

The Stream Microbiome Project: a citizen-scientist collaboration



SMP workshop #1
MWMC 20th Annual Conference
November 21, 2014



“Citizen science”

Projects in which volunteers partner with scientists to answer real-world questions

Cornell University

Scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions.

Oxford English Dictionary, June 2014

Project BudBurst

Timing is everything!

REGISTER | LOGIN

Welcome guest

FrogWatch USA™

USA **nph**
National Phenology Network
Taking the Pulse of Our Planet

Birds in Forested Landscapes

General Instructions | Study Site Instructions | Survey Instructions | Species References | Appendix



Questions About BFL

What is a citizen scientist?
Who can participate?
How much time will it take?
What do participants receive?
Where will you do the work?

Linking volunteer birders and professional biologists in a study of the habitat requirements of North American birds

project
noah

Project Noah is a tool to explore and document wildlife and a platform to harness the power of citizen scientists everywhere.



Washington
NatureMapping Program

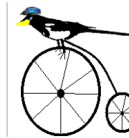
iSpot
your place to share nature

COASST
COASTAL OBSERVATION AND SEABIRD SURVEY TEAM

 **BTO**
Looking out for birds

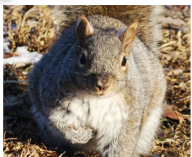
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North America
Annual Midwest Crane Count

OAKMAPPER BETA
Monitoring Sudden Oak Death

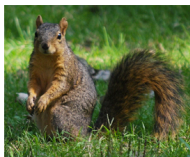


Magpie Monitor Program

Project Squirrel



A grey squirrel in Lincoln Park, Chicago



A fox squirrel in Brookfield, Illinois

vitalsigns
of the Northeast Temperate Network

LIFE HISTORY | ISSUES | MEASURES | OBJECTIVES | CONTACT

STREAM WADERS

VOLUNTEER
MARYLAND DNR

What all these projects have in common:

- Tap into people power – a few scientists can not accomplish what 10s, 100s, or even 1000s of guided people can do.
- The interested public can contribute to science and thereby learn something new and meaningful.
- Benefits society through an improved environment, revised policy, or improved social linkages.

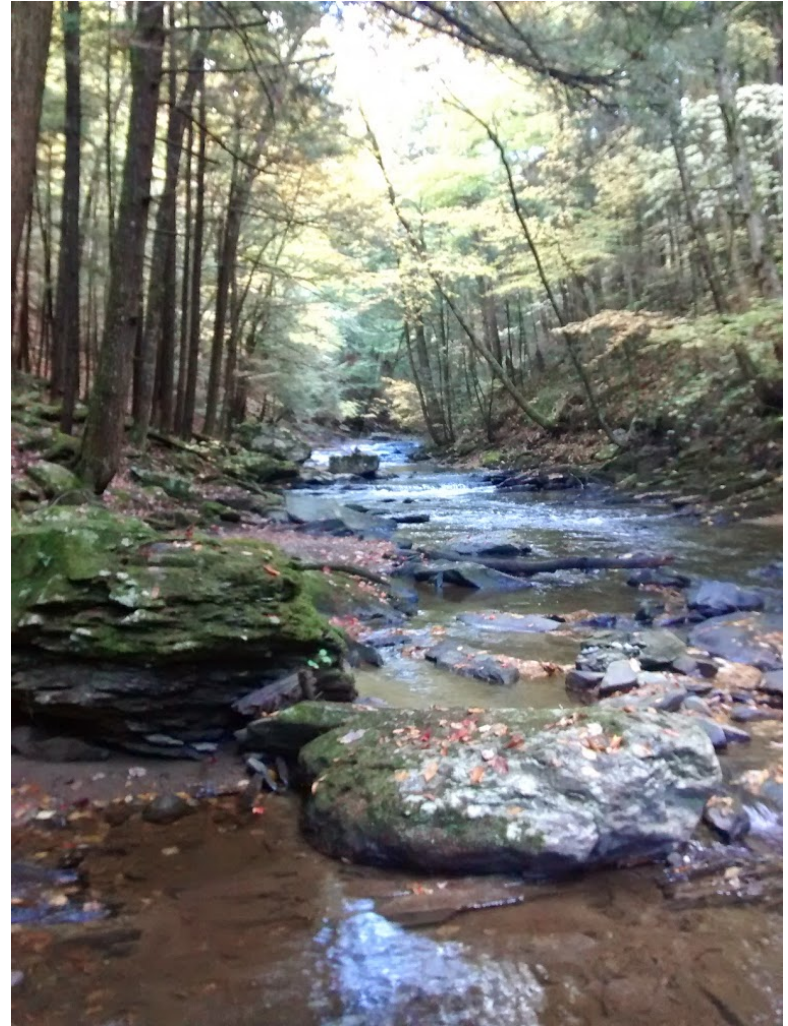
Why a Stream Microbiome Project?

- Watershed groups and other volunteer organizations have an established history of involvement in local water quality issues
- Microbes are increasingly recognized as essential to organismal and ecosystem health → “microbiomes”



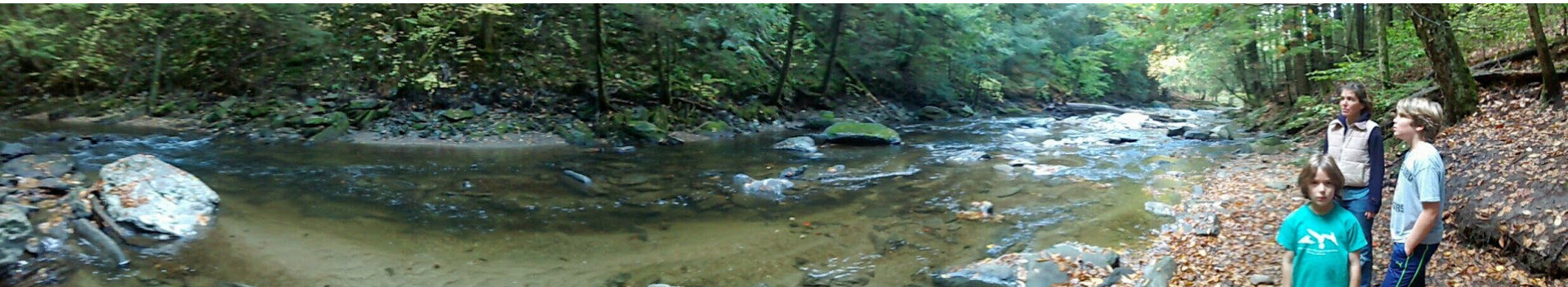
Why a Stream Microbiome Project?

- We know almost NOTHING about the diversity and function of stream microbial communities, and how they respond to environmental degradation
- Our research partnership with the MBSS will relate microbial communities to broad scale changes within the Bay watershed – what about ***what's happening at more local scales?***



Objectives of our citizen science program

1. Engage interested citizens (you!) on the importance of microbes in healthy aquatic ecosystems
2. Collaborate with citizens to help address the biological impacts of different aquatic stressors within local watersheds
3. Share the knowledge and application of modern DNA sequencing technologies, and how they can be used in environmental monitoring



Purpose - Identify Potential Threats

- Agricultural runoff
- Road salt
- Urbanization
- Personal care products
- Lawn chemicals
- Trash
- Etc....



chesapeakebay.net

Generate Hypotheses and Predictions

- Gather background on the stressor
 - What is the nature of the stressor's impact? Is it acute (point-source) or more broadly acting?
 - How might it impact biological communities?
- Predict the effects of the potential stressor on the ecosystem. How might the stressor affect...
 - Number of microbial "species"
 - Diversity of microbial communities
 - Presence/absence of particular groups of microbes (bio-indicators)



Experimental Design

Design an experiment to test your hypotheses:

1. Choose your stream(s):

- Identify a stream or set of streams impacted by your specific stressor
- Do you have existing monitoring data on these streams that could help your predictions?
- Can you identify a control?
 - Upstream/downstream of stressor
 - Another stream not impacted by stressor

Experimental Design, cont....

2. Choose what and when to sample:

- What type of substrate to sample for microbes?
 - Sediment, water, or both?
- When?
 - What season or seasons?
 - Multiple times within a period?
- Replication:
 - 24 replicates per group total; how spread them out?

Sampling Procedure (demonstration, please...)



A worked example:

Now it's your turn (with our help)

- Break into your groups
- Come up with your Purpose, Hypothesis, Predictions
- Design your sampling strategy:
 - Substrate type
 - Time of year
 - What to use as a control / comparison
 - How to divide up your 24 replicates
- Come up with a list of needed supplies
- Review your plan with one of our team members
- Provide us with an address to ship your supplies to, and a date when you need them.