Small Urban Watershed Restoration

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PDH: 4

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Module 1: Organizing to Restore Urban Watersheds

Learning Objectives

By the end of this section, you will be able to:

- **Identify** the specific drainage area and impervious cover thresholds that define urban subwatersheds for restoration purposes.
- **Evaluate** the national regulatory trends and community factors driving current investments in urban watershed restoration.
- **Select** appropriate restoration goals based on the four primary categories of water quality, biological, physical, and community indicators.
- **Identify** the four primary stakeholder groups and their respective roles within the restoration planning pyramid.

Executive Summary: Successful urban watershed restoration is a partnership-driven process best implemented at the subwatershed scale (5 to 10 square miles). Restoration efforts are fueled by regulatory mandates like TMDLs and NPDES permits, as well as increasing public demand for cleaner neighborhoods. Effective programs require aligning diverse stakeholders—including agencies, the public, partners, and funders—around clear, measurable goals to ensure the restoration plan is realistic and financially supported.

Getting the Terminology Right

Fundamental Definitions

- **Urban:** Defined as any watershed or subwatershed with more than **10% total impervious cover**.
- **Watersheds:** Land areas draining surface and groundwater to a downstream water body, typically ranging from **20 to 100 square miles** or more.
- **Subwatersheds:** The primary restoration unit, generally **5 to 10 square miles** or less.
- **Restoration:** The application of any combination of practices that improve stream health, measured by physical, hydrological, chemical, ecological, or social indicators.

Restoration Scale and Components

Subwatersheds are ideal for restoration because they can be assessed rapidly, results can be seen within a few years, and they often fall within a single political jurisdiction.

- **Stream Corridors:** Include the existing network of stream channels and the lands surrounding them.

- **Upland Areas:** Include the remaining subwatershed area that drains to the stream corridor.

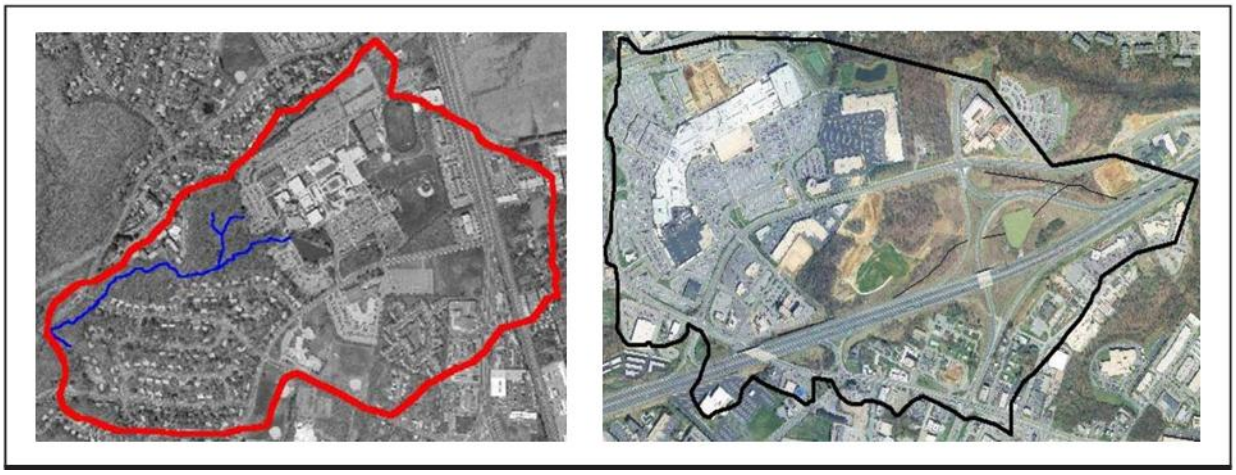

Figure 1: The Stream Corridor and Upland Areas in Urban Subwatersheds.

The photo on the left illustrates a lightly developed subwatershed that has a relatively intact stream corridor and stream network, which can be compared to a highly urban subwatershed where both features have been virtually eliminated.

Stream Order and Classification

Most urban subwatersheds contain perennial streams ranging from first to third order:

- **First Order:** A small stream with no tributaries.
- **Second Order:** Formed by the union of two first-order streams.
- **Third Order:** Formed by the union of two second-order streams.

Trends Driving Growth in Urban Watershed Restoration

The industry is shifting from point-source control to **nonpoint source control**, primarily focusing on urban storm water runoff treatment.

Need to Control Nonpoint Pollution Sources

- Communities have largely addressed point sources (e.g., sewage plants), but many streams still fail water quality standards.
- Nonpoint source control is best accomplished at the subwatershed scale.

Emerging Regulatory Drivers

- **TMDLs:** Total Maximum Daily Loads require specific pollutant reduction plans for impaired waters.
- **NPDES:** EPA's storm water permit program (MS4) regulates municipal storm drain systems for communities over 50,000.
- **Other Mandates:** Includes FEMA flood insurance programs and Endangered Species Act (ESA) requirements.

Increased Local Restoration Capability

- Communities are expanding the scope of watershed activities through better staff, mapping, and funding.

Table 1: Selected Results of National Survey of Municipal Watershed Restoration Activity

Restoration Activity or Practice	Communities Reporting Activity (%)
Small Watershed Planning	55
Subwatershed GIS Mapping	80
Rapid Stream Assessment	49
Storm Water Retrofitting	53
Stream Restoration	51
Discharge Prevention	63
Urban Forestry	49
Watershed Education	65
Hotspot Pollution Prevention	35
Public Involvement	71

Note: 50 + communities surveyed, with populations ranging from 25,000 to 2,000,000. Restoration activity tended to be slightly higher in communities with larger populations and in those covered by Phase I storm water NPDES permits. For complete survey results, consult CWP (2004)

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Growth in Urban Watershed Organizations and Public Demand

- Over 4,000 establish watershed groups act as effective advocates for local restoration.
- Public demand is increasing for healthier neighborhoods, greenways, and flooding solutions.

Many Different Goals Guide Urban Watershed Restoration

Restoration goals are classified by ambition: **Prevention** (keeping conditions from worsening), **Repair** (fixing specific localized problems), or **Improvement** (seeking measurable gains in stream indicators).

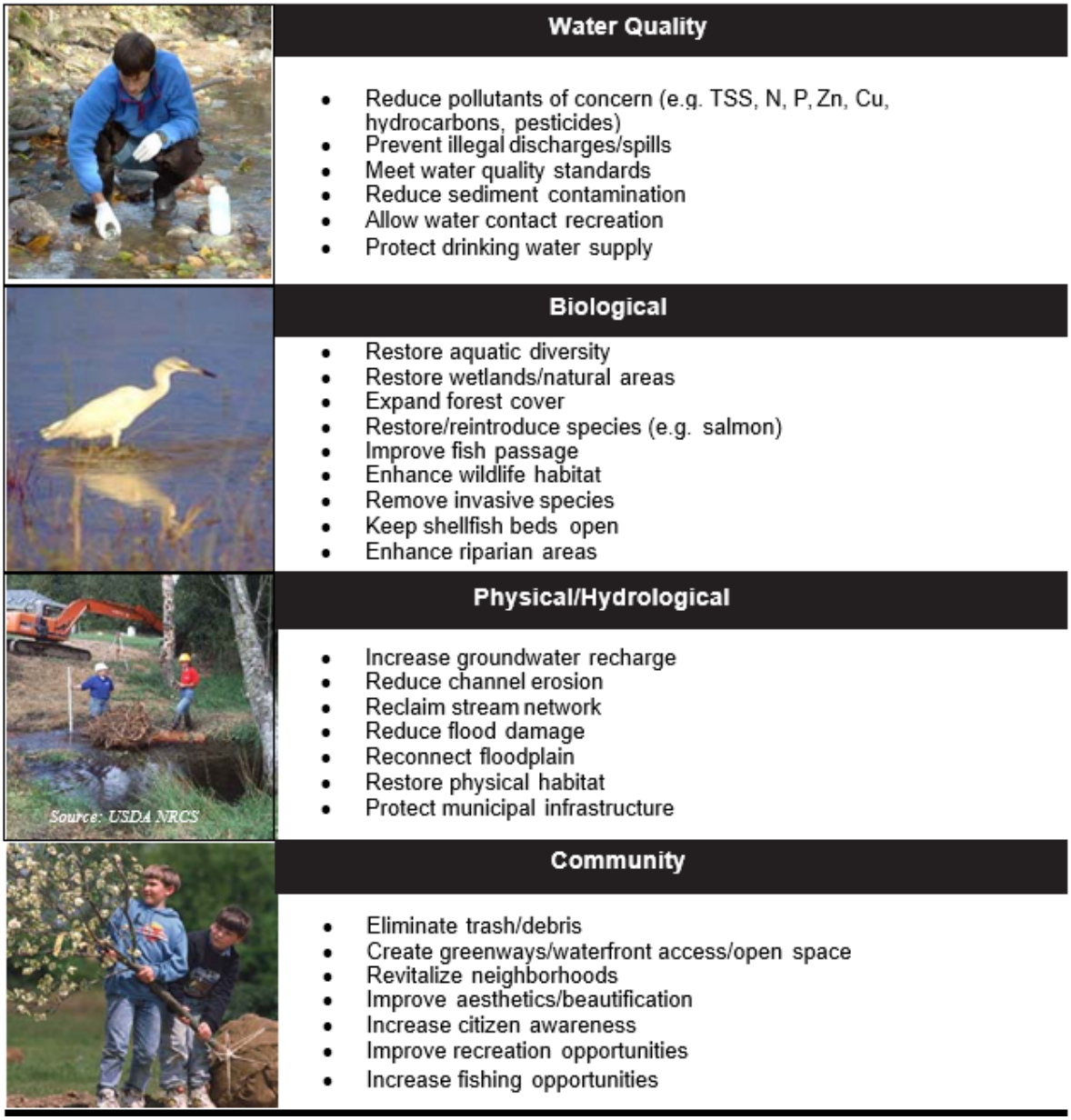

Figure 2: General Classification of Watershed Restoration Goals

Many different goals can be selected to guide watershed restoration; most communities choose several different goals relating to water quality, biological, physical, and community indicators.

⚠️ **Safety Constraint:** Engineers must reconcile ambitious watershed-level goals with the **actual restoration potential** of a subwatershed, which is limited by its percentage of impervious cover and available land for treatment.

The Role of Stakeholders in Watershed Restoration

Stakeholder involvement is modeled as a pyramid; the base includes the general public with low awareness, while the apex contains decision-makers and champions.

The Four Stakeholder Groups

1. **Agencies:** Local governments have primary responsibility, spread across various bureaus that must be coordinated.
2. **The Public:** Stratified by awareness, ranging from the general public to activist watershed groups.
3. **Watershed Partners:** Includes utilities (responsible parties), local media, and local advisors like engineers and scientists.
4. **Funders:** Local government (primary), state/federal grants, and private foundations.

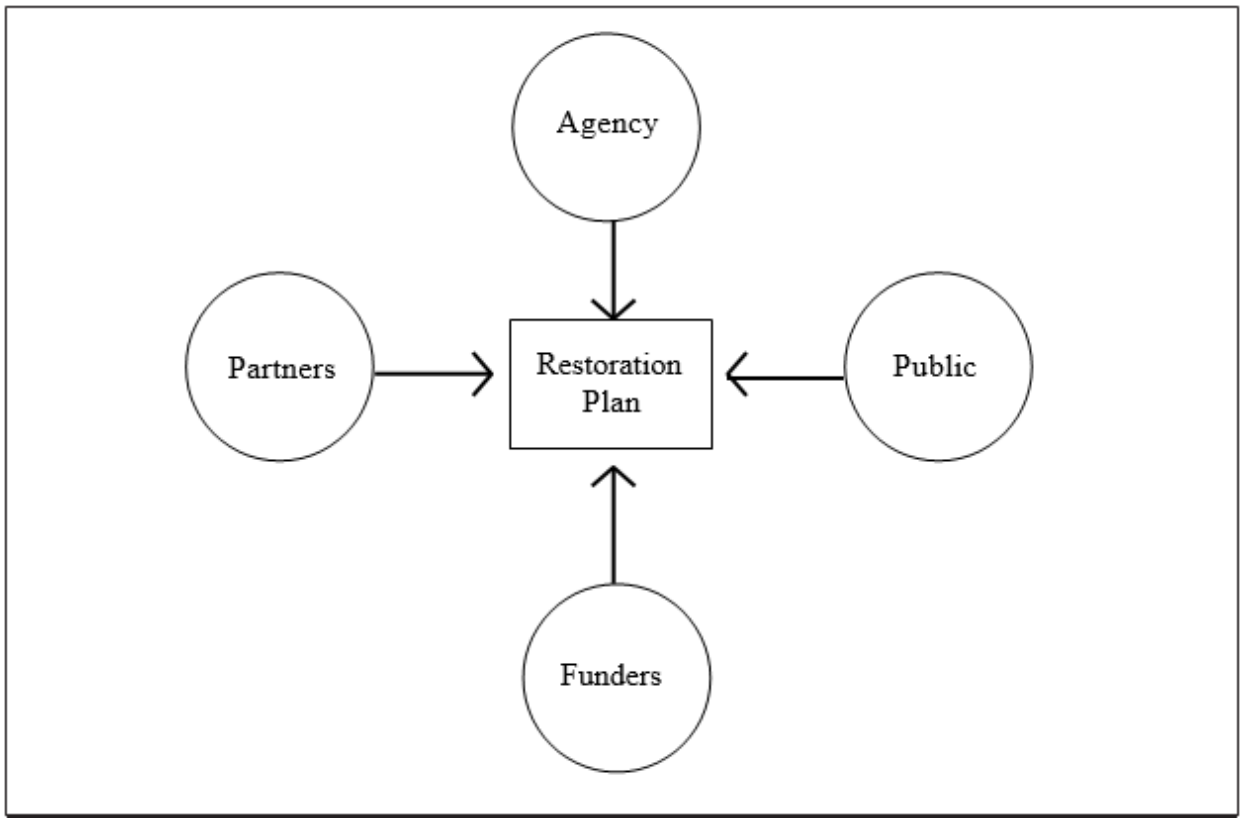

Figure 3: Four Types of Stakeholders Involved in Watershed Restoration Plans

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