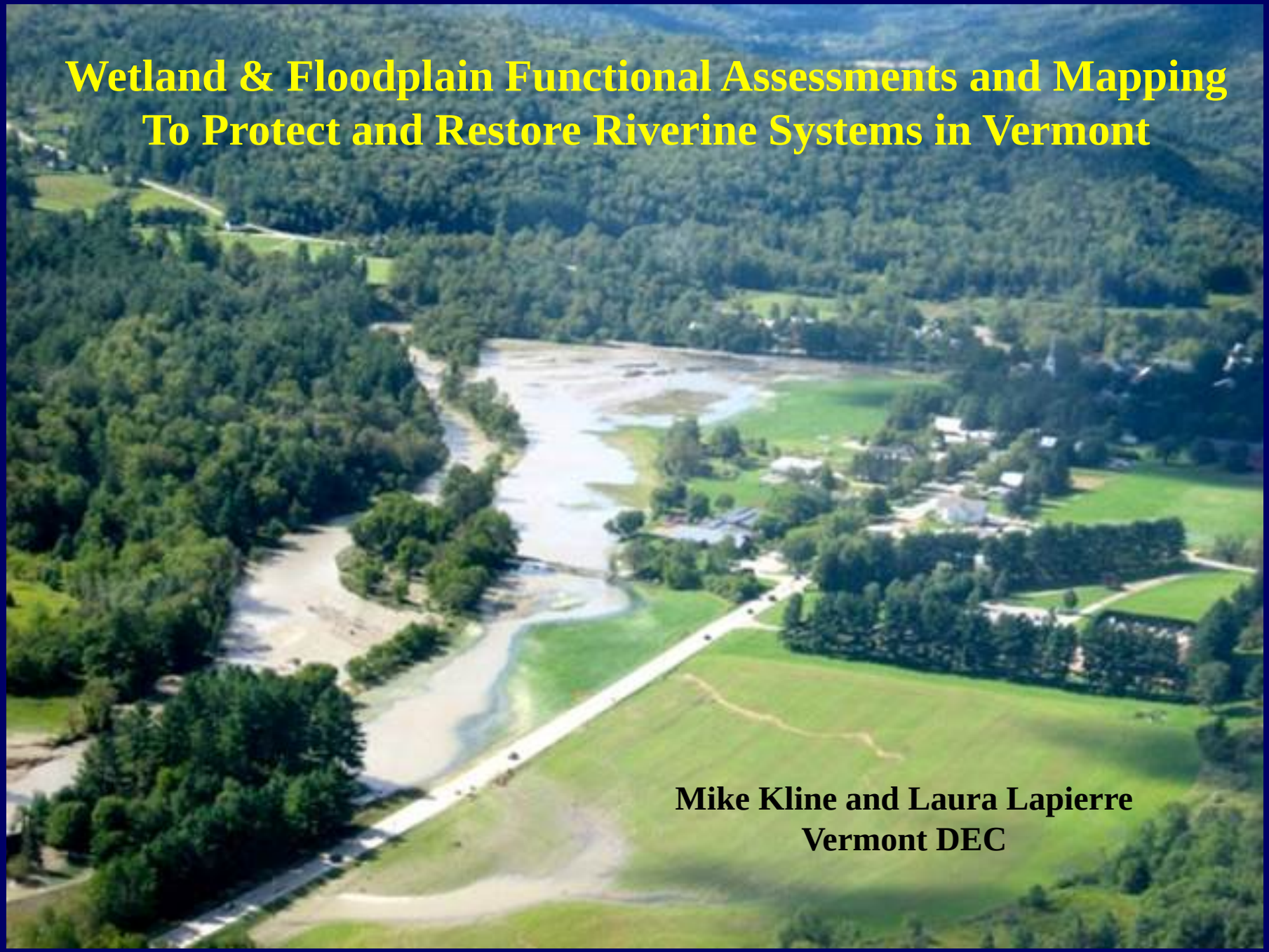
Wetland & Floodplain Functional Assessments and Mapping To Protect and Restore Riverine Systems in Vermont



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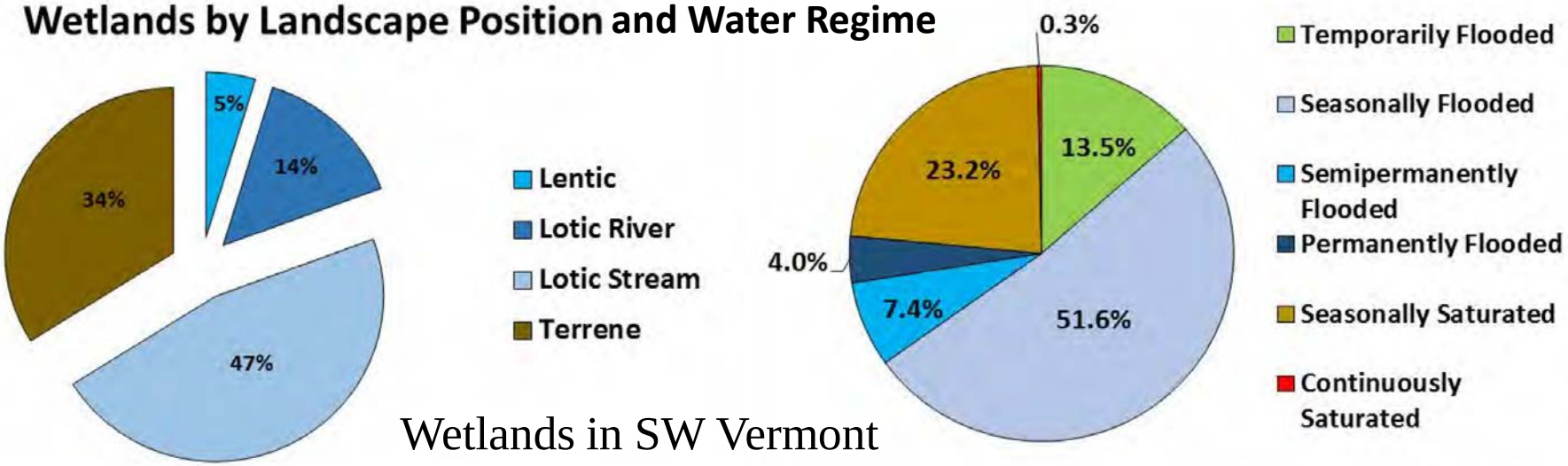
Vermont DEC

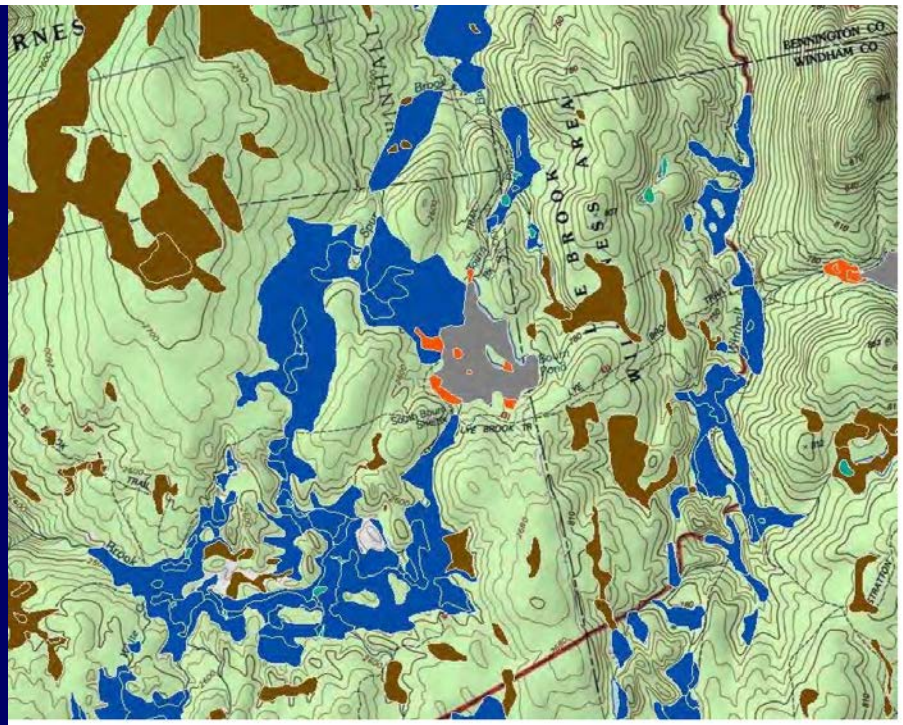
NWI+ Hydro-Geomorphic Characterization of Wetlands



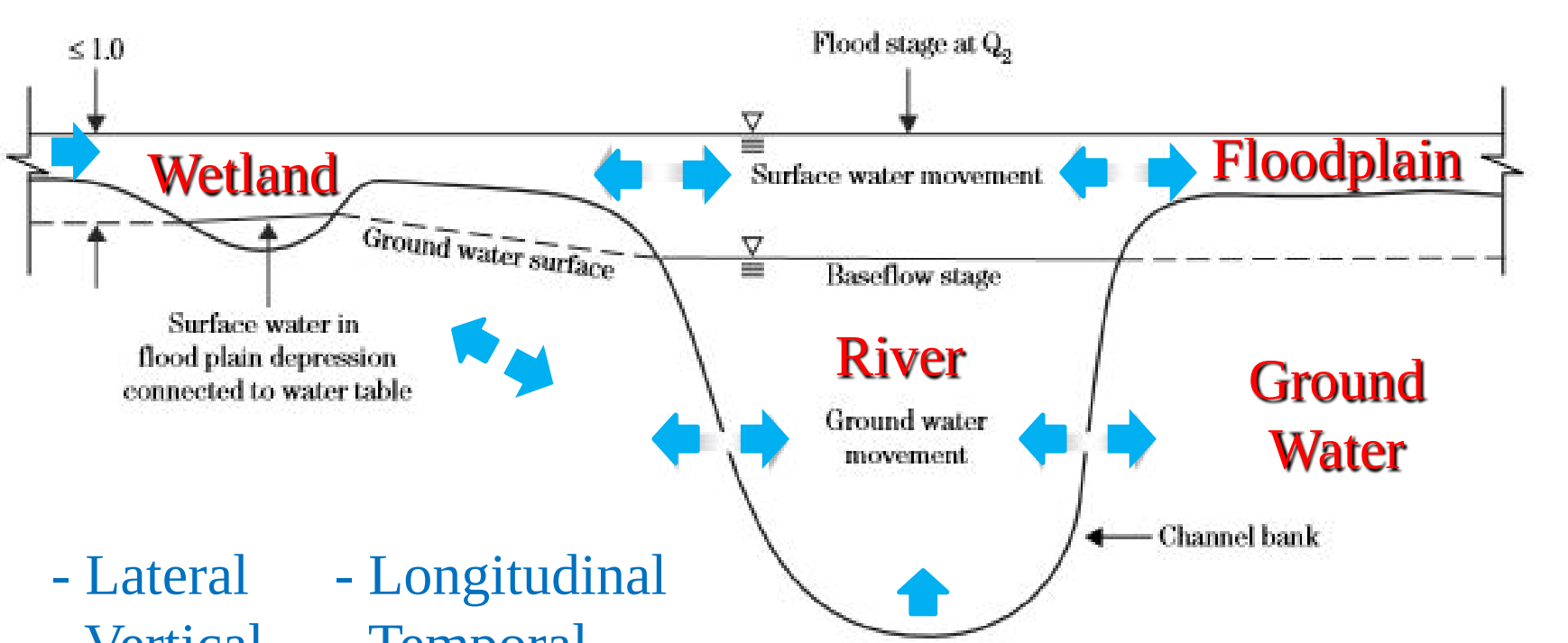
Wetlands in SW Vermont

Understanding the natural hydrology will improve our wetlands restoration.

Vermont is working on mapping tools that will advance our ability to restore the hydrology and fluvial processes of the entire "riverscape."



Vermont Wetland and Floodplain Management Goals:
Maximize Flood Attenuation, Habitat & Water Quality



USDA Tech Note 2008

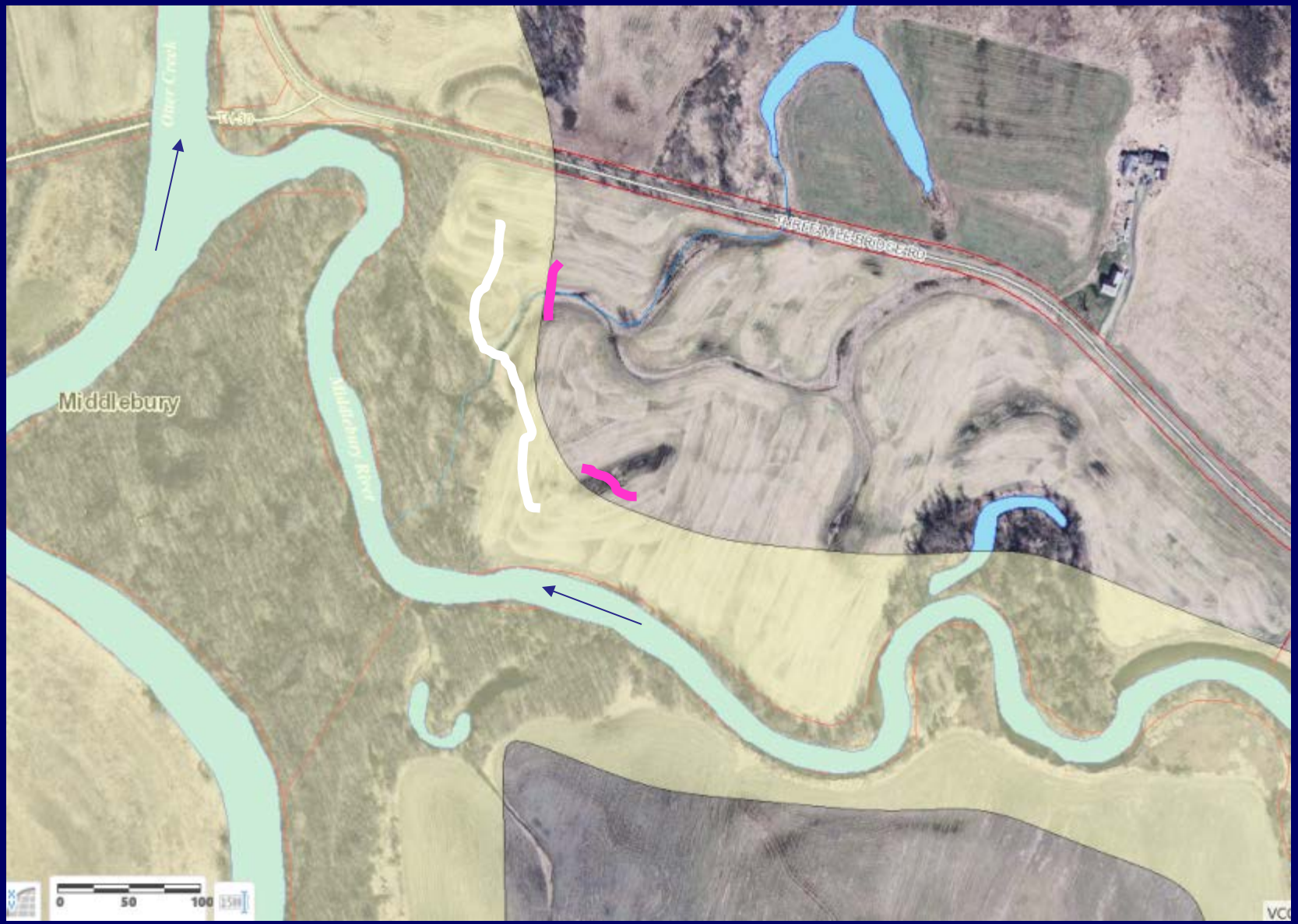
Mapping tools to examine the connectivity of flows, energy, and sediments

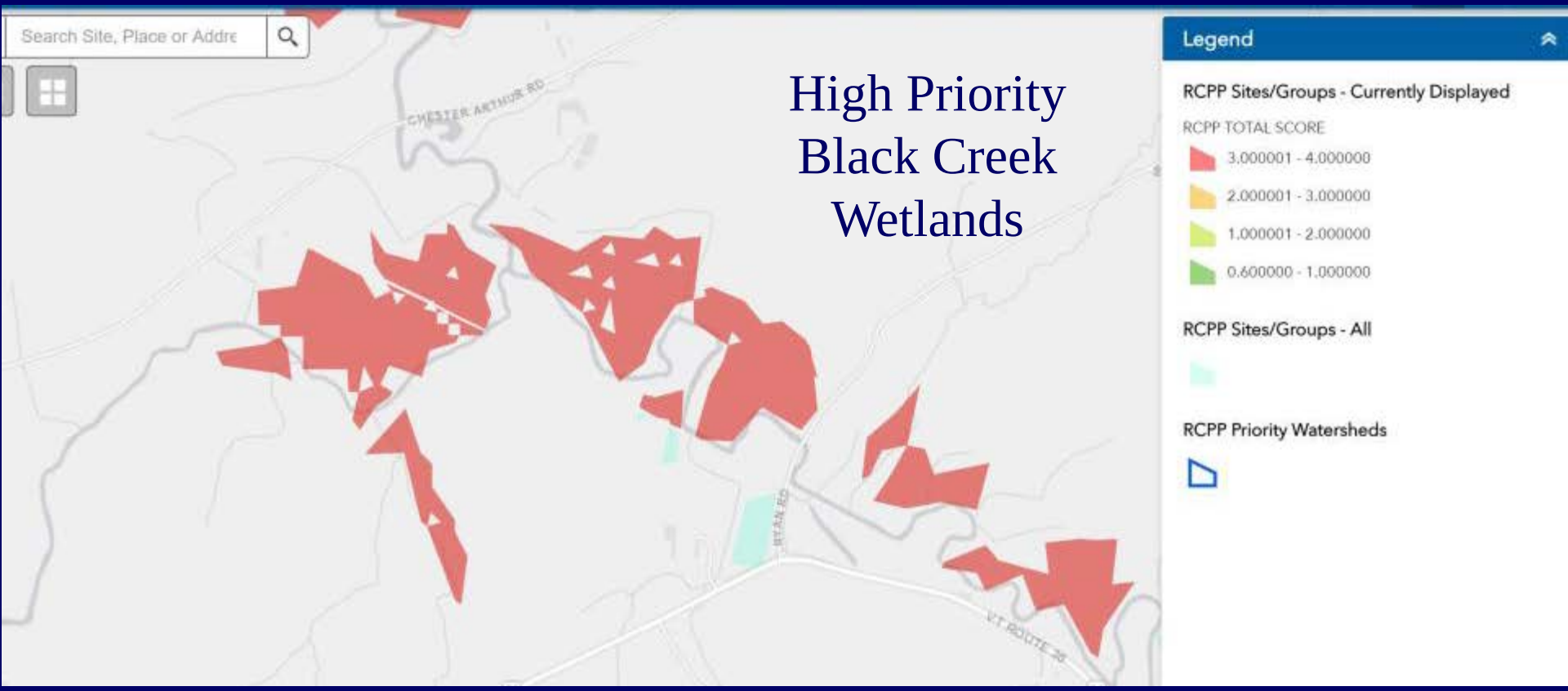
Longitudinal and Lateral Connectivity

56 Wetland Reserve Easements
78 River Corridor Easements

Wetlands and VT River Corridors

69% of Vermont State Wetland Inventory + advisory wetlands intersect with “delineated” River Corridors


Otter Creek
TH 30
THETFORD-BRIDGEPORT RD
Middlebury
Middlebury River
0
50
100



Prioritizing wetland restoration (for nutrient retention):

Site Function

- Soil texture and Erosion risk
- Size class
- Flood class
- Proximity to surface waters (river corridors/floodplains)

Upslope drainage

- Slope and Erosion risk
- Estimated P load
- Land cover
- Hydrologic soil group
- Drainage to wetland area ratio

Existing Conditions

Existing Easements: ☐ FRPP ☐ GRP ☐ WRP ☐ RCE ☐ VLT ☐ VLTO ☐ PUBLIC

Surface Water Present: ☑ Stream/River ☐ Waterbody

The agricultural fields that characterize the site are in hay and corn production. The site is generally bound to the north by a small unnamed tributary. There is a second small stream that enters the site from the west under Route 105 and the railroad tracks. On the site, the flow of this small stream has been split with some directed into a straightened channel and some into a constructed ditch. The streams generally lack a naturally vegetated riparian buffer. There are three mapped Class 2 wetlands along the eastern boundary of the site. The western portion of the site is mapped as hydric soils. Ortho photo review suggests at least seasonal saturation of the remainder of the site.

Restoration Potential

Natural Communities Present: ☑ Shallow Emergent Marsh ☑ Shrub Swamp ☑ Flood Plain Forest ☐ Forested Swamp

Natural Community Comments

There are patches of floodplain forest still present along the Missisquoi River on the eastern boundary of the site. The landscape position along the Missisquoi River and the silt loam soils that characterize the restoration area will likely be conducive to reestablishing floodplain forest. Low-lying areas within the floodplain forest could be restored to emergent marsh. Buffers associated with the tributaries could be restored to emergent marsh or shrub swamp.

Potential Restoration Actions

☐ Remove Tile Drain ☐ Remove Berm(s) ☐ Plug Ditch(es) ☑ Fill Ditch(es)

☑ Excavate Depression ☑ Channel Restoration ☐ Floodplain Restoration ☑ Plantings

Hydrologic Alterations

Portions of the stream channels within the restoration area have been straightened and likely ditched and widened. Natural topographic depressions have likely been removed through site grading.

Restoration Comments

The restoration site can be readily accessed by an existing agricultural road that runs in an east/west direction through the central portion of the site. Restoration activities will include: filling the excavated ditch, restoring channel sinuosity and regrading as necessary; establishing active stream buffer and riparian floodplain planting zones; and excavation of depressions/scrapes.

ARROWWOOD ENVIRONMENTAL

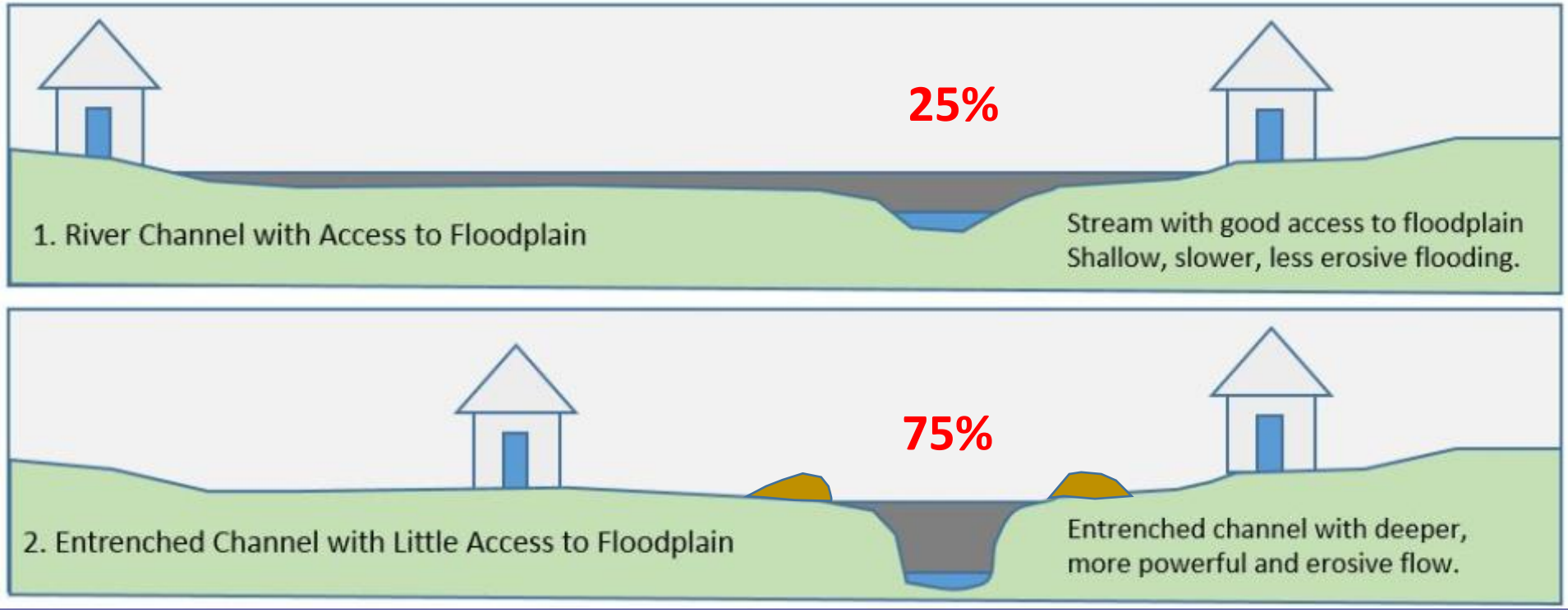
Fitzgerald Environmental Associates, LLC.

Broad Systems Approach

Expert Analysis of Processes & Functions

Vertical/Lateral Connectivity is a greater challenge in Vermont

Deposition, Storage, and Higher Soil Moisture



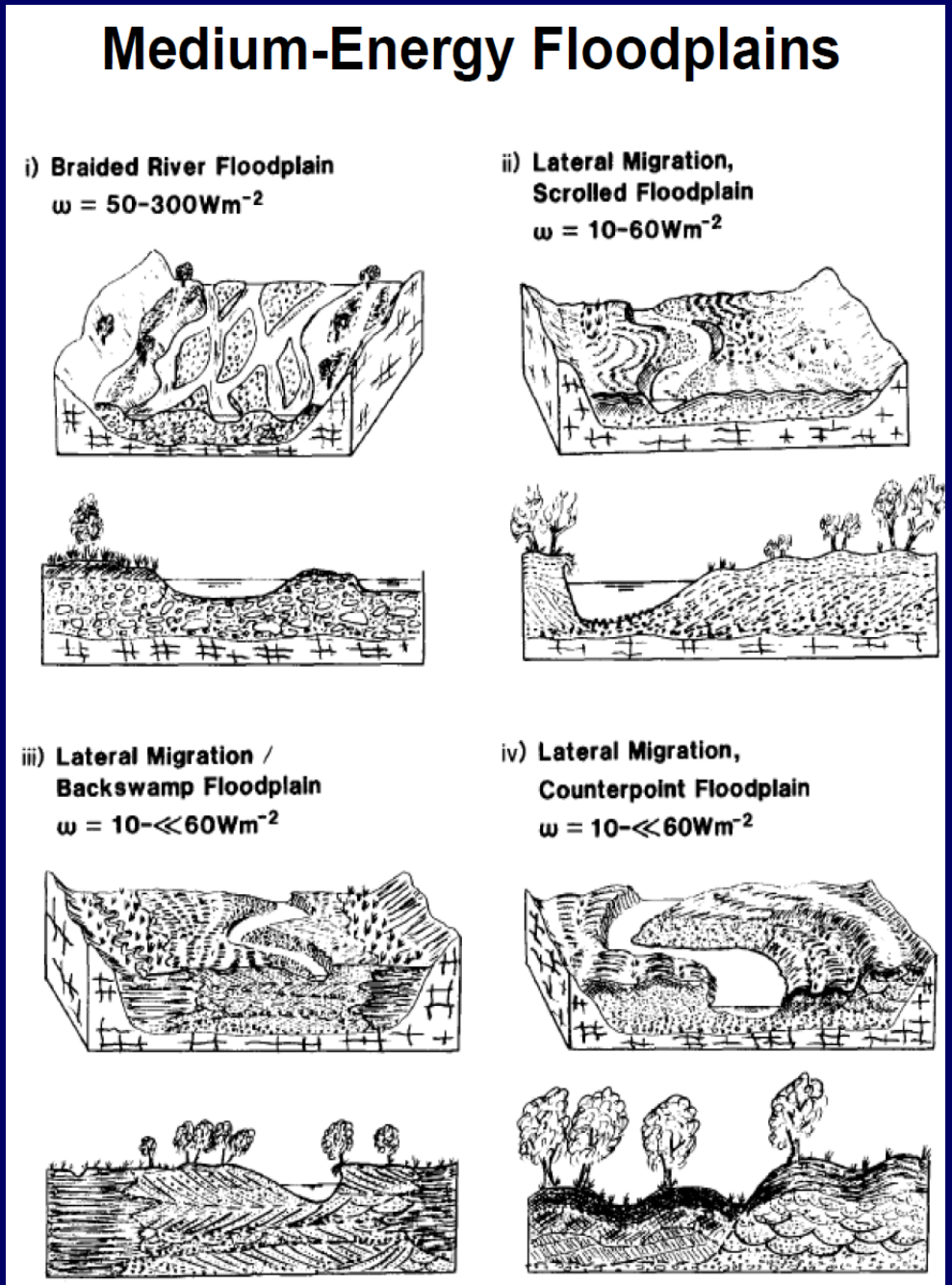
Erosion, Transport, and Decreased Soil Organic Content

Disconnected Floodplains – flood less frequently and for shorter duration, which influences erosion and sedimentation, floodplain morphology (topography), soil characteristics, and vegetation.

Connectivity, fluvial processes and floodplain topography may be difficult to visually interpret with photos and DEMs

Need accessible, summary parameters to characterize hydro-geomorphic processes

Specific Stream Power and Sediment Caliber

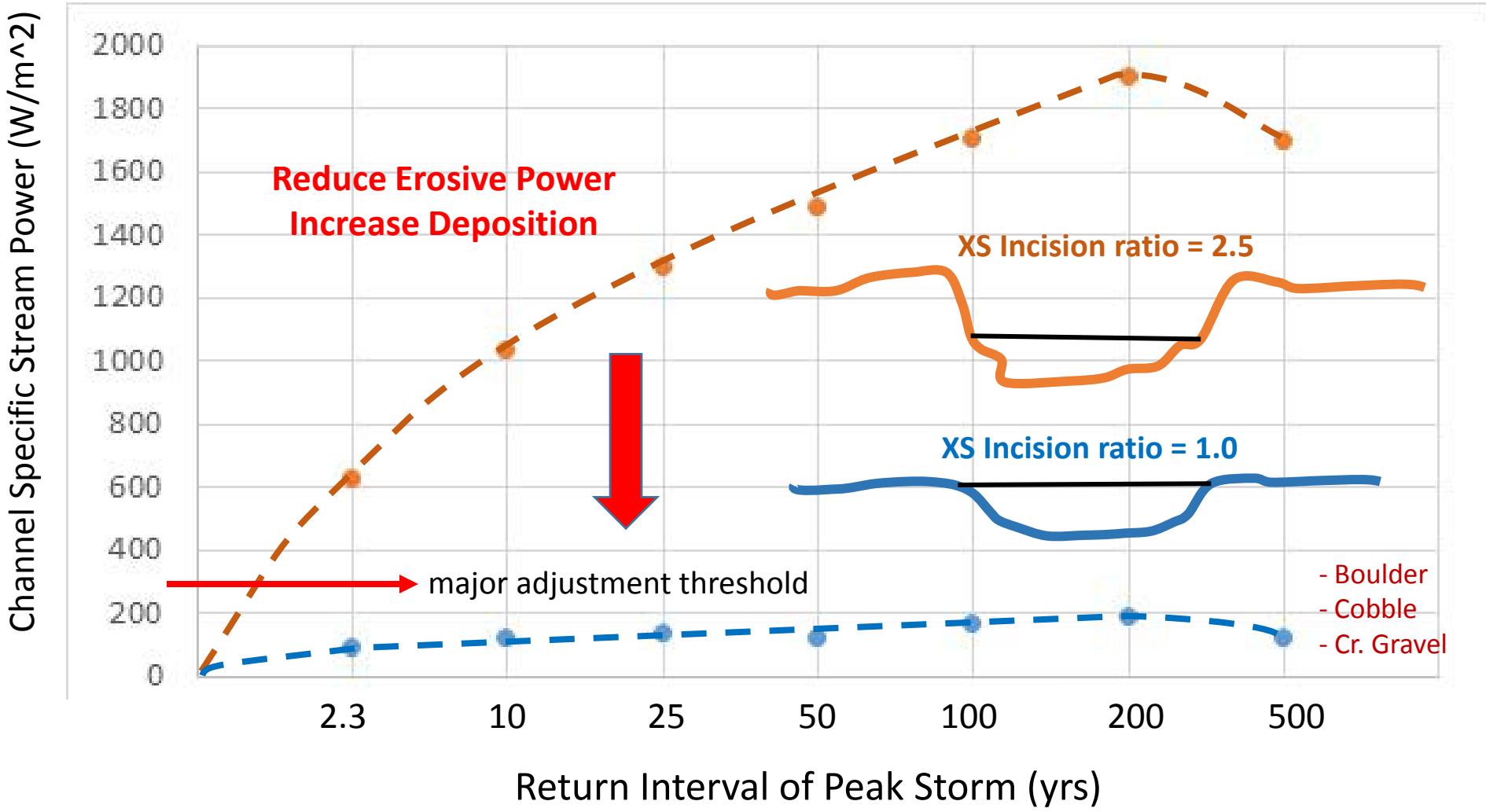


Floodplain connectivity moderates specific stream power which governs erosion and depositional processes and may indicate floodplain and wetland type and function in different valley settings and sediment regimes.

Total Stream Power = $\Omega = \rho\ g\ Q\ S$

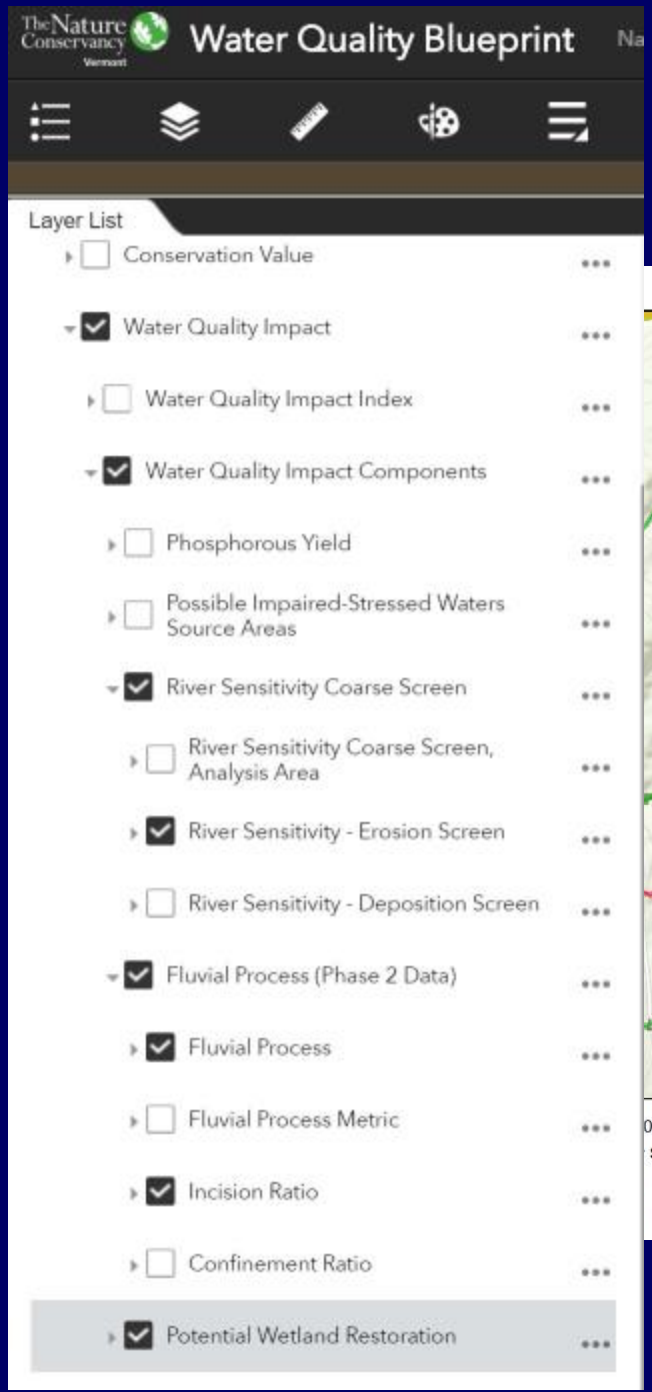
Specific Stream Power = $\omega = \Omega / W$

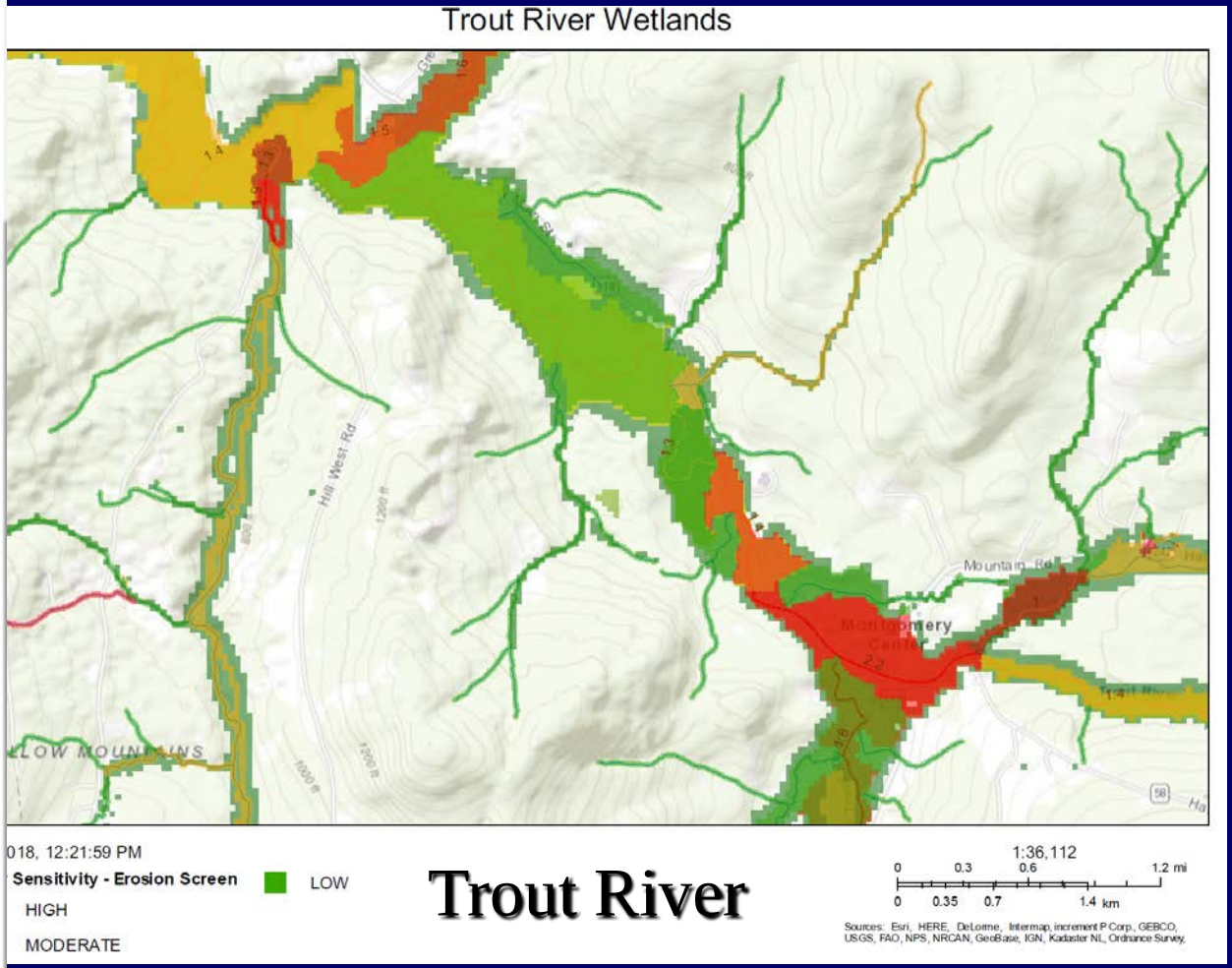
ω is a function of flow depth and slope



Adjoining reaches on the Mad River, VT

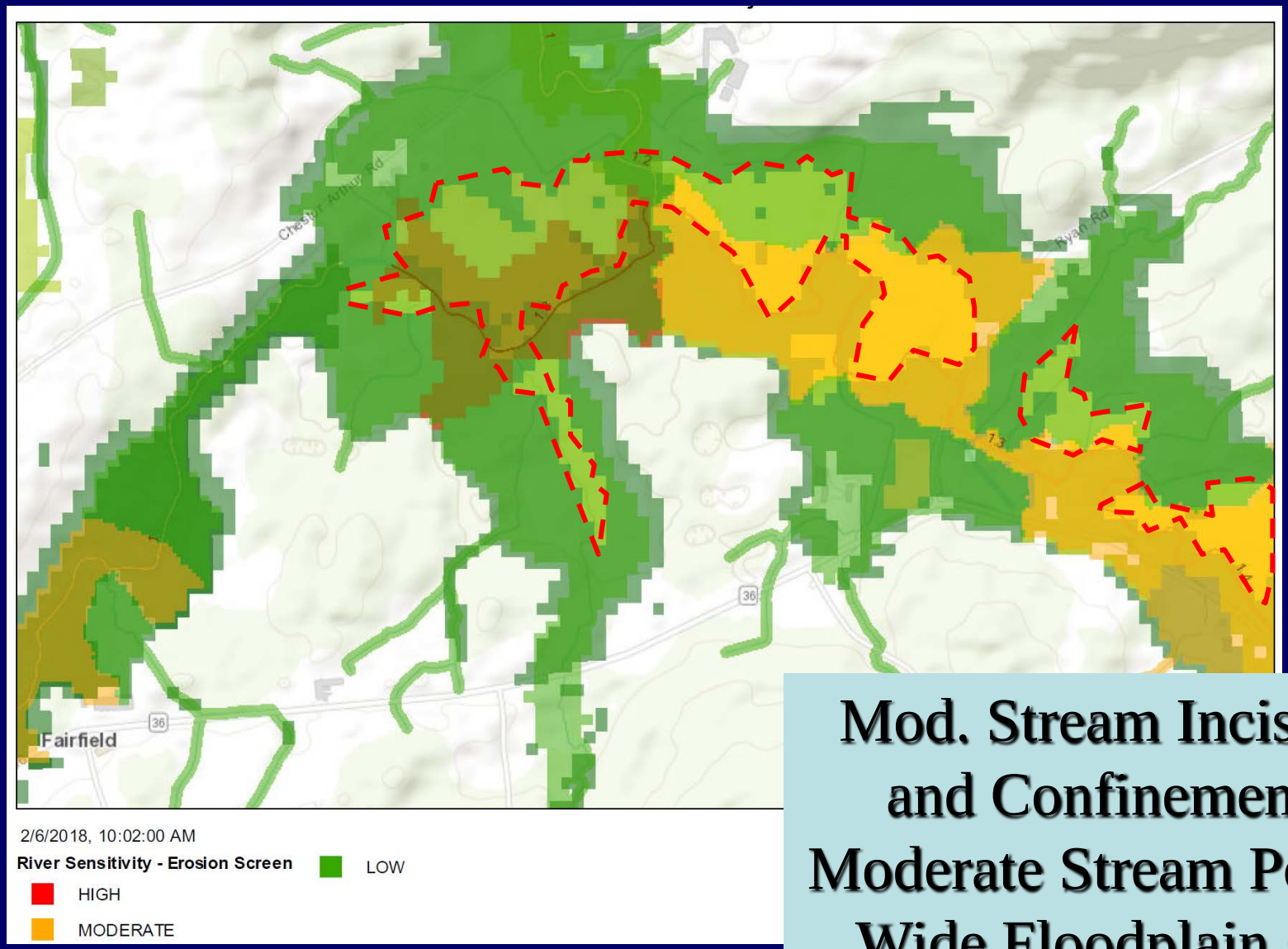
VT TNC Water Quality Blueprint





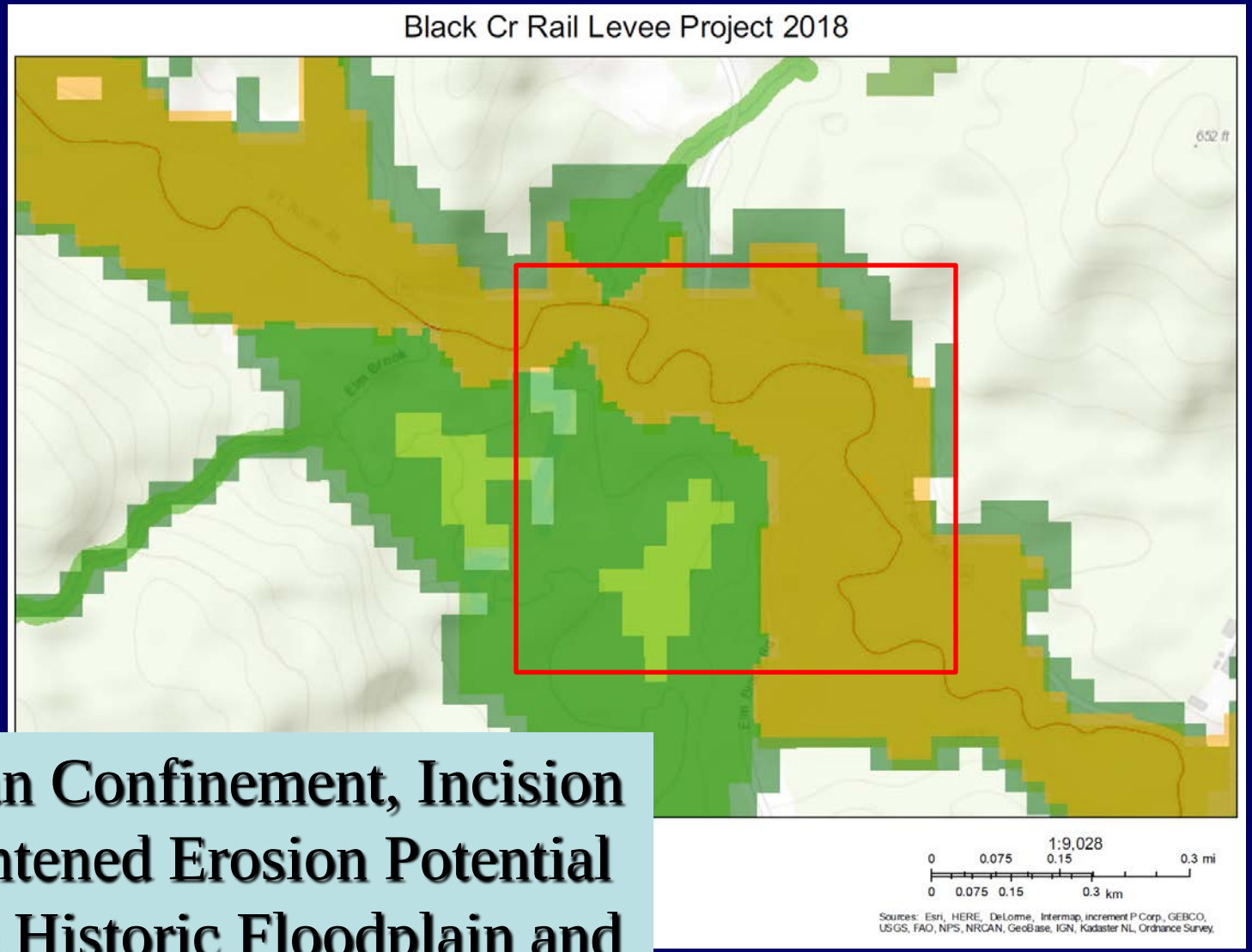
Toward a Watershed Approach

High Priority Black Creek Wetlands and Floodplains



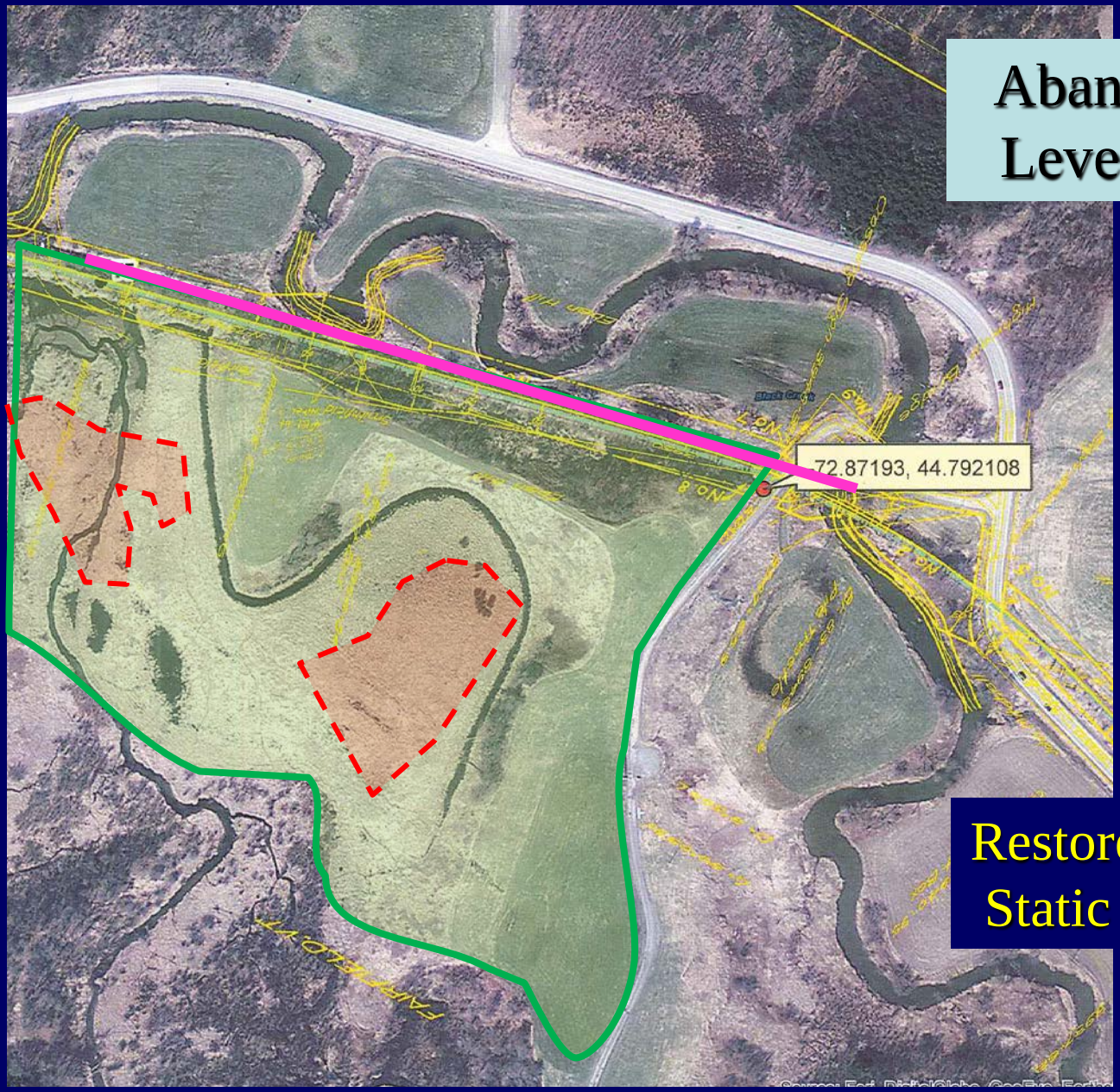
Mod. Stream Incision and Confinement, Moderate Stream Power Wide Floodplain and High Priority Wetland

Black Creek Floodplain-Wetland Restoration Project



Human Confinement, Incision Heightened Erosion Potential Wide Historic Floodplain and High Priority Wetland

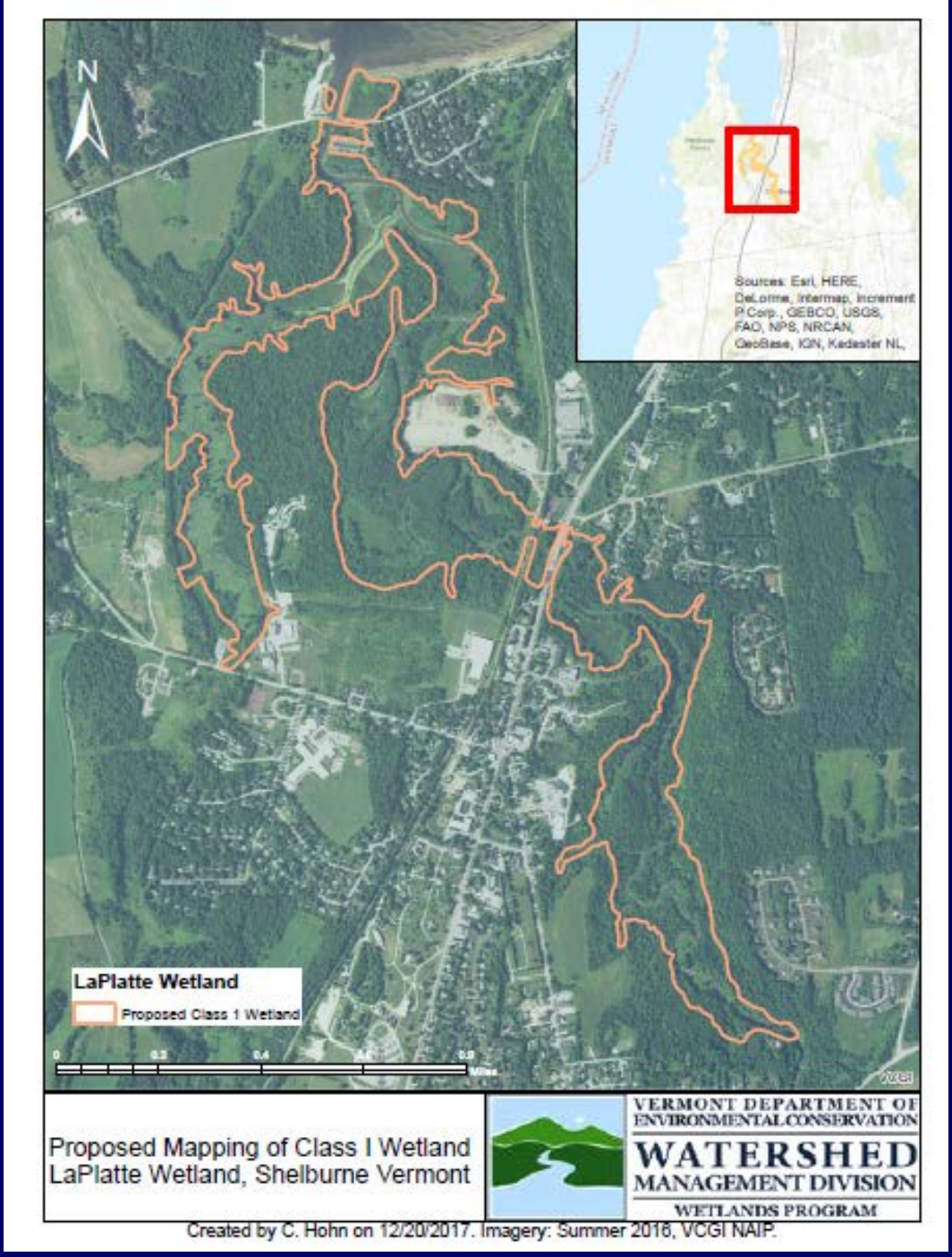
Black Creek Floodplain & Wetland Restoration Project



Abandoned Rail Levee Removal

Restore Processes not Static Wetland Form

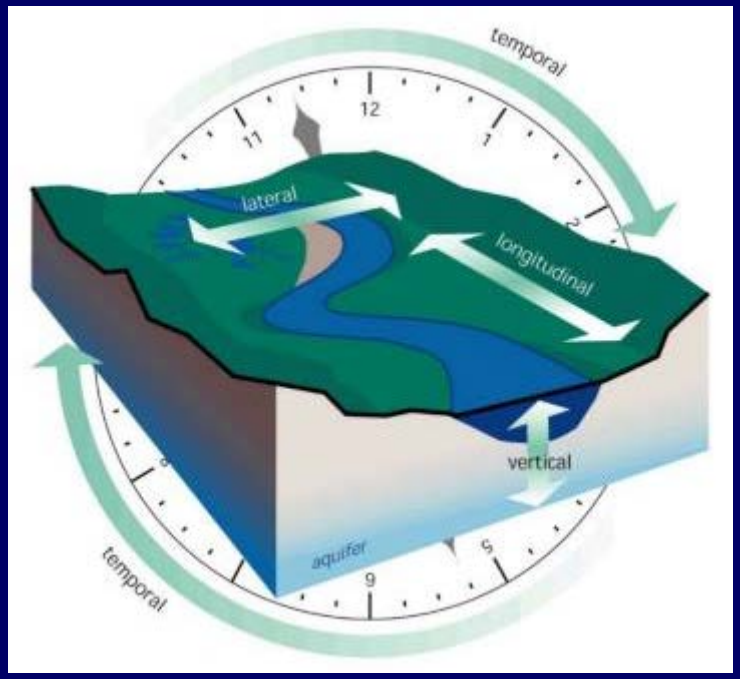
Class I Designations: Increasing protection of exceptional and irreplaceable wetlands.



Maps Support Restoration AND Protection

Flood Resilience – Habitat -- Water Quality

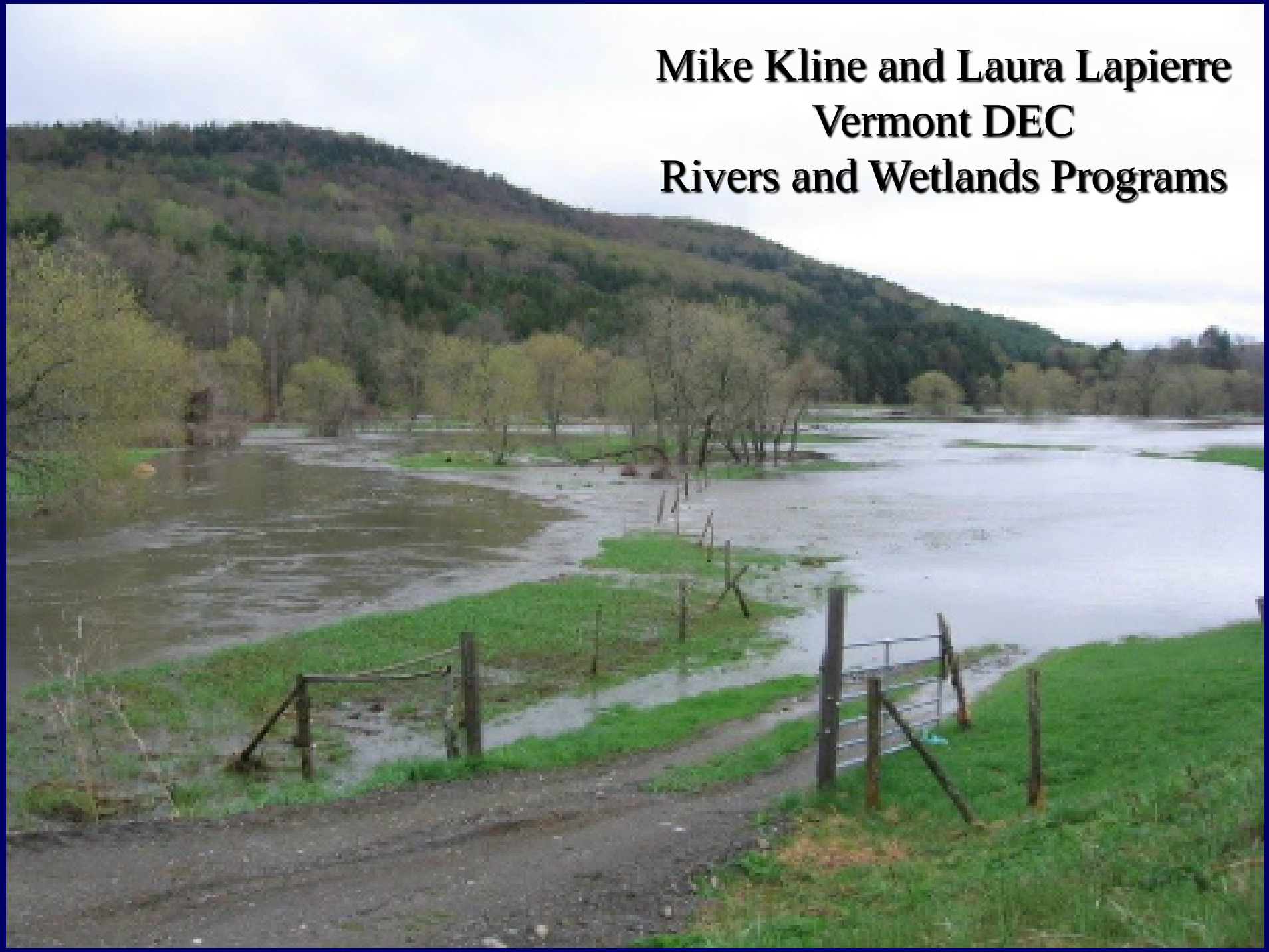
- **Natural Flow Regime:** no change in the pattern of flow rates, annually, seasonally, and daily that would result in less than the full support of designated WQ uses . Flow pattern is characterized by the magnitude, frequency, duration, timing, and rate of change of hydrologic conditions.



- **Equilibrium**: stream alterations shall not result in channel conditions that cause or perpetuate unnatural:
  - aggradation (raising) or
  - degradation (lowering).

- **Connectivity**: stream alterations shall not create a significant disconnect in:
  - the stream bed or banks; or
  - channel from its floodplain.

- **River Corridors**: Proposed development shall not cause the river reach to depart from or further depart from natural stream processes and equilibrium conditions, or the need for stream channelization within the river meander belt.



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Rivers and Wetlands Programs