



Integrating collaborative biological monitoring in the Acadia National Park Water Resources Program.

Maine Sustainability and Water Conference
March 29, 2018 Augusta, ME

Bill Gawley¹, Shannon Wiggin¹, Leon Tsomides²

¹Acadia National Park

²Maine Department of Environmental Protection



Acadia National Park

- 24 named lakes and ponds
 - 19 inside park boundaries
 - 5 partly outside park
- 35 named streams
 - 13 inside park boundaries
 - 21 partly outside park
- and...
 - 5 named springs
 - 10 named wetlands (total wetlands = ~4,175 acres)
 - 3 major estuaries



Water Quality History

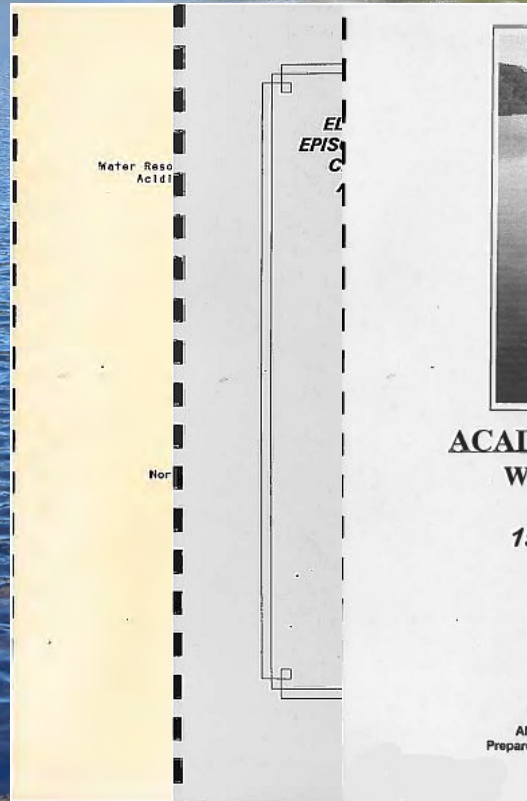
A Biological Survey of the Lakes and Ponds of Mount Desert Island, and the Union and Lower Penobscot River Drainage Systems

BY
JOHN L. FULLER
Associate Professor of Zoology
University of Maine, Orono
and
GERALD P. COOPER
Associate Aquatic Biologist
Institute for Fisheries Research
Ann Arbor, Michigan

Fish Survey Report No. 7

TO
Maine Department of Inland Fisheries
and Game

George J. Stobie, *Commissioner*
W. Earle Bradbury, *Acting Deputy Commissioner*



National Park Service
U. S. Department of the Interior



Natural Resource Stewardship and Science

Water Quality Monitoring at Acadia National Park
Northeast Temperate Network 2013 Summary Report

Natural Resource Data Series NPS/NETN/NRDS—2014/673



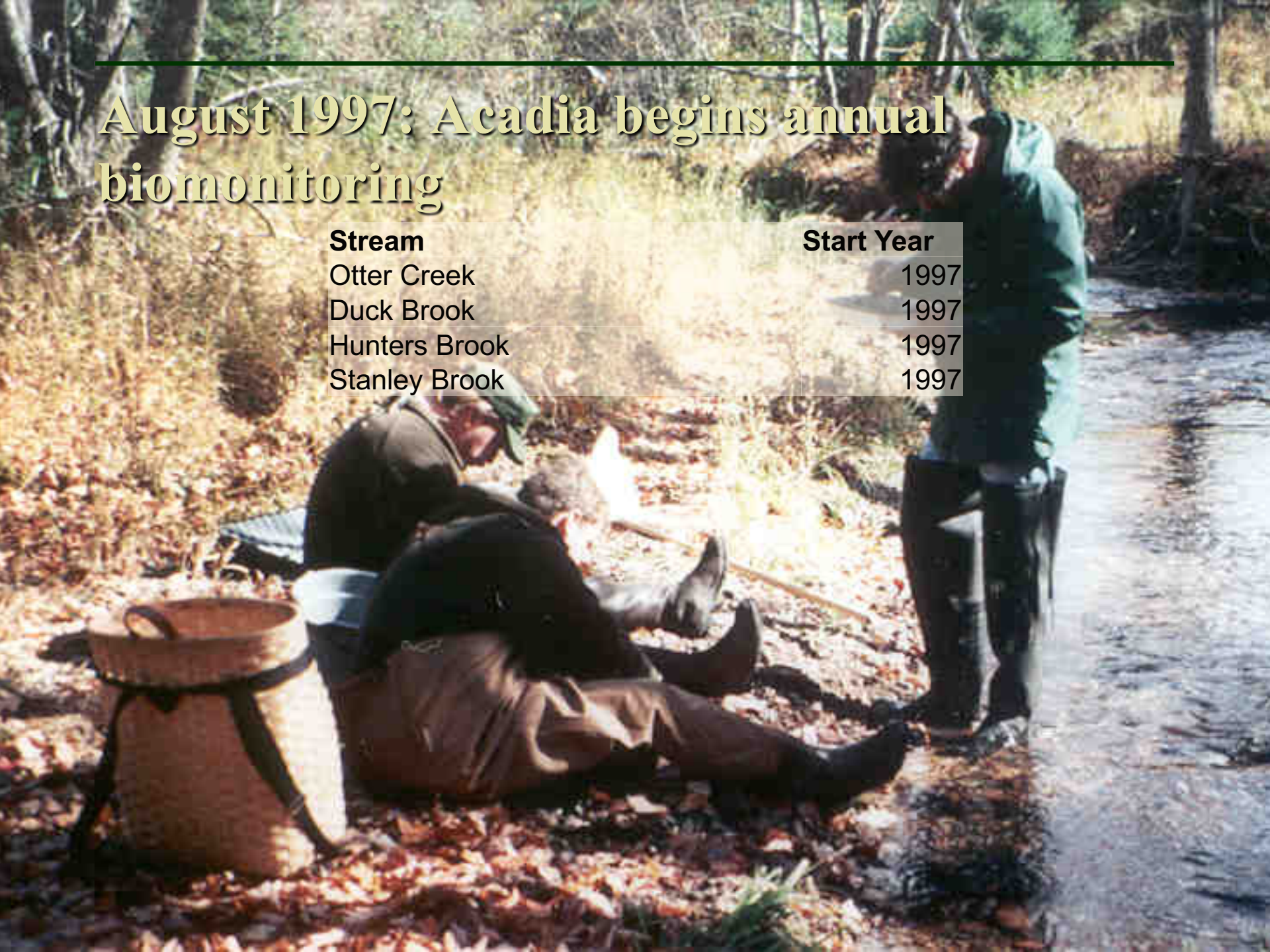
January 1997: Bar Harbor waterline break

- Chlorinated water entering nearby stream.



August 1997: Acadia begins annual biomonitoring

Stream	Start Year
Otter Creek	1997
Duck Brook	1997
Hunters Brook	1997
Stanley Brook	1997



August 1997: Acadia begins annual biomonitoring

Stream	Start Year
Otter Creek	1997
Duck Brook	1997
Hunters Brook	1997
Stanley Brook	1997
Heath Brook	1998
Lurvey Spring Brook	1998



August 2017: Acadia celebrates 20 years of biomonitoring



Benefits of biomonitoring



**Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Classification Attainment Report**

Station Information	
Station Number: S-322	River Basin: Maine Coastal
Waterbody: Duck Brook - Station 322	HUC8 Name: Maine Coastal
Town: Bar Harbor	Latitude: 44 23 36.24 N
Directions: NEW EAGLE LAKE RD.	Longitude: 68 14 4.58 W
	Stream Order: 1

Sample Information		
Log Number: 2412	Type of Sample: ROCK BAG	Date Deployed:
Subsample Factor: X1	Replicates: 3	Date Retrieved:

Classification Attainment		
Statutory Class: AA	Final Determination: A	Date: 9/14/2016
Model Result with P<=0.6: A	Reason for Determination: Model	
Date Last Calculated: 9/8/2016	Comments:	

Model Probabilities		
First Stage Model		C or Better Model
Class A 0.65	Class C 0.02	Class A, B, or C 1.0
Class B 0.34	NA 0.00	Non-Attainment 0.0
B or Better Model		A Model
Class A or B 1.00		Class A 0.0
Class C or Non-Attainment 0.00		Class B or C or Non-Attainment 0.0

Model Variables	
01 Total Mean Abundance	116.00
02 Generic Richness	27.00
03 Plecoptera Mean Abundance	11.33
04 Ephemeroptera Mean Abundance	19.00
05 Shannon-Wiener Generic Diversity	3.76
06 Hill-Sloped Biotic Index	4.17
07 Relative Abundance - Chironomidae	0.35
08 Relative Generic Richness: Diptera	0.37
09 Hydropteryche Abundance	34.22
10 Chironomidae Abundance	1.78
11 EPT Generic Richness	1.30
12 EPT Generic Richness: Diptera	1.30
13 Relative Abundance - Oligochaeta	0.00
14 Perlidae Mean Abundance (Family Functional Group)	11.33
15 Tanypteroidea Mean Abundance (Family Functional Group)	6.55
16 Chironomina Abundance (Family Functional Group)	5.51

Five Most Dominant Taxa	
Rank	Taxon Name
1	<i>Hydropteryche</i>
2	<i>Rhyacotritans</i>
3	<i>Cricotopus</i>
4	<i>Baetis</i>
5	<i>Pavagretina</i>

Maine Department of Environmental Protection Reference Collection
Acadia National Park

Total Number of Species in Reference Collection: 243

Current Date: 09 Jun 2017

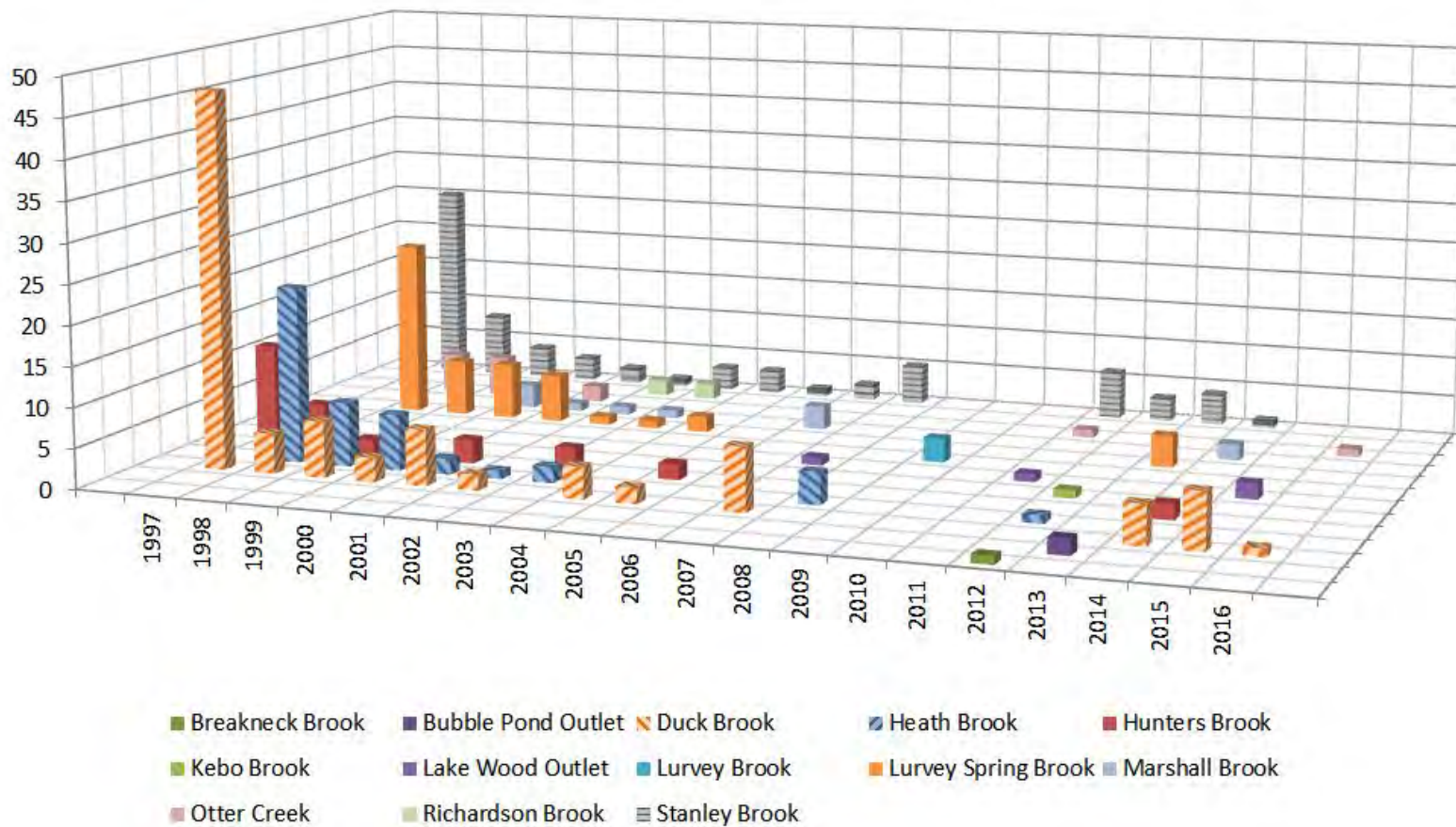
Michael Winnell -- Freshwater Benthic Services, Inc.
Source column: S = slide, V = vial, OV = oversized vial

Numeric listing of contents of Reference Collection

Reference Number	Source	Phylum	Class	Order	Family	Genus/species	Log No.	Station No.	Town or Waterbody
200	S	Amnelida	Aphanoneura	Plesiopora?	Aeolosomatidae	Aeolosoma sp.	Log No.: 935	St. No.: 361	Heath Brook
262	S	Amnelida	Clitellata	Lumbriculida	Lumbriculidae	Styodrilus heringianus	Log No.: 1430	St. No.: 773	Stanley Brook
035	S	Amnelida	Clitellata	Opisthoptera	Lumbricidae		607		Duck Brk
266	V	Amnelida	Clitellata	Rhynchobdellida	Glossiphoniidae	Alboglossiphonia heteroclitia	Log No.: 1427	St. No.: 322	Duck Brook
169	V	Amnelida	Clitellata	Rhynchobdellida	Glossiphoniidae	Glossiphonia elegans	Log No.: 838	St. No.: 362	Lurvey Spring Brook
178	V	Amnelida	Clitellata	Rhynchobdellida	Glossiphoniidae	Helobdella modesta	Log No.: 839	St. No.: 361	Heath Brook
201	S	Amnelida	Clitellata	Tubificida	Naididae (Chaetogasterinae)	Chaetogaster diastrophus	Log No.: 935	St. No.: 361	Heath Brook
192	S	Amnelida	Clitellata	Tubificida	Naididae (Naidinae)	Nais behningi	Log No.: 930	St. No.: 362	Lurvey Spring Brook
238	S	Amnelida	Clitellata	Tubificida	Naididae (Naidinae)	Nais communis	Log No.: 932	St. No.: 322	Duck Brook
101	S	Amnelida	Clitellata	Tubificida	Naididae (Naidinae)	Nais nr. simplex/pardalis	747		Heath Brk
292	S	Amnelida	Clitellata	Tubificida	Naididae (Naidinae)	Nais variabilis	Log No.: 1704	St. No.: 854	Duck Brook
293	S	Amnelida	Clitellata	Tubificida	Naididae (Naidinae)	Slavina appendiculata	Log No.: 1704	St. No.: 854	Duck Brook
203	S	Amnelida	Clitellata	Tubificida	Naididae (Naidinae)	Vejvodskyella comata	Log No.: 935	St. No.: 361	Heath Brook
202	S	Amnelida	Clitellata	Tubificida	Naididae (Pristininae)	Pristina cf. proboscidea	Log No.: 935	St. No.: 361	Heath Brook
260	S	Amnelida	Clitellata	Tubificida	Naididae (Pristininae)	Pristina leidyi	Log No.: 1283	St. No.: 361	Heath Brook
156	V	Arthropoda	Arachnida	Trombidiformes	Eremaeidae	Hydrozetes sp.	745		Stanley Brk.
155	V	Arthropoda	Arachnida	Trombidiformes	Family?		747		Heath Brk.
250	V	Arthropoda	Arachnida	Trombidiformes	Hydrodromidae	Hydrodroma sp.	Log No.: 1280	St. No.: 321	Hunters Brook
153	V	Arthropoda	Arachnida	Trombidiformes	Hygrobatidae	Hygrobates sp.	747		Heath Brk.
154	V	Arthropoda	Arachnida	Trombidiformes	Lebertiidae	Lebertia sp.	747		Heath Brk.
170	V	Arthropoda	Arachnida	Trombidiformes	Sperchontidae	Sperchon sp.	Log No.: 838	St. No.: 362	Lurvey Spring Brook

Acadia NP Reference Collection

Annual Additions to Acadia NP Stream Macroinvertebrate Reference Collection by Stream



SPECIMENS TREATED WITH ARSENIC

AR

Model Results- Attainment Report

Year	Duck Brook	Hunters Brook (DS)	Hunters Brook (US)	Lake Wood Outlet	Lurvey Spring Brook	Marshall Brook	Otter Creek	Stanley Brook
1997	A	A					I	A
1998	A	A			B		I	A
1999	A	I			B		A	A
2000	A	I			A	A	I	A
2001	C	C			B	A	I	A
2002	B	A			C	A		A
2003	A	A			B	C		A
2004	A				A	A		
2005	A		A		A	A		A
2006	A				A	B	B	A
2007	I			C				A
2008						A		
2009	A			B				I
2010	A	I						A
2011	A			B			A	A
2012	A							A
2013	A				A			A
2014	A		A			B		A
2015	A			B		A		A
2016	I		I				A	A

Model Results- Attainment Report



Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Classification Attainment Report

Station Information

Station Number: S-322	River Basin: Maine Coastal
Waterbody: Duck Brook - Station 322	HUCS Name: Maine Coastal
Town: Bar Harbor	Latitude: 44 23 36.24 N
Directions: NEW EAGLE LAKE RD.	Longitude: 68 14 4.58 W
	Stream Order: 1

Sample Information

Log Number: 2412	Type of Sample: ROCK BAG	Date Deployed: 8/6/2015
Subsample Factor: X1	Replicates: 3	Date Retrieved: 9/3/2015

Classification Attainment

Statutory Class: AA	Final Determination: A	Date: 9/14/2016
Model Result with $P \geq 0.6$: A	Reason for Determination: Model	
Date Last Calculated: 9/8/2016	Comments:	

Model Probabilities

First Stage Model		C or Better Model	
Class A	0.65	Class A, B, or C	1.00
Class B	0.34	Non-Attainment	0.00
Class C		0.02	
Class C or Non-Attainment		0.00	

B or Better Model		A Model	
Class A or B	1.00	Class A	0.96
Class C or Non-Attainment	0.00	Class B or C or Non-Attainment	0.04

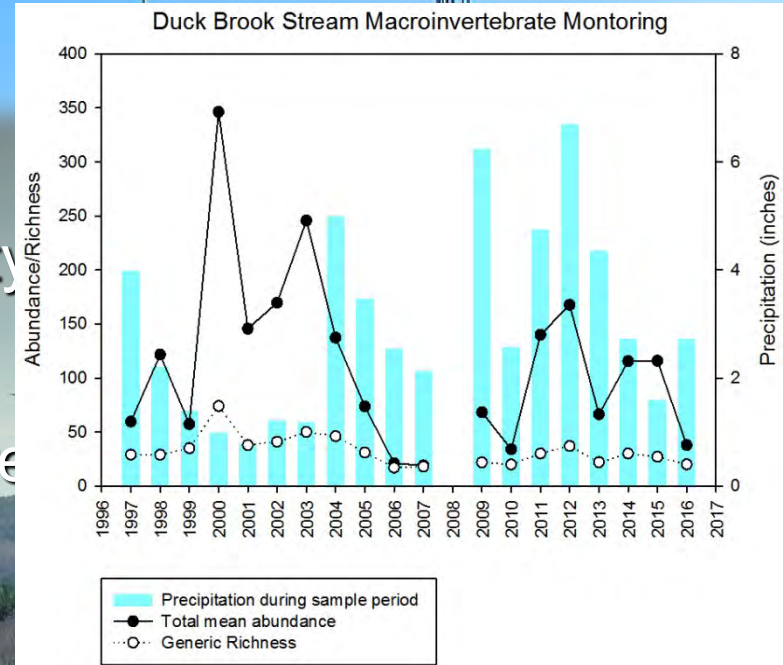
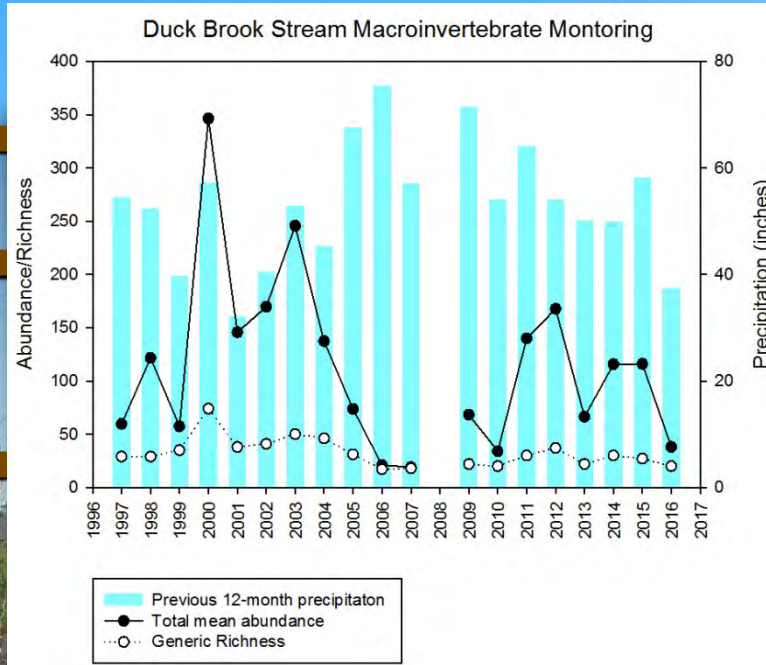
Model Variables

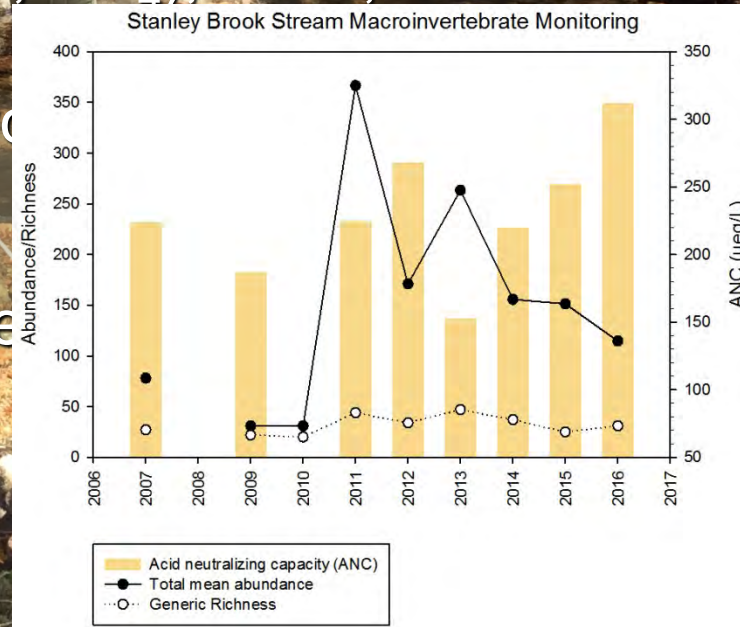
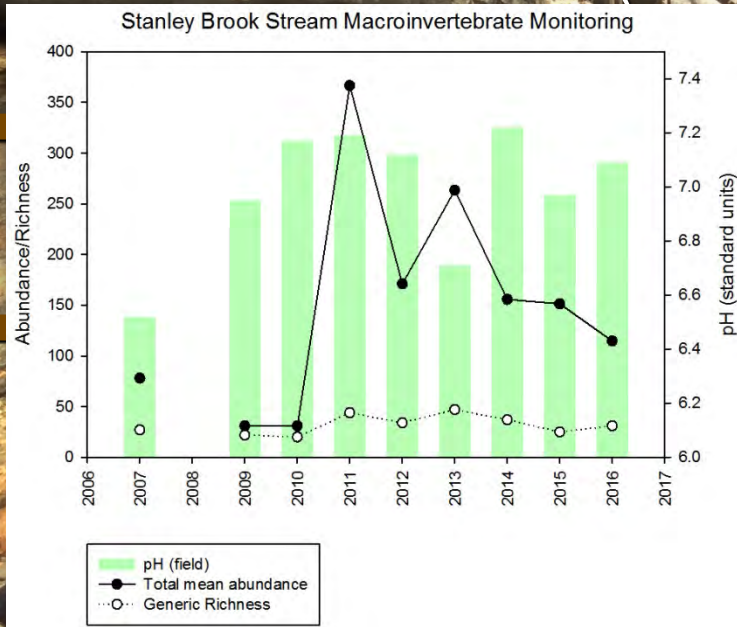
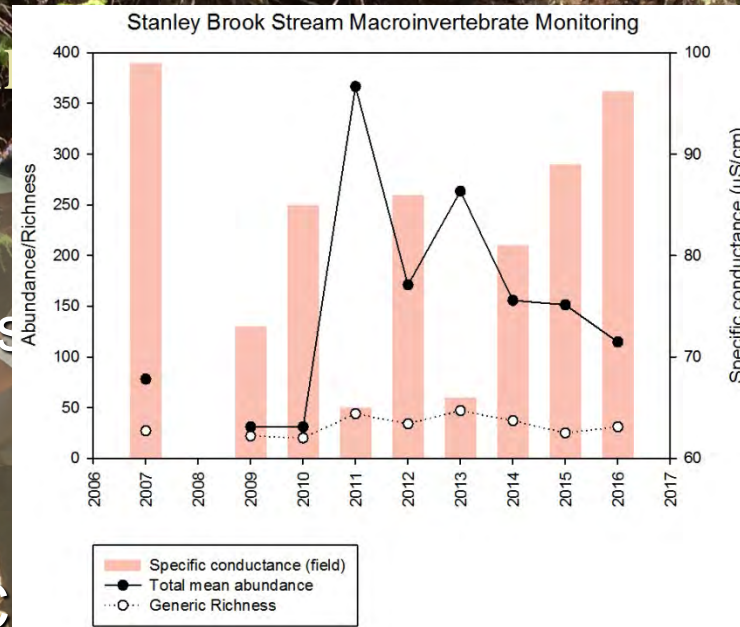
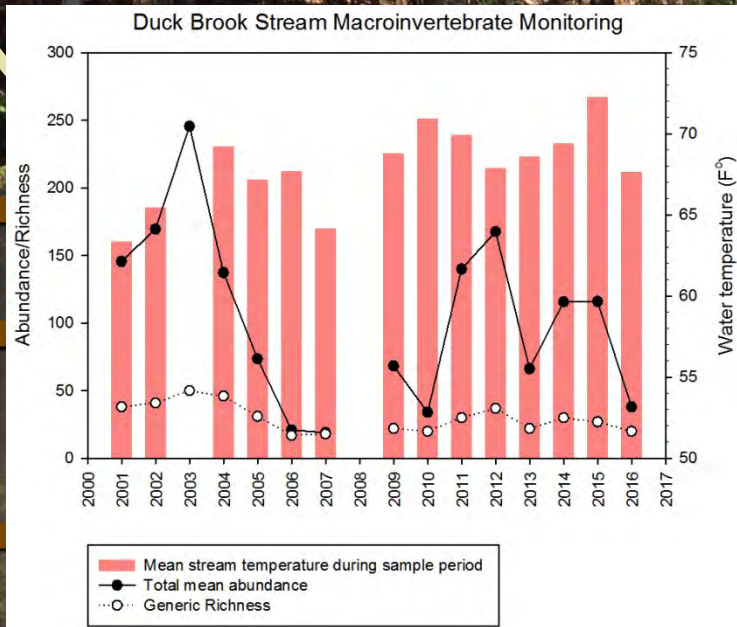
01 Total Mean Abundance	116.00	18 Relative Abundance Ephemeroptera	0.16
02 Generic Richness	27.00	19 EPT Generic Richness	13.00
03 Plecoptera Mean Abundance	11.33	21 Sum of Abundances: <i>Dicrotendipes</i> , <i>Micropectera</i> , <i>Parachironomus</i> , <i>Helobdella</i>	0.00
04 Ephemeroptera Mean Abundance	19.00	23 Relative Generic Richness- Plecoptera	0.07
05 Shannon-Wiener Generic Diversity	3.76	25 Sum of Abundances: <i>Cheumatopsyche</i> , <i>Cricotopus</i> , <i>Tanytarsus</i> , <i>Ablabesmyia</i>	9.71
06 Hilsenhoff Biotic Index	4.17	26 Sum of Abundances: <i>Acroneuria</i> , <i>Maccaffertium</i> , <i>Stenonema</i>	9.67
07 Relative Abundance - Chironomidae	0.35	28 EP Generic Richness/14	0.50
08 Relative Generic Richness Diptera	0.37	30 Presence of Class A Indicator Taxa/7	0.43
09 <i>Hydropsyche</i> Abundance	34.22		
10 <i>Cheumatopsyche</i> Abundance	1.78		
11 EPT Generic Richness Diptera	1.30		
12 Relative Abundance - Oligochaeta	0.00		
13 Relative Abundance - Perididae Mean Abundance (Family Functional Group)	11.33		
16 Tanyptodinae Mean Abundance (Family Functional Group)	6.55		
17 Chironomina Abundance (Family Functional Group)	5.51		

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	<i>Hydropsyche</i>	29.50
2	<i>Rheotanytarsus</i>	11.29
3	<i>Cricotopus</i>	6.83
4	<i>Baetis</i>	6.52
5	<i>Paragnetina</i>	5.75

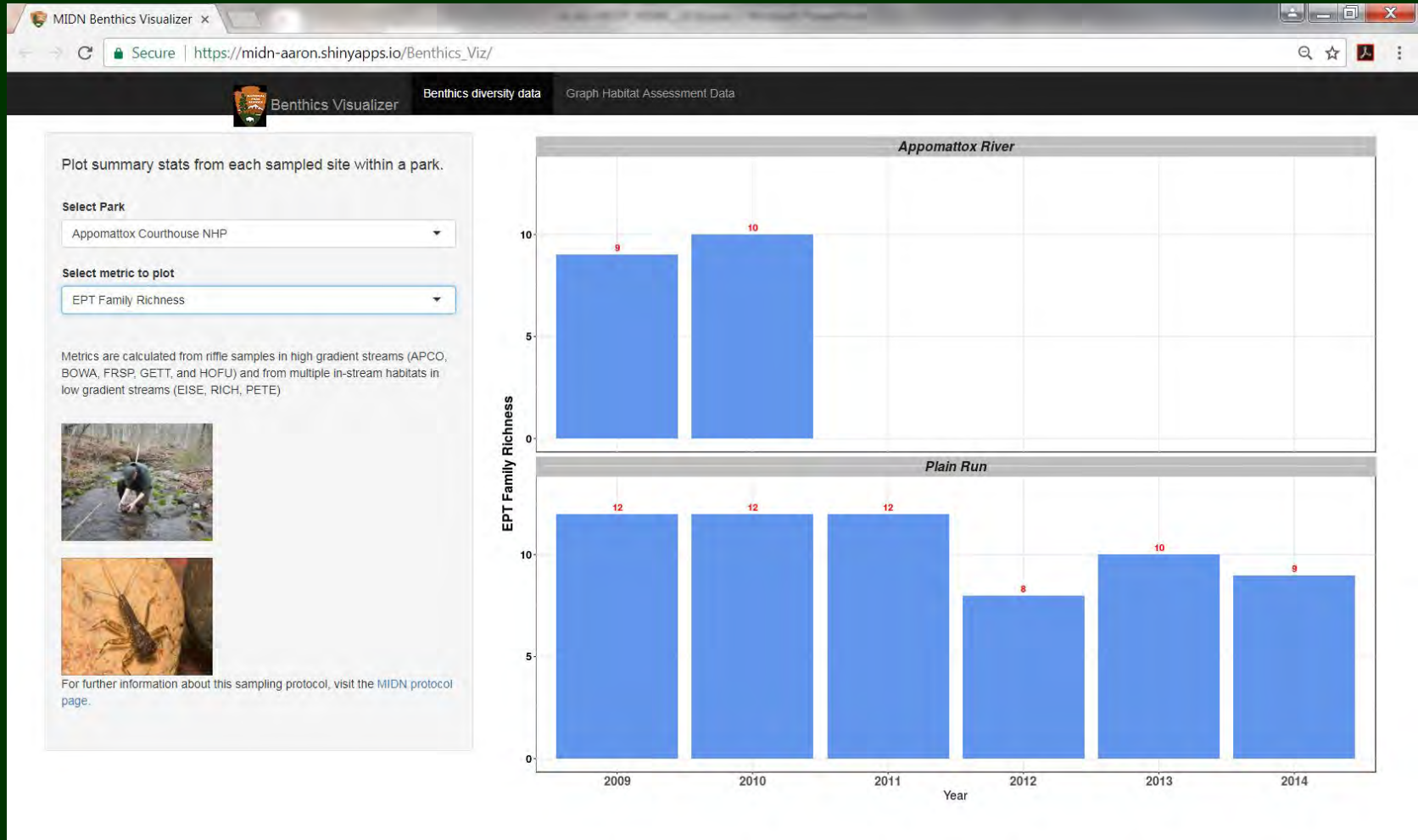
NPS Air/Meteorology Monitoring





Other possibilities...

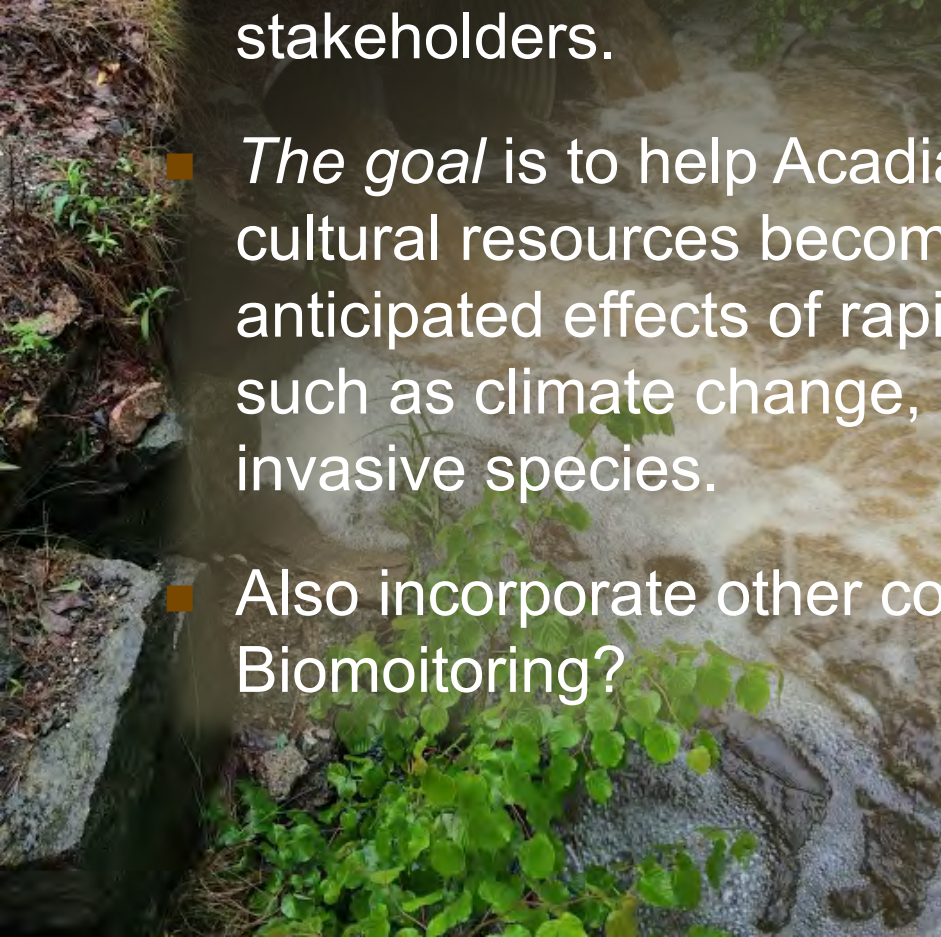
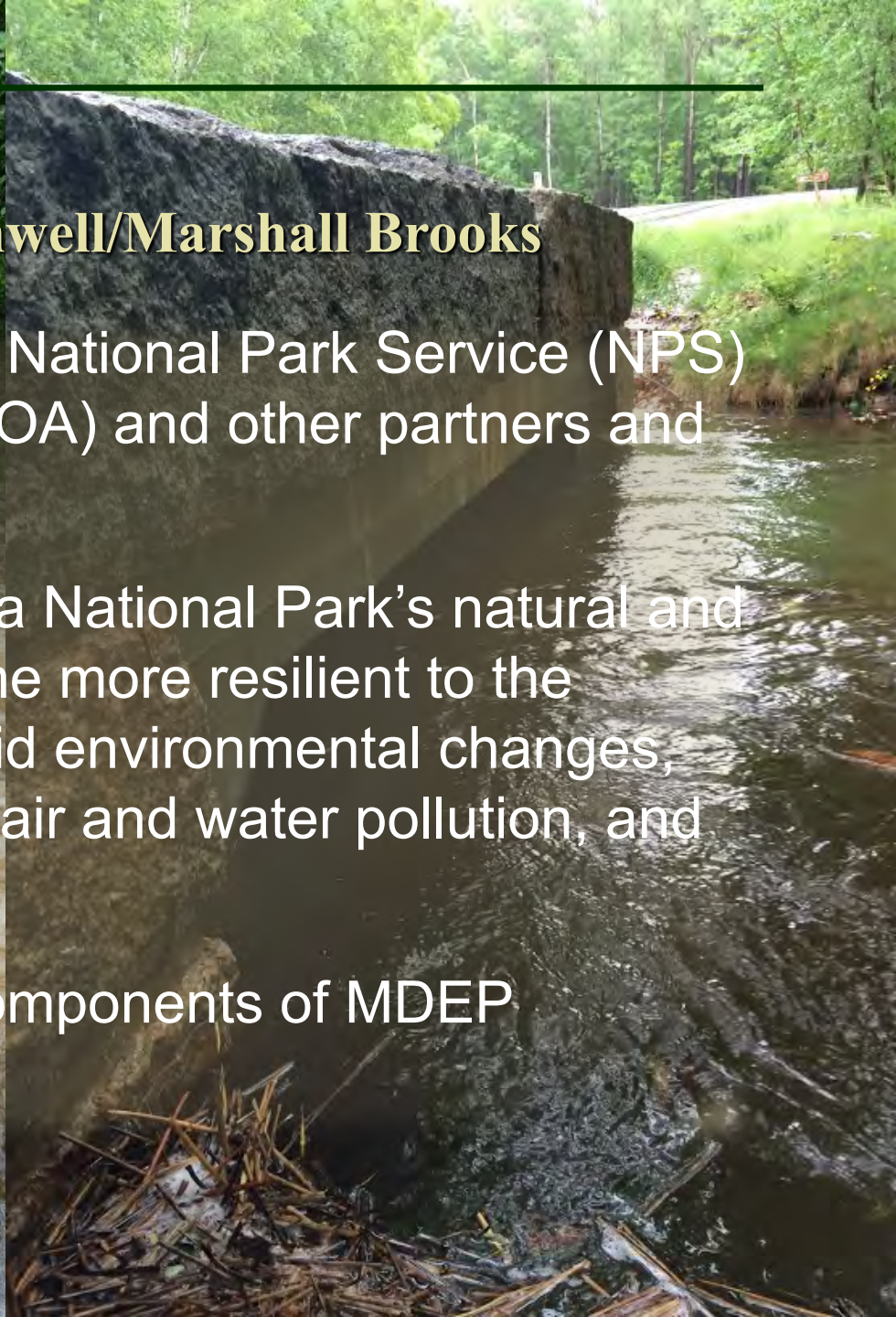
NPS Data Visualization applications





Other possibilities...

Wild Acadia Initiative: Cromwell/Marshall Brooks

- Partnership between the National Park Service (NPS) and Friends of Acadia (FOA) and other partners and stakeholders.
 - *The goal* is to help Acadia National Park's natural and cultural resources become more resilient to the anticipated effects of rapid environmental changes, such as climate change, air and water pollution, and invasive species.
 - Also incorporate other components of MDEP Biomoitoring?
- 
- 

Other possibilities...

Evaluating effects of point sources



Other possibilities...

Evaluating effects of point sources



Other possibilities...

Evaluating effects of point sources



Other possibilities...

Evaluating effects of point sources





Acadia National Park

Air/Water Resource Program

www.nps.gov/acad

bill_gawley@nps.gov

207-288-8723



National Park Service
U.S. Department of the Interior