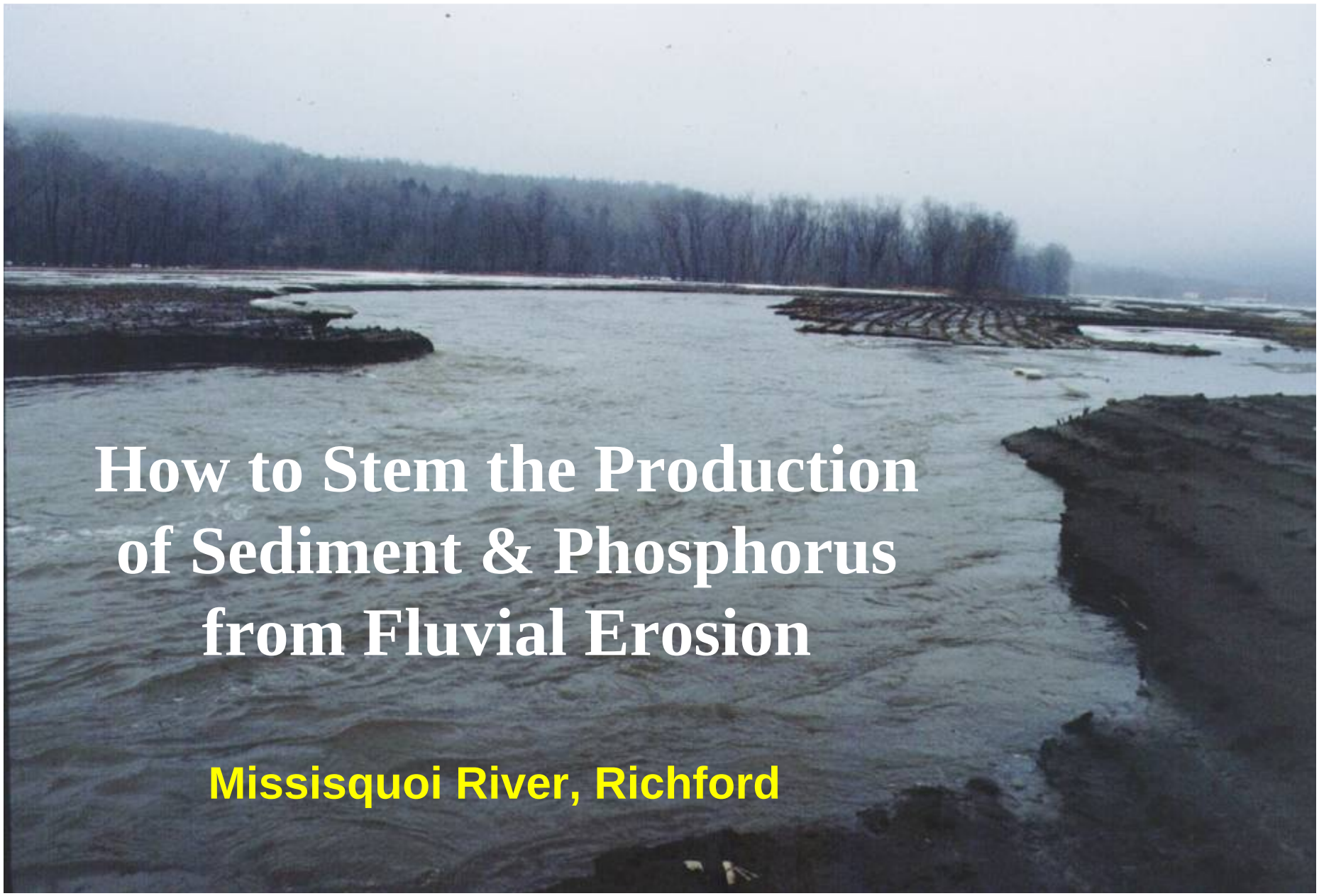
VT Department of Environmental Conservation River Management Program

Missisquoi Bay Basin Fluvial Assessments & River Corridor Management

Trout River, Montgomery

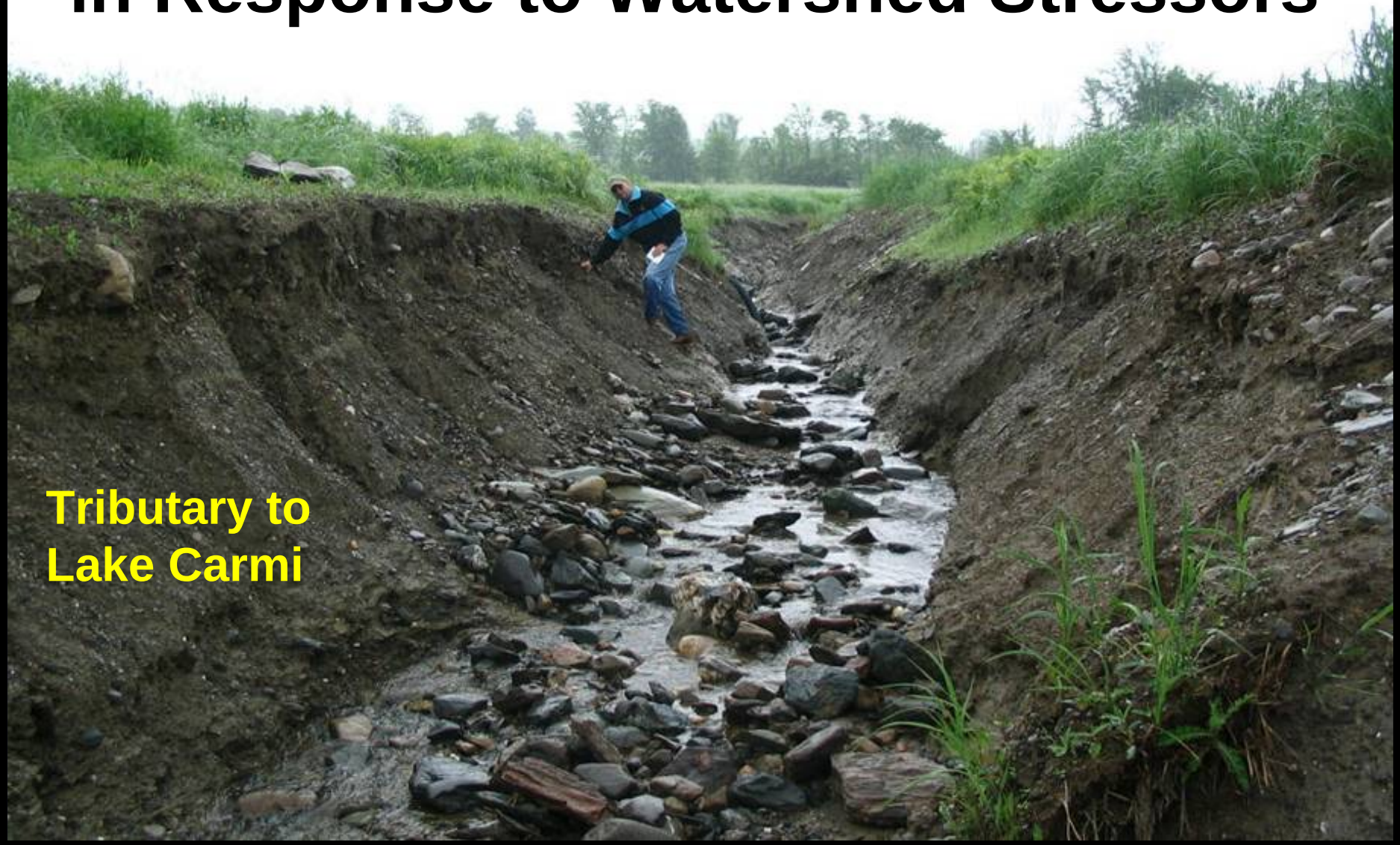


How to Stem the Production of Sediment & Phosphorus from Fluvial Erosion

Missisquoi River, Richford

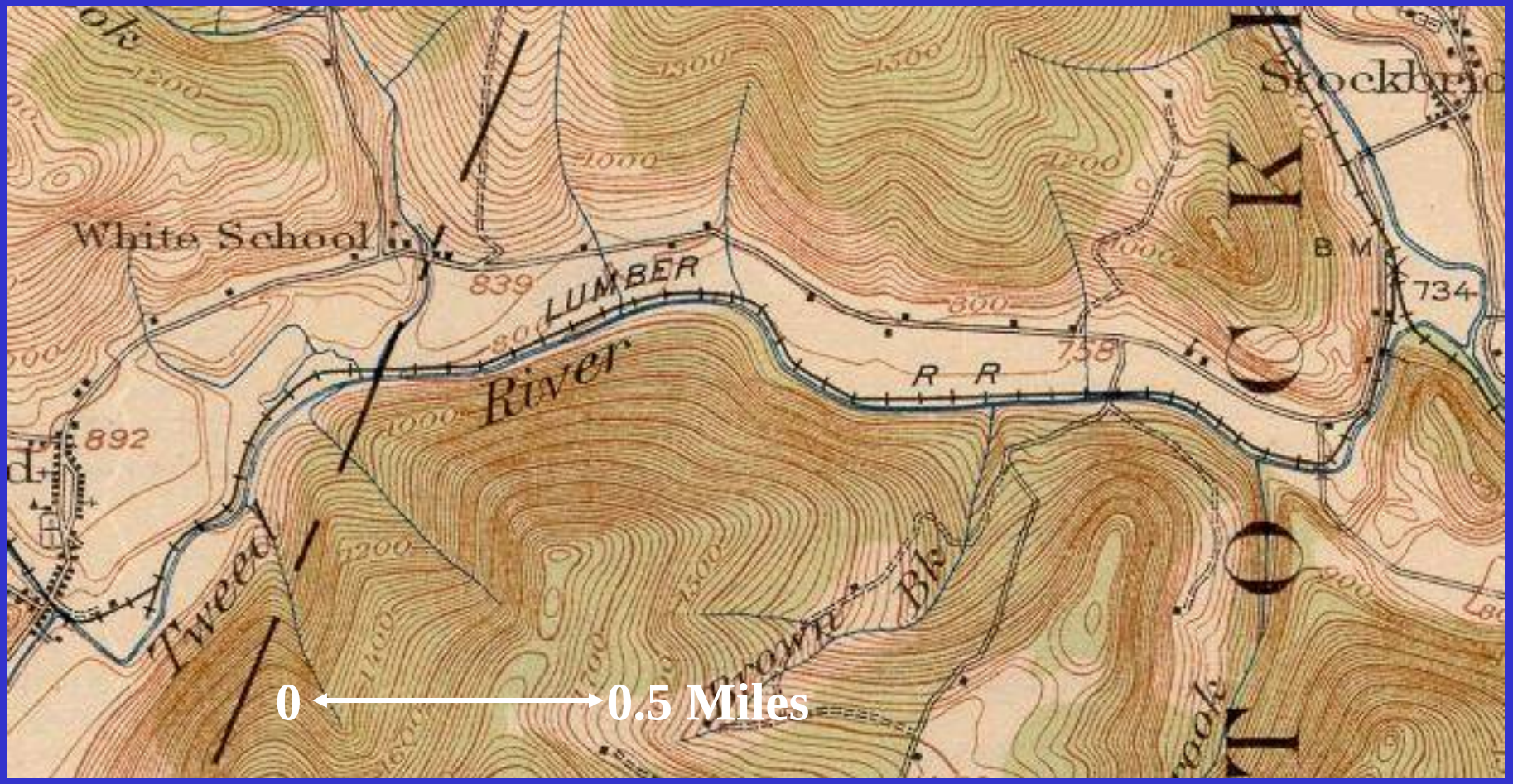
Reducing Sediment and Nutrient Production from Fluvial Processes is a Multi-Objective Solution

Understanding Channel Adjustment in Response to Watershed Stressors

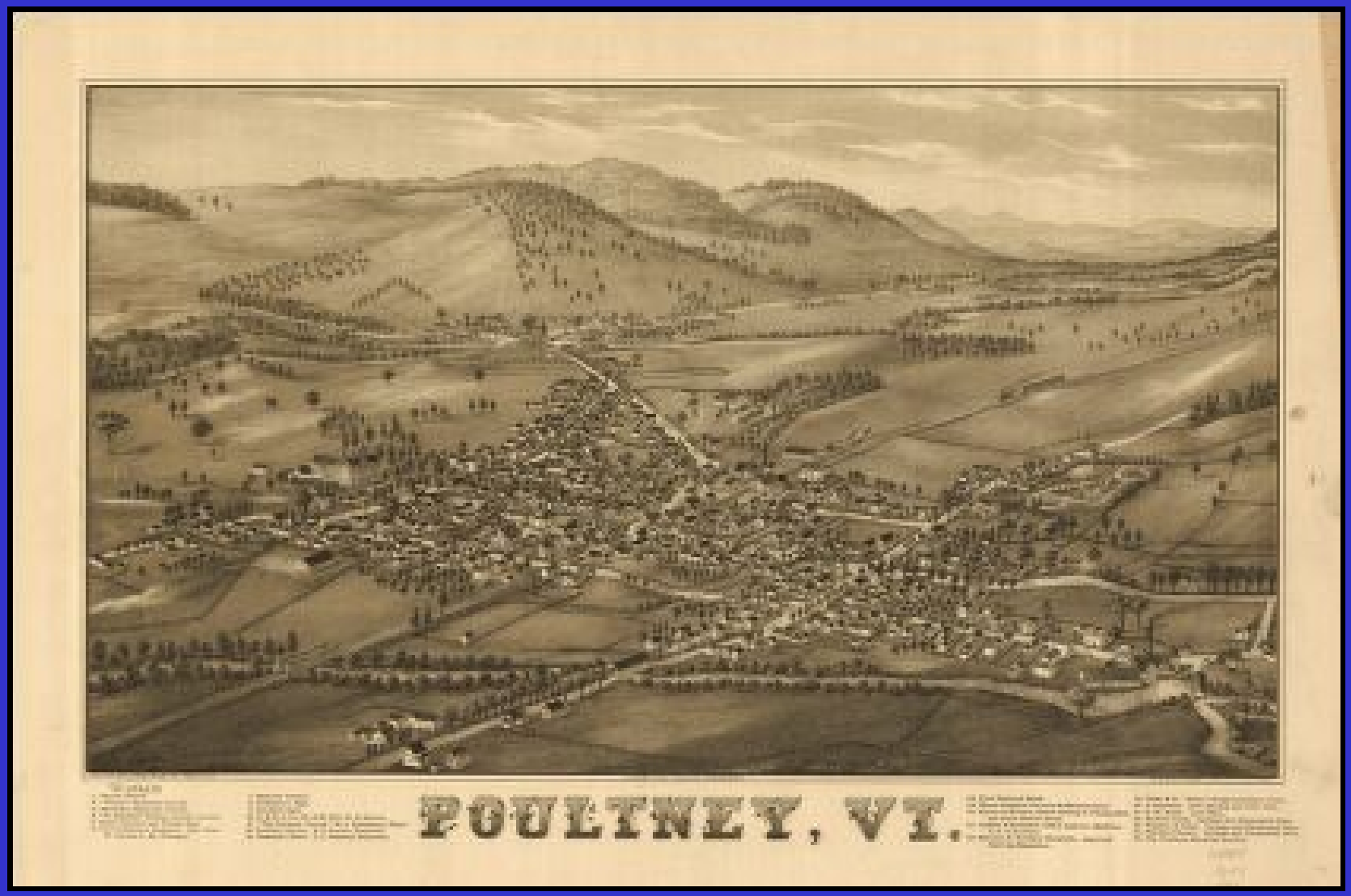


The Primary Causes of Current Instability are Rooted in our History

Topographic Map (1917) Explains Channelization



Watershed Inputs Changed - Rivers Straightened



With Early Settlement

Roads – Railroads

Straight Channels

VERMONT HISTORICAL SOCIETY

Up to 80% of Stream Miles in the Lake Champlain Basin have been Modified to Accommodate Roads, Railroads, Agriculture and Other Land Uses

Physical Imperatives are Predictable

Explaining Channel Evolution

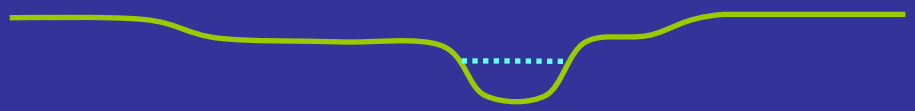
Stage

1 Pre-1800

Equilibrium condition

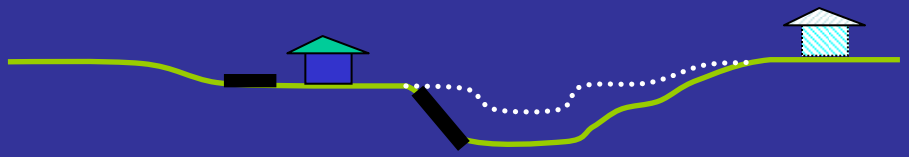
Modification of watershed inputs, channels & floodplains

2 Pre-1900



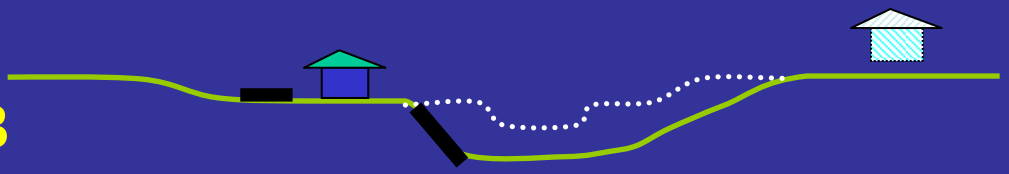
Geomorphic response begins

3 1927



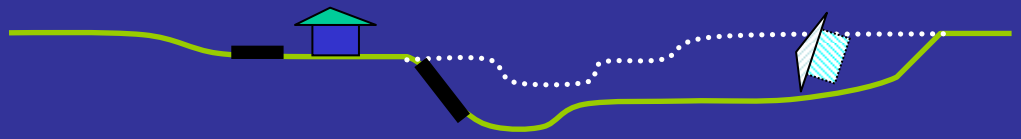
Widening to balance energy with boundary conditions

4 1973



Developing new flood plain

5 20??



Equilibrium condition

After Shumm, et.al.

Stage 1

Rock River, Highgate

Stage 1

Black Creek, Fairfield

Rock River
Franklin

Stage 2

Stage 2

Rugg Brook,
St. Albans Town

Stage 3

Trout River, Montgomery

Stage 3

Trout River, Montgomery

Bankfull Flow

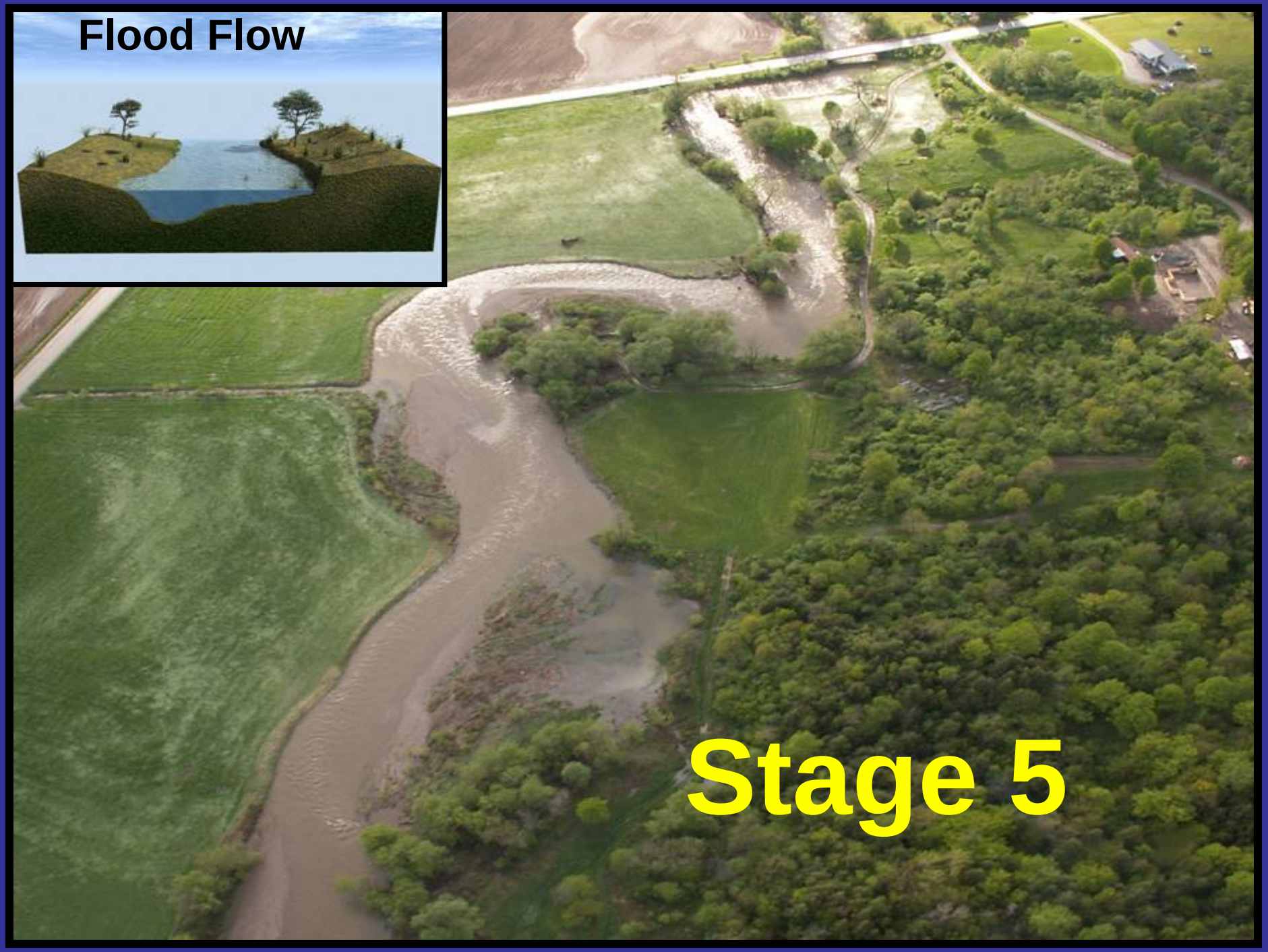
Stage 4
Trout & Missisquoi Rivers, Berkshire

Stage 4

West Branch, Stowe

Bankfull Flow

Rock River, Highgate
Stage 5


Flood Flow
Stage 5

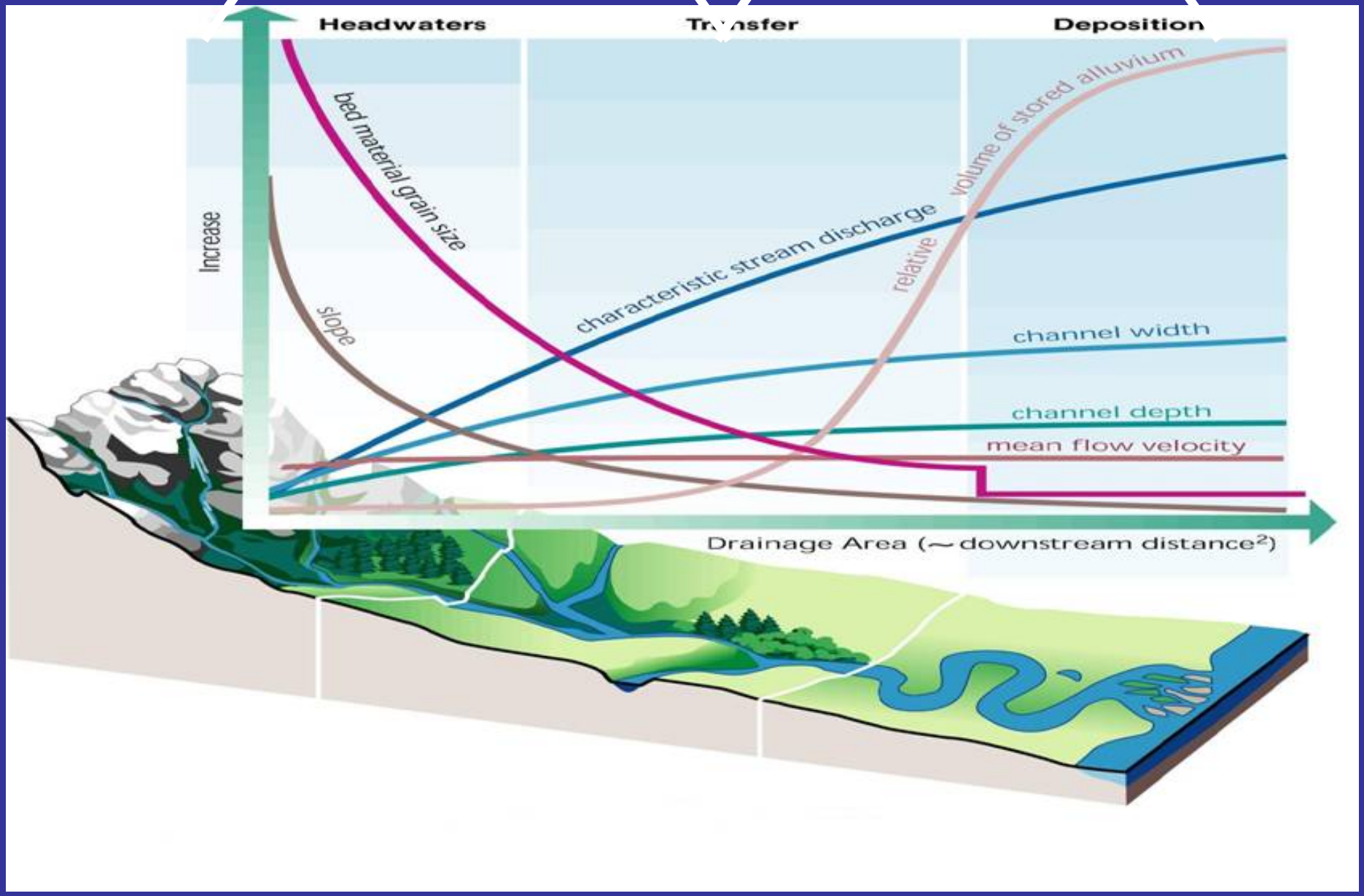
Stage 4
10.18.2006

Stage 5
Restored Flood Plain
Trout River, Montgomery
10.18.2006

Channel Evolution and the Sediment Regime

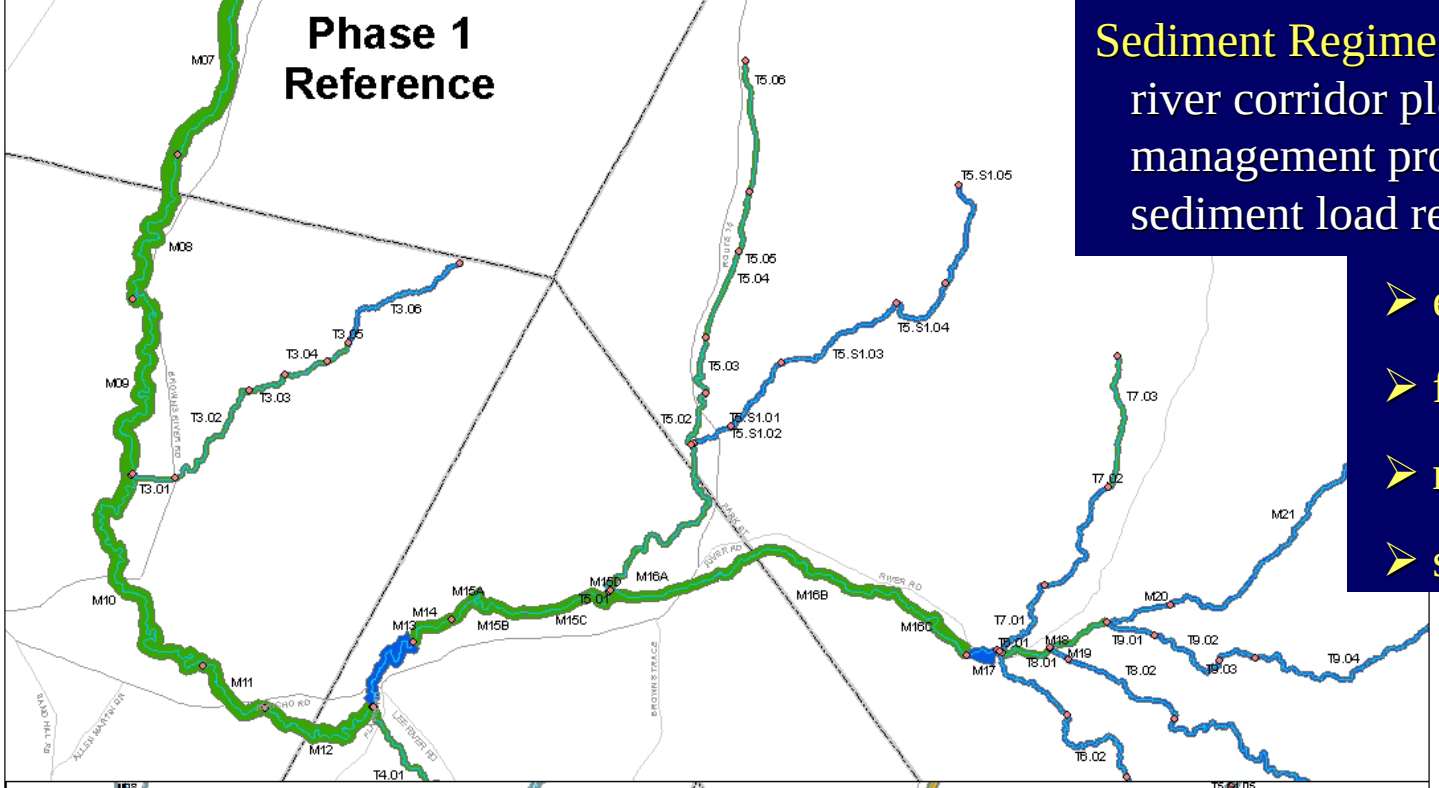
Sediment Source & Transport

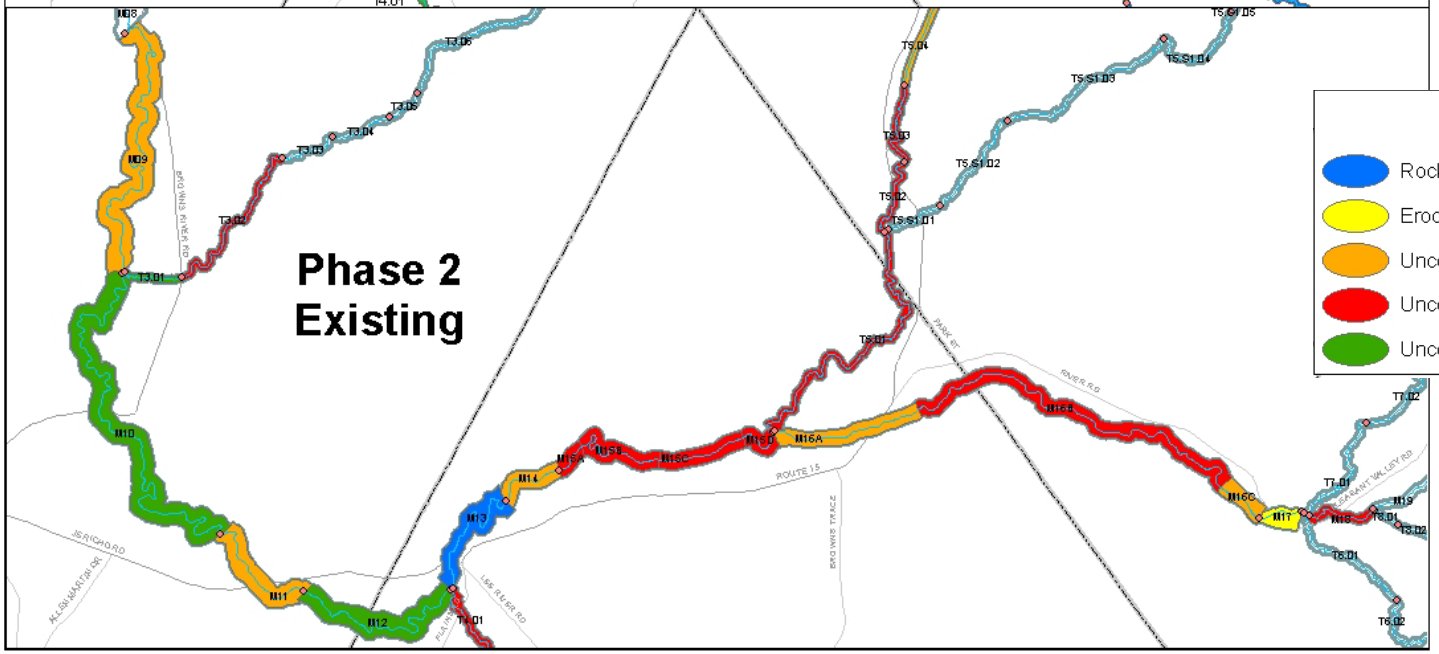
Sediment Deposition & Response



Sediment Regime Mapping to support river corridor planning and river management projects to achieve sediment load reduction by increasing:

- equilibrium conditions
- floodplain storage,
- riparian vegetation, and
- stream bank stability





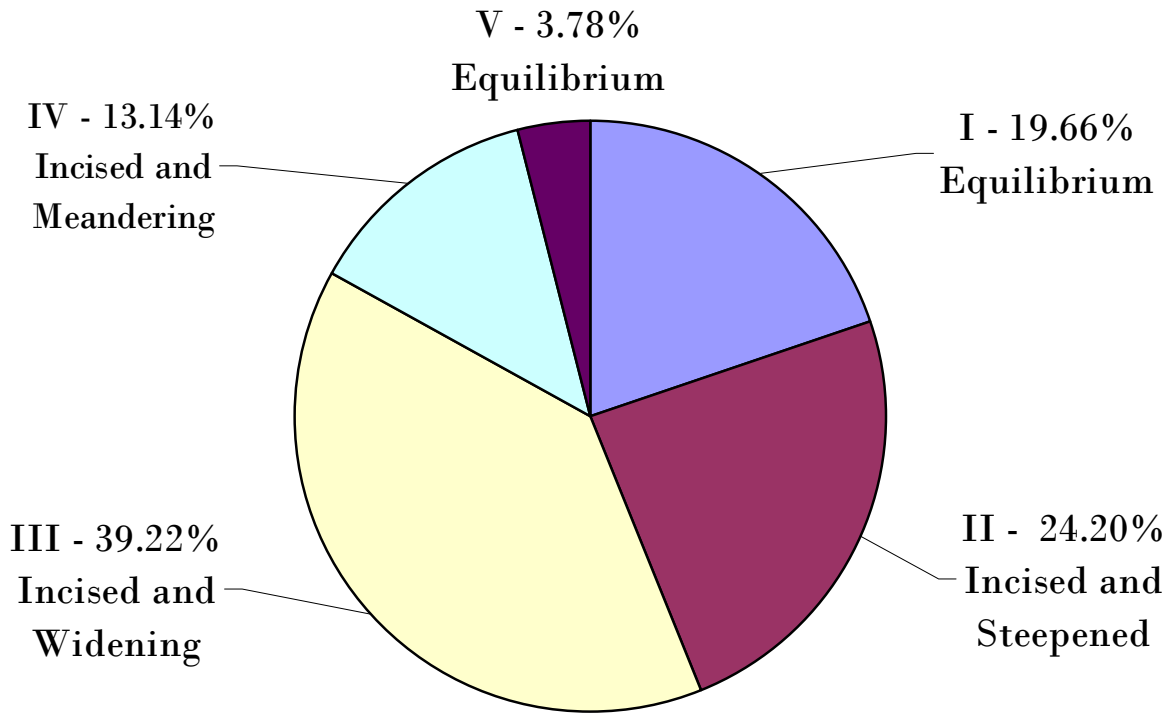
Legend

- Rock Confined Transport
- Erodible Confined Transport
- Unconfined Transport
- Unconfined Fine Transport, Coarse Sediment Supply
- Unconfined Fine Storage

N

Evolution Stage	*Number of Segments*	*Percent Segments*	*Number of Miles*	*Percent Length*
I	208.0	19.66%	167.5	22.13%
II	256.0	24.20%	147.5	19.49%
III	415.0	39.22%	316.8	41.84%
IV	139.0	13.14%	102.4	13.53%
V	40.0	3.78%	22.8	3.01%
Total	1,058.0	100.00%	757.1	100.00%

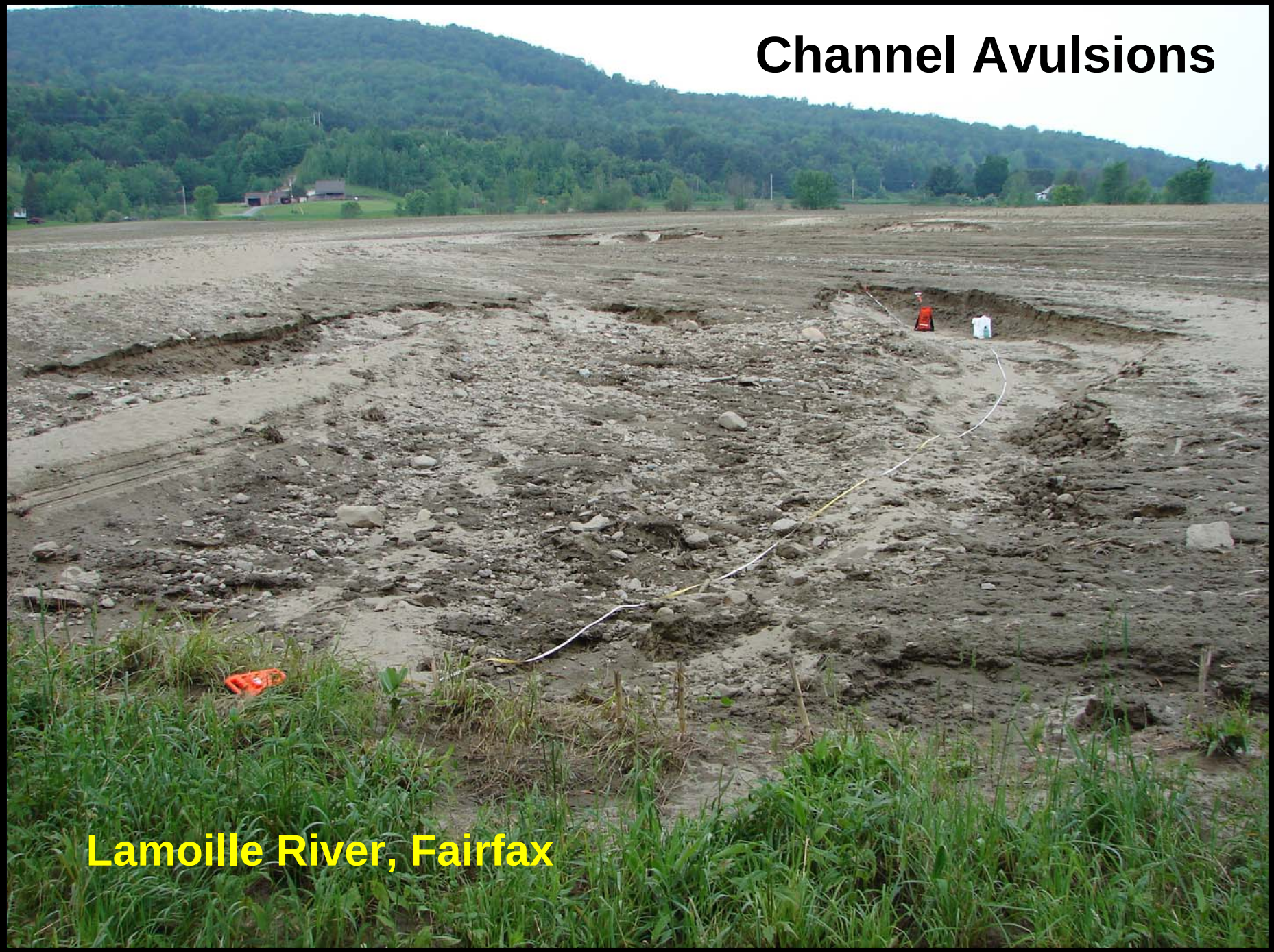
Percentage of Assessed Stream Segments in Various Stages of Evolution



The Consequences

Missisquoi Delta 2006

Channel Avulsions



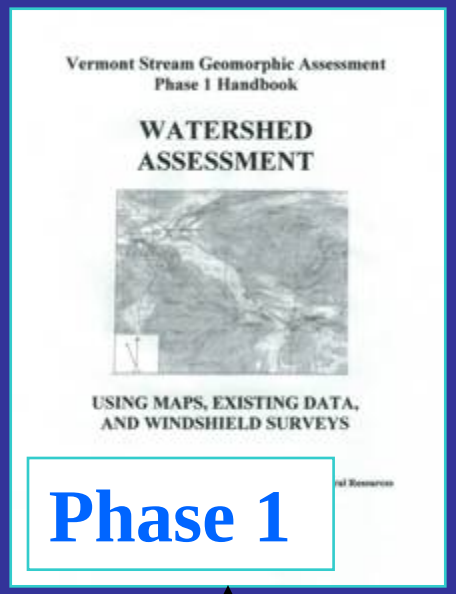
Alluvial Soils & Nutrient Export from Watershed

Tyler Branch, Enosburg
Threats to Residential Land Use

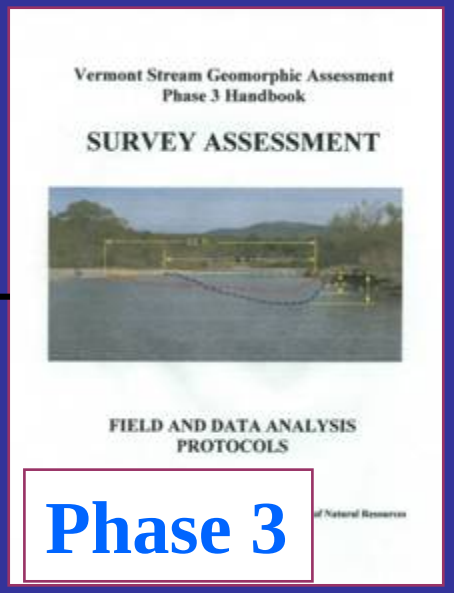
Outflanking Stream Crossing

Sediment Transport Discontinuity

Stream Geomorphic Assessments



- Corridor Planning
- Project Identification
- Project Development
- Project Implementation



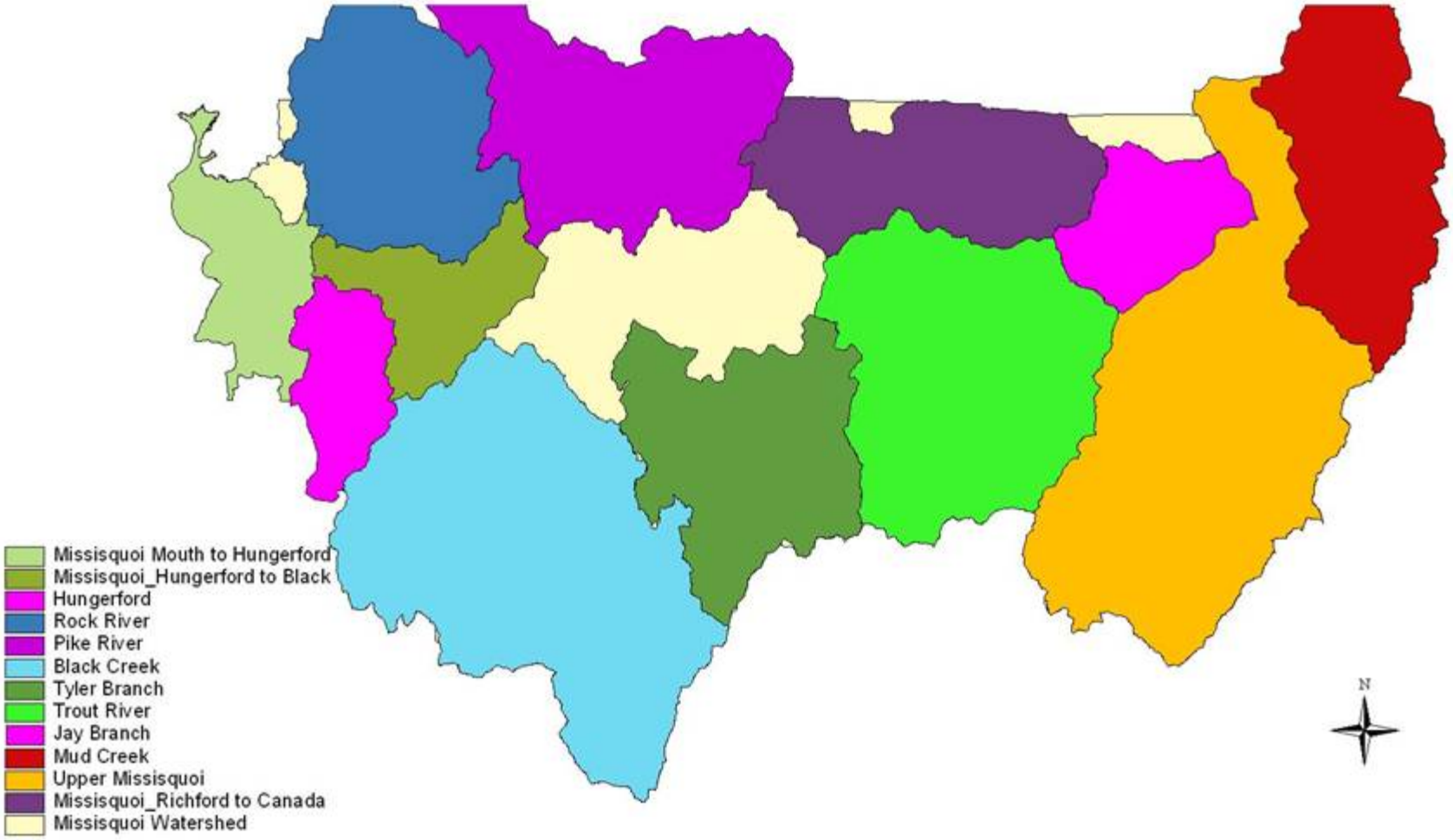
Vermont ANR Stream Geomorphic Assessment

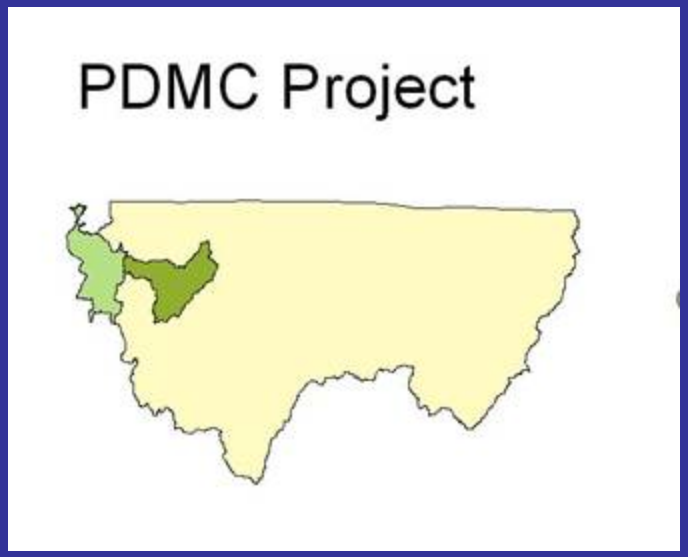
Assessment Objectives

Identification of:

- **stream condition** as compared to a reference stream of the same type
- **adjustment process** or physical change currently underway in the channel
- **sensitivity** of valley, floodplain, and channel to human or natural changes
- **Habitat condition**

Missisquoi Watershed Assessments





Pre-Disaster Mitigation

- Working with towns to develop strategies to avoid erosion and flooding hazards

- Funding through FEMA
  - 3 year project
  - NRPC sponsoring grant

- Phase 2 data collected to support process

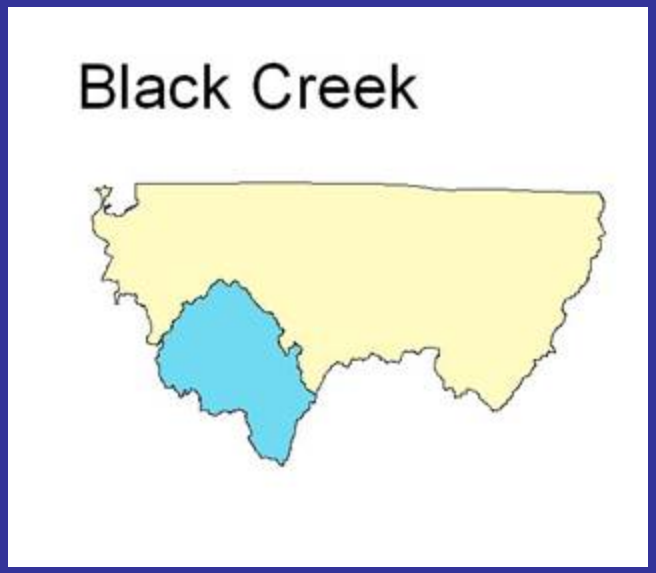
Avoiding Flooding Hazards

- Phase 2 Data Collection
  - Initial Project Identification
  - Project Development
  - Project Implementation

Rock River
* Using Assessment Data to Identify and Develop Multi-Objective Projects

- Phase 2 Data Collection
  - Initial Project Identification
- NRCS and partners - CCPI grant
- UVM – Phosphorus study

- Phase 2 Data Collection
  - Initial Project Identification



Lamoille Valley Rail Bed Project

* Rail bed lowering to provide floodplain connection

- Wanzer Brook Phase 2 Data Collection
  - Initial Project Identification
  - Project Development
  - Project Implementation

Wanzer Brook
- Floodplain Restoration
- CREP

Black Creek Rail-bed Removal

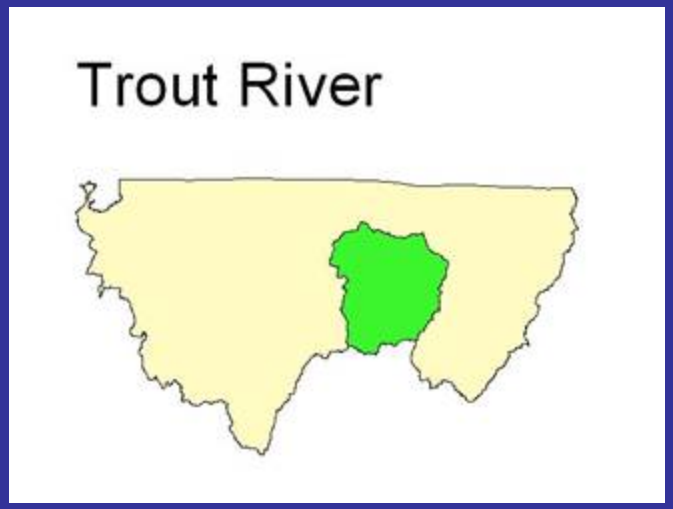
- Increase Floodplain storage
- Fine Sediment Attenuation
- CREP
- WHIP
- Wetland Restoration

Tyler Branch

- Phase 2 Data Collection
  - Initial Project Identification
  - Project Development
  - Project Implementation

Tyler Branch
Multiple Objectives

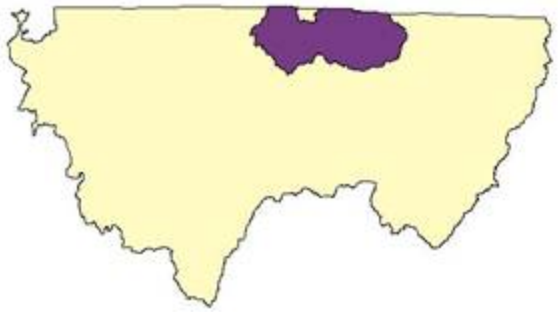
- Sediment Attenuation
- Planform Adjustments
- CREP
- Corridor Protection
- Habitat



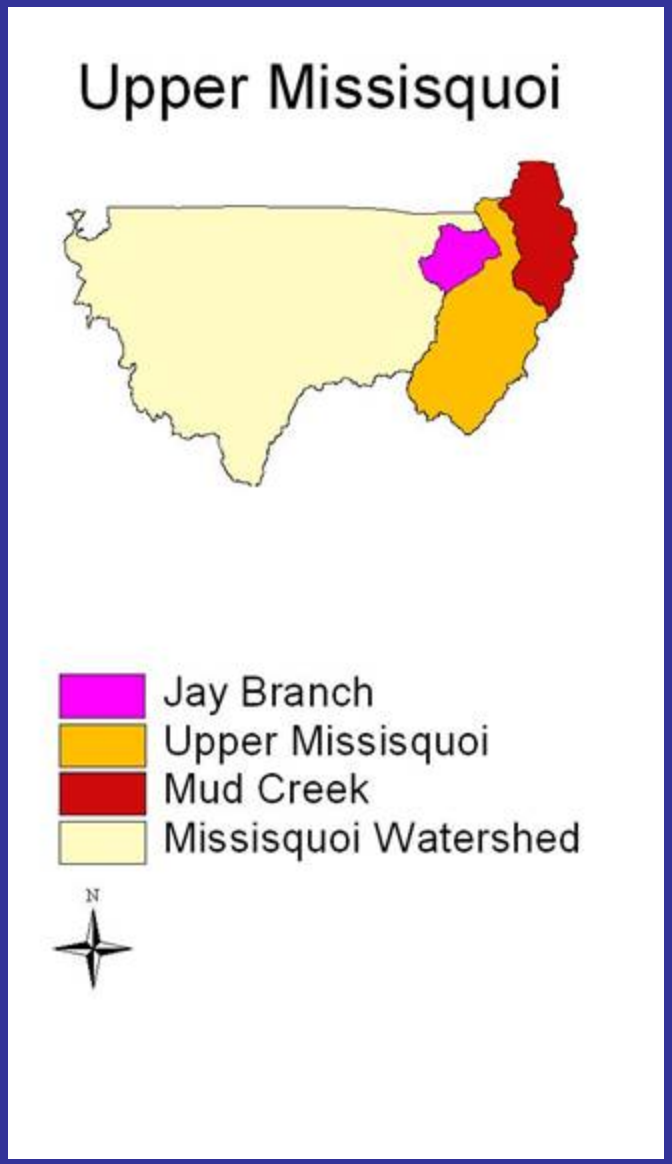
- Phase 2 Data Collection
  - Initial Project Identification

Developing and Monitoring Current Projects

Missisquoi
Trout to Canada



- Phase 2 Data Collection
  - Initial Project Identification

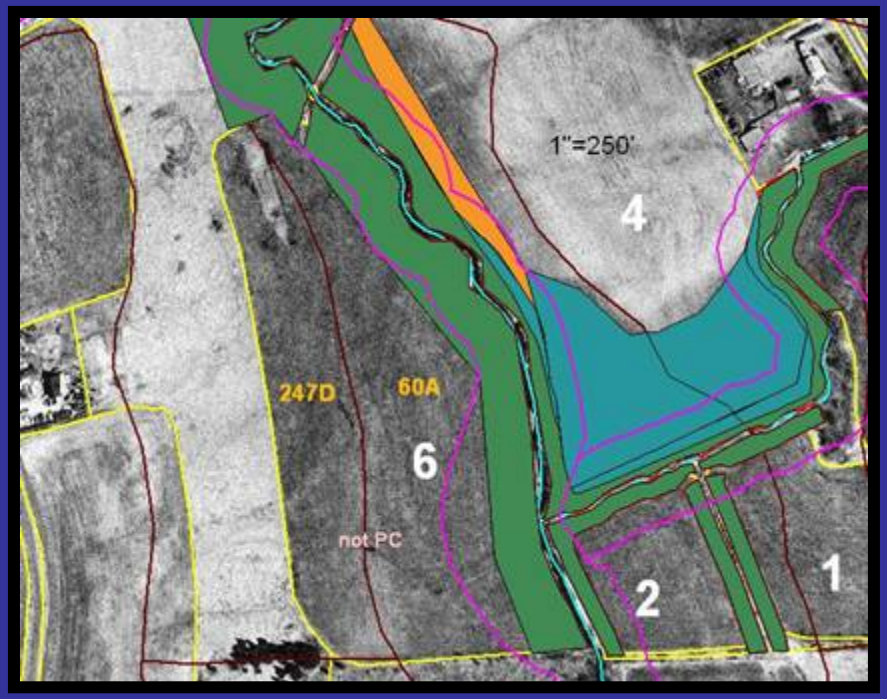


- Phase 1 Data Collection
- Phase 2 Data Collection on Mud & Jay Branch
- Initial Project Identification

Mud Creek

Multiple objectives

- CREP
- Corridor Protection
- Create better crossing
- Remove Berm



Putting a Project on the Ground

- **Project Identified** – Goals and Objectives of the Project Determined
- **Conceptual Design** put together
- Approach Landowner - Determine **Landowner Willingness** to Participate
- Determine **Partners and Funding Sources** can be Utilized to help make the Project Happen
- **Final Design** based on: funding / partners / landowner constraints / Alternatives considered to meet the original goals and objectives
- **Paper work** ☺
  * Grant agreements for funding
  * Getting landowner agreements signed
  * Contracts with various partners who may provide funding
  * Permits
- **Implementation**
  * Project supervisor (helps make sure the project gets done correctly)
  * Final Design agreed on by landowner and all partners
  * Hiring contractor to put the project on the ground
- **Monitoring**

Partners

- Community and Landowners
- RMP
- FSA
- USDA
- USF& W
- Wetlands Program
- Conservation Districts
- Watershed Associations
- Regional Planning Commissions

Support Mechanisms

- River Conservancy
- Vermont Land Trust
- Municipal Incentives
- Basin Planning
- CREP

Funding Mechanisms

- River Corridor Grants
- FSA & AAF&M– CREP funding
- USDA Funds
- USF&W Funds
- Wetland Program
- Better Back Roads

Can’t We Just Filter the Sediment & Nutrients?

Mouth of Rock River, Missisquoi Bay

Rugg Brook Stage 2

Rugg Brook Stage 5
Rugg Brook, St. Albans Town

Trout River, Montgomery
River Corridor
Protection & Restoration

Ag Land Use and Water Quality Objectives Often May Not be Reconciled
Rock River, Highgate
Incentives & Compensatory Programs are Needed to Protect & Restore River Corridors

Next steps

- Continue Building Partnerships
- Collect Data
- Develop Projects
- Implement Projects
- Monitor Projects
- Develop Realistic Expectations of Progress

Rivers Are of Inestimable Value to Everyone
Tyler Branch, West Enosburg