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Effectiveness Monitoring for Stream Restoration

A One Day Charrette

The Maryland Water Monitoring Council and the Maryland Stream Restoration Association

Effectiveness Monitoring for Stream Restoration - Can We Improve Methods, Process & Communication?

Keynote Speaker – John Griffin – Secretary of Maryland Department of Natural Resources

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“Time is running out for the Bay…”

““Outer edge of credibility with the public in terms of getting some results.”

“Stream restoration is part of the solution, and your work is important ...”

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Guiding questions:

o - How can we demonstrate that stream restoration projects are meeting their objectives?

o - How can we learn from stream restoration projects in order to improve stream assessment, restoration design, and project implementation?

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Plenary Speakers

- **Bill Stack**, Baltimore City
- **Margaret Palmer**, University of Maryland
- **Peter Wilcock**, Johns Hopkins University

Concurrent Break-out Sessions: Improving Methods, Process & Communication

- Water Quality
- Geomorphology
- Biological Community
- Aesthetics/Recreation

Summary and Next Steps

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William P. Stack, P.E.

Chief Water Quality Management Section

Baltimore City Department of Public Works

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Why are we restoring streams vs. why should we restore streams?

1. For some it's obvious, (threatened infrastructure, serious erosion)
2. Satisfying CWA objectives…not as clear
3. Need to understand *impairments,* and role local impairment may have on downstream impairments
4. Restoration has shown benefits in sediment and nutrient reductions
5. For nutrients, we're making progress in WWTP and AG, but not yet in urban runoff

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Margaret A. Palmer

Chesapeake Biological Laboratory

University of Maryland Center for Environmental Science

1. What we're doing needs change
   – presented results of NRRSS database; of 317 projects only 11 % had before and after and reference site monitoring, and only 10% related that monitoring to original goals of restoration
2. Adopt tiered monitoring requirements
   - motivation determines effort, effort varies and goals determine what is monitored
3. Develop sound basis for use of metrics – structural metrics don't necessarily represent function!
4. Identify criteria for priority – agree on why, and goals, develop reporting database, identify indicators of success
5. Rely on an independent body to approve projects
6. Build funds for improving methods and assessment

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Peter Wilcock

Geography & Environmental Engineering

National Center for Earth-surface Dynamics

Johns Hopkins University

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Are we collecting stream monitoring information and using it to better inform the practice?

-Objectives need to be explicit and quantifiable

-With experiments there is some rigor applied to testing and reporting; which isn't easy with stream restoration

-Many challenges with monitoring

-Proposal – Maryland Stream Restoration Monitoring Center!

- Define best monitoring practice
- Archive & access monitoring data
- Coordinate and focus monitoring
- Analyze monitoring data
- Revise decision and design meth

Governing Board and Staff
Place where we can record best practices, archive data, coordinate, analyze and connect!

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Four Breakout Sessions –

Water Quality

Geomorphic

Biological

Recreation/Aesthetics

What is or should be monitored?

When and How?

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Water Quality

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What should we monitor?

Concentrations

- Sediment
- Nutrients
  - Nitrogen (N)
  - Phosphorus (P)
  - Metals
  - Biochemical oxygen demand (BOD)
  - Biology for abnormalities/invasives
    - Pesticides
- Trash/debris
- Pathogens

Geomorphology

Hydraulic resistance

Hydrologic Residence Time

Root zone connectivity with base flow

Temperature

Natural History

Wetlands

Assimilative Capacity

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Geomorphic;

What; organized by goal

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Restore Sediment Transport to Natural Conditions

1. *Observe bank erosion; lateral migration of banks*
2. *Observe exposed sediment.*
3. *Measure Sediment Transport ;sediment flux through the site*
4. *Assess Channel erosion and stability*

Restore Hydrologic Function

1. *Monitor streamflow*
2. *Monitor baseflow*
3. *Channel Characteristics e.g. Roughness*
4. *Floodplain characteristics*
5. *Land use data and geology (discharge)*

Protect Infrastructure

1. *Armoring to protect*
2. *Monitoring to check for downstream impacts of structures*

Support of Biota

1. *Vegetation*
2. *Instream habitat quality*
3. *Physical Structure*

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Geomorphic How

Most effective monitoring technique is to take channel cross section, profile and dimension pattern profile.

Complexity of the channel

Dynamic equilibrium

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Biological

Watershed level

Land use

Water chemistry (including temperature)

Birds

Fish stocks/status of fisheries

BMP implementation

Mussels

Hydrology

Channel morphology

Invasive v native

Macro invertebrates

Habitat

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Biological

At the reach level

Macro invertebrates
Respiration
Periphyton
Birds
Fish
Salamanders/herps
Invasive v. native
Habitat
SAVs/Vegetation

Intermittent streams

Salamanders
Biota
Fungus
Denitrification
Carbon sequestration

Sandy Beds?

Epiphytic organisms
Roots and vegetation

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Recreation/ Aesthetics

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WHAT TO MONITOR FOR RESTORATION EFFECTIVENESS:

Dependent on prior/anticipated use. May include:

1. *visual appearance and sight lines*
2. *riparian and in-stream vegetation*
3. *Wildlife*
4. *aquatic life*
5. *stream and riparian soil stability*
6. *human use, both active and passive*
7. *opinions, both stakeholders and users*

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SUMMARY CHART

Outcomes		Scale	Frequency	Duration
Geomorphic Stability	Dimension/pattern/ profile (channel complexity)	Hundreds of meters outside project – ~ 125%?	Annually	5 year minimum variable; maybe decades
Hydrologic Function	• Stream flow → • Rainfall → • Roughness (channel and floodplain) →	Watershed)where flows expect to change or as necessary) Project scale	Continuous Annual	10 years minimum 5 years and longer for trees
Support of Biota	• In-stream habitat quality → ➢ depth of pool/riffles ➢ woody debris • Vegetation → • Physical structure – morphology/ → grain size/flood plain interaction	Project scale and reach scale (~ 125%) Project scale Project scale	Annual Annual Annual	5 years 5 years 5 years
Protecting Infrastructure	• Is it functional? • Unintended consequences?	Project Scale Project Scale	After significant event and annually Same	5 years 5 years
Sediment Transport	• Bank erosion → • Exposed sediment → • Sediment transport flux →	Site to reach scale Same Watershed or large project reach	Annually and after event Same Events – auto samplers	5 years 5 years Couple of seasons after

MSRA

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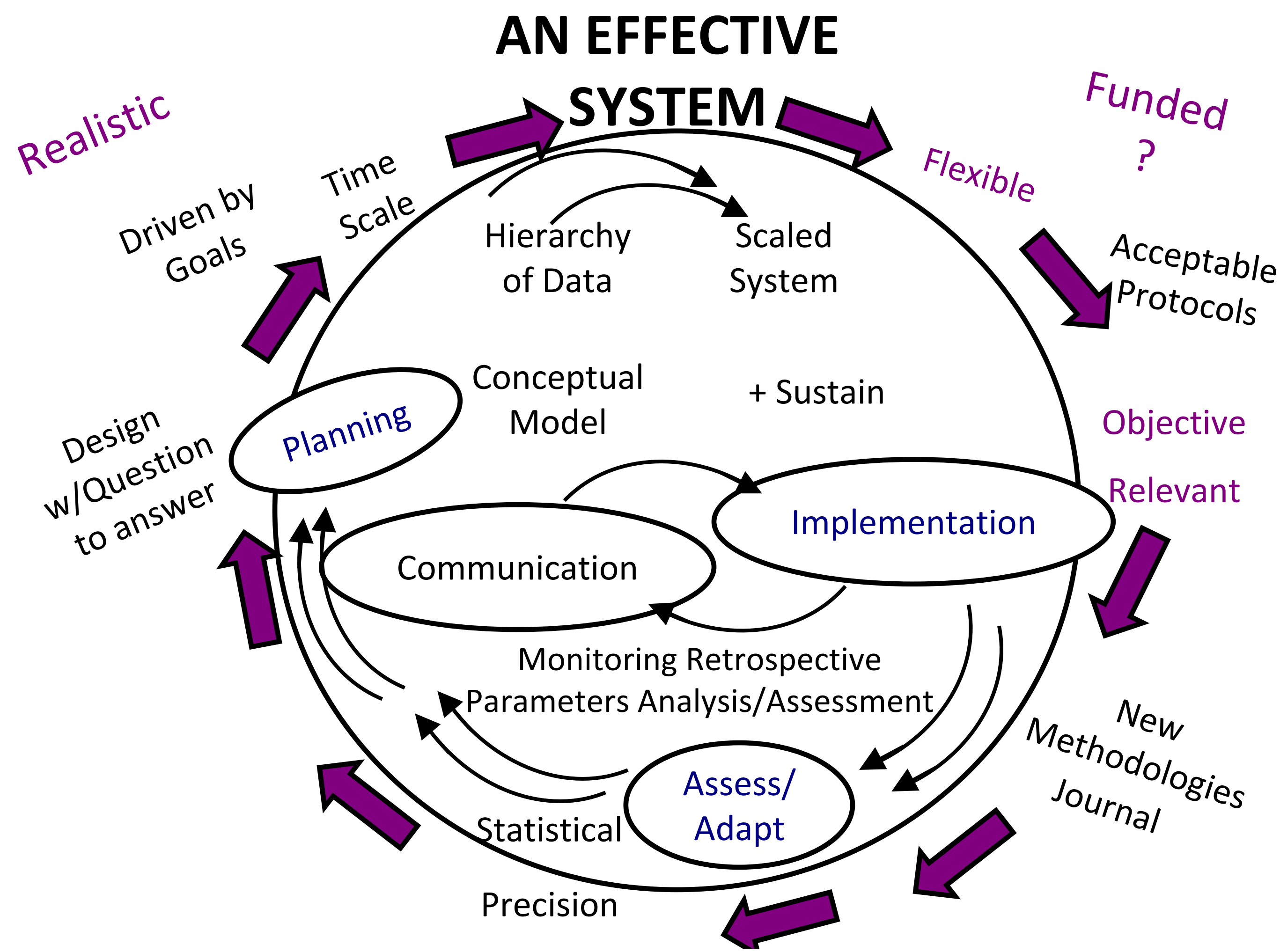

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Maryland Stream Restoration Association

Proceeding with Database

www.marylandstreams.org

Spring 2010 Meeting Elections for President Elect and Secretary

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