Hinkson Creek

Biological and Water Quality Assessment 2001-2006

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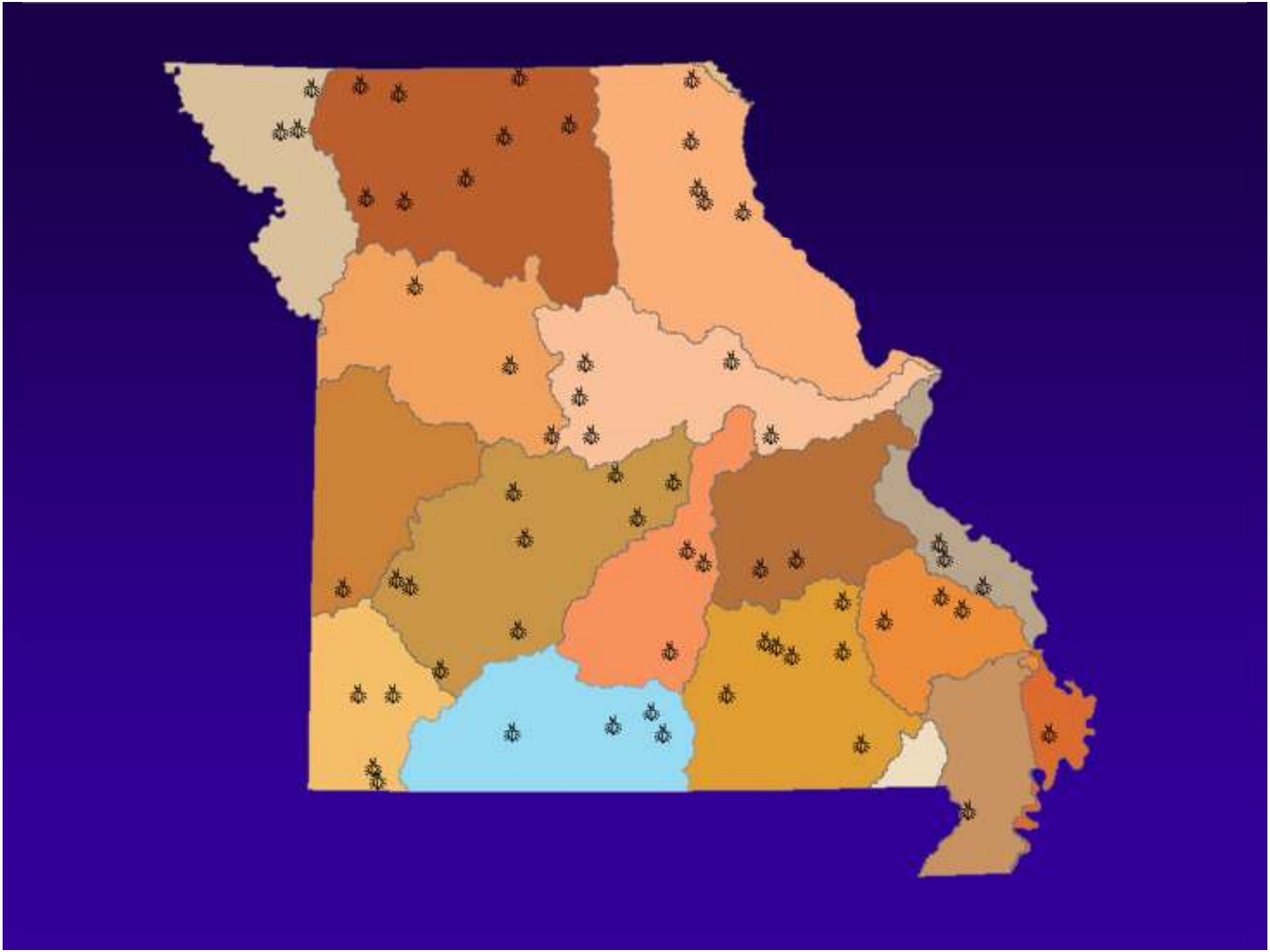
Water Quality Monitoring Section



Multi-habitat Sampling

Riffle / Run Prevalence

Glide / Pool Prevalence

Riffle/Run Prevalence

- Flowing water over coarse substrate
  - 6 sample composite of 1 m^2 each
- Non-flowing water over depositional substrate
  - 6 sample composite of 1 m^2 each
- Root Mat
  - 6 sample composite of 1 linear meter each

Data Analysis

- Taxa Richness
- EPT Taxa
- Biotic Index
- Shannon Diversity Index

Macroinvertebrate Stream Condition Index

Rating	MSCI Score
Fully Biologically Supporting	16-20
Partially Biologically Supporting	10-14
Non-Biologically Supporting	4-8

2001/2002 MDNR Hinkson Creek Study

Study Area

- Hinkson Creek
  - 8 stations from Scott Blvd. to Rogers Road
- Bonne Femme Creek
  - 2 stations at Nashville Church Road

EPT Taxa

- an indication of the diversity of mayflies, stoneflies, and caddisflies
- among the most sensitive insects to a variety of pollutants

Mayfly

Stonefly

Caddisfly

Results

Fall 2001

- EPT Taxa fairly consistent
- Total Taxa similar among stations

Results

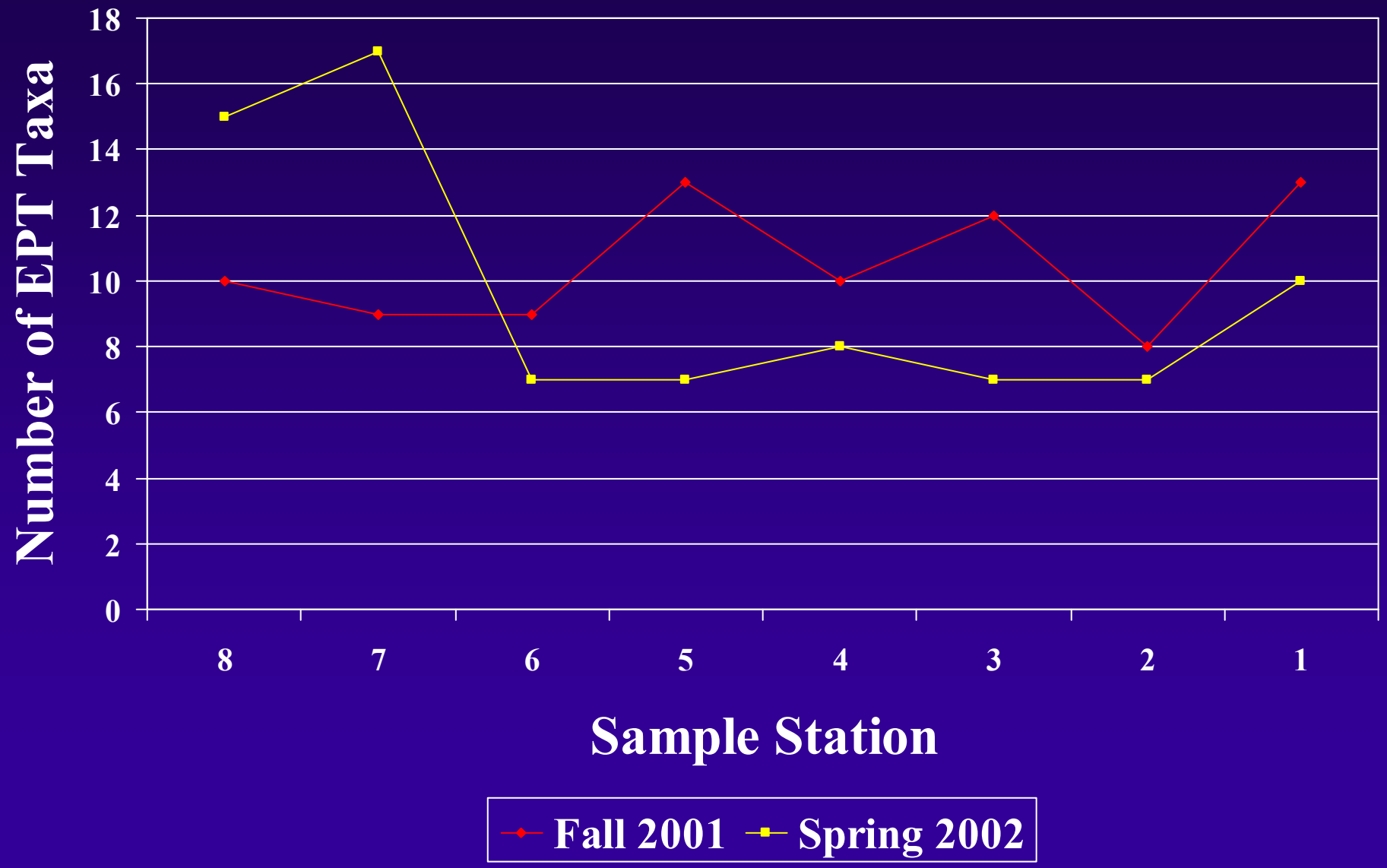
Fall 2001

- EPT Taxa fairly consistent
- Total Taxa similar among stations

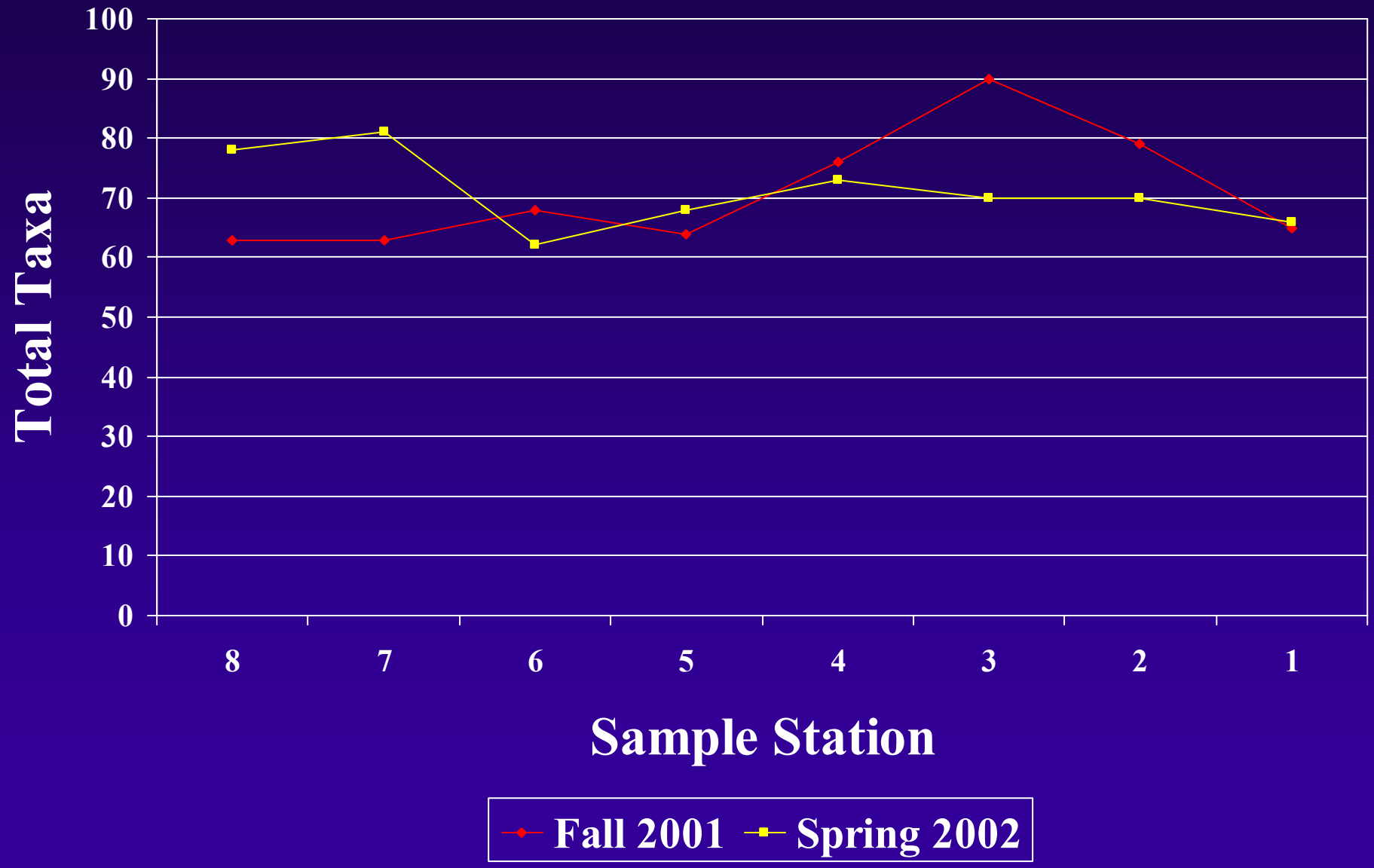
Spring 2002

- Sharp decline of EPT Taxa in urban portion
  -Stoneflies eliminated
- Total Taxa declined substantially

Hinkson Creek EPT Taxa



Hinkson Creek Total Taxa



Hinkson Creek Study

- Conducted over three phases
- Impaired segment assessed sequentially beginning with upstream reach
- Three phase study used the Water Quality Triad as its model

Aquatic Toxicity

- Microtox (bacterial luminescence)
- Water flea (*Ceriodaphnia dubia*)
- Toxicity Identification Evaluation Procedures (phase I characterization)

Chemical Analysis

- Field analyses (D.O., pH, cond., temp.)
- Metals (As,Ca,Cd,Cr,Cu,Hg,Na,Ni,Pb,Zn)
- Inorganics (COD, Cl, NFR, phosphorus, nitrogen)
- Organics (BNAs, petroleum fractions, qualitative organics)
- Microtox

Phase I

- Hinkson Creek water quality assessment
  - Interstate 70 to Broadway
- Biological assessment
  - Hinkson Cr. Road to Broadway
- Summer 2003 through June 2004

Phase I Findings

- Periodic storm water toxicity
- High concentrations of sodium and calcium chloride in snowmelt

Some of the Organic Chemicals Found During Study

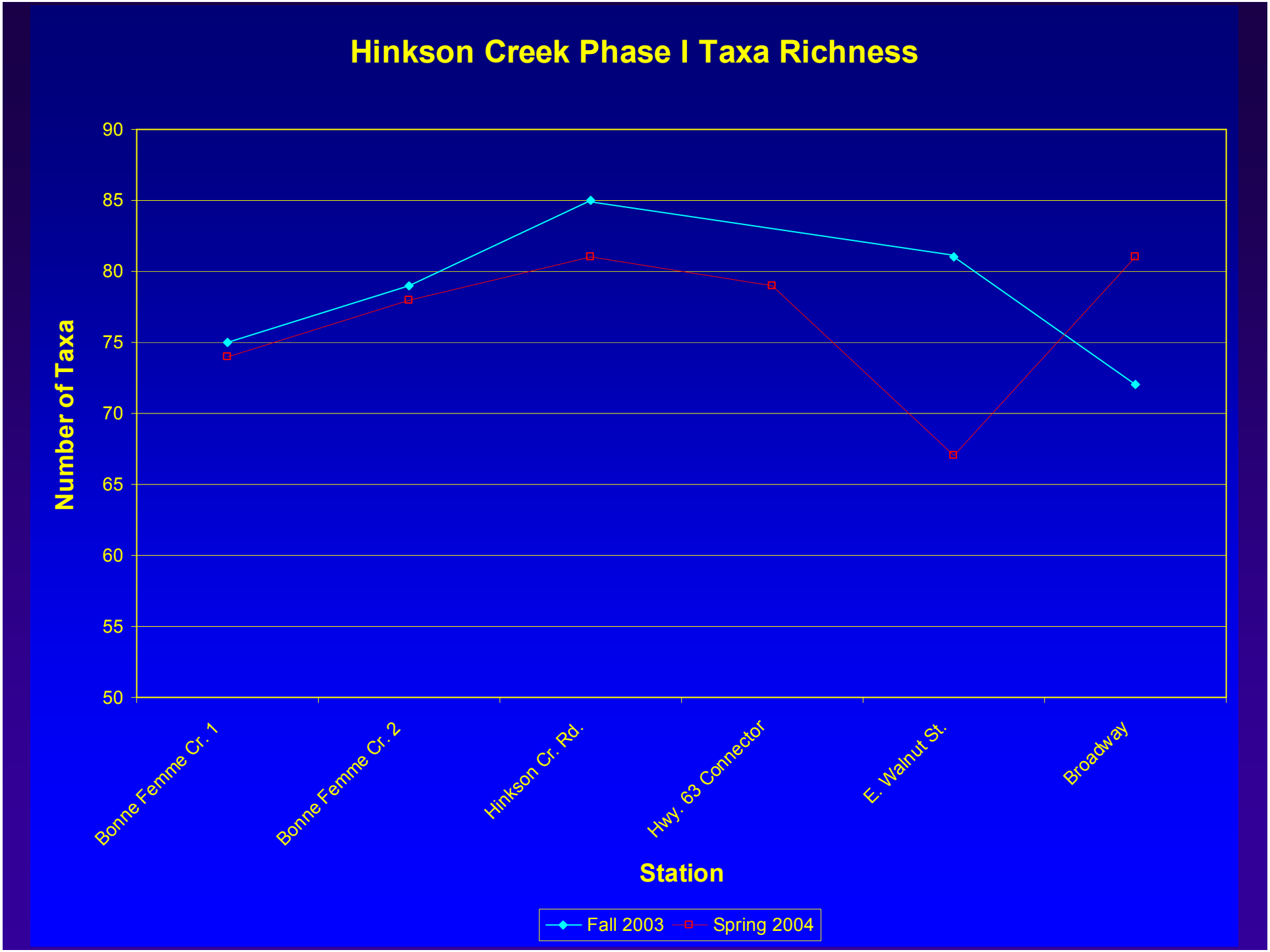
- 4 methyl phenol
- nitroanaline
- benzoic acid
- benzo (a) anthracine
- benzo (a) pyrene
- chrysene
- fluoanthene
- Indeno (1,2,3-cd) pyrene
- phenanthrene
- pyrene
- bis (2 ethyl hexl) phthalate
- phthalic acid
- squalene
- palmitic acid
- benzothiozolone
- methyl esters
- alkanes
- carbaryl
- caffeine
- TPH

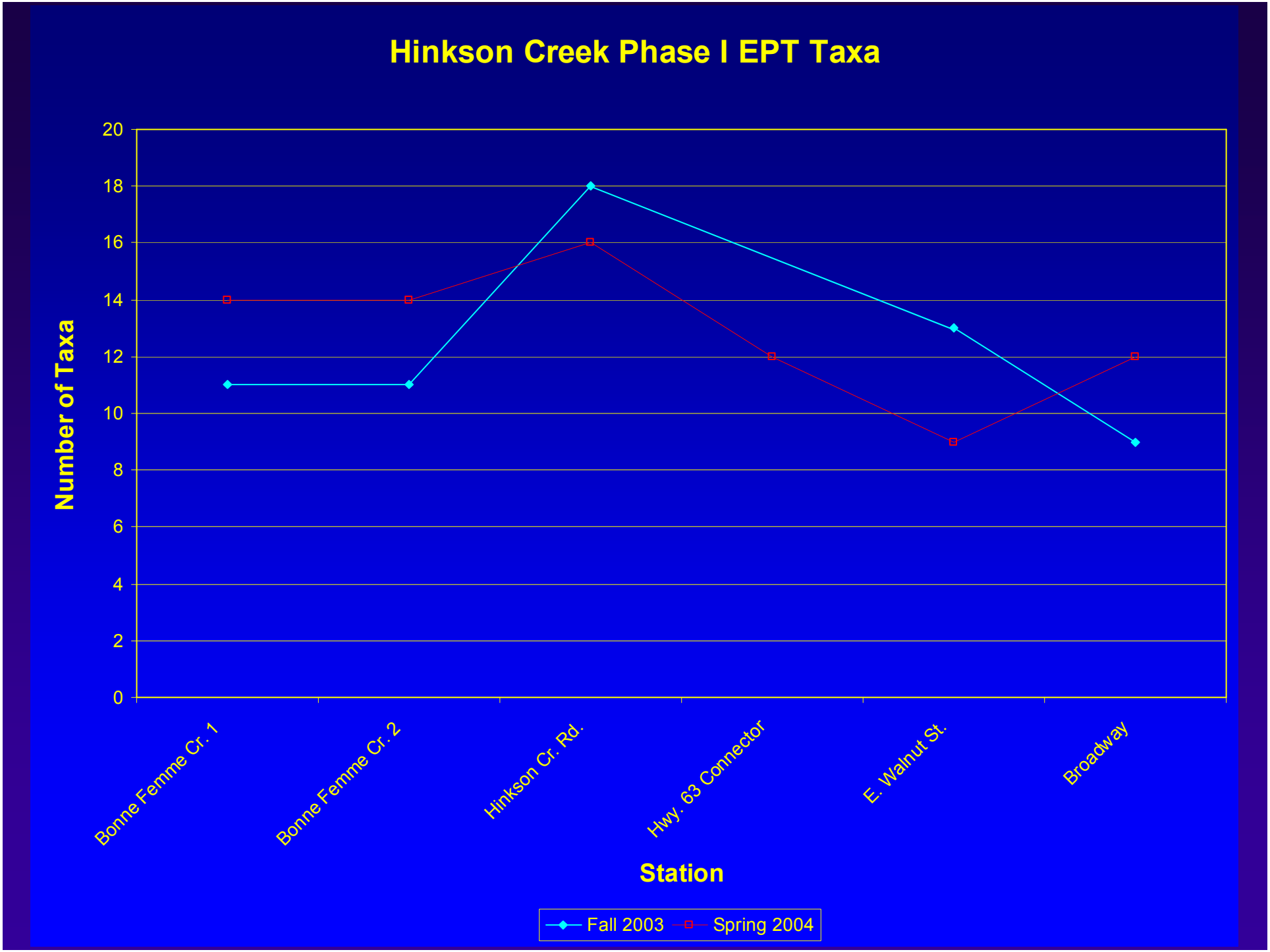
Phase I Findings (cont.)
Fall 2003 Aquatic Community

- All Hinkson Creek stations fully supporting
- EPT Taxa lower in urban reach
- Taxa Richness decreased slightly in urban reach

Phase I Findings (cont.)
Spring 2004 Aquatic Community

- Three of four Hinkson Creek stations fully supporting
- EPT Taxa lower in urban reach
- Taxa Richness decreased slightly in middle portion


Hinkson Creek Phase I Taxa Richness
Number of Taxa
90
85
80
75
70
65
60
55
50
Bonne Femme Cr. 1
Bonne Femme Cr. 2
Hinkson Cr. Rd.
Hwy. 63 Connector
E. Walnut St.
Broadway
Station
Fall 2003
Spring 2004


Hinkson Creek Phase I EPT Taxa
Number of Taxa
20
18
16
14
12
10
8
6
4
2
0
Bonne Femme Cr. 1
Bonne Femme Cr. 2
Hinkson Cr. Rd.
Hwy. 63 Connector
E. Walnut St.
Broadway
Station
Fall 2003
Spring 2004

Phase I: What Did We Learn?

- The aquatic community showed impairment between I-70 and Broadway.
- Toxicity was documented in some (16%) of the storm water discharges and in Hinkson Creek at Broadway.
- Organic chemicals in some storm water samples and high levels of sodium and calcium chloride in snowmelt samples.

Phase II

- Middle reach of Hinkson Creek
- Water quality and biological assessment between Broadway and Providence
- June 2004 through June 2005

Phase II Study Parameters

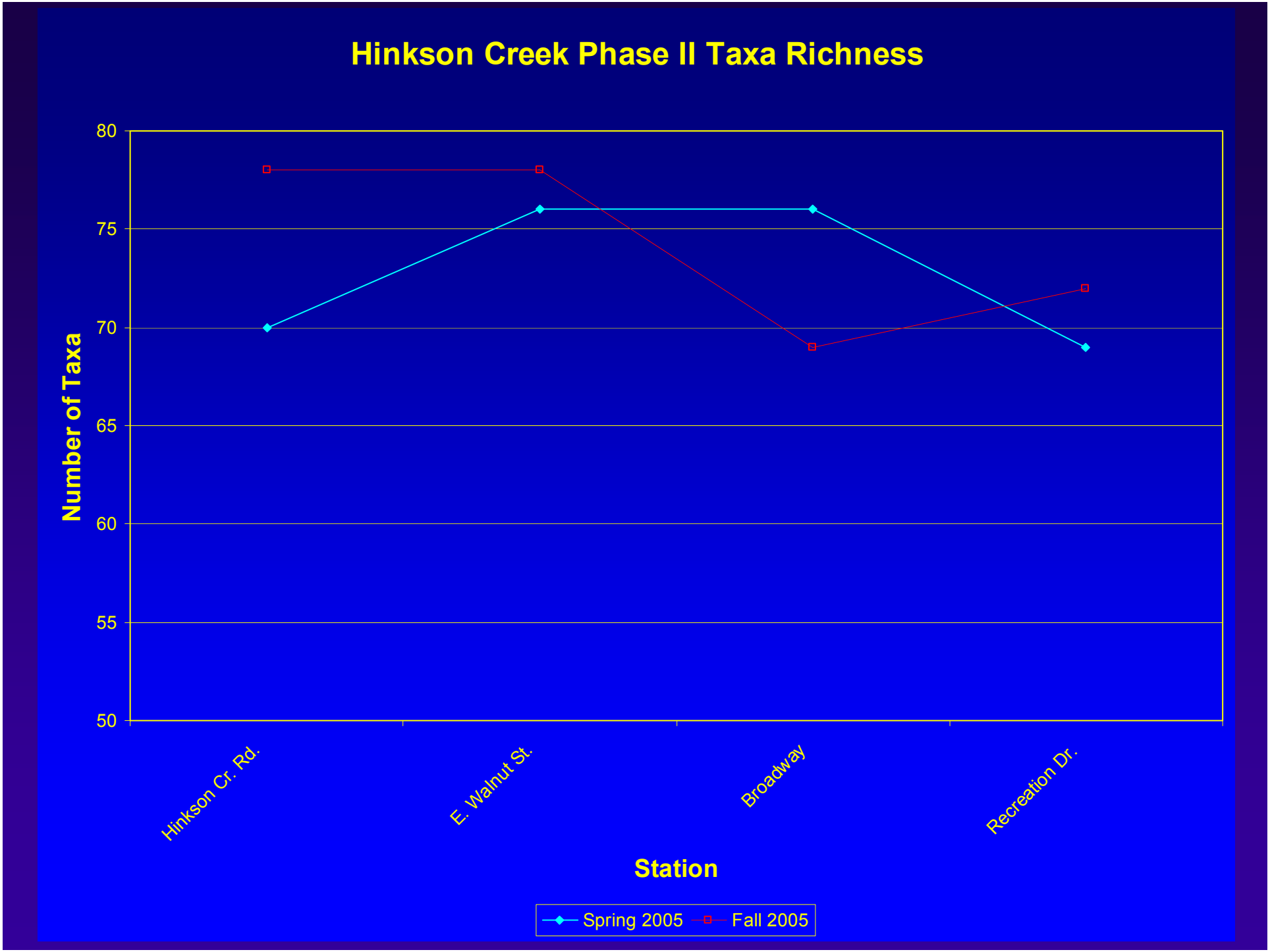
- Microtox/*Ceriodaphnia*
- Water Chemistry
- Storm Water
- Semi Permeable Membrane Devices
- Biological Assessment

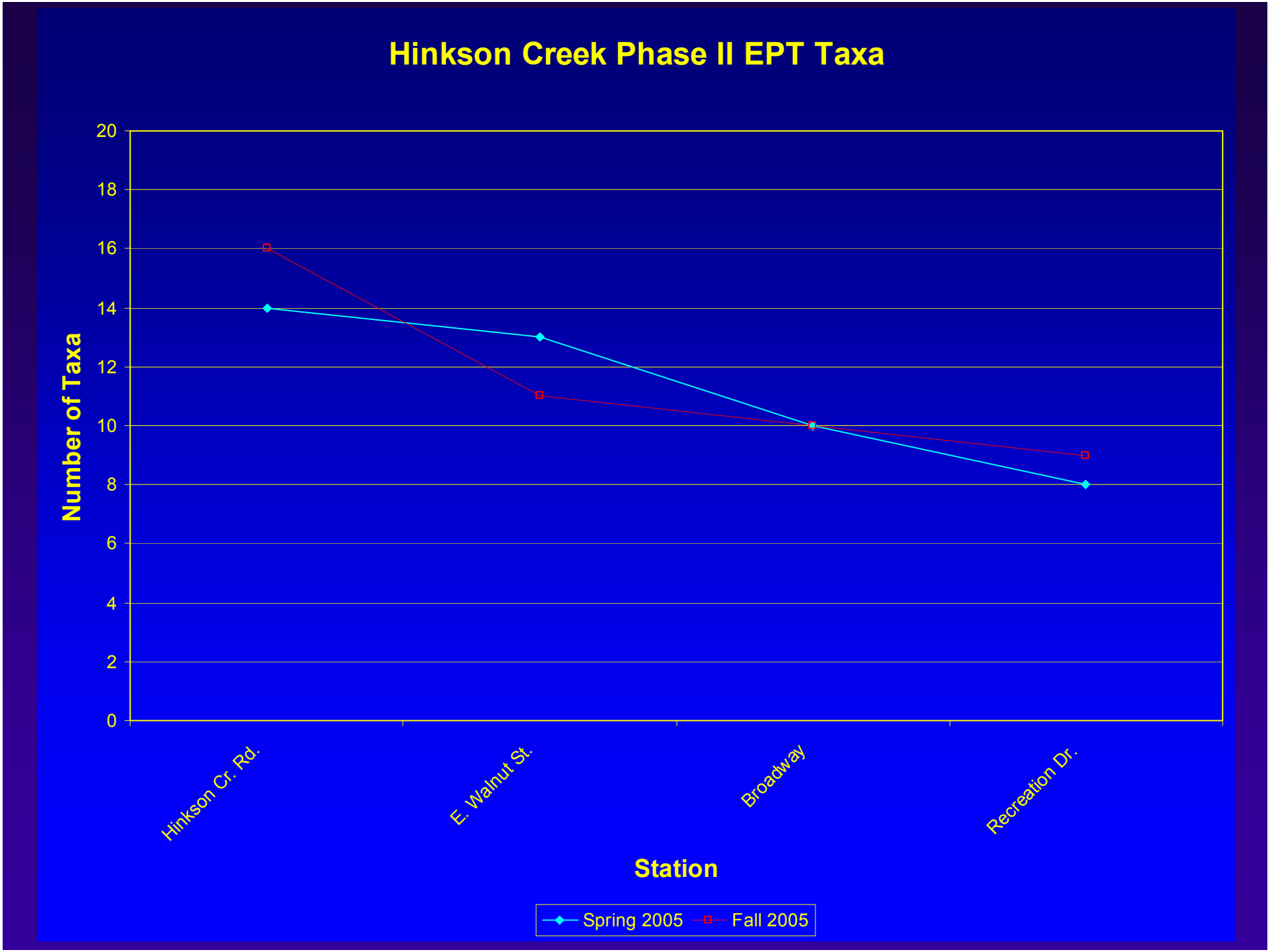
Phase II Findings

- Periodic storm water toxicity
- Suite of organic chemicals similar to Phase I
- SPMD analyses found various contaminants

Phase II Findings (cont.)
Aquatic Community Assessment

- E. Walnut Street station fully supporting
- EPT Taxa lower in urban reach
- Taxa Richness decreased only slightly in urban reach


Hinkson Creek Phase II Taxa Richness
80
75
70
65
60
55
50
Number of Taxa
Hinkson Cr. Rd.
E. Walnut St.
Broadway
Recreation Dr.
Station
Spring 2005
Fall 2005


Hinkson Creek Phase II EPT Taxa
Number of Taxa
20
18
16
14
12
10
8
6
4
2
0
Hinkson Cr. Rd.
E. Walnut St.
Broadway
Recreation Dr.
Station
Spring 2005
Fall 2005

Phase II: What Did We Learn?

- Conclusions similar to Phase I
- Fully supporting macroinvertebrate score for upper portion of urbanized reach
- Differences were observed in macroinvertebrate community (urban vs. upstream control)

Phase III

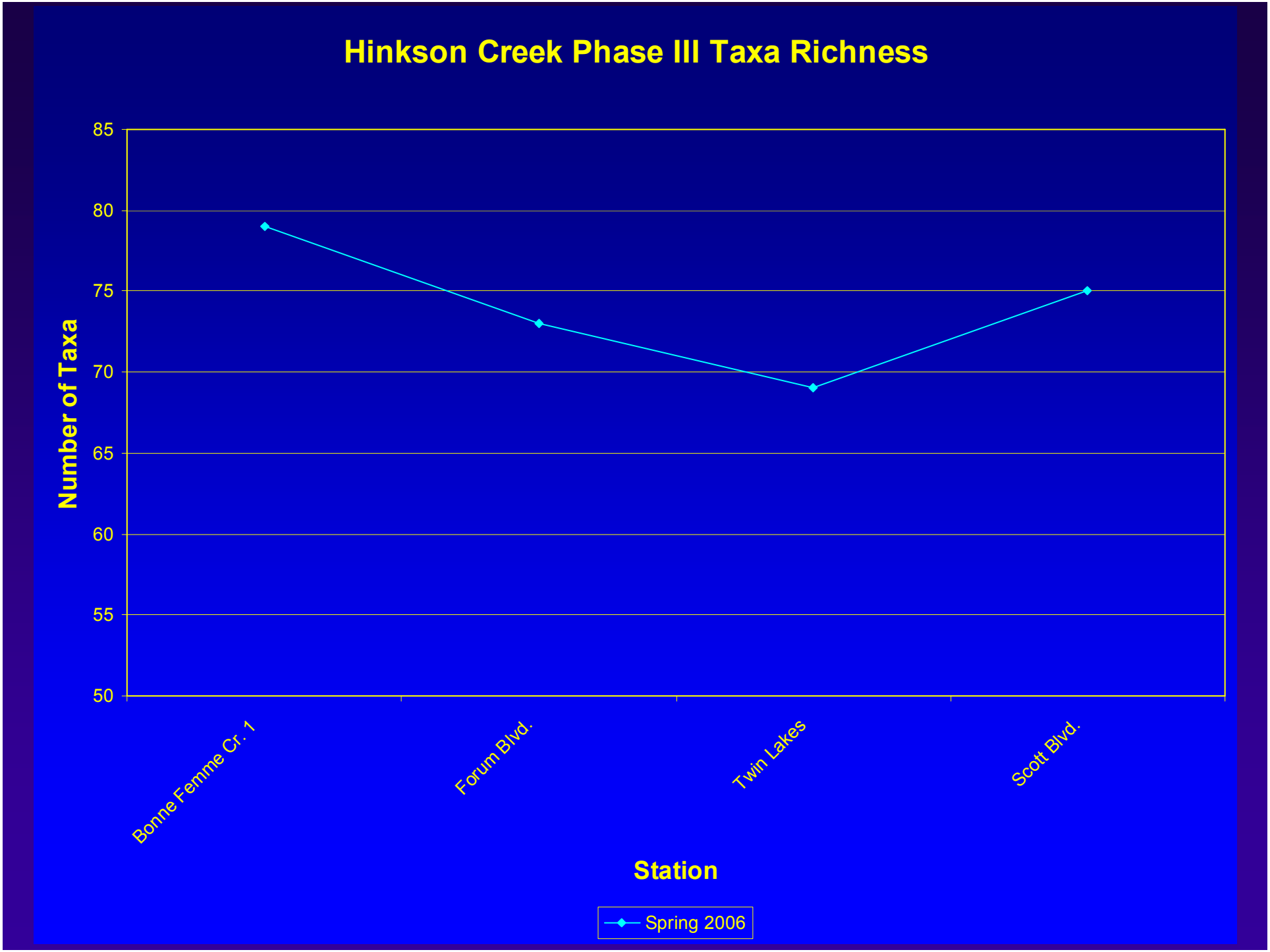
- Downstream reach of Hinkson Creek
- Water quality and biological assessment between Providence Road and Perche Creek
- June 2005 through June 2006

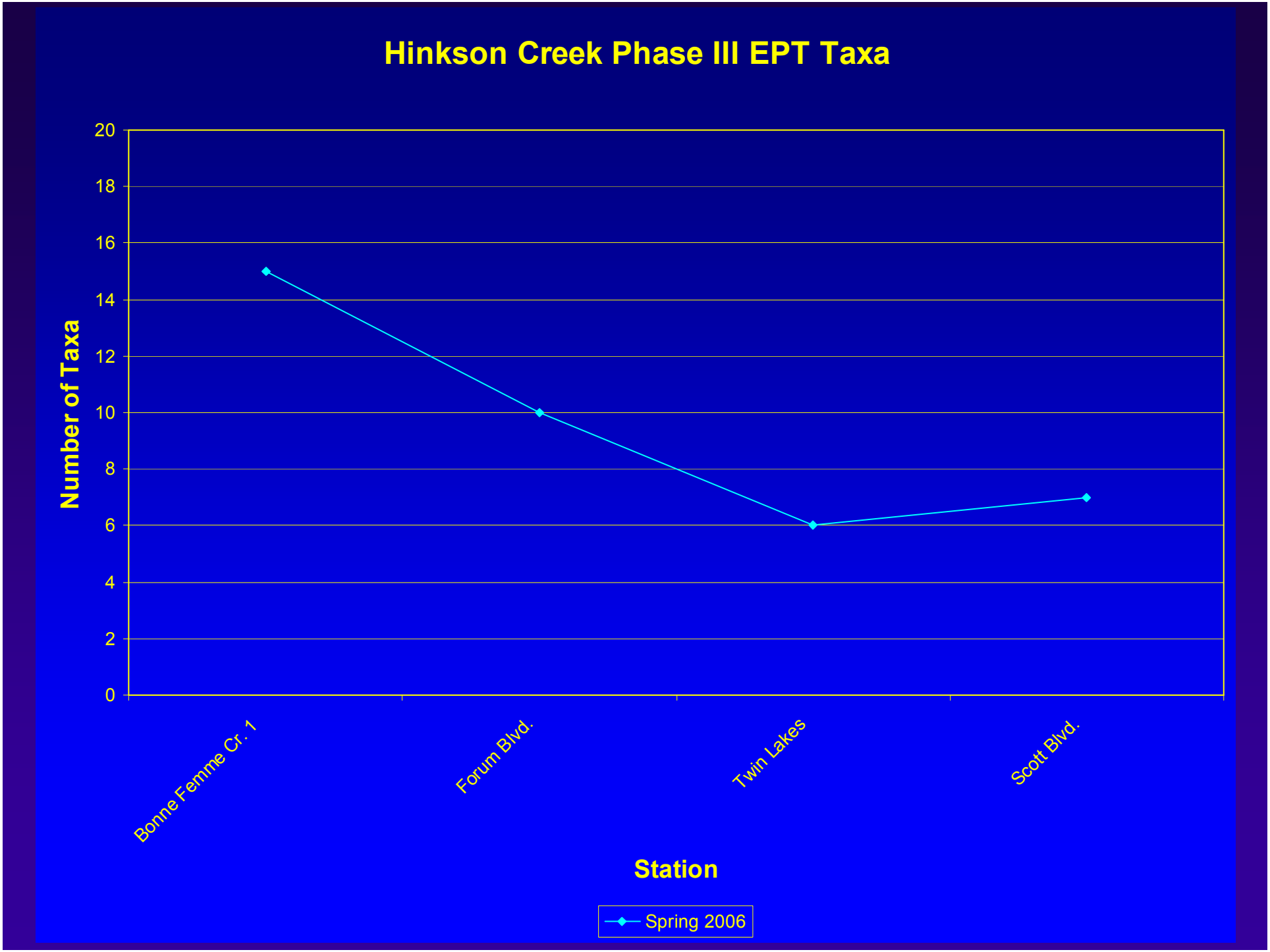
Phase III Study Parameters

- Microtox
- Water Chemistry
- Storm Water
- Biological Assessment
- Dissolved Oxygen

Phase III Findings

- No storm water toxicity
- Organic chemicals below detectable levels
- Two of three test stations fully supporting
- EPT Taxa lower in urban reach
- Taxa Richness only slightly lower in urban reach
- Overall, aquatic community similar between spring 2002 and spring 2006


Hinkson Creek Phase III Taxa Richness
Number of Taxa
85
80
75
70
65
60
55
50
Bonne Femme Cr. 1
Forum Blvd.
Twin Lakes
Scott Blvd.
Station
Spring 2006


Hinkson Creek Phase III EPT Taxa
Number of Taxa
20
18
16
14
12
10
8
6
4
2
0
Bonne Femme Cr. 1
Forum Blvd.
Twin Lakes
Scott Blvd.
Station
Spring 2006

Phase III: What Did We Learn?

- No storm water toxicity
- Organic chemicals below laboratory detectable levels
- Possible dissolved oxygen issues
- Observed aquatic community differences

Conclusions

- Benthic aquatic community in the urban reach tends to show at least some impairment
- Intermittent storm water toxicity
- Periodic dissolved oxygen deficiencies

Conclusions (cont.)

- Chemicals associated with snowmelt periodically yield toxic effects
- Chemicals that tend to bioaccumulate were present in low levels

Hinkson Creek Studies Online

- 2001-2002 Bioassessment
  - http://dnr.mo.gov/env/esp/docs/HinksonCreekReport.pdf
- Phase I-III Assessments
  - http://dnr.mo.gov/env/esp/wqm/phase1-hinksonck-study.pdf
  - http://dnr.mo.gov/env/esp/wqm/phase2-hinksonck-study.pdf
  - http://dnr.mo.gov/env/esp/docs/HinksonCreek_PhaseIII_FinalReport.pdf