

Linking Watersheds and Landscapes to Aquatic Ecosystems

The Lower Fox River
Watershed Monitoring Program
High School Summit: March 9, 2005



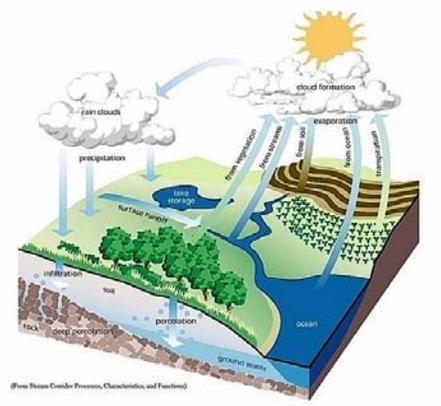
The Answers We Find Depend on the Questions We Ask.

Finding solutions to today's problems will require new ways of thinking about those problems → Recognizing connections among parts!



Making “Connections - First Step: *Understanding the Hydrologic Cycle*

- The Great Connector...
 - Dissolved and Suspended Material
- The Water Cycle ...
 - Atmosphere
 - Precipitation
 - Surface Runoff
 - Infiltration
 - Groundwater
 - Evapotranspiration



(From Science: Consider Processes, Characteristics, and Feedbacks)

Second Step: *Understanding Spatial and Temporal “Scale” of Patterns, Processes and Change*



Geological & Ecological Time

- Glacial History
 - What we see today is in great part dependent upon events that happened in the past.
- Ecological Connections
 - What we will see in the future is influenced by events today

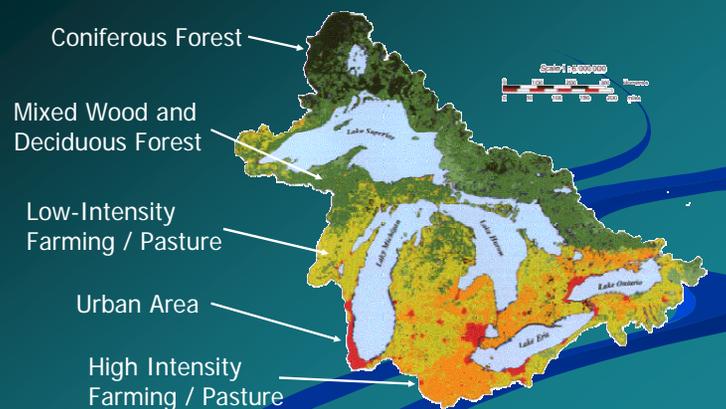


The Concept of "Landscape"

- Geological
 - Land
 - Water
- Biological
 - Ecoregions
 - Adaptation
 - Migration
 - Extinction
- Human
 - Social - Cultural
 - Economic



Human Impacts on the Land: Land Use in the Great Lakes Basin



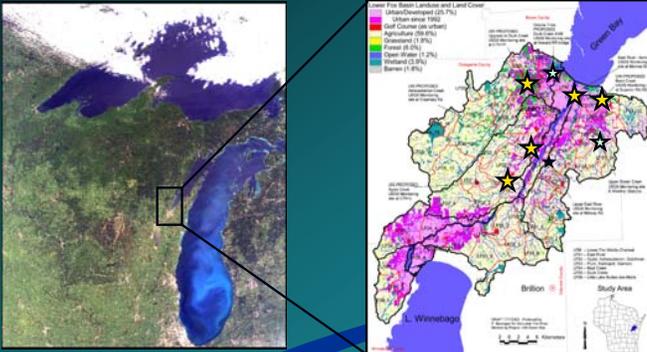
Third Step:

Understanding the Connection between the Land and the Water

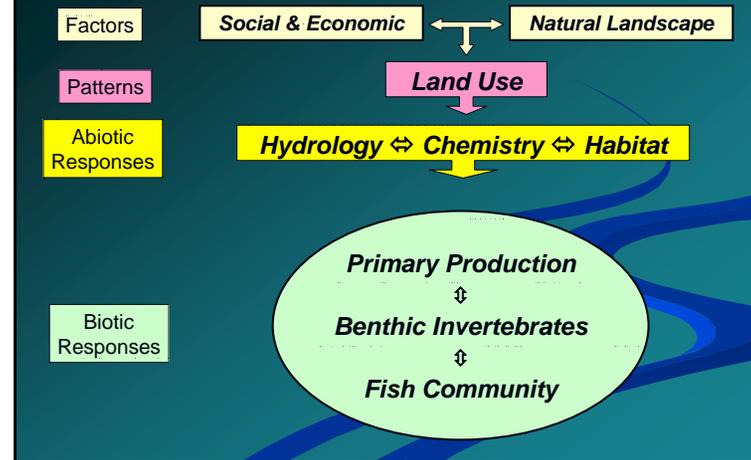
- The Watershed Concept
 - The land area that drains into a particular lake or river.
- Multidisciplinary "Teams" for Study and Management



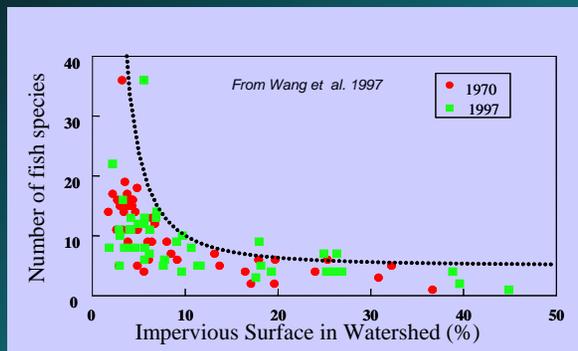
Watersheds, Land Use, and Water



Continuum of Causes & Effects in Watersheds

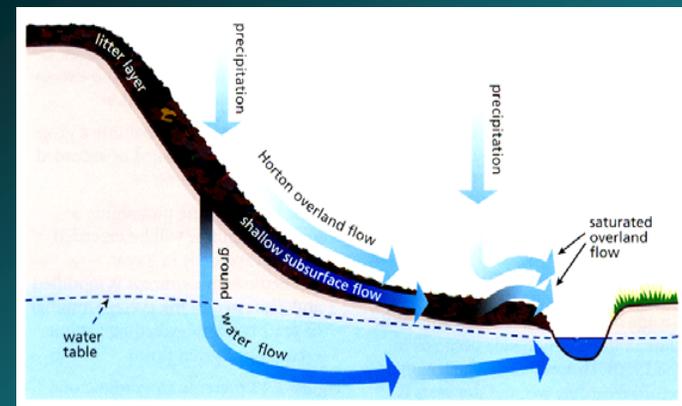


Urbanization & the Loss of Fish Species - Southeastern Wisconsin

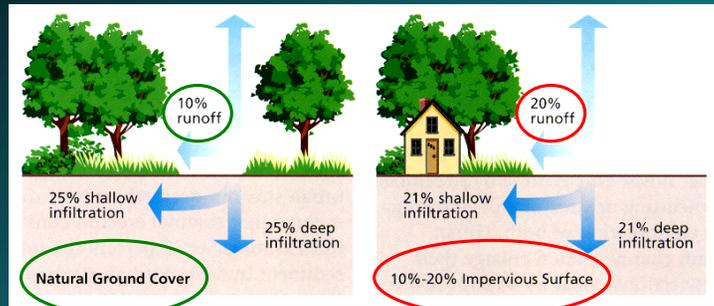


Land use Changes & Water Quality

Infiltration and Surface Runoff

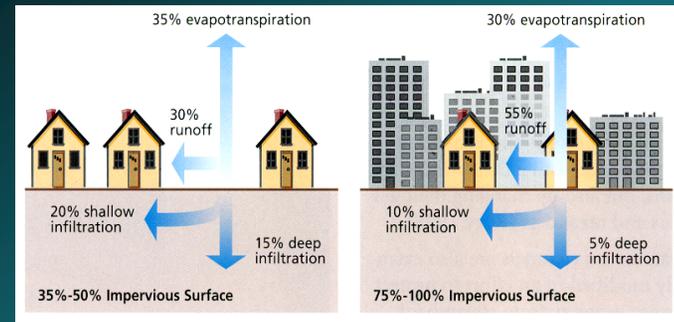


Urbanization = Impervious Surface: Low levels of urbanization increase runoff



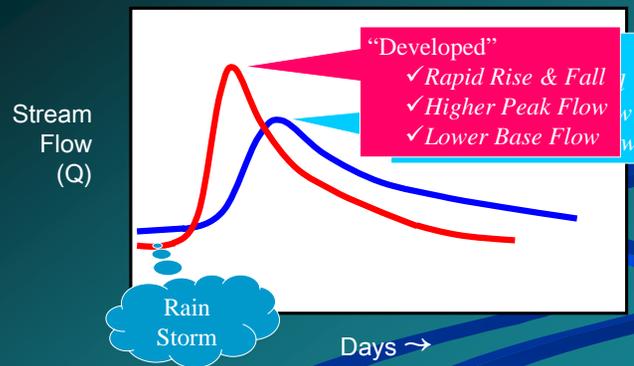
From: *Stream Corridor Restoration: Principles, Process, and Practices*
Federal Interagency Stream Restoration Working Group, 1998

Effects of Impervious Surface: High levels of urbanization



From: *Stream Corridor Restoration: Principles, Process, and Practices*
Federal Interagency Stream Restoration Working Group, 1998

Stream Basics ... The Hydrograph



Effects of Urbanization on Stream Biological and Habitat Integrity



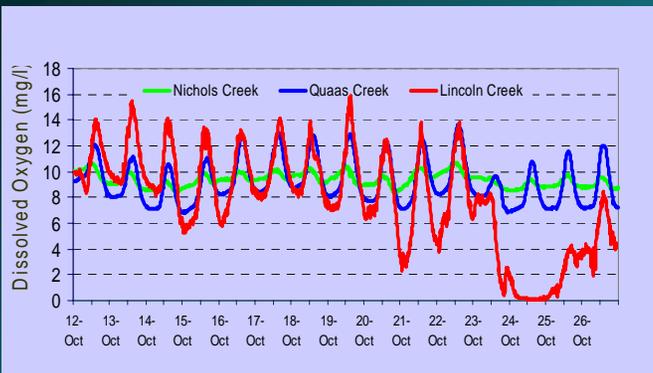
- Increased Peak Flow during Storms
- Increased Bank Erosion
- Decreased Base Flow and dry Streams
- Decreased Water Quality
- Degradation of Stream Substrates
- Habitat Loss & Fragmentation
- Species Loss - Fish, Invertebrates, Plants

Agricultural Impacts: Non Point Pollution: Nutrients and Sediment



Milwaukee Harbor after heavy rain

Nutrients, Algae, and Dissolved Oxygen *Forested – Agricultural - Urban*



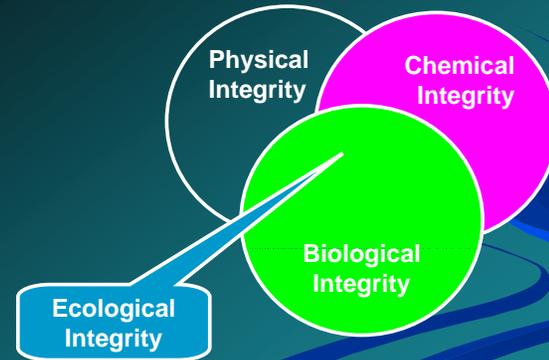
Goals Clean Waters Act (CWA)

- In Section 101(a) of the federal Clean Water Act (CWA), it is stated that it's the "*Congressional declaration of goals and policy*" to achieve the "*Restoration and maintenance of chemical, physical and biological integrity of Nation's waters...*"

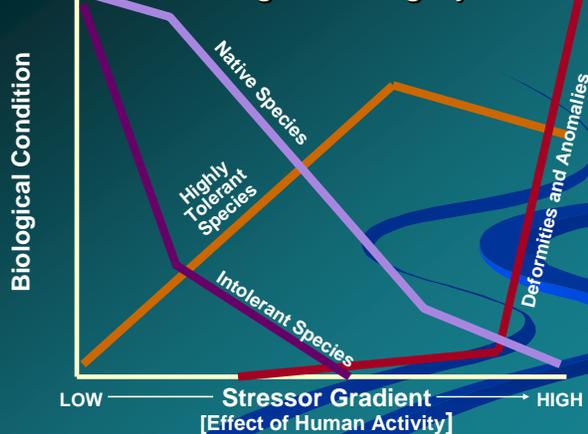


Watershed Monitoring Program

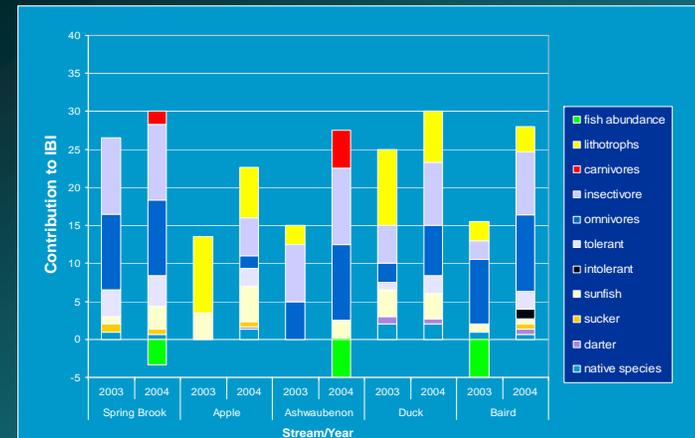
The 3 Dimensions of Ecological Integrity (CWA)



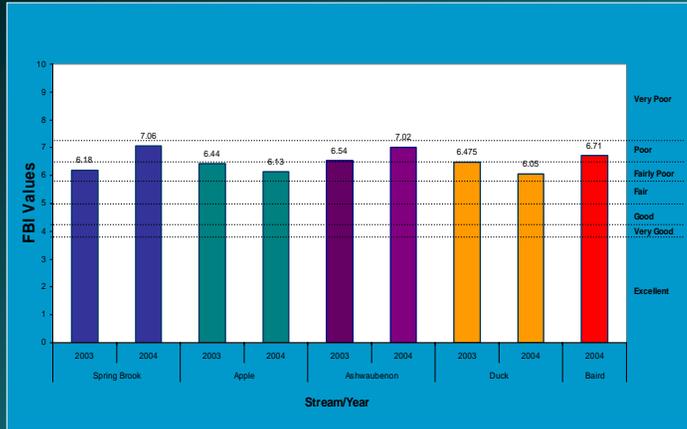
Effects of Stress on Components of Biological Integrity



Fish Index of Biotic Integrity (IBI) Tributary 2003 and 2004 Summer Sampling

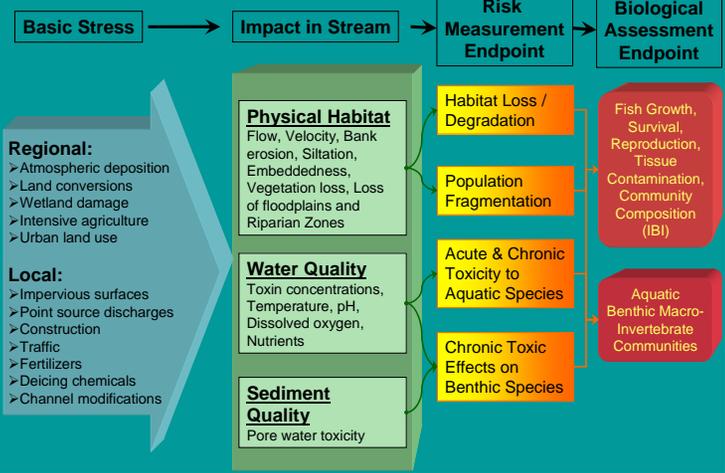


Aquatic Macroinvertebrates



Finding Solutions:

Understanding Watershed Risks



World-wide Issues

Sustainability and Economic Development: Biodiversity, Conservation and Ecology in Romania

- **Historical "Crossroads" since 750 BC**
- **Recent History**
 - Communist Dictatorship
 - 50 Years until 1989
- **Environmental Problems**
 - Industrial Toxins
 - Water Quality
 - Deforestation
- **Ecological Treasures**
 - Carpathian Mountains
 - Danube Delta
 - Black Sea Coast



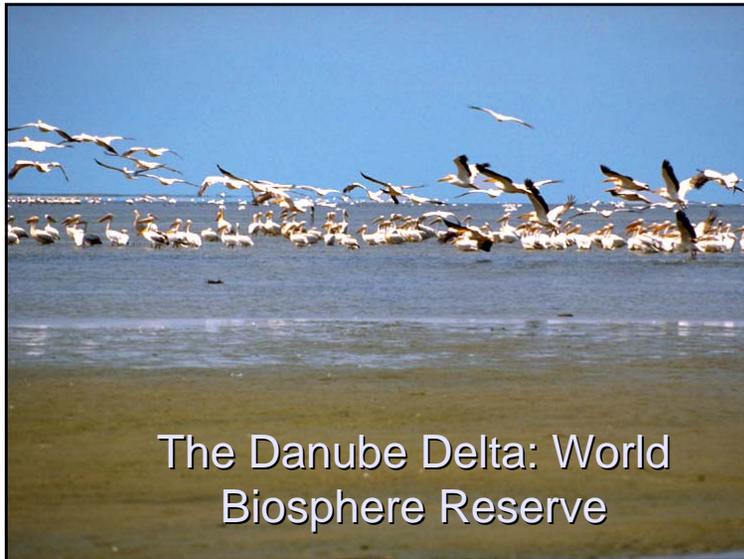
Carpathian Mountains: UN Designated Bio-Reserve





Transylvania

- Cultural and Historical Nexus
 - Hungarian
 - German
 - Ottoman



The Danube Delta: World Biosphere Reserve

Complex Environmental Issues

- **Urban Expansion**
 - Creation of “suburban” lifestyle is being promoted to increase property values, growth and economic expansion
- **Agricultural “Modernization”**
 - Consolidation and expansion of small farms to use “mechanized” farming methods

