

VOLUNTEER STREAM MONITORING IN NORTHEASTERN NEBRASKA



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*Streams in NE
Nebraska are some of
the most perturbed on
Earth.*

*Education and production
of valid biological data
are two ways to improve
stream health in NE
Nebraska.*



Goal of Volunteer Stream Assessment in Northeastern Nebraska

- To produce positive environmental change in watersheds through education and the production of *valid data*.
- *To produce valid data through the use of standardized methods for collection and analysis of data*

Volunteer Stream Monitoring in Northeastern Nebraska

- Service Learning
 - Advanced Ecology
 - Environmental Concerns
- Community Volunteer Stream Monitoring

Service Learning

- Wayne State College: ‘strengthens its academic programs with the community, state, nation and world through 'serving to learn and learning to serve.’’

Advanced Ecology

- “Volunteer base”: Juniors and Seniors at Wayne State College
- Students studied S. Logan Creek at Wayne

Goals of Volunteer Monitoring with Advanced Ecology Class

- To perform a simple biological assessment of South Logan Creek, Nebraska to determine whether the WWTP effluent was producing high abundance of midges
- To learn stream ecology
- To learn bioassessment techniques

Advanced Ecology Project: Methods

- Physical, chemical, habitat, and biological specimens were collected using the EPA Rapid Bioassessment Protocol (RBP)
- Biota were collected using a kick net



Advanced Ecology Project: Methods



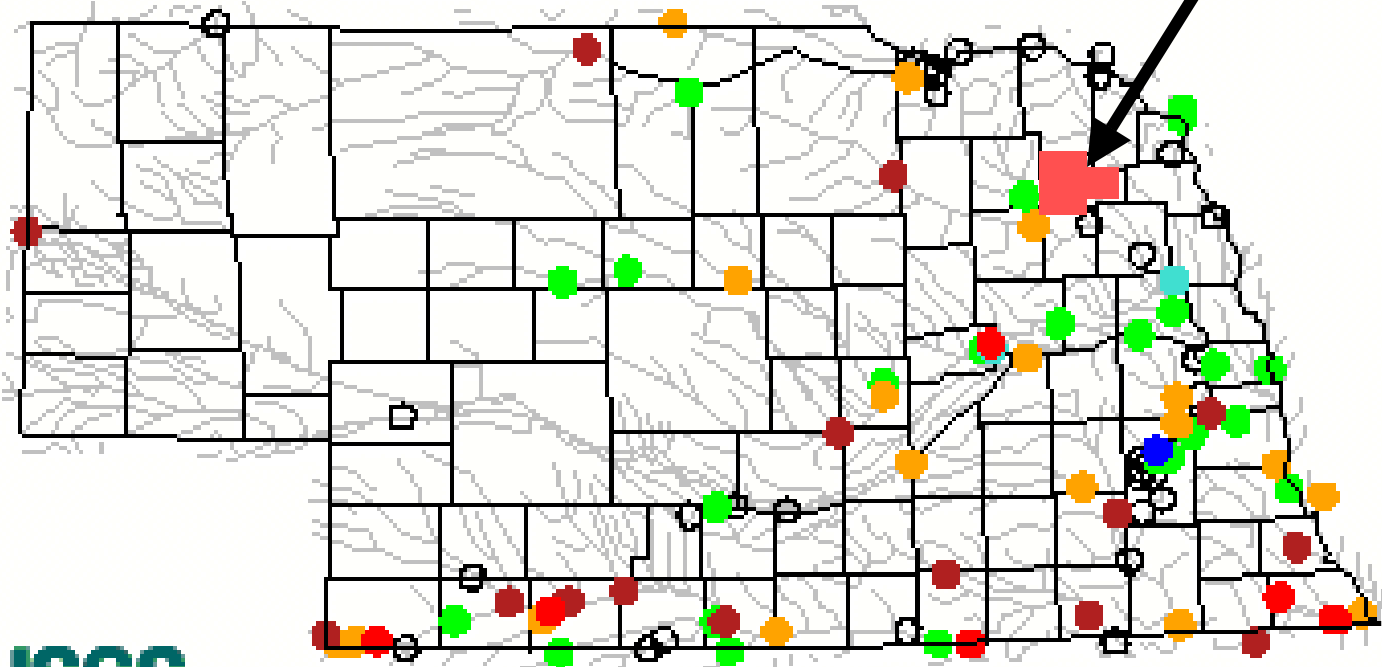
- Two sites, one upstream and one downstream of WWTP
- Kick net sampling was done in 5 minute intervals in each of three macrohabitats
- Samples were collected Summer, 2001

Advanced Ecology Project: Methods

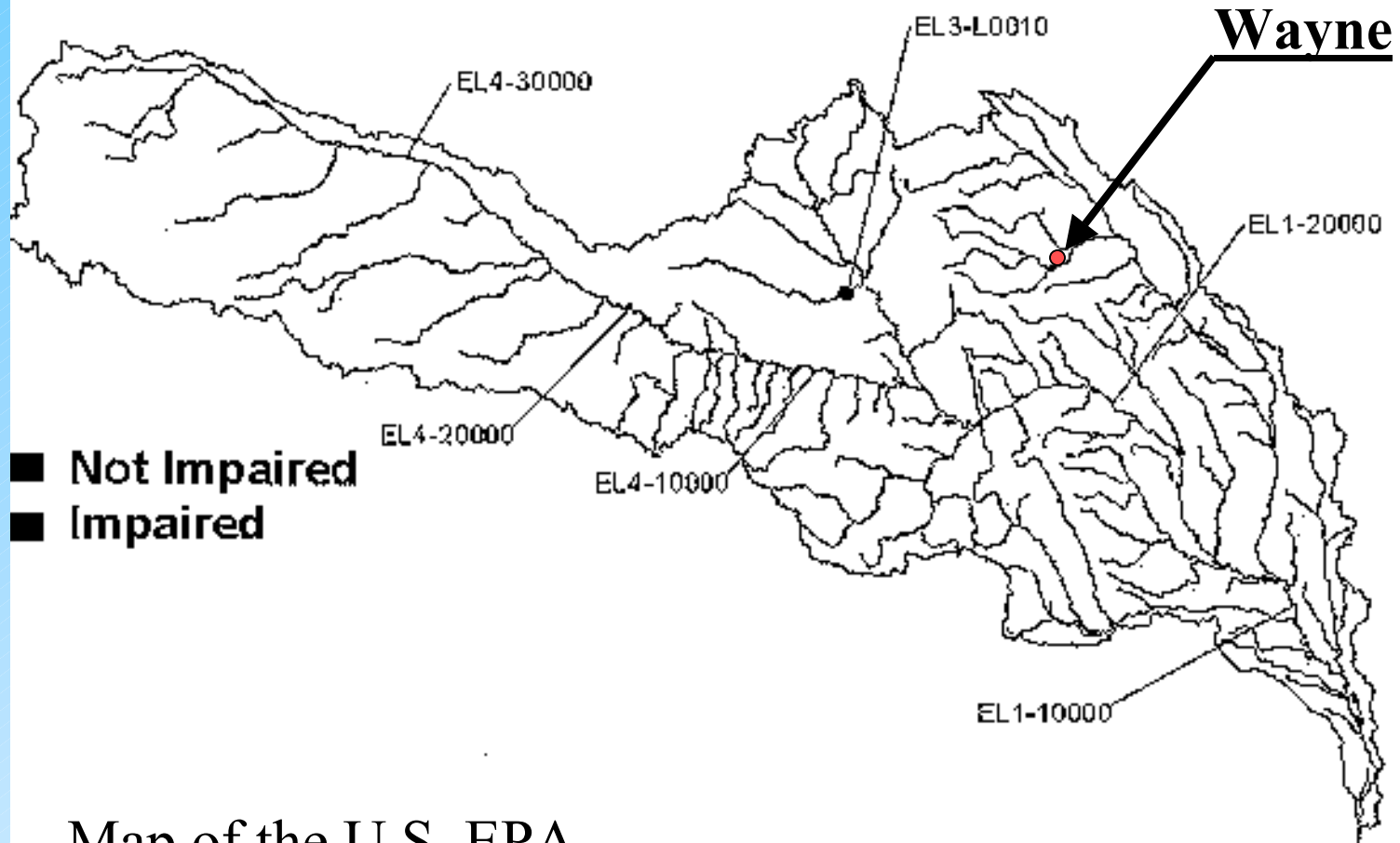
- Specimens were preserved in the field using 70% Isopropyl Alcohol
- Specimens were sorted and identified in the lab NOT using dissecting microscopes
- Identifications to genus were done using Merritt and Cummins (2000)
- Analyses were performed using MS Excel

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Elkhorn Basin - 2002 Section 303(d) Listed Waters Part 1 - Waters Needing a TMDL



Map of the U.S. EPA

Physical and Chemical Parameters Measured at South Logan Creek, Nebraska

Parameter	Site 1	Site 2
Stream Reach	25 m	25 m
Stream Width	6.2 m	5.5 m
Average Depth	24 cm	23.7 cm
Average Velocity/Riffle	.5 m/sec	.75 m/sec
Average Velocity/Run	0.33	.33 m/sec
Water Temperature	22 C	18.7 C
Conductivity	930 uS	735 uS
Dissolved Oxygen	6.7 mg/L	6.6 mg/L
Turbidity	76%	70.70%

Results



A total of 52 taxa were
counted
identified
analyzed

Table 1: Taxa identified from South Logan Creek, Wayne, Nebraska

Class	Order	Family	Genus and species	
Insecta	Odonata	Coenagrionidae	Genus	
			<i>Enallagma</i>	
		<i>Chromagrion</i>		
		Calopterygidae	<i>Heterina</i>	
			<i>Calopteryx</i>	
		Ephemeroptera	Baetidae	Genus
				Genus
				<i>Baetis</i>
				<i>Caenis</i>
			Heptageniidae	
	Trichorythidae		<i>Trichorythodes</i>	
	Hemiptera		Veliidae	<i>Microvelia</i>
	Trichoptera	Hydroptilidae	<i>Hydroptila</i>	
			<i>Stactobiella</i>	
		Hydropsychidae	Genus	
			<i>Parapsyche</i>	
			<i>Cheumatopsyche</i>	
			<i>Hydropsyche</i>	
	<i>Ceratopsyche</i>			
	Lepidoptera	Arctiidae	<i>Estigmene</i>	
		Pyralidae		
	Coleoptera	Elmidae	<i>Stenelmis</i>	
			<i>Dubriaphria</i>	
Dytiscidae		<i>Hydrovatus</i>		
Staphylinidae		<i>Stenus</i>		

Table 1: Taxa identified from South Logan Creek, Wayne, Nebraska

Class	Order	Family	Genus and species
	Diptera	Chironomidae	<i>Conchapelopia</i>
			<i>Cricotopus</i>
			<i>Eukiefferiella</i>
			<i>Nanocladius</i>
			<i>Paratrichocladius</i>
			<i>Rheocricotopus</i>
			<i>Thienemanniella</i>
			<i>Chironomus</i>
			<i>Cryptochironomus</i>
			<i>Dicrotendipes</i>
			<i>Polypedilum</i>
			<i>Paratanytarsus</i>
			<i>Tanytarsus</i>
		Simuliidae	<i>Simulium</i>
		Tipulidae	
		Dolichopididae	
		Culicidae	
		Psychodidae	
		Ceratopogonidae	<i>Atrichopogon</i>
Crustacea	Amphipoda	Talitridae	<i>Hyalella azteca</i>
	Isopoda		
Gastropoda			Genus
		Physidae	<i>Physa</i>
		Planorbidae	<i>Radix auricularia</i>
		Lymnaeidae	
Pelycopoda			
Oligochaeta			

Descriptive Statistics and Index Values for South Logan Creek, Nebraska

	Site 1	Site 2
Total	992	518
Count	30	43
Average	33.07	12.05
Stdev	49.56	25.19
Max	223	119
Min	1	1
Median	10.5	3
Diversity	2.65	2.65
V eveness	0.38	0.42
HBI	2.88	2.84

Effectiveness of Project

- Measurements:
- Grading
 - tests
 - report
- Quality Assurance
 - all specimens were confirmed
- Class comments

Conclusions

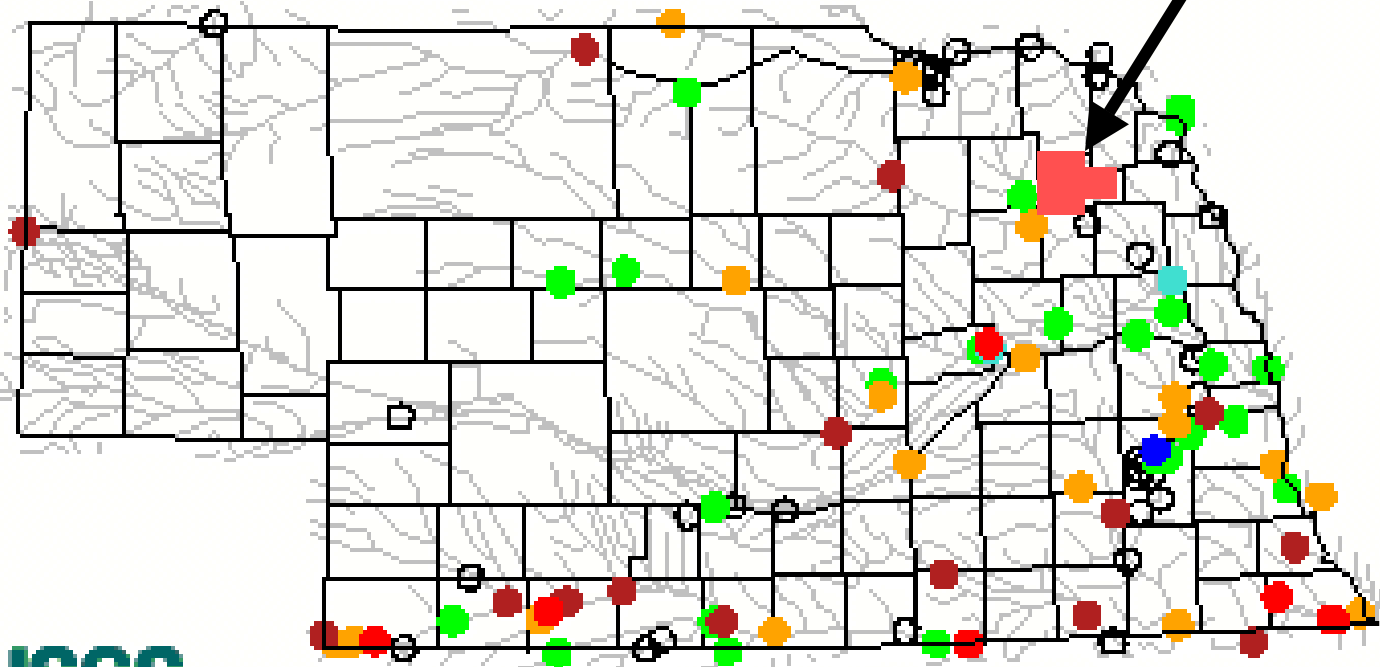
- The project was a success
- Students learned bioassessment techniques
- Students learned the value of the ecosystem
- They produced reports which I summarized for the Wayne WWTP
- Most comments indicated the students liked the class and the experience
- The worst comments indicated that it was too much work

Environmental Concerns

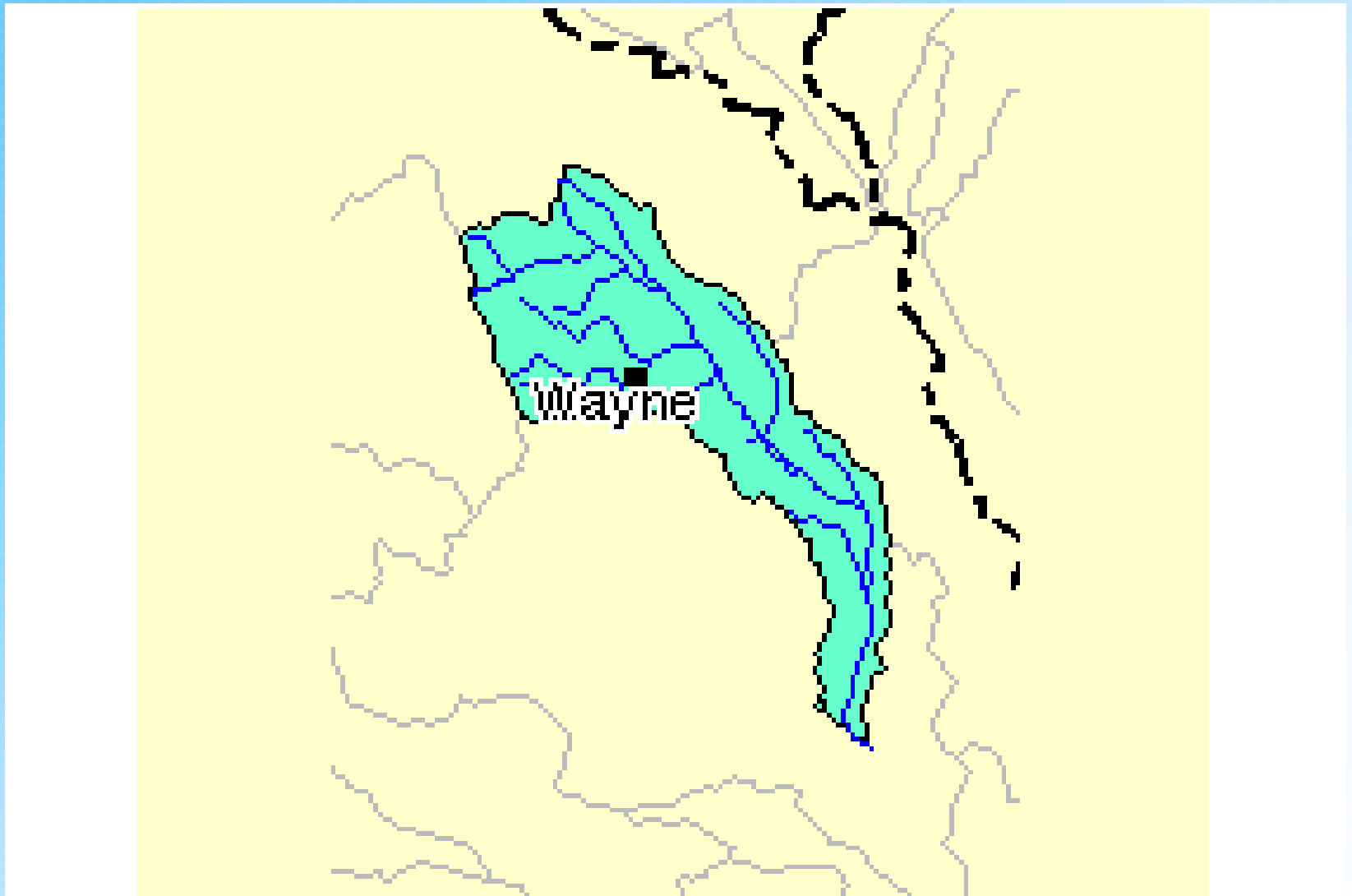
- “Volunteer Base”: Students in the general education course
- Students study the South Logan Creek Watershed

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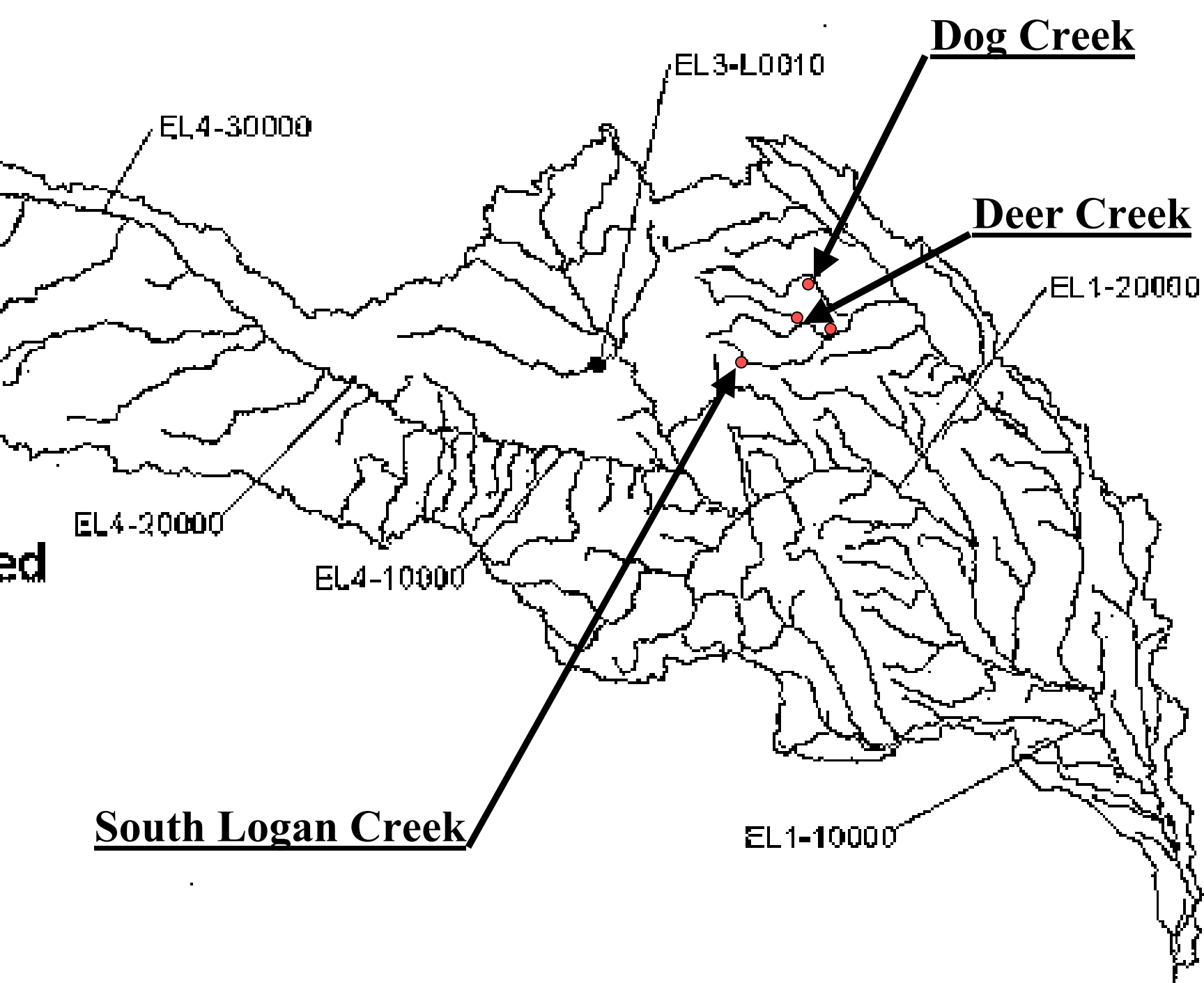
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Map from the U.S. EPA



Map from U.S. EPA



Goals of Environmental Concerns Volunteer Monitoring Project

- To do long-term monitoring of the South Logan Creek Watershed
- To learn about the value of stream ecosystems
- To learn the scientific method
- To learn how to do simple analysis
- To write a basic scientific report

Environmental Concerns Project: Methods

- Students were trained in sorting and identification before collecting in the field
- This was done due to the season (winter)
- And to mimic training community volunteers would receive

Environmental Concerns Project: Methods

- Methods followed modified EPA RBP
- Modifications removed jargon from habitat and physical/chemical data sheets
- Samples were collected Spring, 2001
- Samples were collected using semi-quantitative methods:
 - 1 minute kick nets into a d-net at riffle, run, and pool



Environmental Concerns Project: Methods

- Specimens were preserved in 70% isopropyl alcohol in the field
- Sorting was done in the lab using white pans, but no microscopes
- Identifications to family were made using dissecting microscopes and following a regional key
- The regional key was made without jargon
- Analyses were performed using MS Excel

Results



A total of 19 taxa were
counted
identified
analyzed

Taxa from South Logan Creek

Scientific Name	S. Logan at Winside Run	S. Logan at Winside Pool	S. Logan at Wayne, Riffle	S. Logan at Wayne, Run
Hydropsychidae	3	8	21	0
Oligochaeta	0	8	117	3
Simuliidae	0	0	141	1
Heptageniidae	0	0	1	0
Hydroptilidae	0	0	2	0
Chironomidae	2889	3432	473	211
Ceratopogonidae	0	16	0	0
Coenagrionidae	30	24	15	7
Physidae	360	496	1	5
Limnaeidae	12	16	0	3
Sphaeriidae	12	80	1	1
Hirudinea	0	32	0	1
Talitridae	0	8	0	8
Asellidae	0	0	1	0
Corixidae	0	0	1	1
Tipulidae	0	0	1	0
Caenidae	0	0	0	3
Dytiscidae	15	16	0	2
Elmidae	0	8	0	0
Total	3321	4144	775	246

Family Level Richness and HBI Values for South Logan Creek
and the WCBP Ecoregion Reference Condition
(Donley 1998)

Season	Site	Richness	HBI
Summer	S. Logan Creek, Wayne, Riffle	28	2.76
Spring	S. Logan Creek, Winside, Run	7	2.98
Spring	S. Logan Creek, Windside, Pool	12	2.96
Spring	S. Logan Creek, Wayne, Riffle	12	3.12
Spring	S. Logan Creek, Wayne, Run	12	2.96
Yearly	WCBP Reference Condition	38	2.79

Effectiveness of Project

- Lab report
- Quality Assurance and Quality Control
 - A small study was conducted . . .



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Quality Assurance Study Design

- Two labs were run by a professor with extensive training in aquatic ecology
 - Trained students assisted with identifications, sorting and counts
- Two labs were run by a professor with training equivalent to Volunteer Stream Monitoring or Assessment training
 - Trained students assisted with identifications, sorting and counts

Quality Assurance Study Design

- Samples:
 - Three samples from each lab were randomly selected and identified
 - Two collection events and four labs resulted in 24 samples re-identified
 - Percent incorrect in identifications and counts was calculated

Descriptive Statistics for QA Environmental Concerns Stream Monitoring

TR		MW	
	<i>Column1</i>		<i>Column1</i>
Mean	13.67	Mean	63.67
Standard Error	2.85	Standard Error	7.96
Median	11.50	Median	63.50
Standard Deviation	9.88	Standard Deviation	27.57
Sample Variance	97.70	Sample Variance	760.24
Range	33.00	Range	93.00
Minimum	0.00	Minimum	7.00
Maximum	33.00	Maximum	100.00
Count	12.00	Count	12.00

Results of ANOVAs Comparing Percent Incorrect in Identifications Between Labs and Sampling Events

Sampling Event	Comparison	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Winter, Spring	TR:TR	1.96	0.19	4.96
Winter, Spring	MW:MW	0.03	0.86	4.96
Winter	TR: MW	11.17	0.01	4.96
Spring	TR: MW	23.71	0.00	4.96

Summary of QA

- Labs with less expertise generated statistically significantly more error than the lab with expertise
- There was no statistically significant variation between percent incorrect identifications and counts between same labs, but different sampling events

Conclusions for QA

- Thus, each lab was consistent with itself in terms of error
- But the different labs were significantly different from each other

Discussion

- Non-majors class
- Willingness to do a good job differed between “good” and “bad” students
- Although some “good” students made assumptions
- Lack of training
- Student assistants were not confident in their abilities



Recomendations



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- Better taxonomic training
- *Always* check samples and identifications
- Return to the field with trainees to check their collection methods!!

Future Directions

- Other professor went through more intensive training this summer--more QA studies will determine the effectiveness of this training
- Training commenced this summer and will continue this fall for community wide Volunteer Stream Monitoring
- A student will compare kick netting and drift nets for use in streams in Northeastern Nebraska