

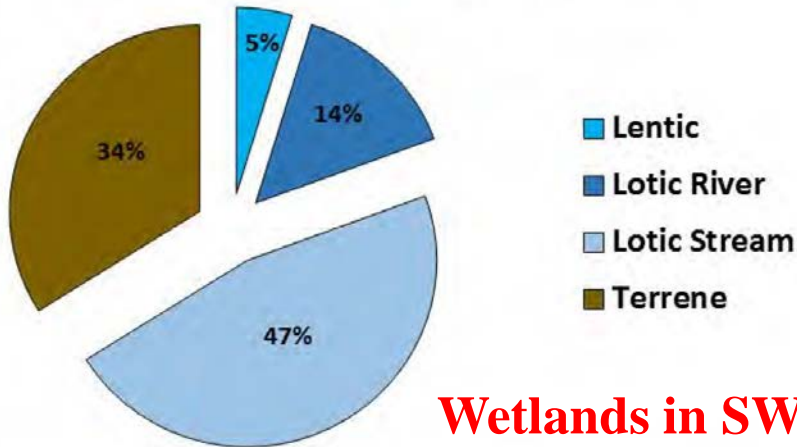


Wetland & Floodplain Functional Assessments and Mapping To Protect and Restore Riverine Systems in Vermont

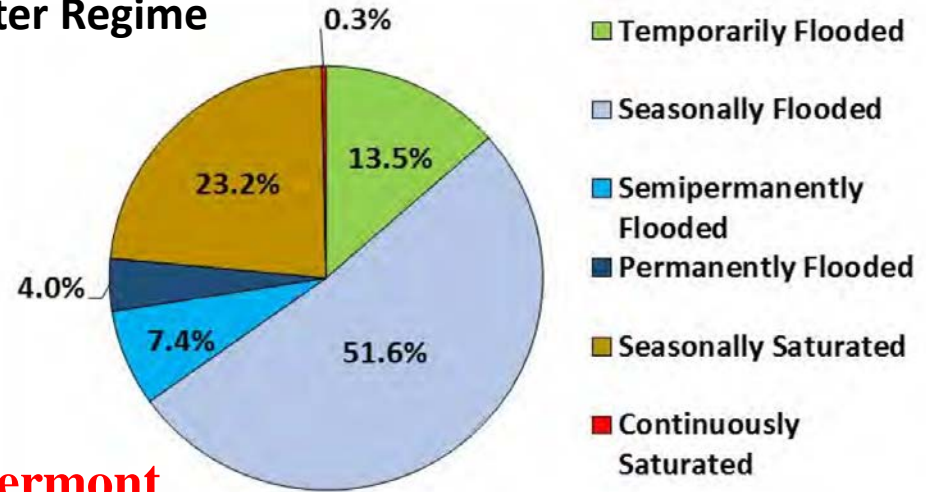
**Mike Kline
Vermont DEC**

NWI+ Hydro-Geomorphic Characterization of Wetlands

Wetlands by Landscape Position and Water Regime

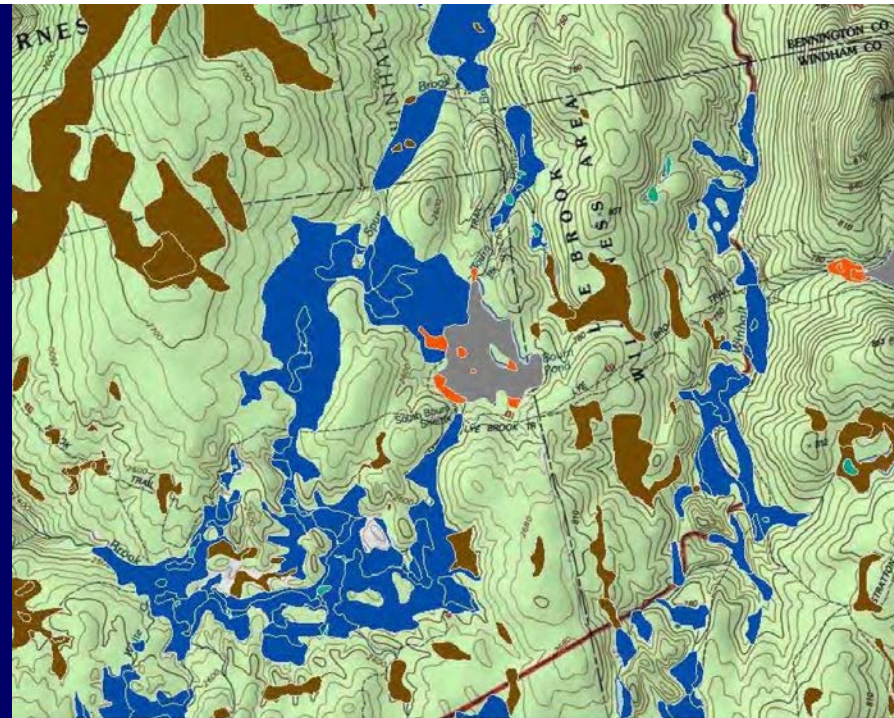


Wetlands in SW Vermont

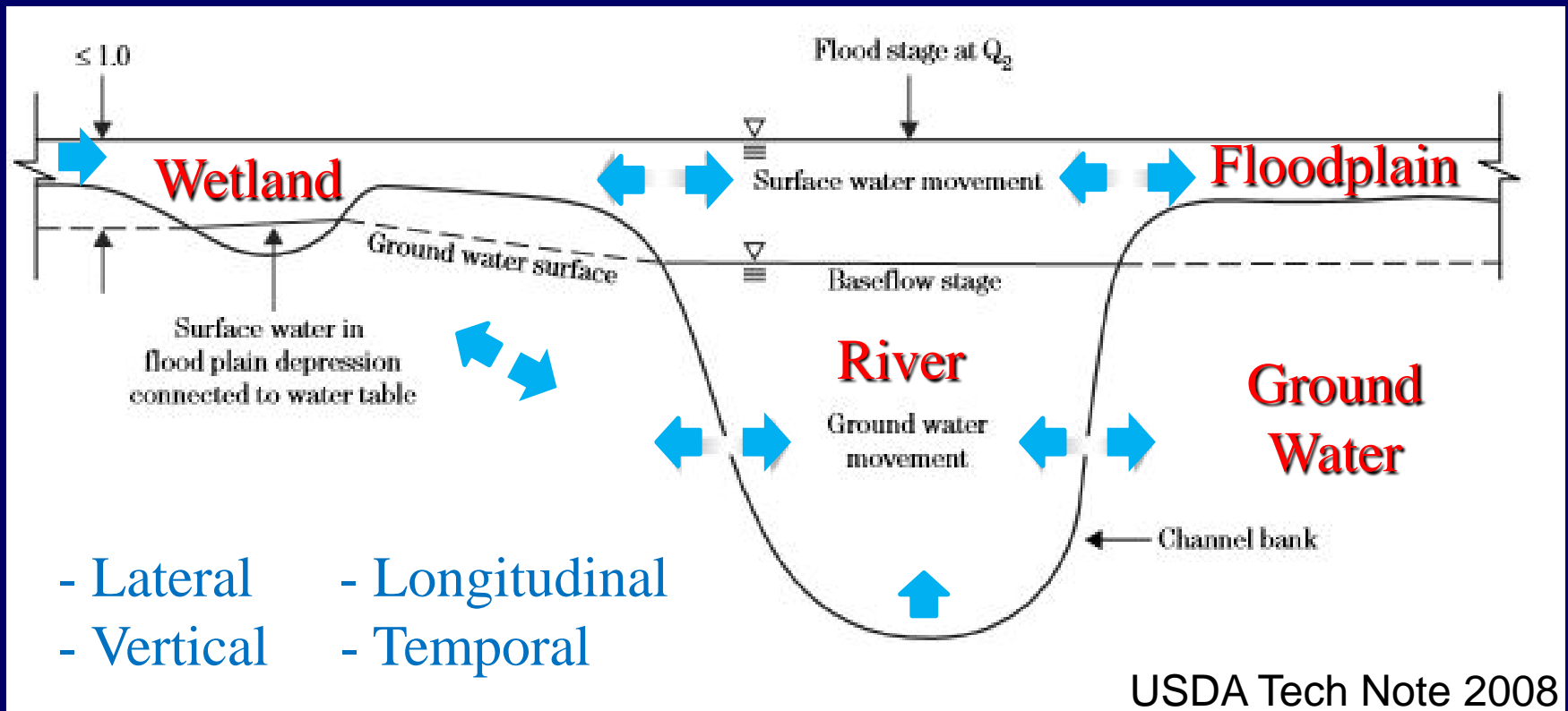


Understanding the natural hydrology will improve wetland restoration.

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



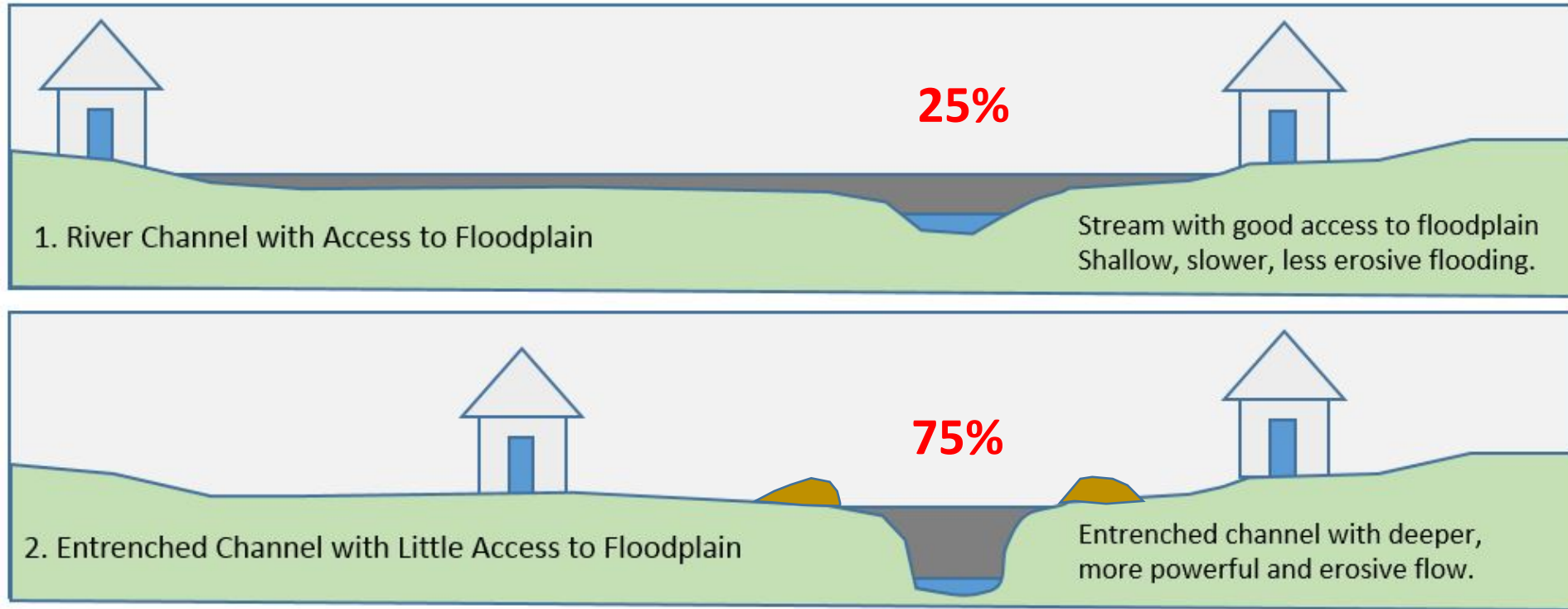
Vermont Wetland and Floodplain Management Goals: Maximize Flood Attenuation, Habitat & Water Quality



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

Our wetland and floodplain mapping needs to start with the river

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.

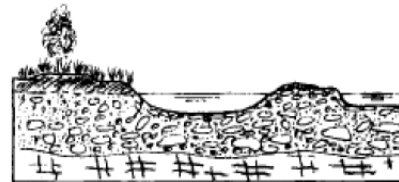
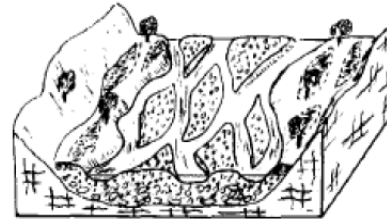
Connectivity, fluvial processes and floodplain topography may be difficult to visually interpret with photos and DEMs

Need accessible, summary parameters to characterize hydro-geomorphic processes

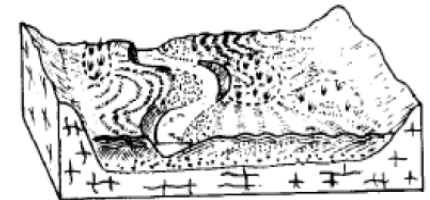
**Specific Stream Power
and Sediment Caliber**

Medium-Energy Floodplains

i) Braided River Floodplain
 $\omega = 50-300\text{Wm}^{-2}$



ii) Lateral Migration, Scrolled Floodplain
 $\omega = 10-60\text{Wm}^{-2}$



iii) Lateral Migration / Backswamp Floodplain
 $\omega = 10 \ll 60\text{Wm}^{-2}$

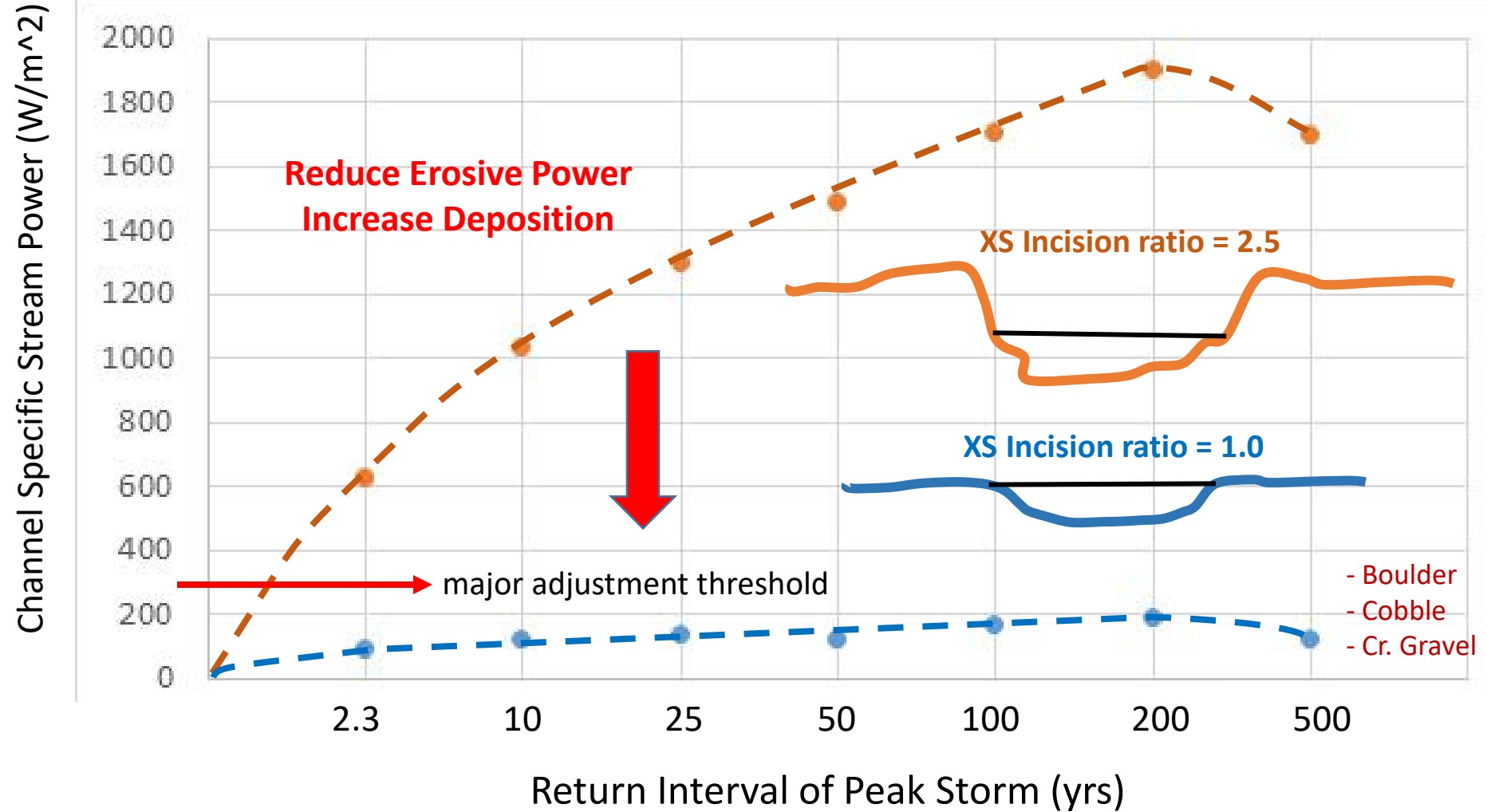


iv) Lateral Migration, Counterpoint Floodplain
 $\omega = 10 \ll 60\text{Wm}^{-2}$



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



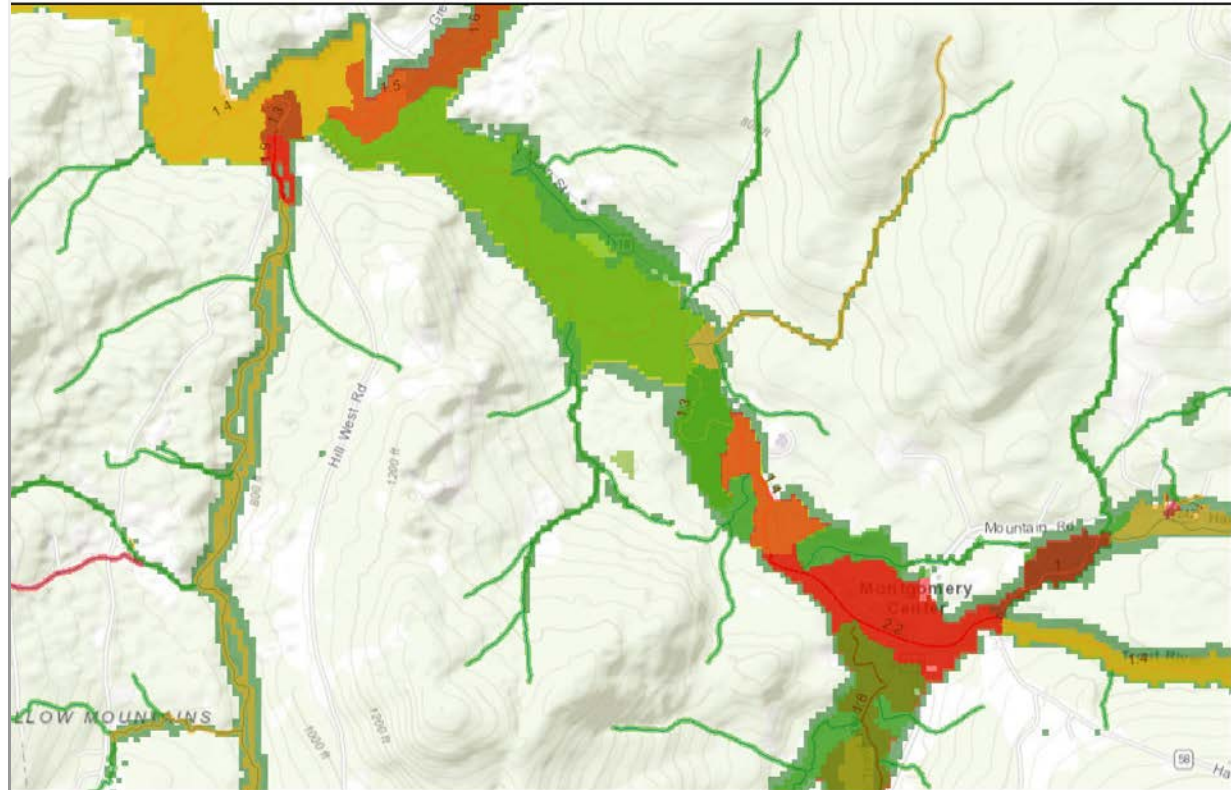
Adjoining reaches on the Mad River, VT

VT TNC Water Quality Blueprint

Layer List

- Conservation Value ...
- Water Quality Impact ...
- Water Quality Impact Index ...
- Water Quality Impact Components ...
 - Phosphorous Yield ...
 - Possible Impaired-Stressed Waters Source Areas ...
 - River Sensitivity Coarse Screen ...
 - River Sensitivity Coarse Screen, Analysis Area ...
 - River Sensitivity - Erosion Screen ...
 - River Sensitivity - Deposition Screen ...
- Fluvial Process (Phase 2 Data) ...
 - Fluvial Process ...
 - Fluvial Process Metric ...
 - Incision Ratio ...
 - Confinement Ratio ...
- Potential Wetland Restoration ...

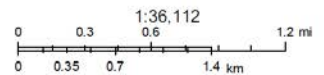
Trout River Wetlands



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Sensitivity - Erosion Screen ■ LOW
 HIGH
 MODERATE

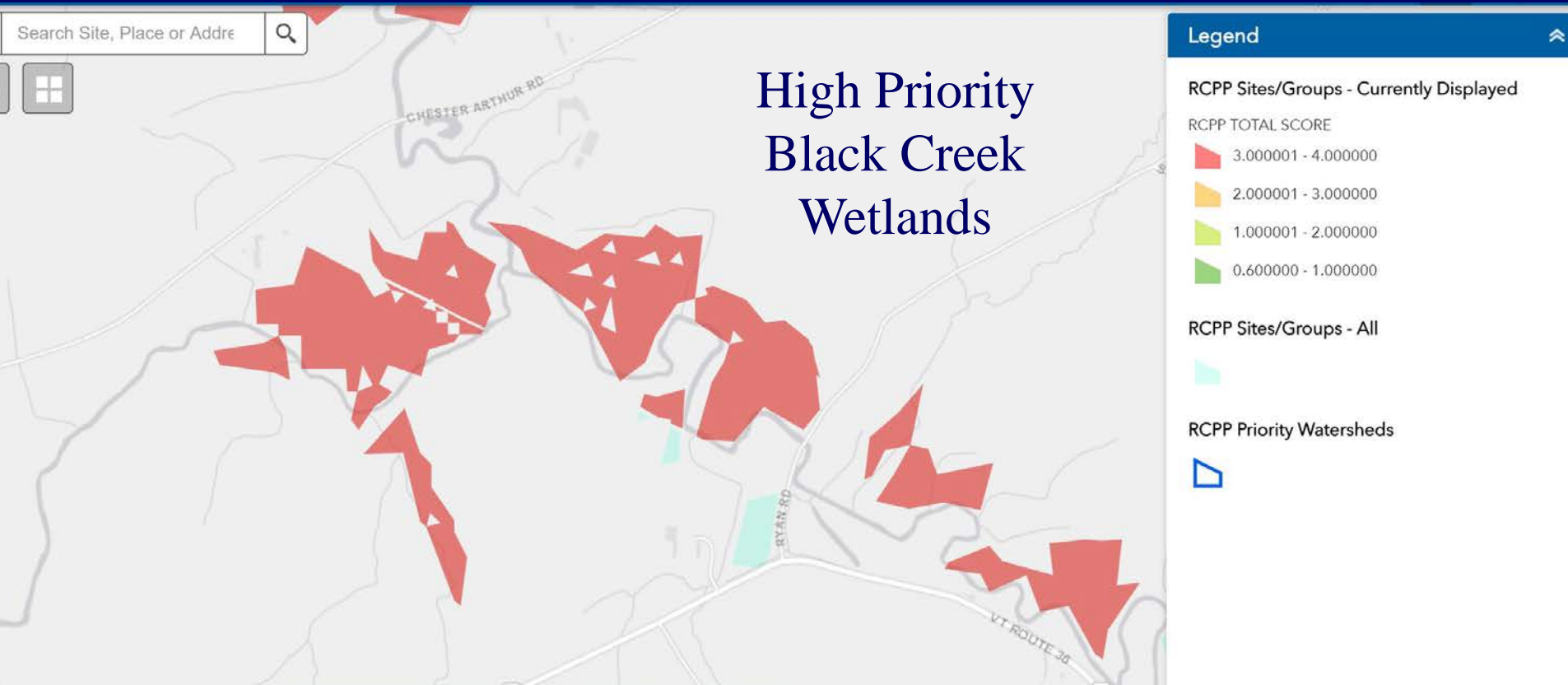
Trout River



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeBCast, IGN, Kadaster NL, Ordnance Survey.

Toward a Watershed Approach

TNC Blueprint includes the Lake Champlain Wetland Restoration Plan



Prioritizing wetland restoration (for nutrient retention):

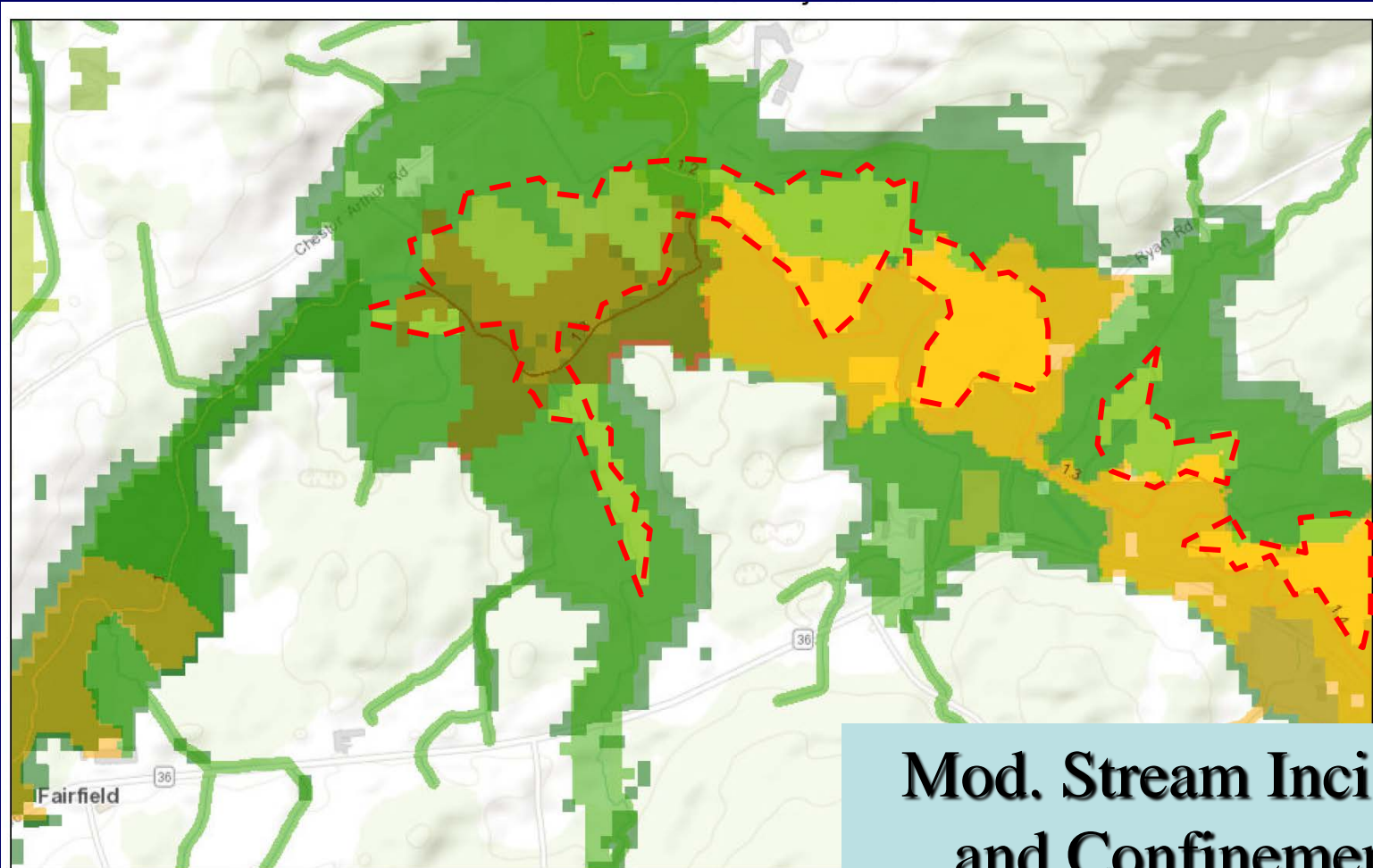
Site Function

- 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

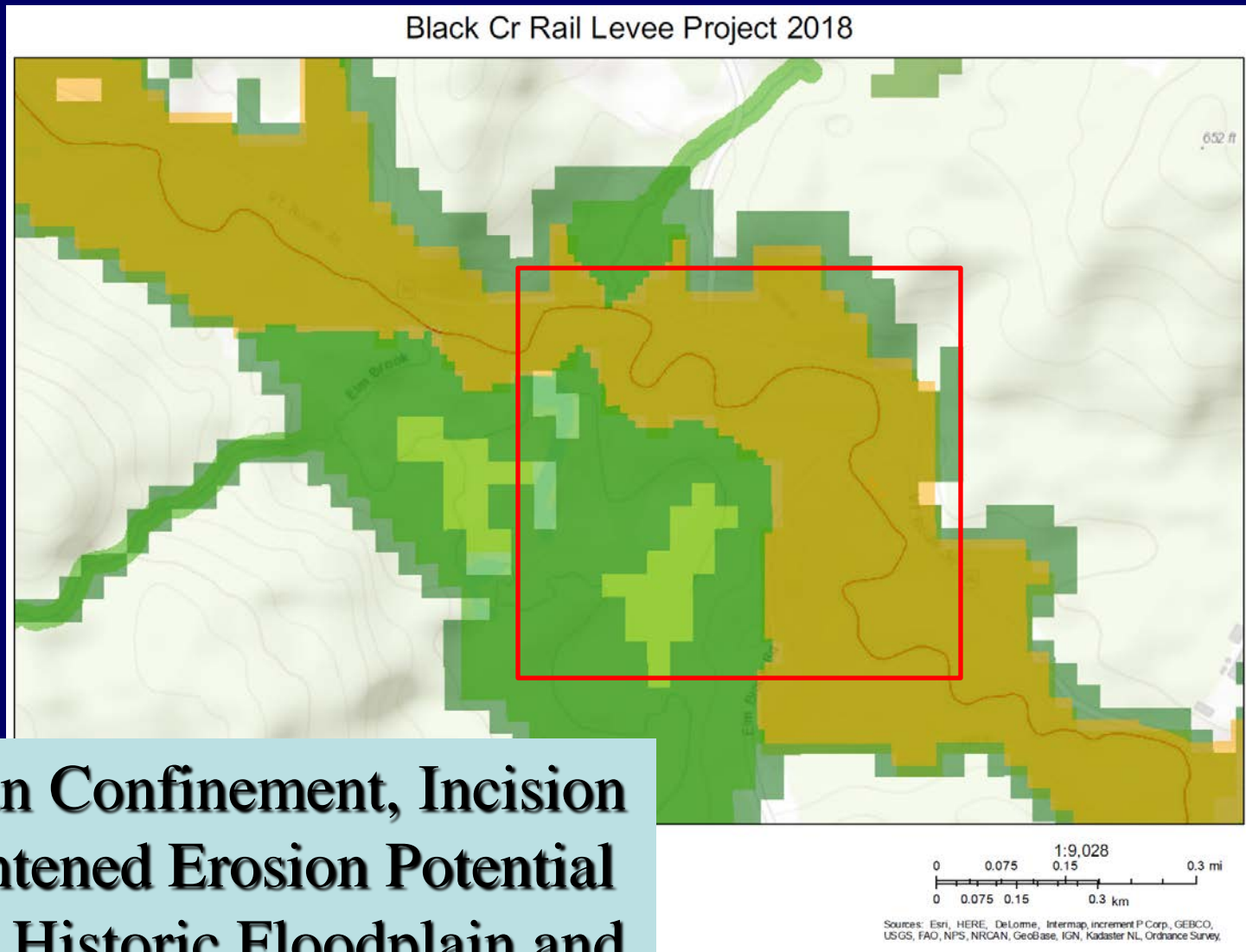
High Priority Black Creek Wetlands and Floodplains



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River Sensitivity - Erosion Screen ■ LOW
■ HIGH
■ MODERATE

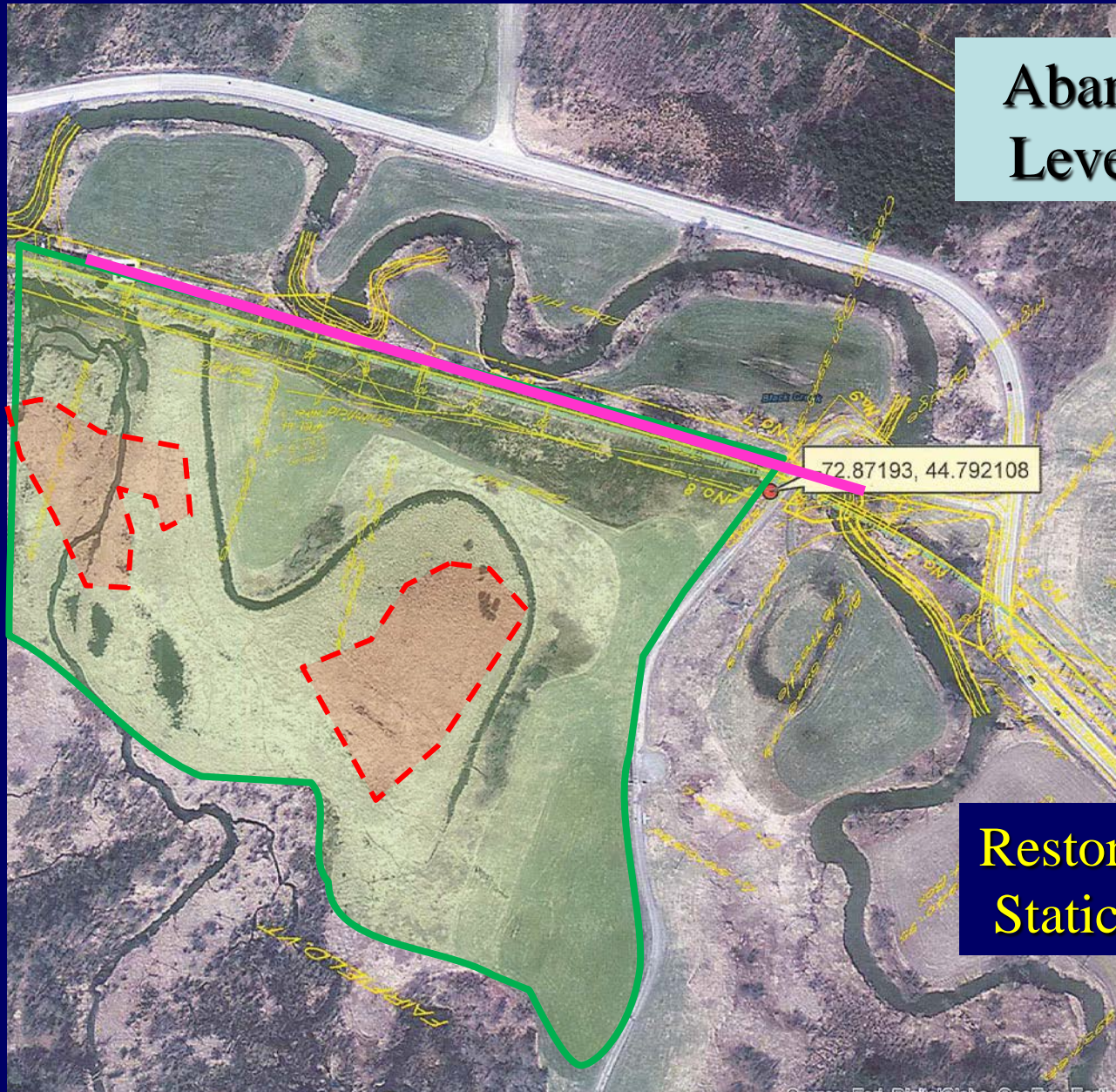
**Mod. Stream Incision
and Confinement,
Moderate Stream Power
Wide Floodplain and
High Priority Wetland**

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



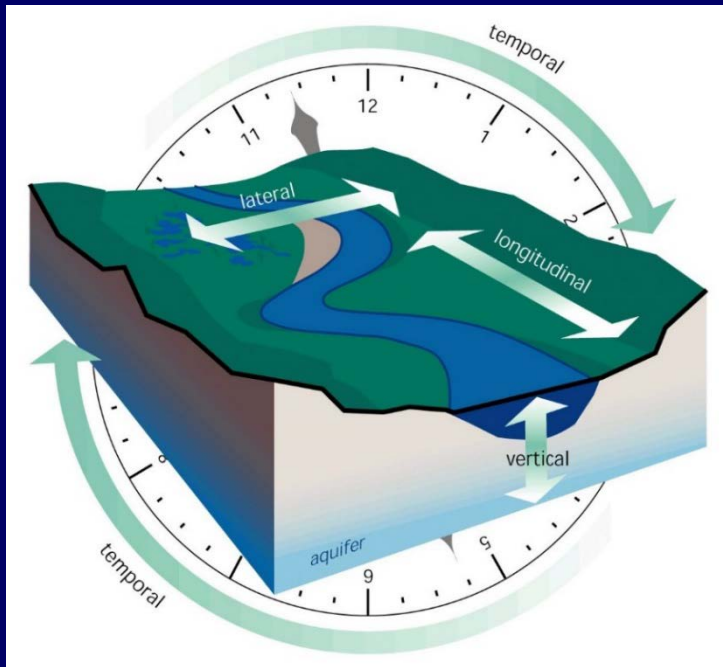
**Abandoned Rail
Levee Removal**

**Restore Processes not
Static Wetland Form**

Maps Needed to Apply VT Performance Standards

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.

**Mike Kline
Vermont DEC
Rivers Program**

