


Vital Signs monitoring in our parks: What to measure?



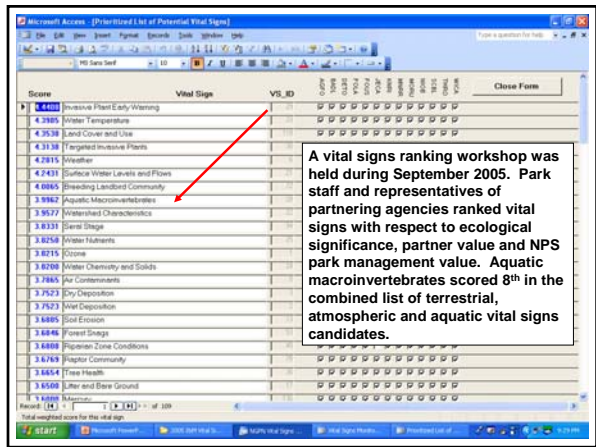
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Vital Signs Monitoring?

- What's a vital sign?
- What are some examples?
- Vital signs and aquatic resources:
 - Core vital signs
 - Vital signs specific resources/concern
 - Selection with resp
 - NPS Mission versus regulatory needs

Vital sign = element or process that represents the overall **health** or condition of park resources.

	Yes	No
Avifauna diversity		Ecosystem Health
Invertebrate IBI		Birds
Annual net primary production		Fat content of grasshopper sparrows



A vital signs ranking workshop was held during September 2005. Park staff and representatives of partnering agencies ranked vital signs with respect to ecological significance, partner value and NPS park management value. Aquatic macroinvertebrates scored 8th in the combined list of terrestrial, atmospheric and aquatic vital signs candidates.

Study Objectives

- Assess current conditions within the aquatic habitats of the NGPN parks.
- Develop a list of potential vital signs which might be used to evaluate the health of aquatic habitats within the NGPN.

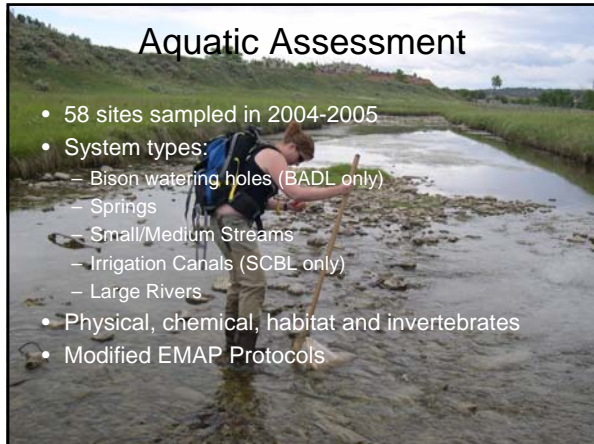


Lotic Reaches & Ponds Sampled

Park	River	Canal	Stream	Spring	Pond
AGFO			1		
BADL			3	1	5
DETO	1			3	
FOLA	3		1		
FOUS	1				
JECA				3	
KNRI	3				
MNRR	3				
MORU			5		
NIOB	3		5		
SCBL	1	4		1	
THRO	3				
WICA			8		

Aquatic Assessment

- 58 sites sampled in 2004-2005
- System types:
 - Bison watering holes (BADL only)
 - Springs
 - Small/Medium Streams
 - Irrigation Canals (SCBL only)
 - Large Rivers
- Physical, chemical, habitat and invertebrates
- Modified EMAP Protocols



Metric Selection Process:

- 1) 60-70 community metrics were calculated from raw invertebrate counts for each aquatic system type (Bison Impoundment, Spring, Stream, River)
- 2) Kruskal-Wallis F statistics were calculated to evaluate among versus within site variability for each metric and aquatic system type (DP)
- 3) Metrics were ranked by DP within their descriptive groups (Composition, Diversity, Feeding Guild, Habit Guild, Tolerance)
- 4) Obvious redundancy among highly ranking metrics was eliminated by selecting that metric with the highest DP and/or greatest data range
- 5) Metrics with a high percentage (>25%) of undefined values were eliminated (e.g., ratio metrics)
- 6) Metrics with a greater range of values were selected over those with a narrower range of values
- 7) Metrics of greater utility to partners were selected over those not used by partners
- 8) Metrics exhibiting significant relationships with measures of chemical, habitat and landscape disturbance were selected over those without relationships

KW-ANOVA for Stream H' by Site

Source	DF	SS	MS	F	P
Between	17	6488.5	381.7	2.76	0.0061
Within	33	4561.5	138.2		
Total	50	11050.0			

Selected metrics should discriminate well among sites which differ biologically. Good discriminatory power implies high between-site variability relative to within-site variability. Thus, discriminatory power might be evaluated using an F-ratio from a test of site differences.



Optimal Metrics: Bison Holes

Metric	Min	Med	Max
% Dominant	27.8	46.9	100
% Chironomidae	0.0	19.6	78.9
Non-Insecta Richness	0	1	4
Margalef Index	0.00	1.62	2.77
Chironomidae Richness	0	2	4
Shredder Richness	0	1	3
Feeding Guild H'	0.00	0.93	1.18
Clinger Richness	0	1	3
Habit Evenness	0.00	0.62	0.93
Tolerant Richness	0	4	8

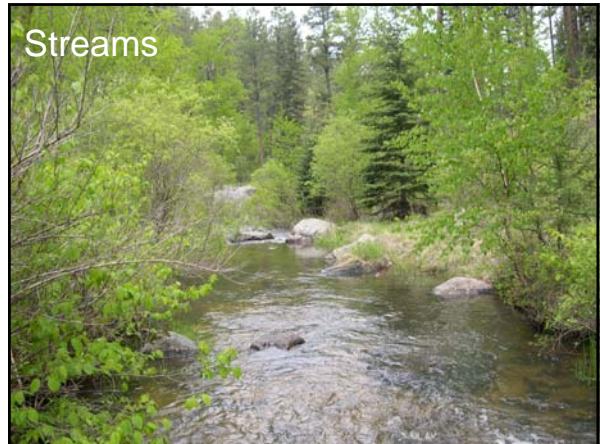
*Blue font indicates significant KW F statistic for between site differences



Optimal Metrics: Springs

Metric	Min	Med	Max
Percent Chironomidae	0.0	3.2	100
Percent EPT	0.0	16.7	97.1
EPT Richness	0	1	4
Chironomidae Richness	0	1	4
Percent Shredders	0.0	9.1	85.7
Percent Collector-Gather	14.3	36.4	100.0
Percent Predator	0.0	6.5	78.6
Percent Climber	0.0	0.0	85.7
Percent Glider	0.0	0.0	41.7
Modified HBI	2.0	5.5	8.9

*Blue font indicates significant KW F statistic for between site differences



Optimal Metrics: Streams

Metric	Min	Med	Max
Percent Non-Insecta	0.0	10.3	100
EPT:Chironomidae	0.00	0.81	1.00
EPT Richness	0	3	11
Chironomidae Richness	0	3	14
Shannon H'	0.00	1.85	2.80
Predator Richness	0	4	14
Feeding Guild H'	0.00	0.93	1.29
Percent Sprawlers	0.0	12.5	66.1
Habit Guild H'	0.00	1.14	1.54
Modified HBI	3.07	5.05	9.60

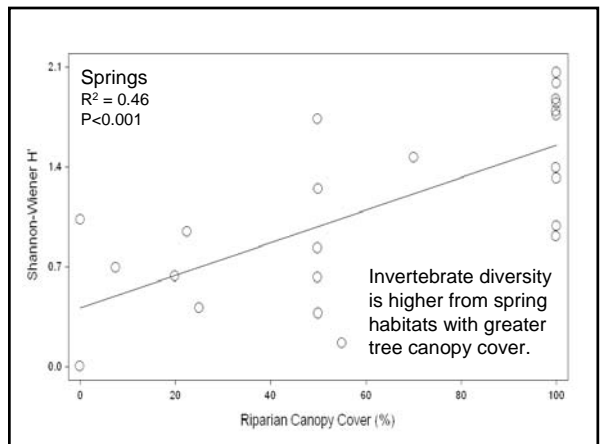
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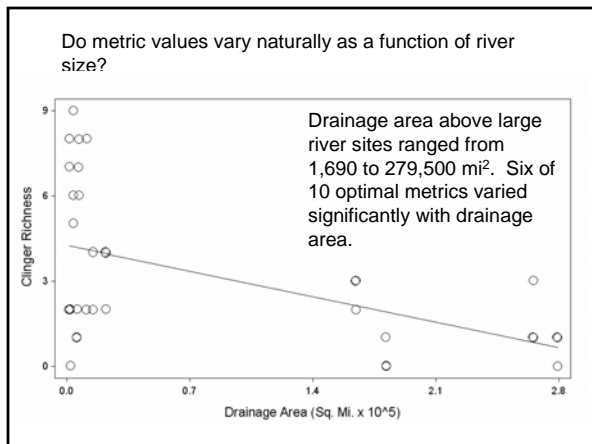
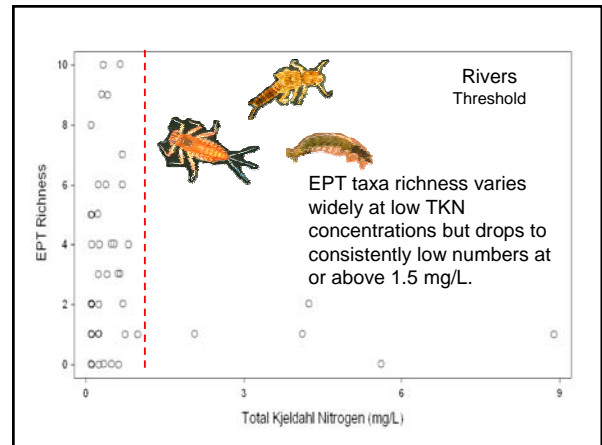
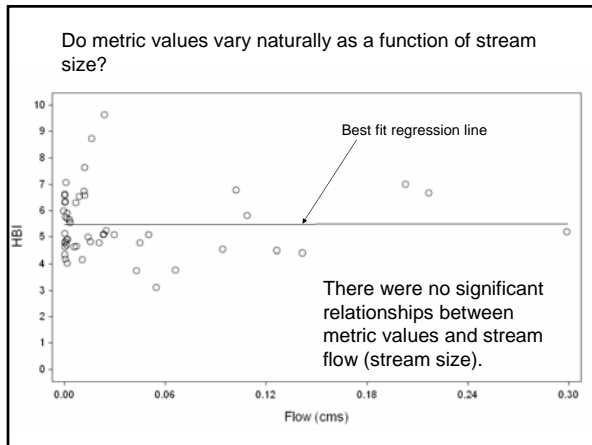
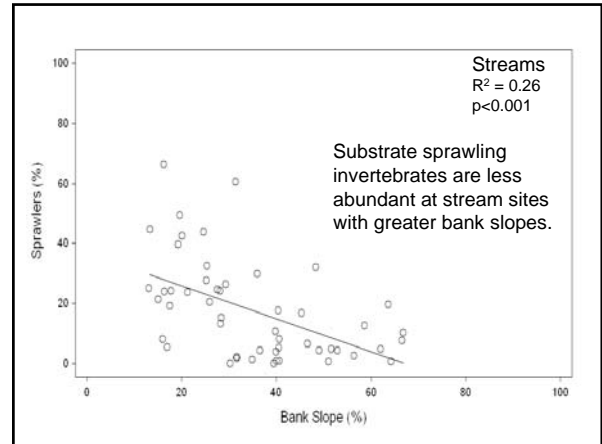
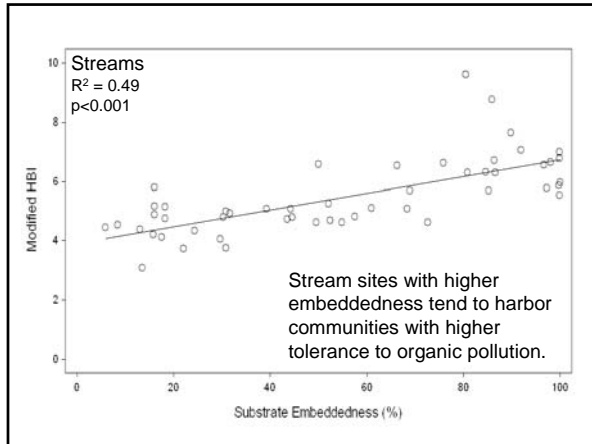


Optimal Metrics: Large Rivers

Metric	Min	Med	Max
Percent EPT	0.0	24.5	93.5
Percent Chironomidae	0.0	9.6	100
Total Richness	2	9	26
Non-Insecta Richness	0	2	6
EPT Richness	0	2	10
Collector-Filterer Richness	0	1	6
Collector-Gather Richness	1	4	13
Clinger Richness	0	2	10
Swimmer Richness	0	2	7
Modified HBI	2.92	5.23	9.00

*Blue font indicates significant KW F statistic for between site differences





- ## Discussion Points
- Commonality among metric sets
 - Chironomidae Richness
 - Percent Chironomidae
 - EPT Richness
 - HBI
 - Commonality among metric sets utilized by other monitoring agencies
 - NE, WY (ND and SD without defined metric sets)
 - US EPA, USGS
 - Recommended aquatic vital signs
 - Core vital signs
 - Channel and riparian habitat assessment
 - Macroinvertebrate optimal metric sets
 - Park-specific metrics (e.g., unionid mussel abundance/diversity)
 - Importance of integrated efforts with partnering agencies



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