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Session A9: Green Infrastructure and Blue Habitat: Impacts of Watershed Conditions and Stormwater Management on River Health and Fish Passage

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Green Infrastructure and Blue Habitat: Impacts of watershed conditions and stormwater management on river health and fish passage

CATHY BOZEK, AQUATIC ECOLOGIST, THE NATURE CONSERVANCY, MASSACHUSETTS, USA
H ow e v e r . . .
Some areas have high percentages of **Impervious Cover** in the watershed
IMPERVIOUS COVER IN THE NORTHEAST US

From EPA: Impervious surface, B1 population scenario, 2010
Watershed impervious cover has an impact on stream macroinvertebrate communities even at low levels.

Impervious cover is a strong indicator of fluvial fish community health.

Recent research indicates lower thresholds.
WHAT DO IMPERVIOUS SURFACES DO?

ALTERED HYDROLOGY

Graphic: Horsley-Witten Group 2008
WHAT ARE THE LINKS?

FLOW

More Water:
• Increased volume of runoff
• Greater stream/runoff velocity during storms
• Increased peak discharge
  → Erosion
  → Impacts fish movement

Less Water:
• Reduced base flow
  → Reduce habitat amount and quality
  → Stresses fish, migration problems
WHAT ARE THE LINKS?

SEDIMENT

- **Fine sediment** fills interstitial spaces
  - makes streambed uniform, reduces habitat diversity
  - reduces habitat for inverts

- **Sediment** also:
  - clogs gills
  - reduces feeding success
  - affects migration
  - smothers vegetation
  - carries metals and nutrients
WHAT ARE THE LINKS?

**POLLUTION**

- **Nutrients:**
  - algal blooms → low DO
  - affects migration, fish kills
- **Metals:**
  - behavioral/ reproductive abnormalities
- **Organics:**
  - reduced immune response, fin erosion, egg mortality
- **Salts:**
  - impact prey, vegetation
- **Temperature:**
  - Impacts to movement, spawning
WHAT CAN WE DO?
GREEN INFRASTRUCTURE

• **Site-based:** Constructed systems mimic natural hydrology

OR

• **Landscape level:** Conservation and restoration of natural lands
WHAT CAN WE DO?

Gray Infrastructure
• Goal is to get water off site as quickly as possible
• Minimal water quality treatment

Vs.

Green Infrastructure
• Infiltrates water on site
• Water quality treatment
• Can be used in coordination with gray infrastructure

Photo: erdmananthony.com
GREEN INFRASTRUCTURE
MANAGING FLOW AND POLLUTION

HYDRAULIC PERFORMANCE

From: UNH Stormwater Center 2012 Biennial Report
Data for subsurface gravel wetland.

POLLUTANT REMOVAL: 2004–2010

From: UNH Stormwater Center 2012 Biennial Report
Data for subsurface gravel wetland.
MORE GREEN INFRASTRUCTURE

Outreach/Education
- Working with engineers
- Educating legislators
- Workshops
- Demonstration projects

Policy
- Regulations and permits
- Incentives
  - Funding
  - Technical assistance
- Stormwater utilities
- Many levels

Prioritization
- Study hydrology and land use
- Model and prioritize projects
- Guide city/ regional plans
TAKE HOME MESSAGES

1. Can’t just open passage, need to improve habitat
2. Habitat is impacted from actions on land
3. Use green infrastructure
4. Empower municipalities and landowners to do more green infrastructure projects