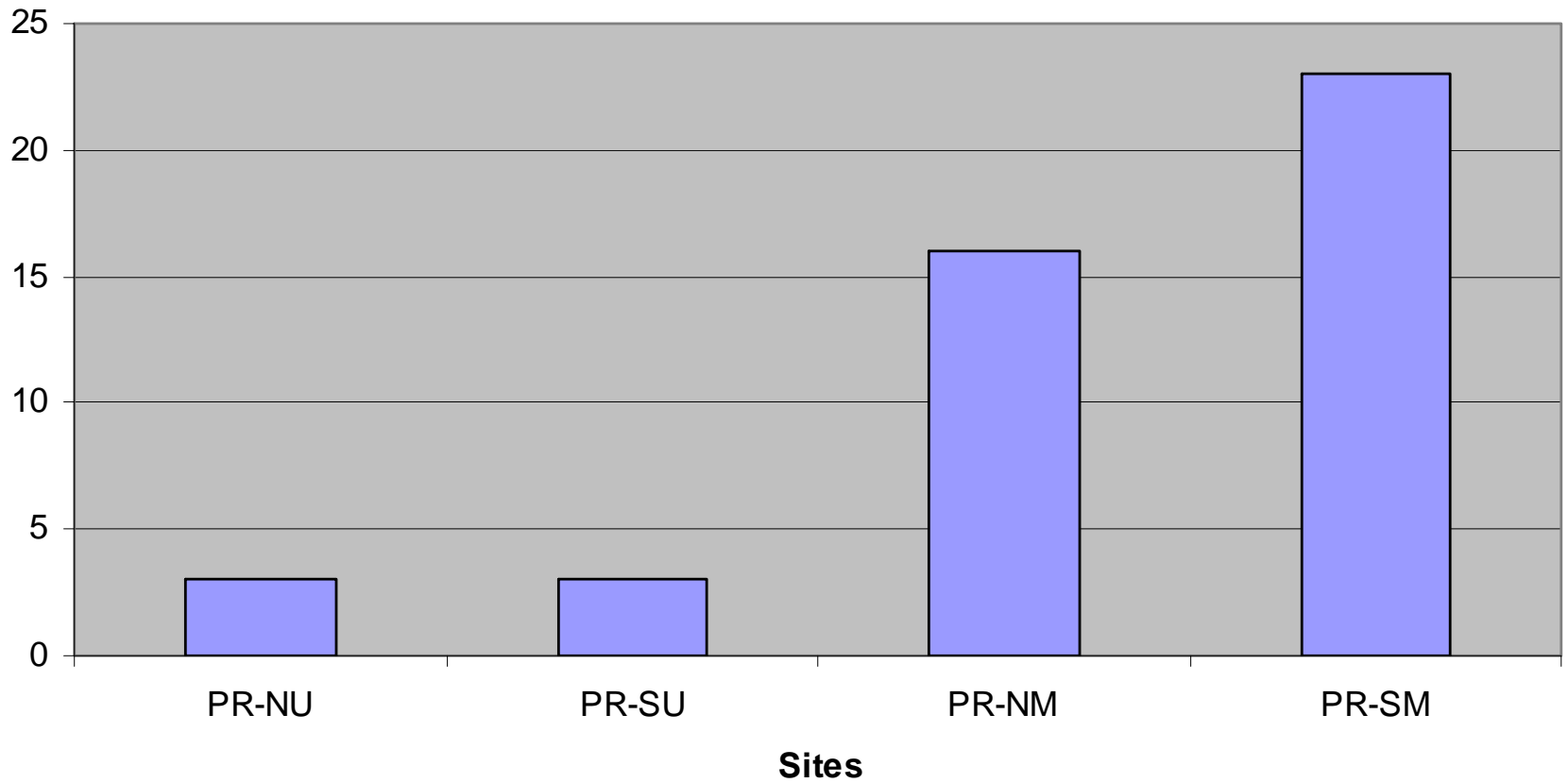




Okay- They weren't that big

Common Carp

Species Richness- Fish

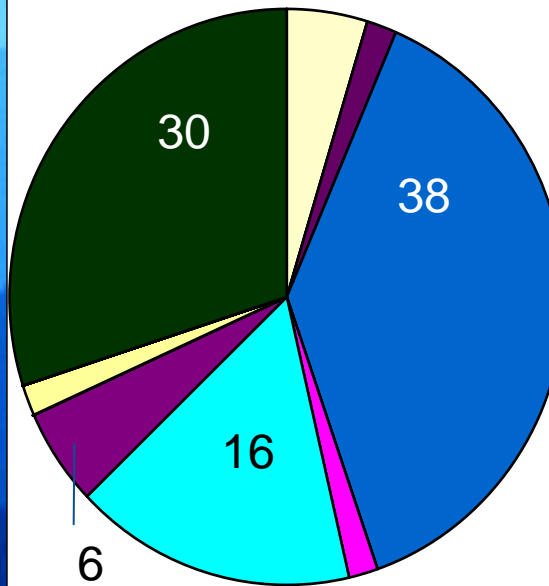


■ # of Taxa

SPRING

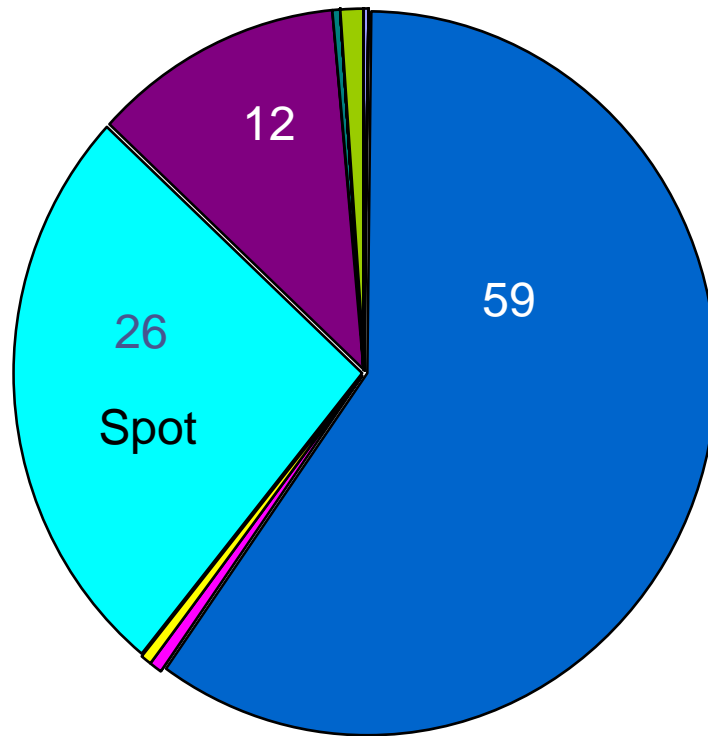
Lower North Spring

Channel



Lower South Spring

Fall

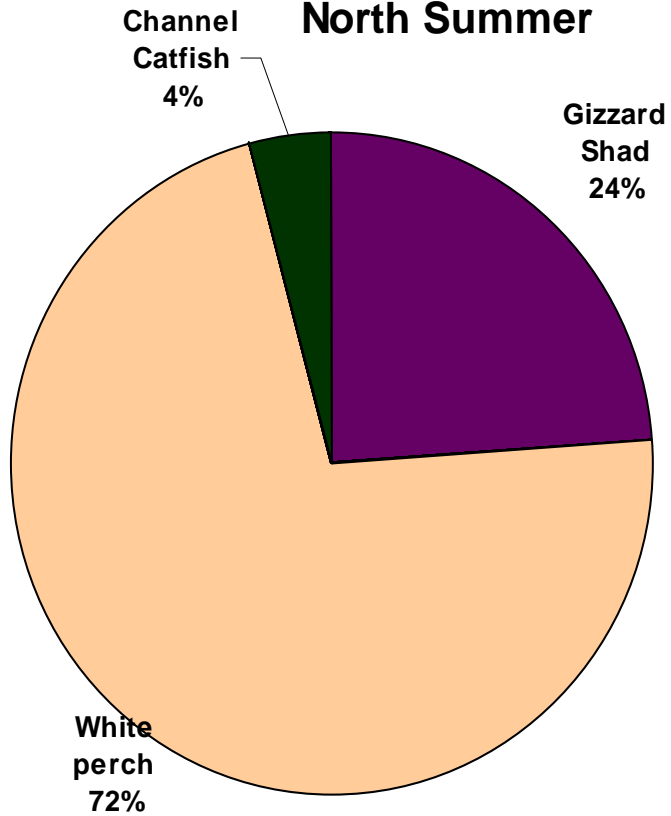


Whitesucker

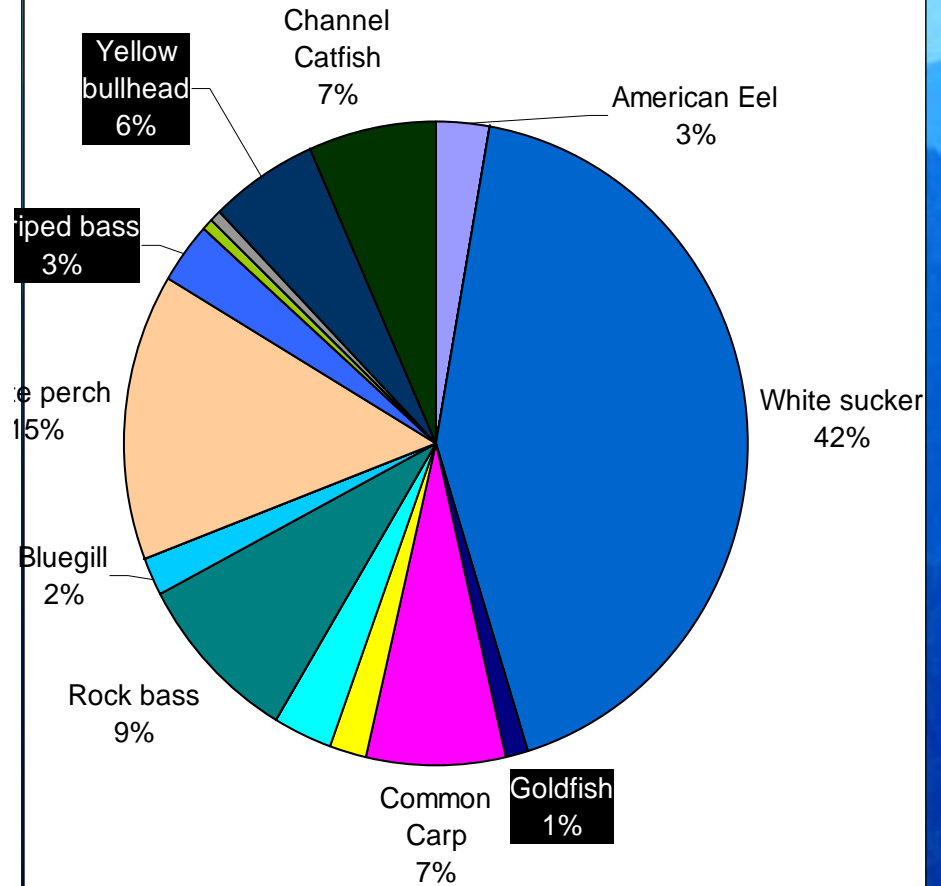
- American Eel
- Blueback herring
- American Shad
- Gizzard Shad
- White sucker
- Goldfish
- Common Carp
- Golden Shiner
- Spottail shiner
- Fallfish
- Rock bass
- Bluegillx Pum[kin se
- Bluegill
- Pumpkinseed
- Red breasted Sunfis
- Smallmouth bass
- Largemouth bass
- Black Crappie
- White perch
- Striped bass
- Yellow Perch
- Northern Pike
- Chain Pickerel
- White catfish
- Yellow bullhead
- Brown bullhead
- Channel Catfish

SUMMER

North Summer

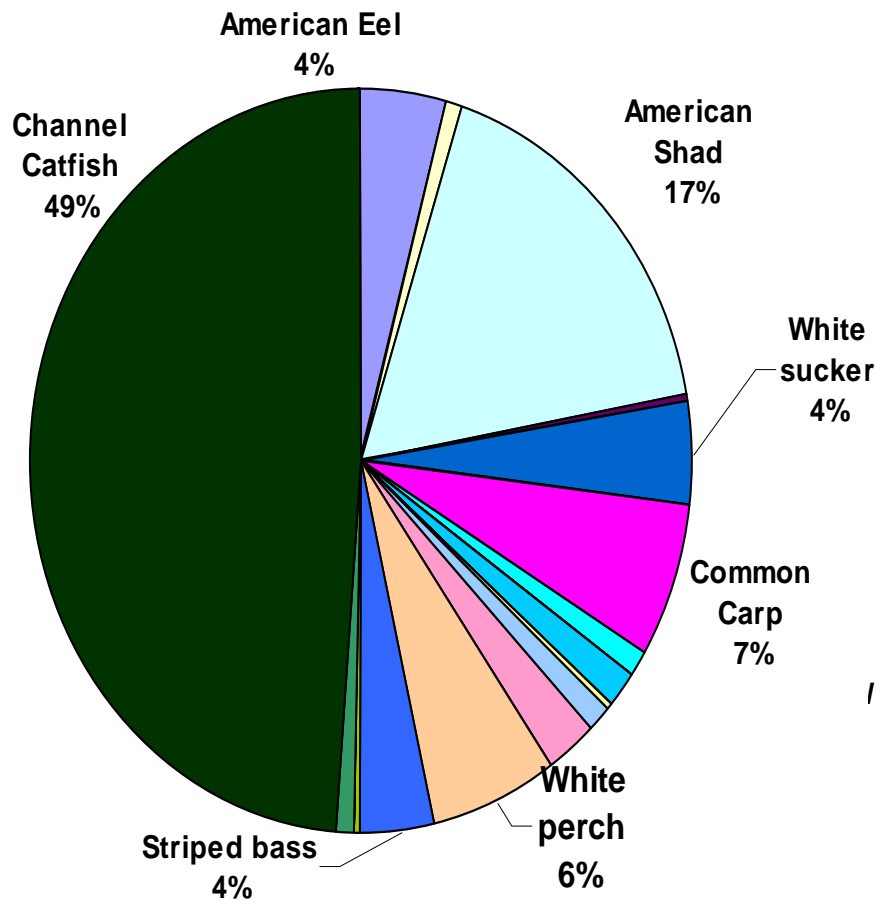


South Summer

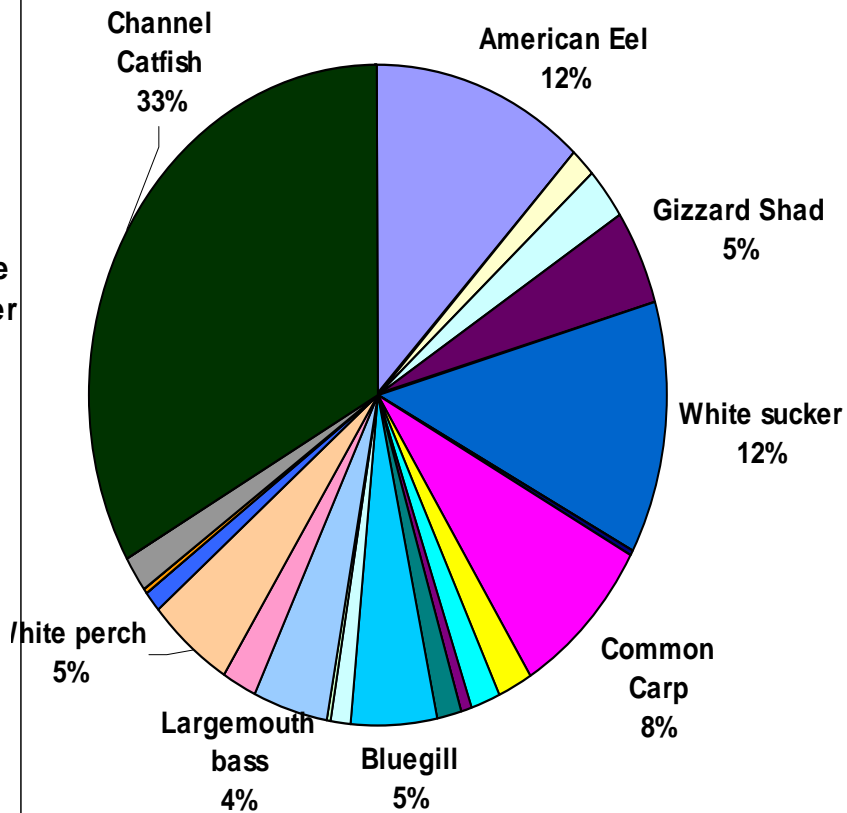


FALL

North Fall

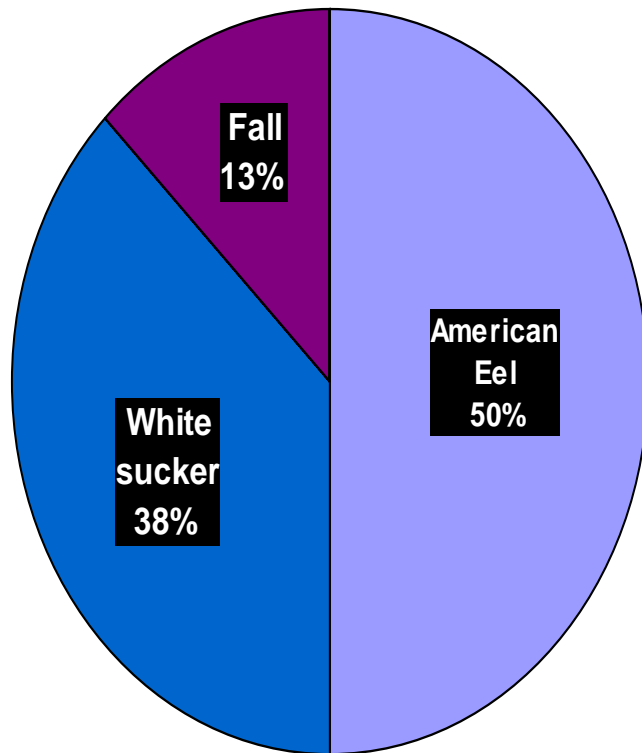


South Fall

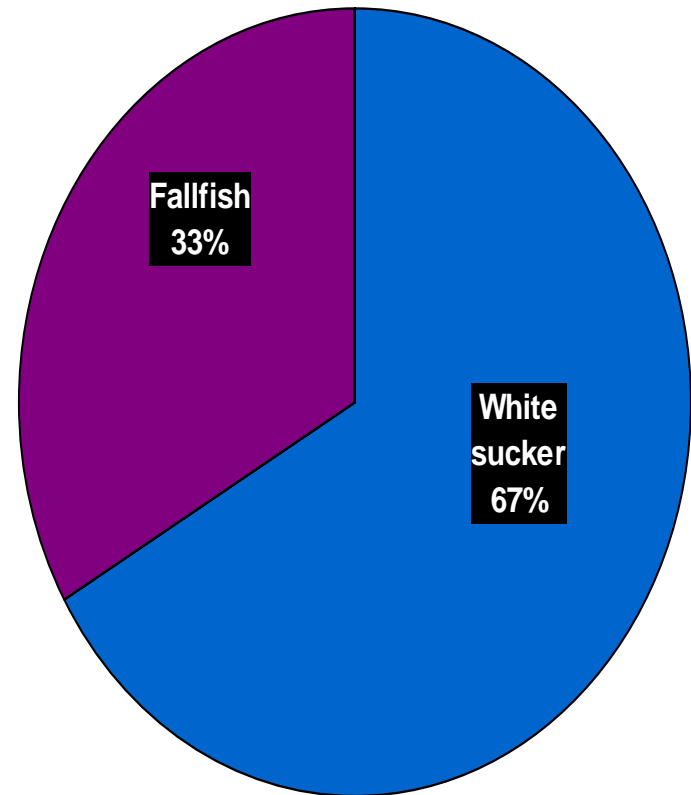


WINTER

North Winter



South Winter



		PR-NM	PR-SM
	# of unique spp	2	9
Notemigonus crysoleucas	Golden Shiner	0.00	1.33
Ambloplites rupestris	Rock bass	0.00	2.21
Lepomis macrochirus/gibbosus	Bluegillx Pumpkin d	0.00	0.07
Lepomis gibbosus	Pumpkinseed	0.00	0.44
Lepomis auritus	Redbreasted Sunfish	0.00	0.10
Micropterus dolmieu	Smallmouth bass	0.45	0.00
Esox lucius	Northern Pike	0.00	0.09
Ameiurus catus	White catfish	0.00	0.69
Ameiurus natalis	Yellow bullhead	0.00	1.05
Ameiurus nebulosus	Brown bullhead	0.62	0.00
Total		1.06	5.97



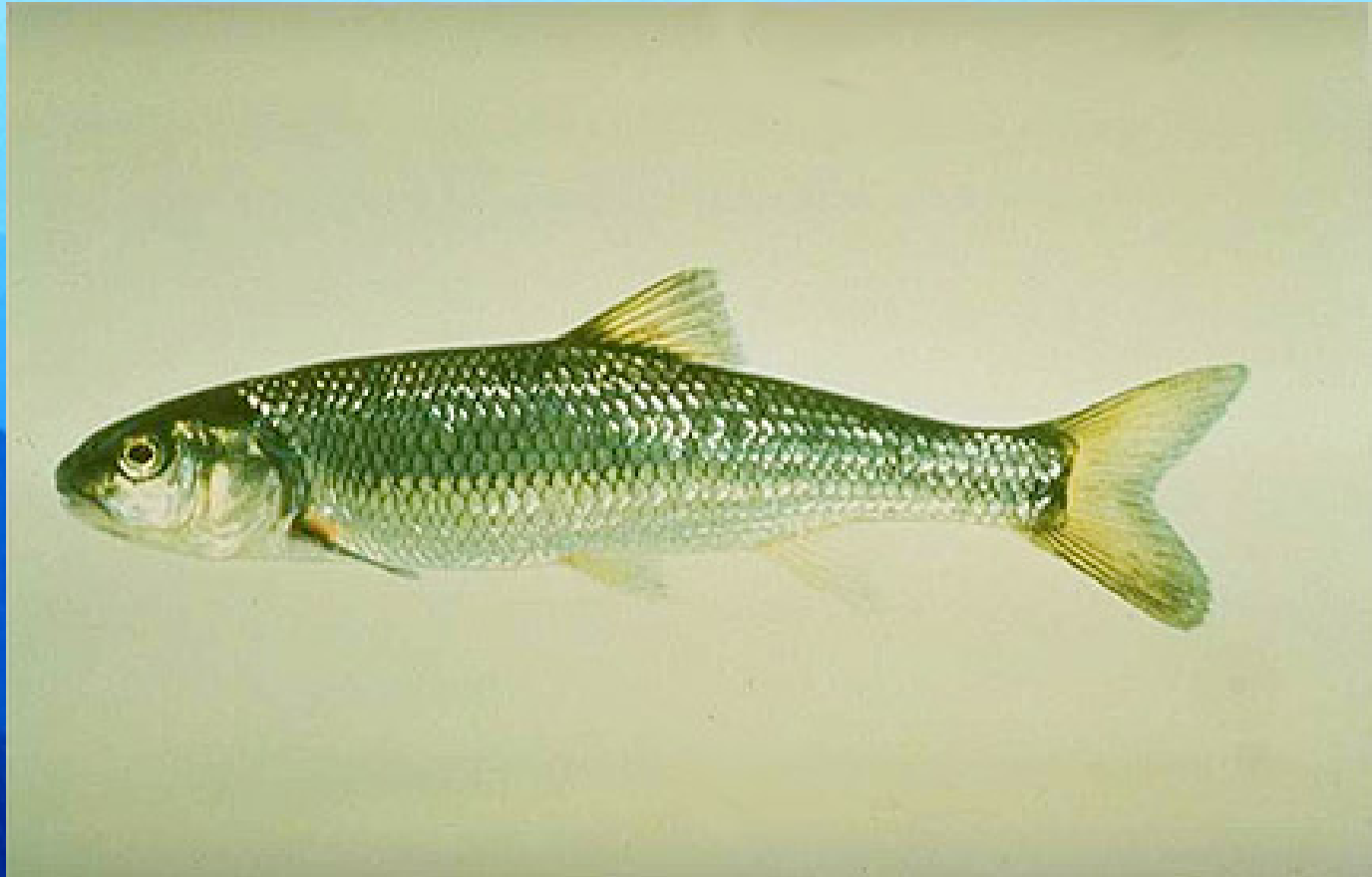
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CARP



White Perch



Fallfish



American shad - *Alosa sapidissima*
averages 14-29 inches



Channel Catfish



White Sucker



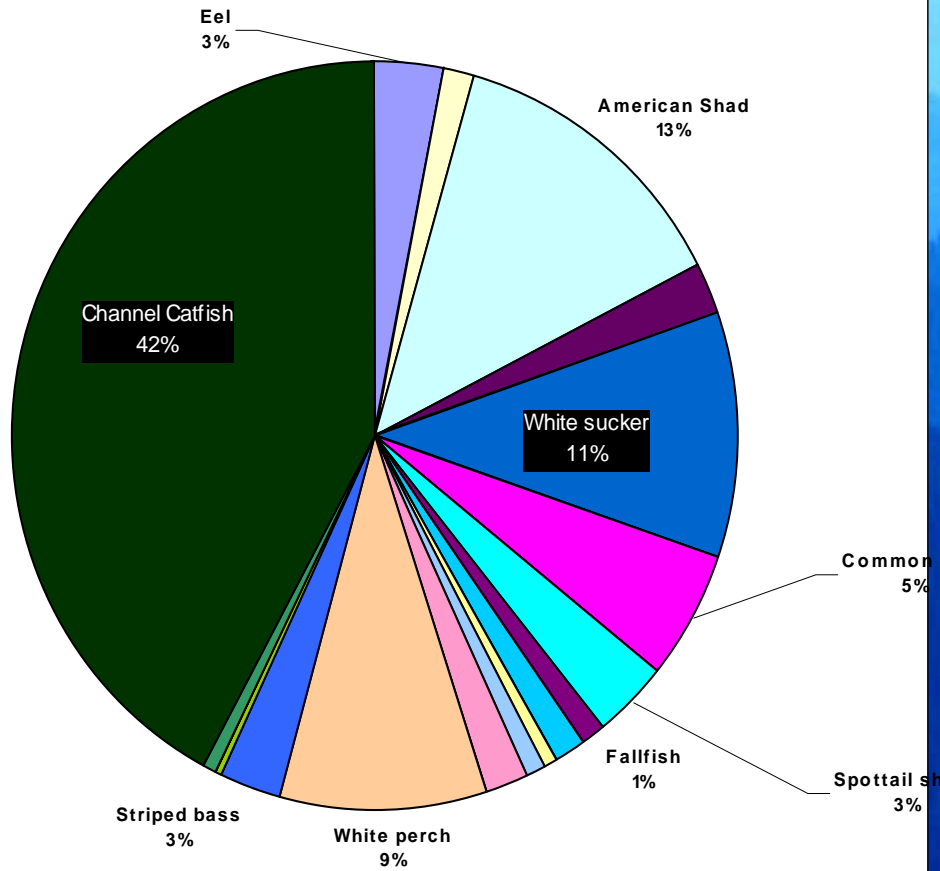
American Eel



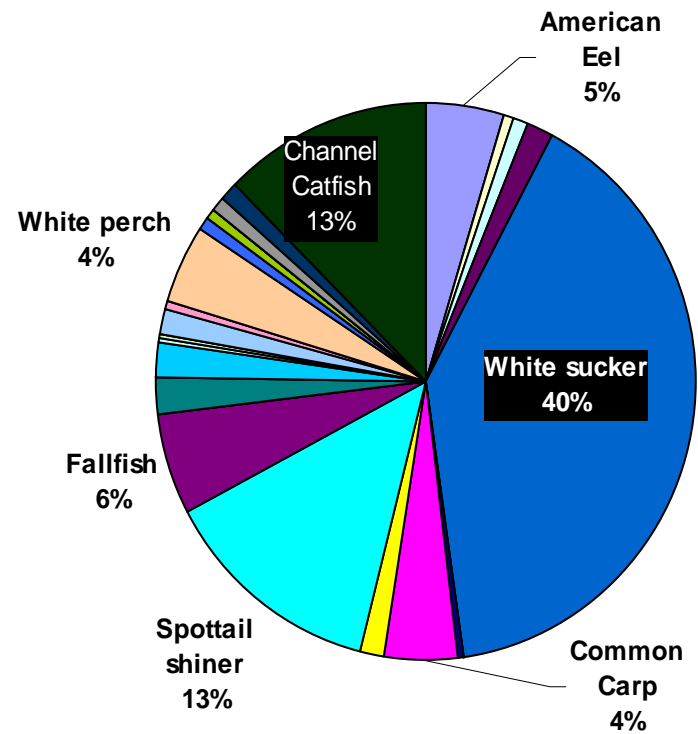
Gizzard Shad

Fish Distribution Combined

North Comb



South Comb



Most Illuminating

22. 6. 2005





22. 6. 2005

LIGHT AT THE END OF THE TUNNEL

QUESTIONS????