Understanding and Rehabilitating Damaged Riverine Ecosystems

Jack G. Imhof,
Director, Conservation Ecology
Trout Unlimited Canada

To

Global Water Futures Meeting, June 6, 2018
McMaster University, Hamilton, ON

Presentation Outline

- The Issue and Conflict – Natural Infrastructure
- Restoration or Rehabilitation?
- Issue of Scale
- Restoring Function
- Learning to Speak each Other's Language
- Moving towards a Rehabilitation Economy

The Apparent Conflict

- Managing water and watercourses on the landscape is necessary for production of food, recreation, livestock, industry and water supplies
- There a value for land and water not in active use… often termed "Wasteland" by some
- Watersheds, streams and their corridors are our "Natural Infrastructure"!

Value of Natural Infrastructure

- Values:
  - Water storage, supply and management
  - Cleansing of water and health of the land
  - Recreation and food sources
  - Biodiversity - Habitat for living things
  - Spiritual and Physical Well-being
- Conditions to strive for:
  - Better management of water in and on the landscape
  - Stream competence : move and store water and sediment while maintaining its form
  - Healthy riparian areas and floodplains
  - Transform nutrients and sequester carbon
  - Low maintenance costs and sustainable
  - Healthy physical habitat for animals (maintain healthy food web)

Restoration vs. Rehabilitation

Restoration

- Returning an ecosystem to it original (pre-settlement) condition and function

Rehabilitation

- Modification of an existing ecosystem to restore healthy function and dynamic stability

Why Rehabilitation?

- None of our watersheds and streams are unimpaired
- Unlikely to restore to a previous condition, should strive to rehabilitate FUNCTIONS
- Most are in various states of disrepair (morphology, sediments, water quality, riparian structure, biotic community; dysfunctional food web).
- It is imperative to rebuild functional systems as fast as we can to offset degradation elsewhere.

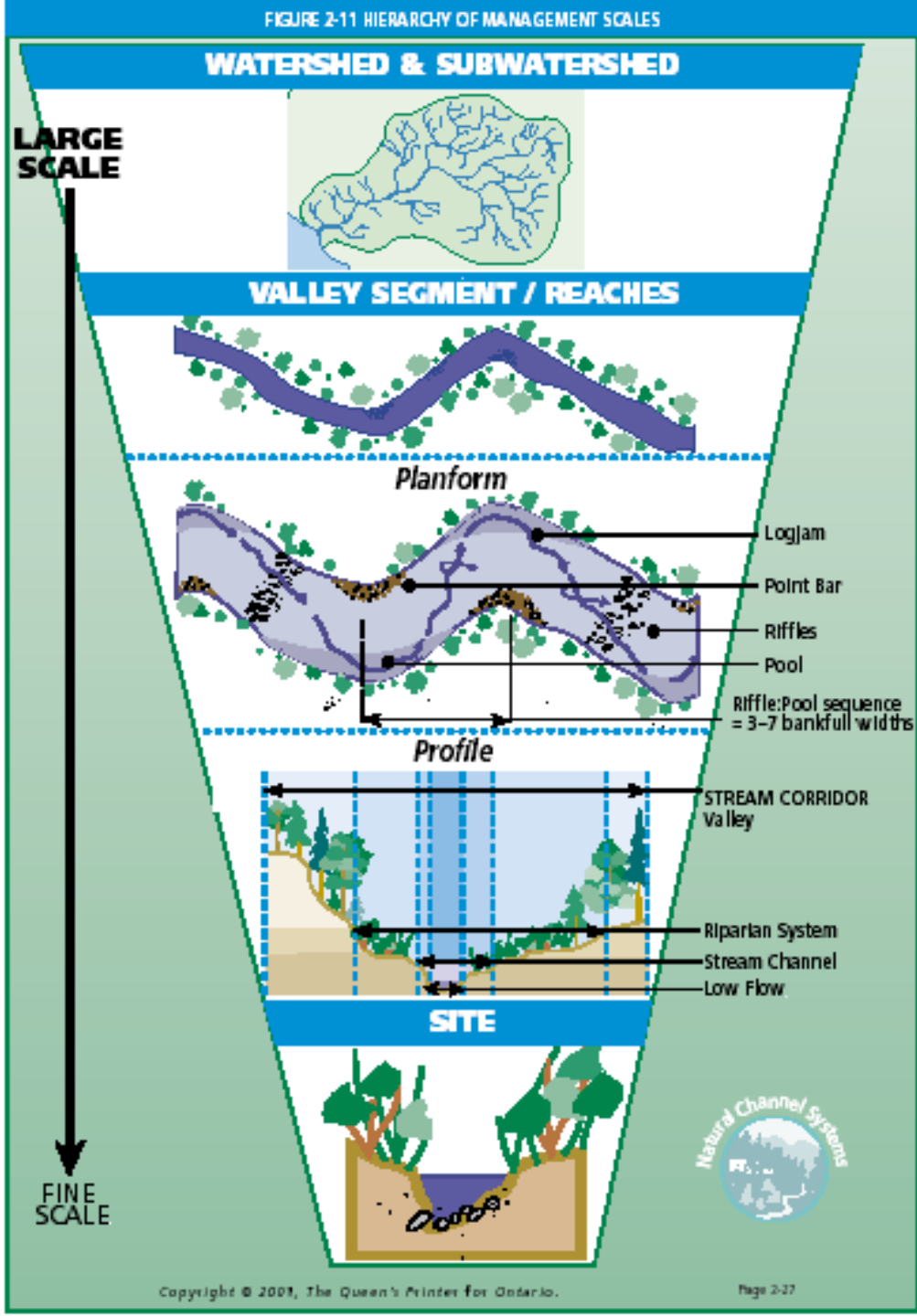
l Canada

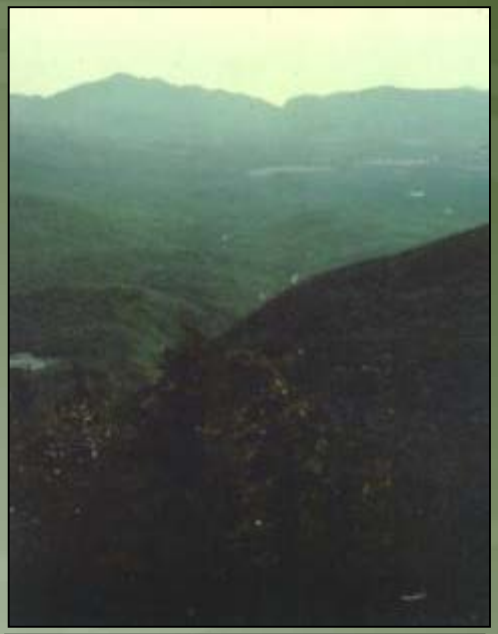
The Approach

- We need to create contextual understanding to aid planning and management and apply tools linked to an understanding of:
  - Form and Function;
  - Cause:Effect, Cause:Response relationships
  - Consequences of various management outcomes towards the POTENTIAL of the system
  - Storage, transformation and sequestering of nutrients and carbon to better restore system functions and stability
- In order to build an integrative management system

Building Context

- Which end of the telescope should you be using?
- If we only fix what we perceive to be the problem at the site, we may NOT really fix ANYTHING
- What is the cause of the problem?





Geology provides the rock and structure

Climate creates the weather, weathering and water

Vegetation modifies water flow over and through the watershed

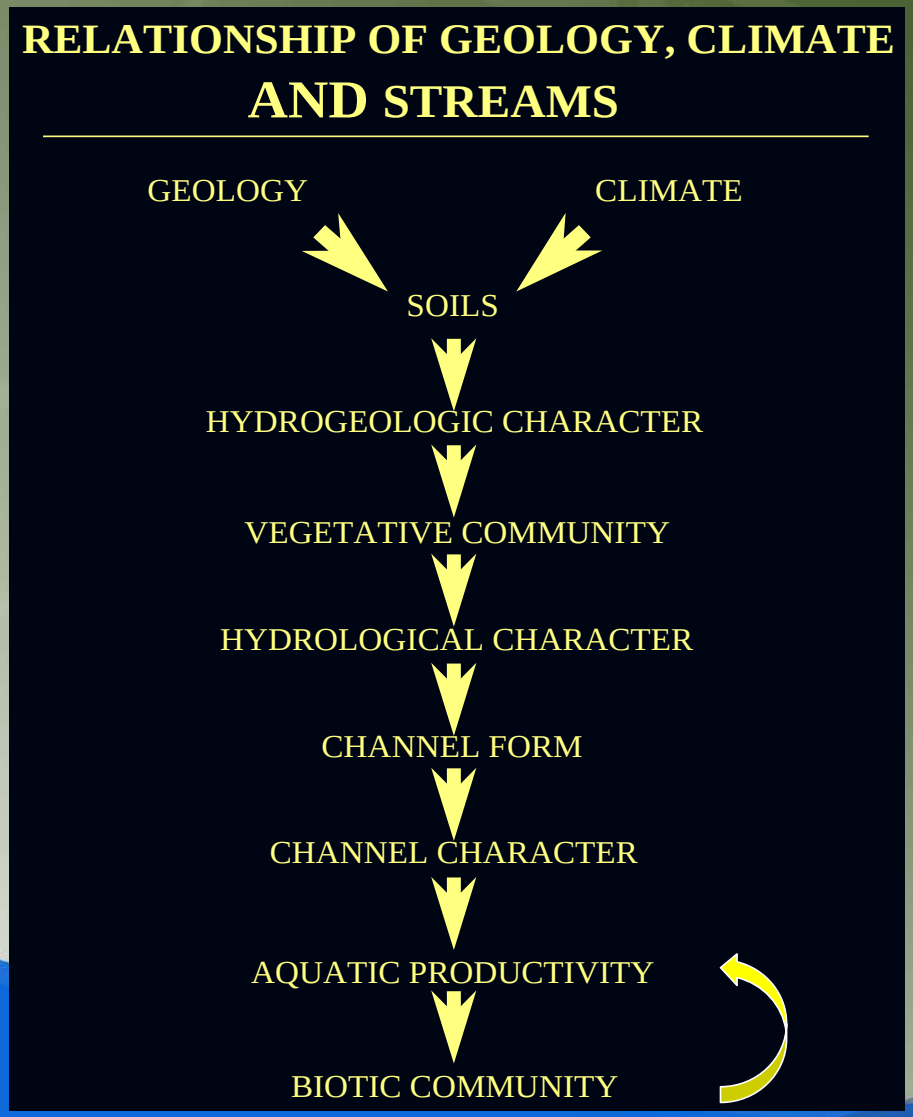
The site creates the channel form that provides habitat and stability

The valley directs and concentrates surface and groundwater

Regimes Driven by Geology and Climate

- The interaction of geology and climate drive several major regimes and characteristics of watersheds:
  - Flow regime
  - Sediment regime
  - Temperature regime and characteristics
  - Chemical regime
  - Potential productivity and assimilative capacity
  - Channel form and habitat characteristics and supply

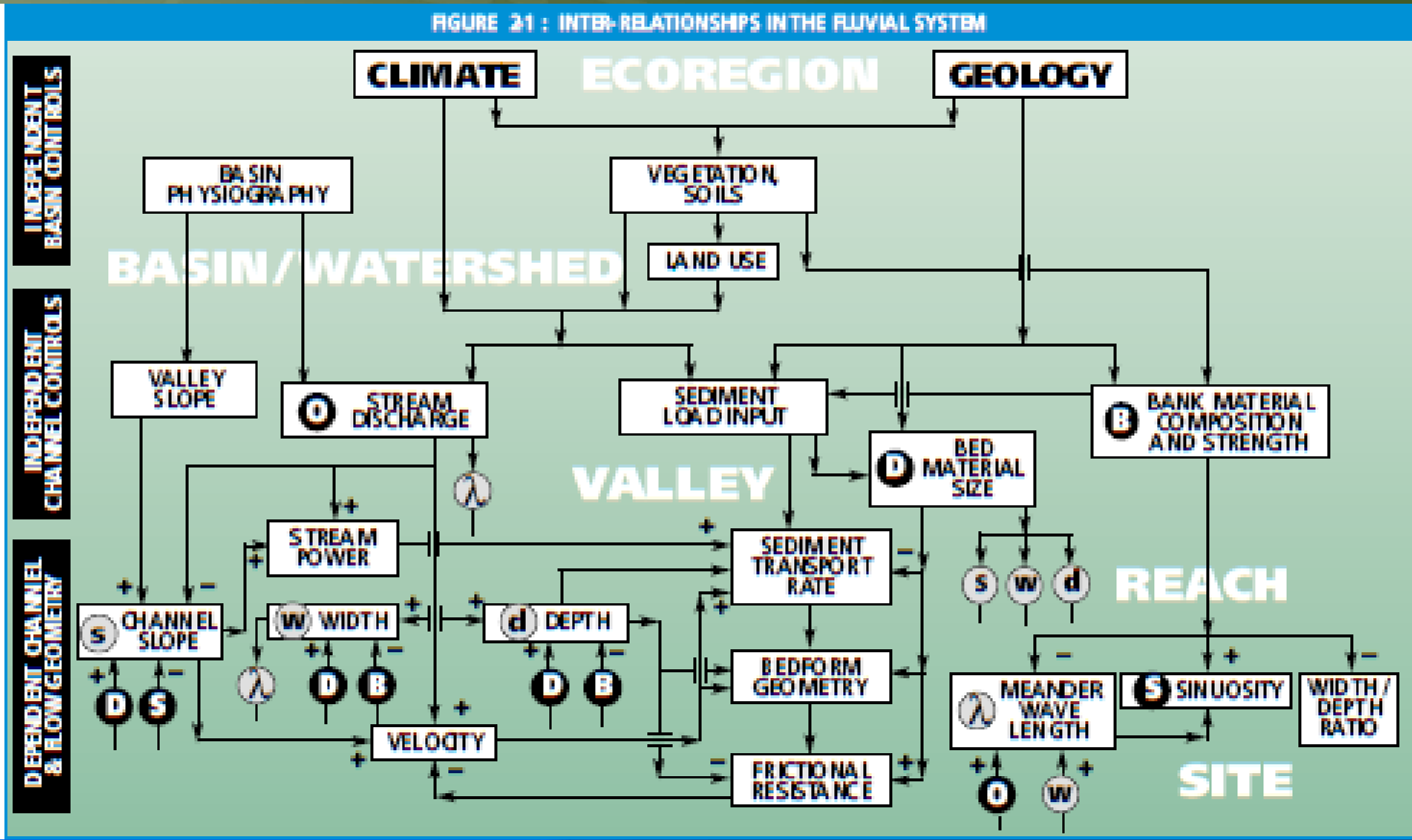
Driving our Aquatic Ecosystems



- At various spatial scales, there are drivers that exert direction and control
- These control conditions at finer scales that ultimately provide for the life of animals in our watersheds
- Know what scale is best to understand and manage

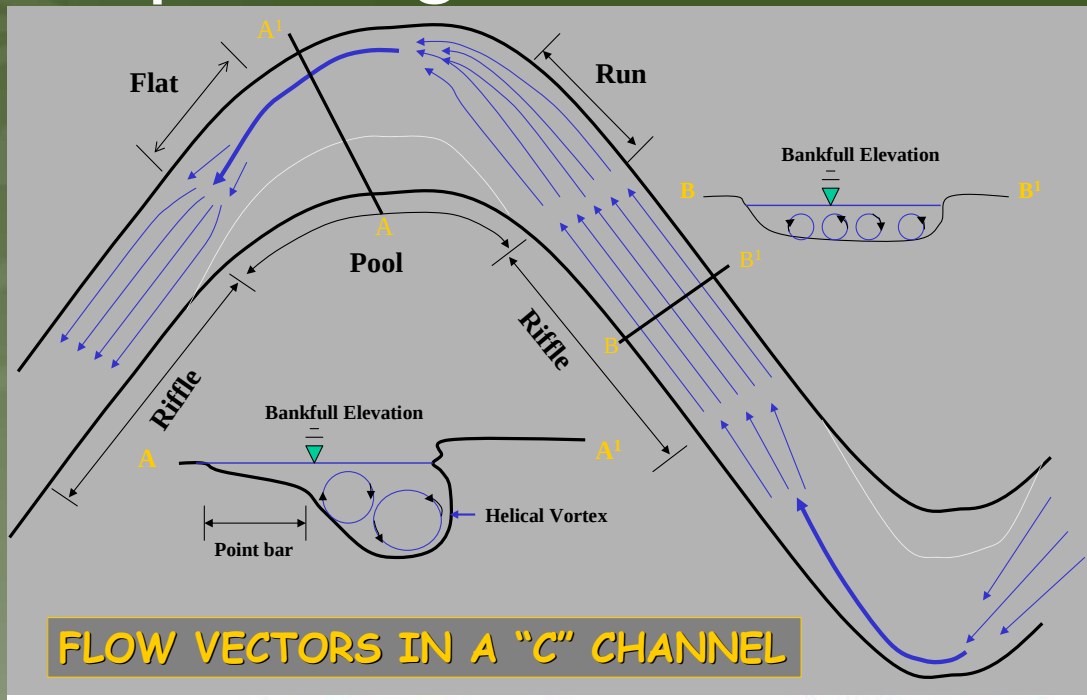
Streams and Their Corridors

Rivers are Complicated



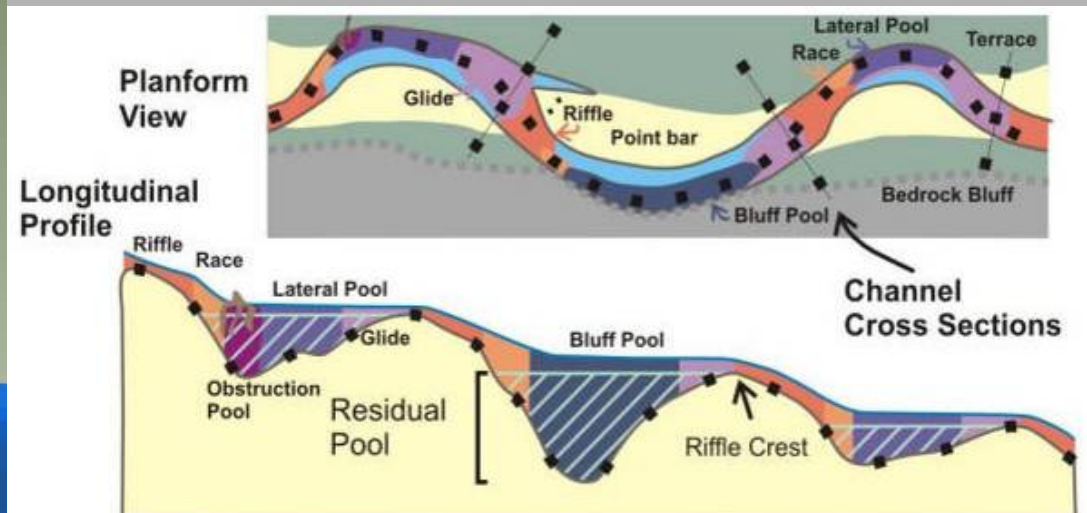
The Dissipation Of Energy In Two Vectors Creates Repeating Patterns

Horizontal Dissipation creates Meandering Patterns



Vertical Dissipation

creates a Meander Pattern that we call Riffles and Pools or Step:pools, etc.



STREAM AND ITS' VALLEY

"A stream is only as healthy as the valley through which it flows".

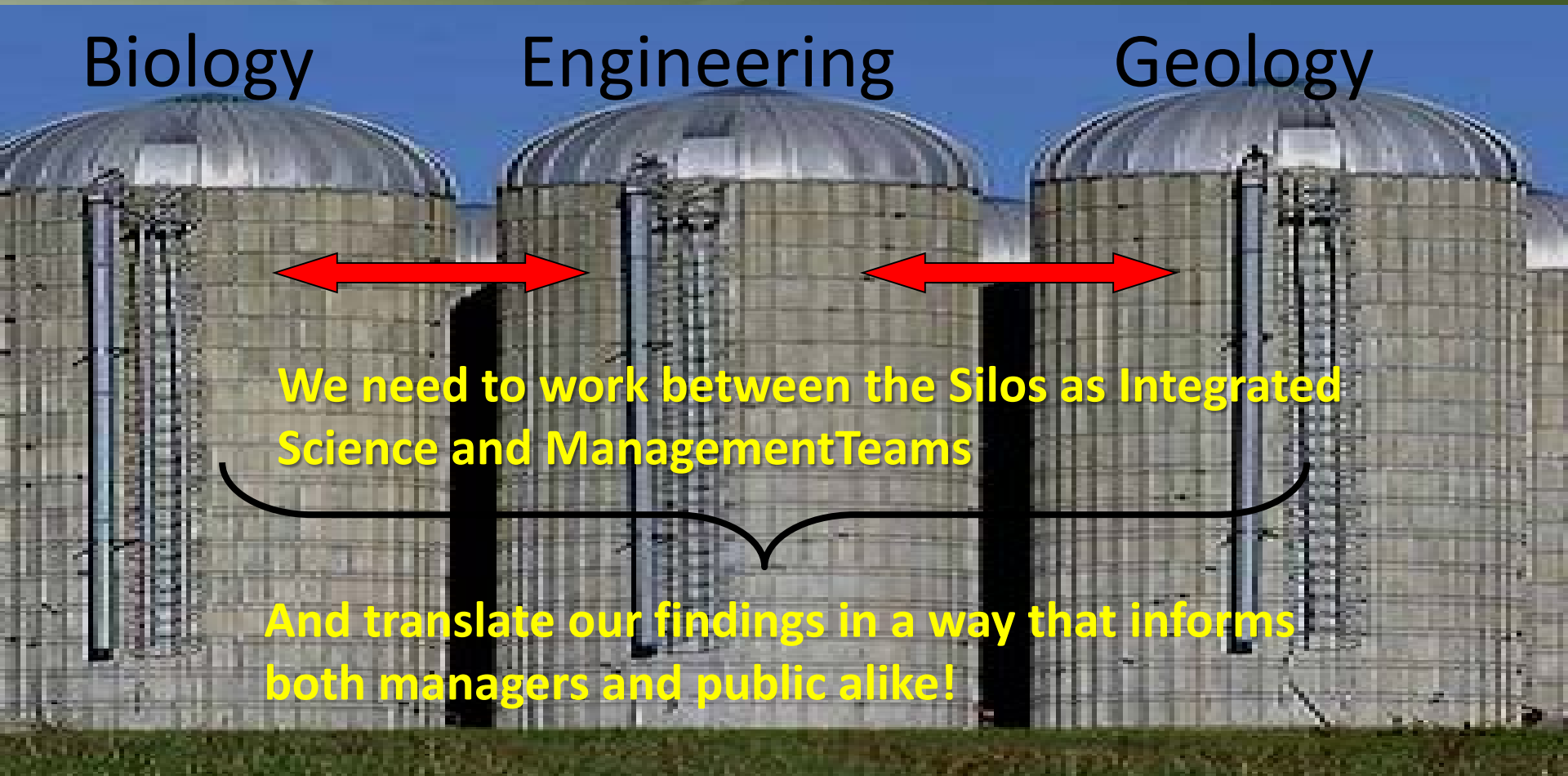
H.B.N. Hynes (SIL, Edgardo Baldi Memorial Lecture 1975)

Functional Features of Riparian Lands

- Riparian Lands Provide a Number of Functions:
  - Flow Management
  - Channel Shape and Bank Stability
  - Capture and Transform nutrients and clean the water
  - Carbon Sequestering
  - Food Source, migration corridors, habitat for the all varieties of life

The Professional Challenge:

The Traditional Approach to Science and Practice…Siloed!



Moving towards a Rehabilitation Economy and Practice

- Science is critical to sound management and policy
- Context is everything in environmental management and rehabilitation of our water and land resources
- Protecting the best is a good policy, as long as we Rehabilitate the Rest!
- Ultimately, we need to integrate our thinking and science and put it into practice
- The Challenge with managing water and ecosystems is learning to integrate our science and understanding!

Thank you!