

# Mapping Vermont's Critical Watershed Resource Areas: Data Integration using the Recovery Potential and Healthy Watersheds Approach.

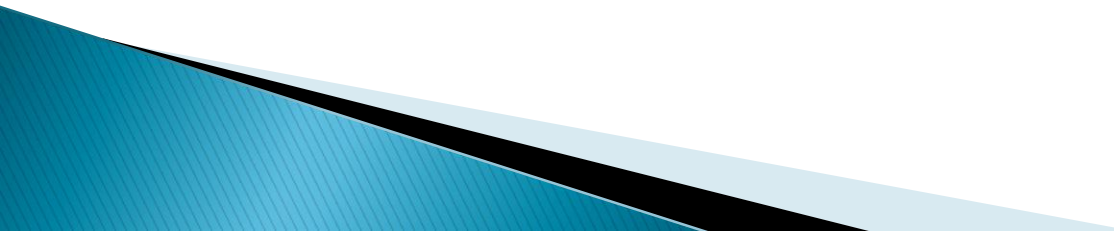
Neil Kamman, VTDEC

Laura Gabanski, USEPA OWOW

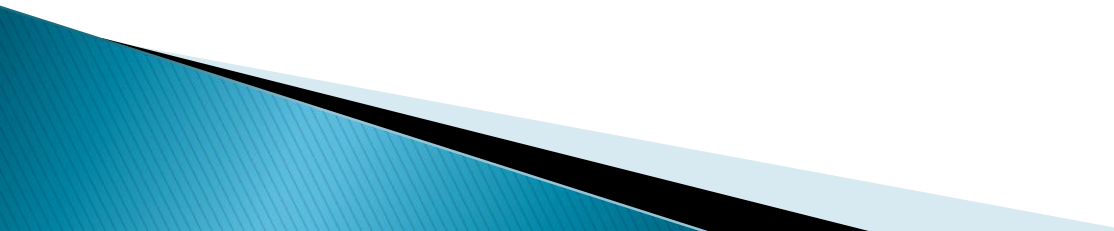
Corey Godfrey, Cadmus Group

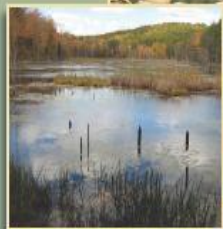
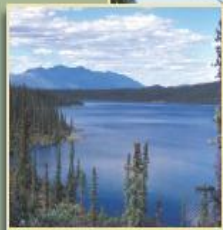
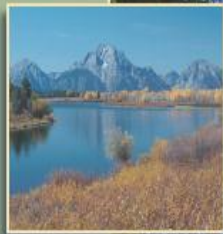
...and many others...

# Itinerary

- ▶ Healthy Watersheds and Recovery Potential
  - ▶ Demonstration of Healthy Watershed Analysis in VT
  - ▶ Intersection with Recovery Potential
  - ▶ Integrated assessments guide implementation of the VT Surface Water Management Strategy
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# Healthy Watersheds Identification

- ▶ Healthy watersheds (entirety or as components) have intact/connected and functioning biology, habitat, water chemistry, sediment transport and fluvial geomorphology, hydrology, and vegetative cover in the landscape.
  - ▶ Process is defined at six basic hierarchal levels of evaluation (HWI technical document, [www.epa.gov/healthywatersheds](http://www.epa.gov/healthywatersheds))
  - ▶ Product of EPA OWOW – NPS Program Branch
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# Identifying and Protecting Healthy Watersheds

Concepts, Assessments, and Management Approaches

February 2012

# Healthy Watersheds Identification

## Healthy Watersheds Assessment Component



Landscape Condition

Definable using landscape metrics in GIS



Habitat

Landscape metrics in GIS, with monitoring data



Hydrology

GIS evaluation of infrastructural controls on hydrology



Geomorphology

May be remotely sensed, but must be field verified



Water Quality

Field measurements and modeling



Biological Condition

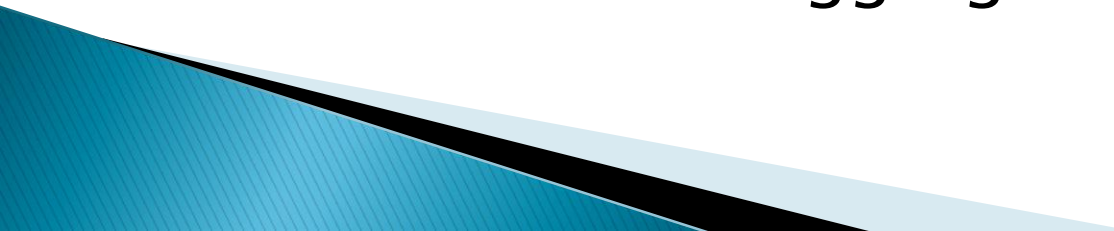
Field measurements, period.

# Recovery Potential Evaluation

- ▶ Intersection of
  - Empirically derived probability that a site/reach/HUC can be restored
  - Social likelihood that restoration can be achieved
- ▶ Like HW, each recovery potential “axis” has multiple indicators.
- ▶ Product of EPA OWOW – TMDL Program Branch



# VT's involvement in these processes

- ▶ VT Natural Heritage Program has analyzed habitat contiguity and blocks across the state.
  - ▶ VT's River Science Program was highly informative to both EPA efforts
  - ▶ VT Integrated bio, chem, and physical assessment programs provide useful data for State of modest aggregated capabilities
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# HW Evaluation in VT

## Landscape Condition

- ▶ Contiguous Habitat Block Analysis to identify areas of intact vegetative cover important for maintaining natural hydrology and nutrient/organic matter input into the aquatic ecosystem.
  - *HWI indicator was % of HUC in connected natural lands*
- ▶ Active River Area (TNC) used to define areas of river corridor and floodplain connectivity.
  - *HWI indicator was % of natural land in active area*



# Landscape Condition

- ▶ Considerable areas of habitat contiguity in HUC
- ▶ Note river corridor and floodplains creates a perceived block in E-W migration
- ▶ However, ARA in many of these areas is in natural cover.



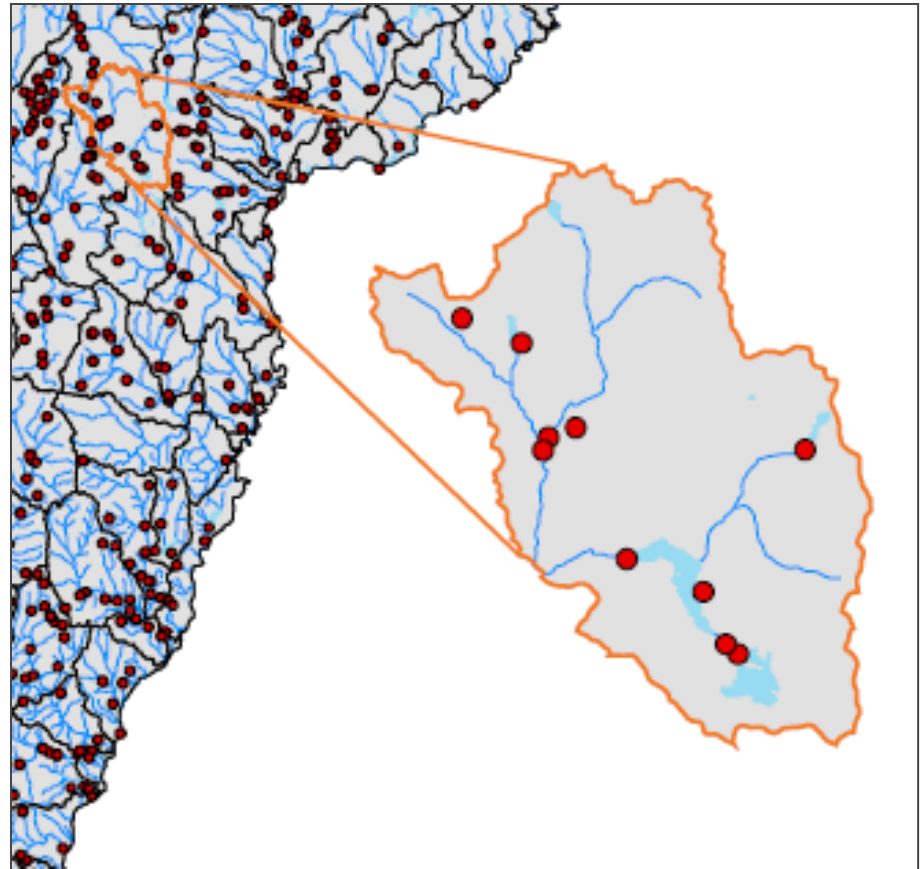
# Habitat Condition

- ▶ Number of dams per stream mile
  - *Assesses AOP, thermal modification, disequilibrium threats*
- ▶ % of total mapped wetlands in Class I and II
  - *Direct aquatic habitat, connectivity between stream, and lake habitats, WQ functions and values*
- ▶ A moderate amount of wetland cover is evident in this HUC – large complex in the western portion, and a chain of floodplain wetlands upstream of Cabot




# Hydrologic Modification

- ▶ HWI Metric:  
Impounded  
volume relative to  
annual flow
- ▶ 10 dams in HUC
- ▶ East portion of  
watershed has  
large annual  
impounded  
volume

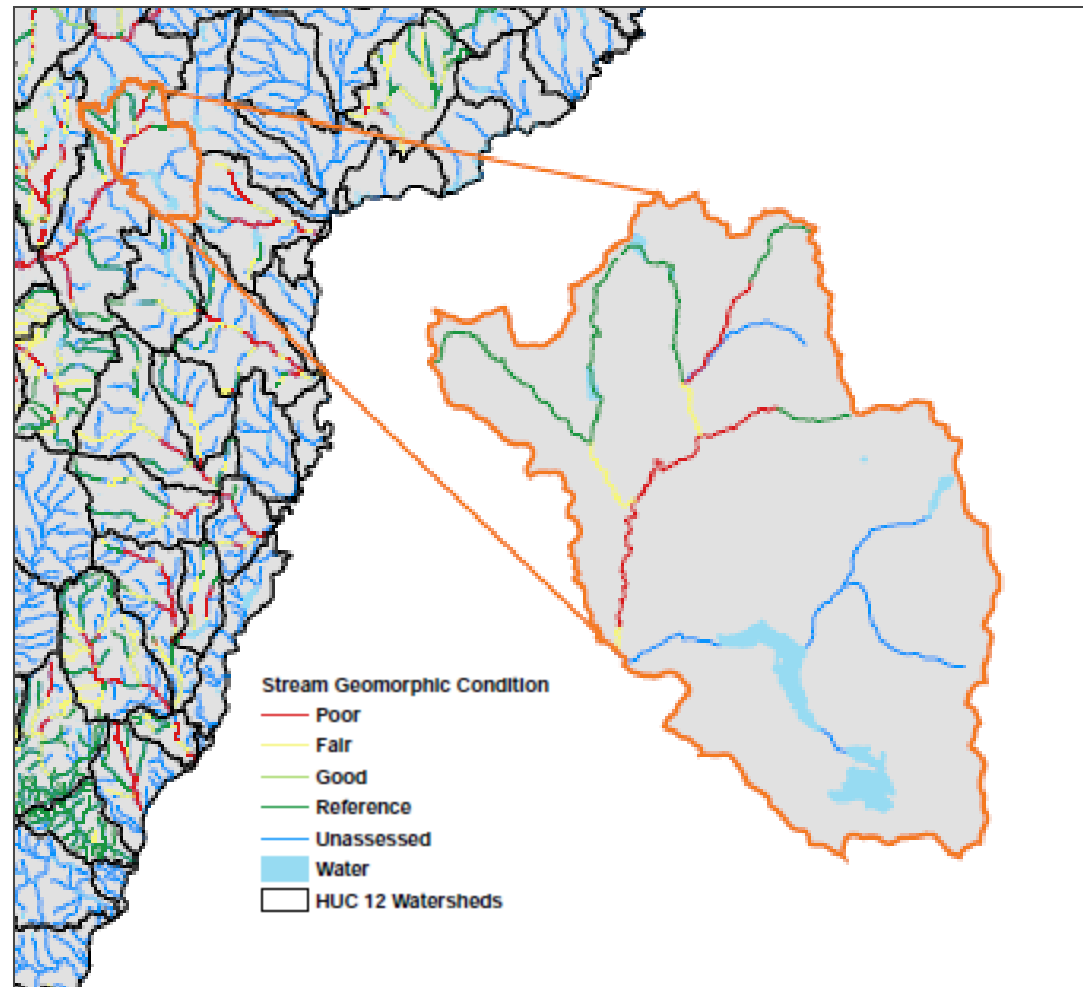


# Geomorphology (Physical Integrity)

- ▶ VT has very advanced stream geomorphic assessment program
  - ▶ 75% of State has been assessed at Phase I
  - ▶ 35% at Phase II
  - ▶ Corridor Plans in many watersheds
  - ▶ HWI Thresholds
    - Reference: Equilibrium Condition
    - Good: Minor adjustment from equilibrium, or re-approaching equilibrium
    - Fair: Loss of floodplain access due to incision, or moderate to major planform adjustments
    - Poor: In active re-adjustment with highly altered sediment, thermal, and CWD regimes
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# Geomorphology

- ▶ 1 / 2 of HUC assessed
- ▶ Headwaters exhibit equilibrium, but stream in downtown Cabot town center is “unraveling”



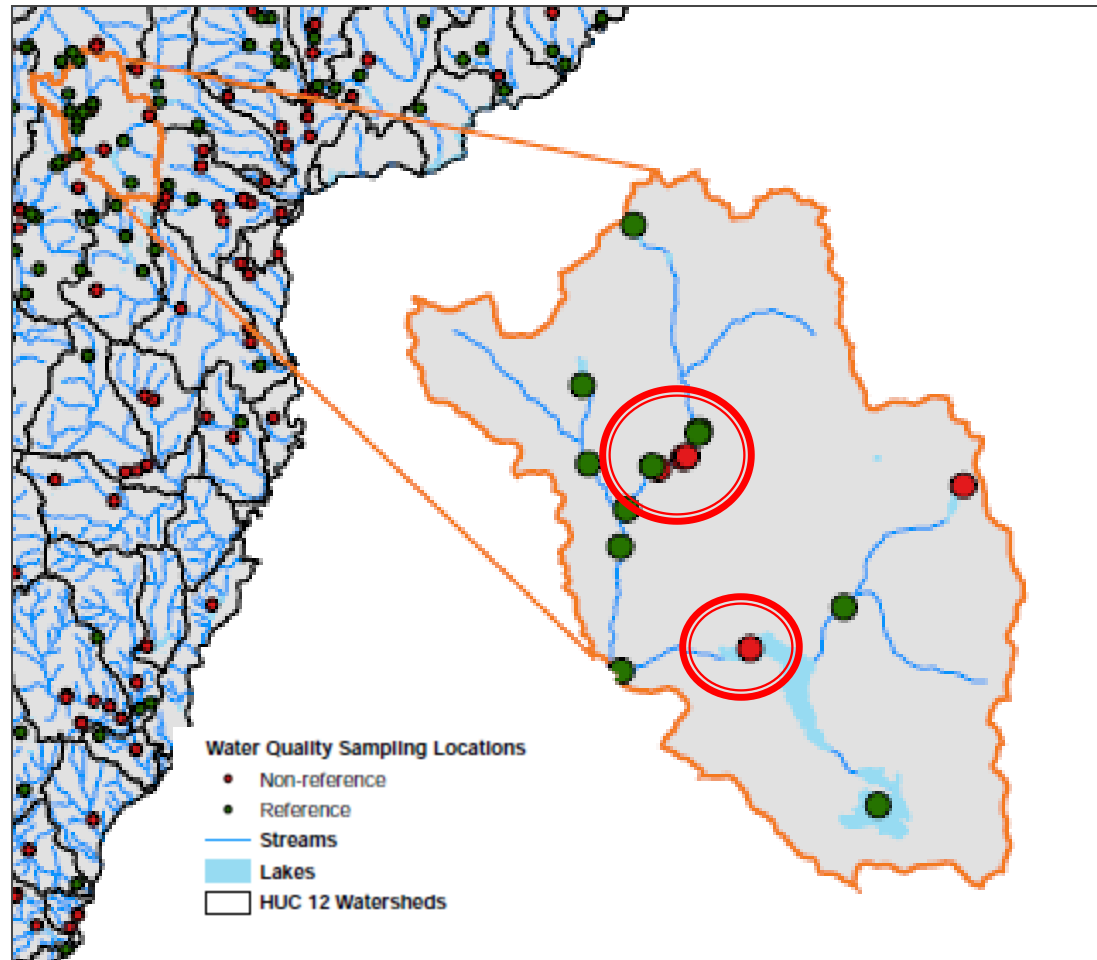
# Water Quality

- ▶ VT has a mature WQ monitoring program consisting of a wide network of State, Partner, and Volunteer–managed sites.
- ▶ Over 1500 individual locations available
- ▶ HWI thresholds based on National Wadeable Streams Assessment reference screening criteria for sites.
  - *Good: Within upper 75<sup>th</sup> percentile of reference distributions*
  - *Fair: 5<sup>th</sup> – 25<sup>th</sup> percentile of reference distributions*
  - *Poor: <5<sup>th</sup> percentile of reference distribution.*



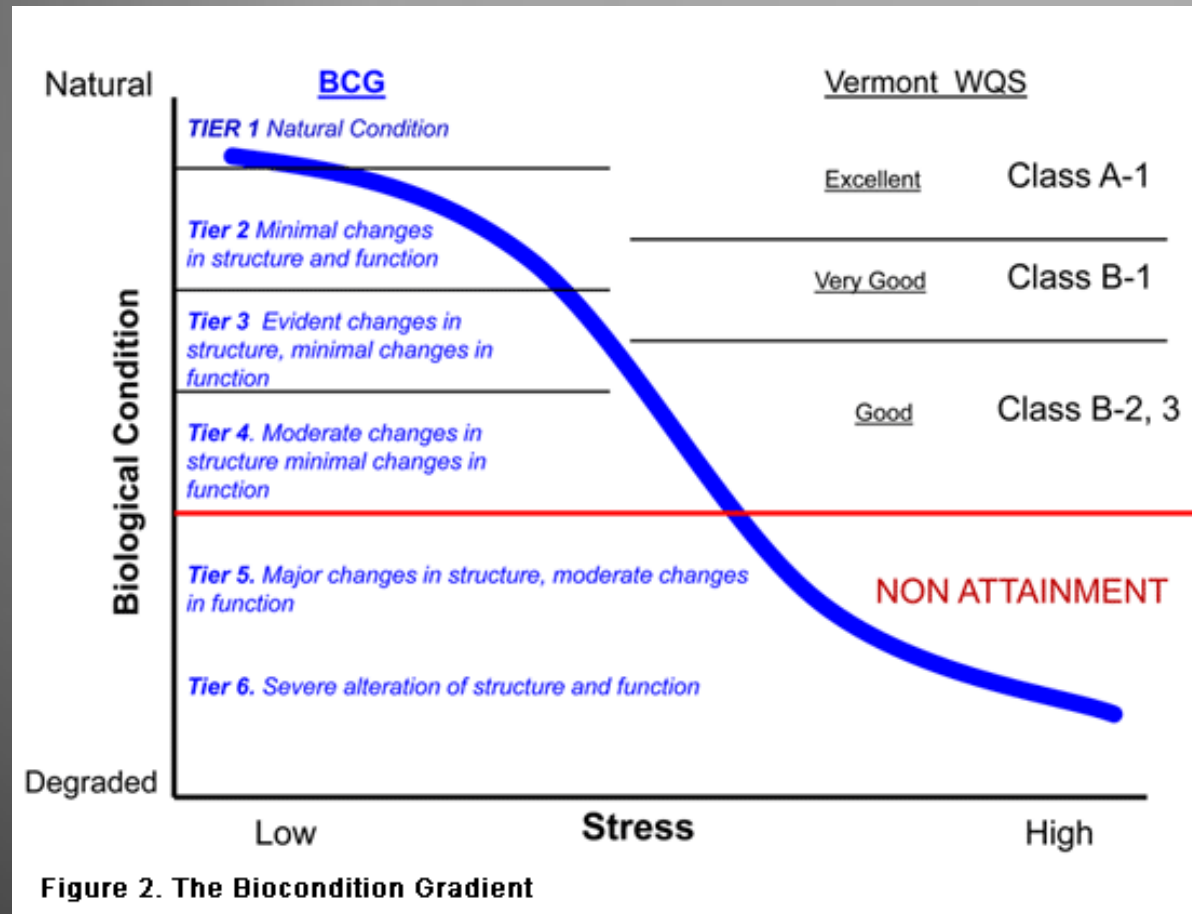
# WQ Monitoring locations in reference condition

- ▶ Majority of sites in reference condition
- ▶ Dam outlet and Cabot Town Center are issues problem areas



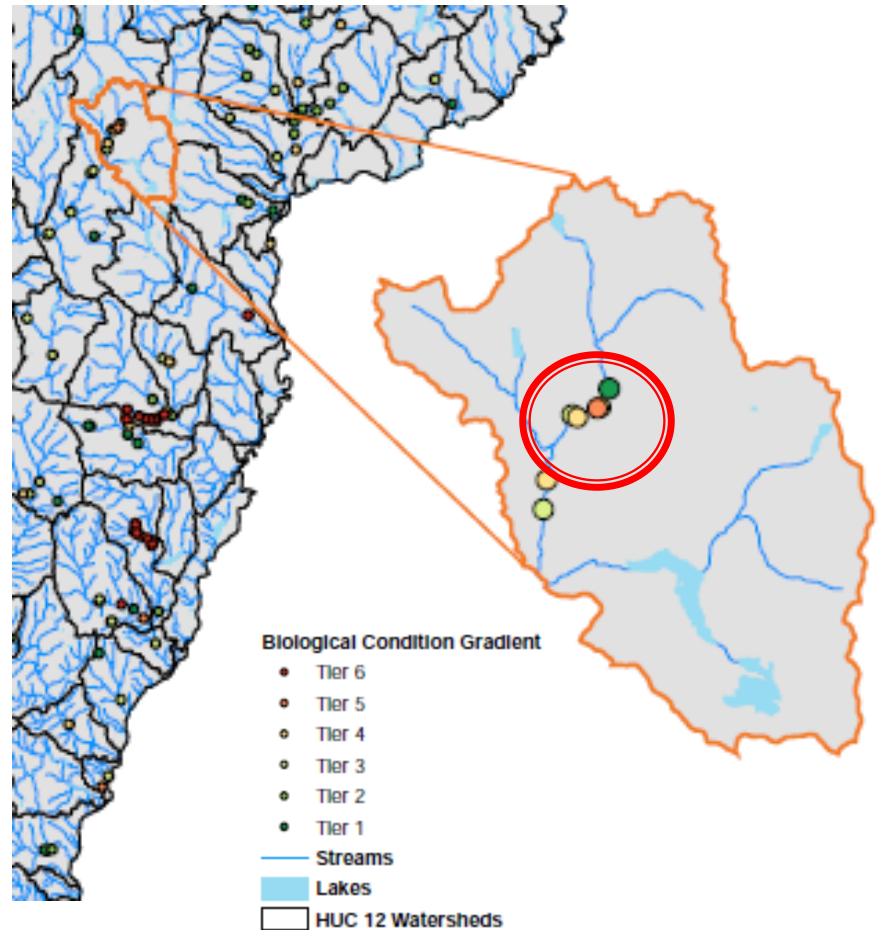
# Biotic Integrity

- ▶ VT has a mature ambient biomonitoring program.
- ▶ Over 1800 individual locations sampled
- ▶ Macroinvertebrate and fish indicators in VT's procedures
- ▶ HWI thresholds based on Tiered Aquatic Life Use framework



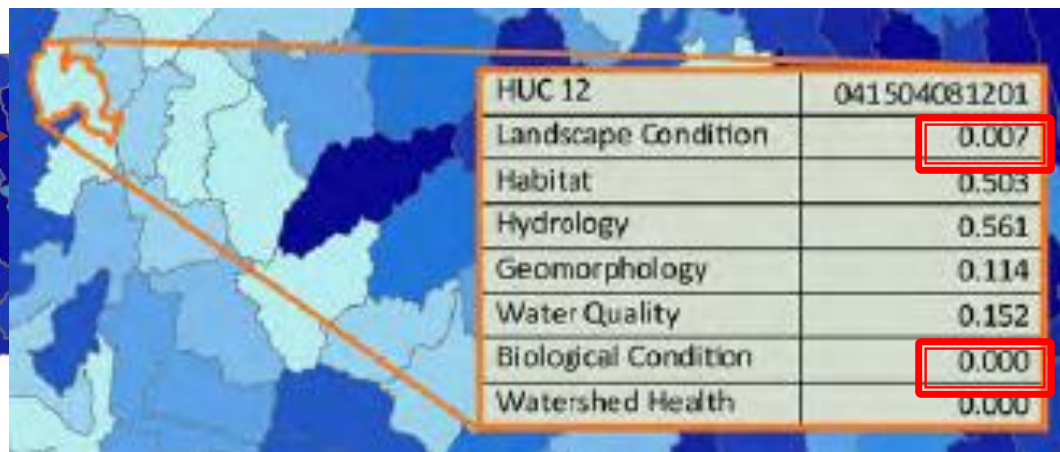
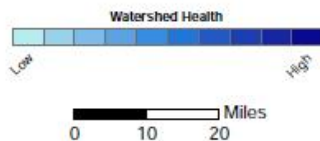
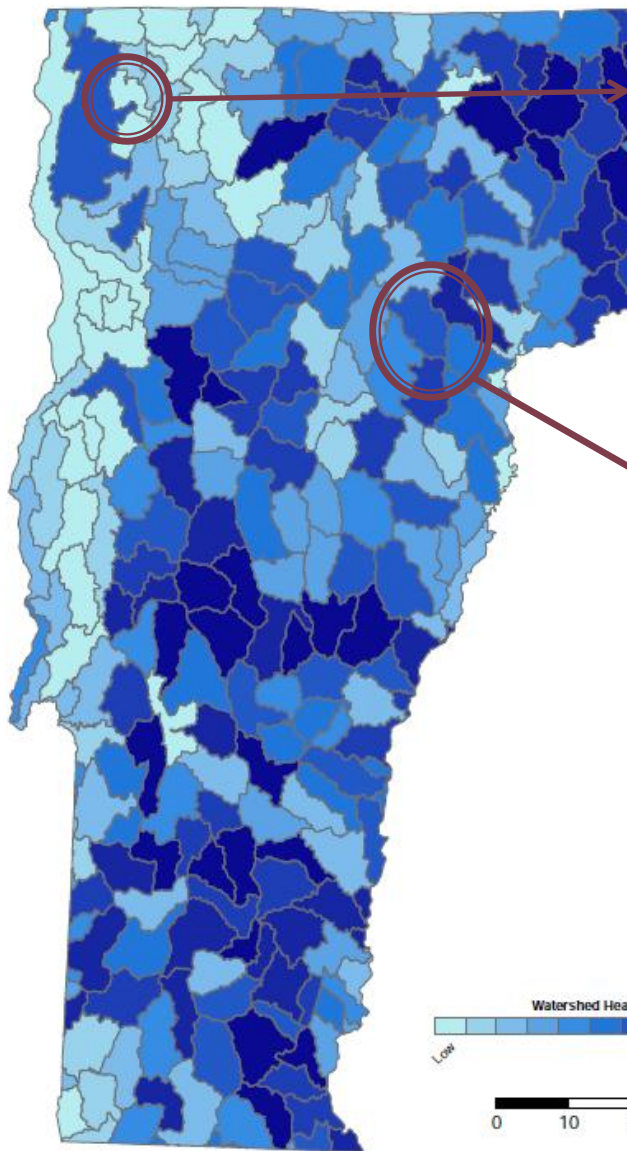
# Biotic Integrity using TALU

- ▶ Only one true reference site in HUC
- ▶ Data are sparse for a comprehensive assessment of this HUC.
- ▶ Stresses to BI in Cabot

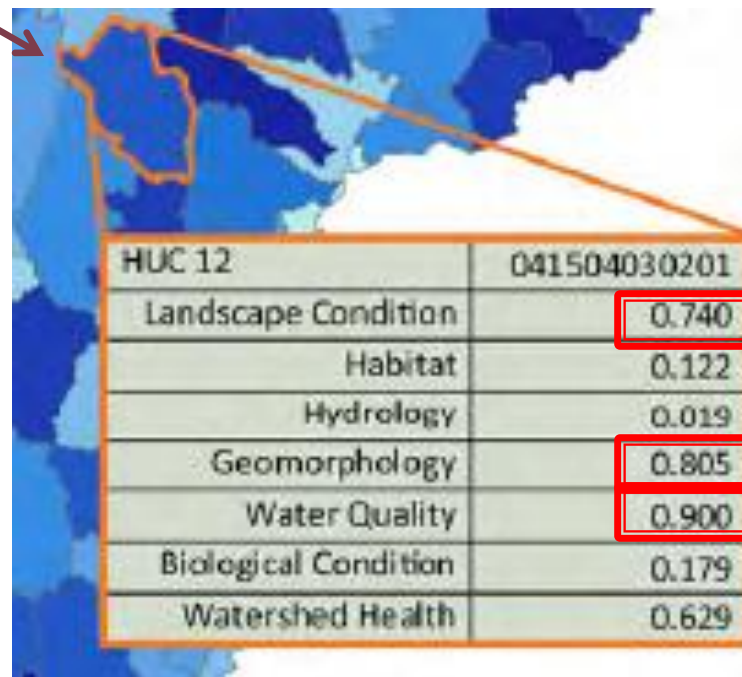


# Integrating the Assessments

- ▶ Each indicator normalized
- ▶ No weighting was applied
  - Food for thought – is it reasonable to weight SGA's and biological assessments higher due to the strength of these assessments and importance in regulatory processes?
- ▶ Sum of scores scaled lowest watershed health to highest

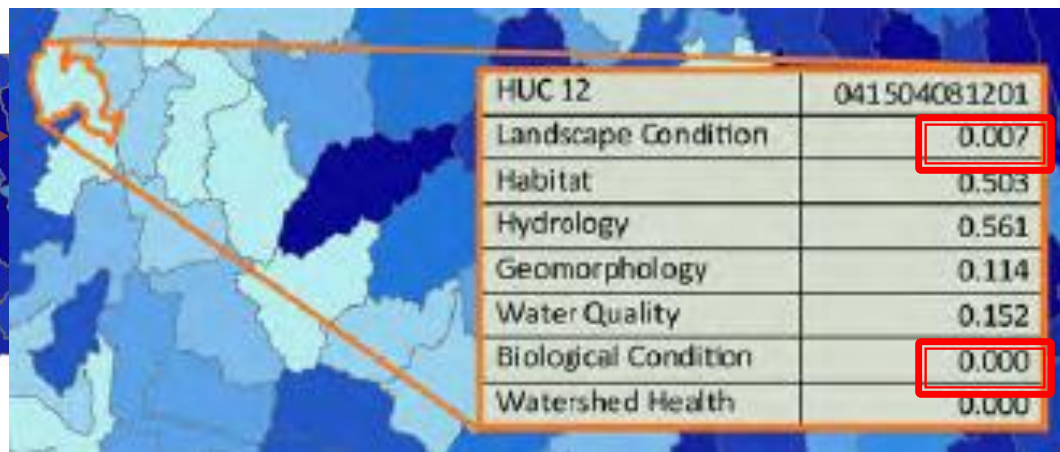
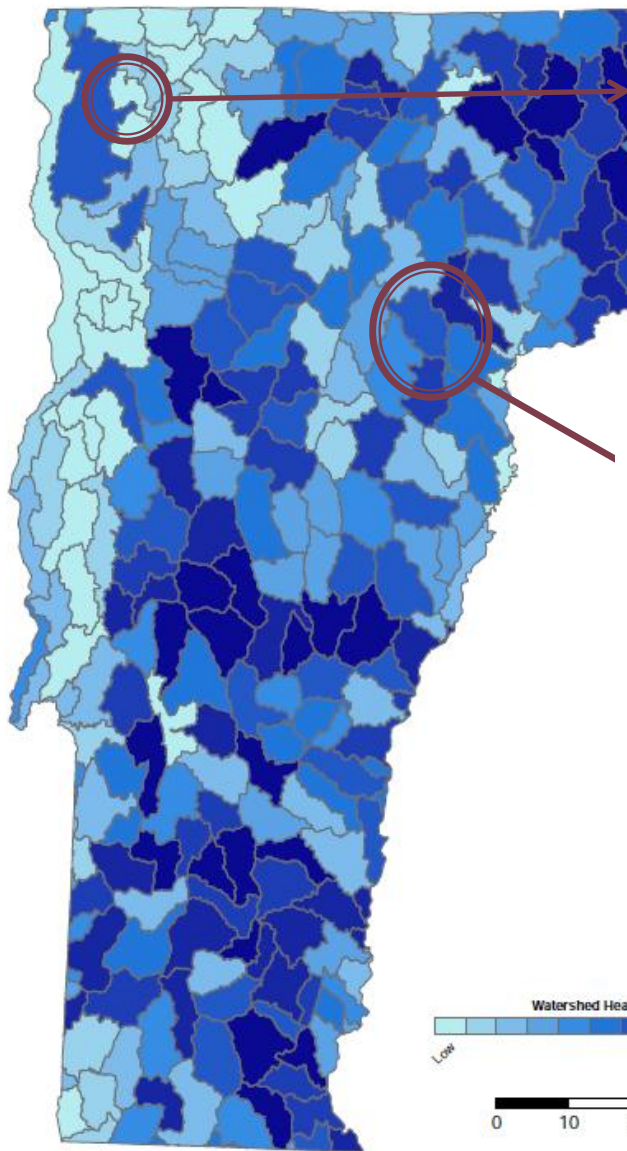


Rugg and Stevens Brooks, St. Albans Bay Watershed

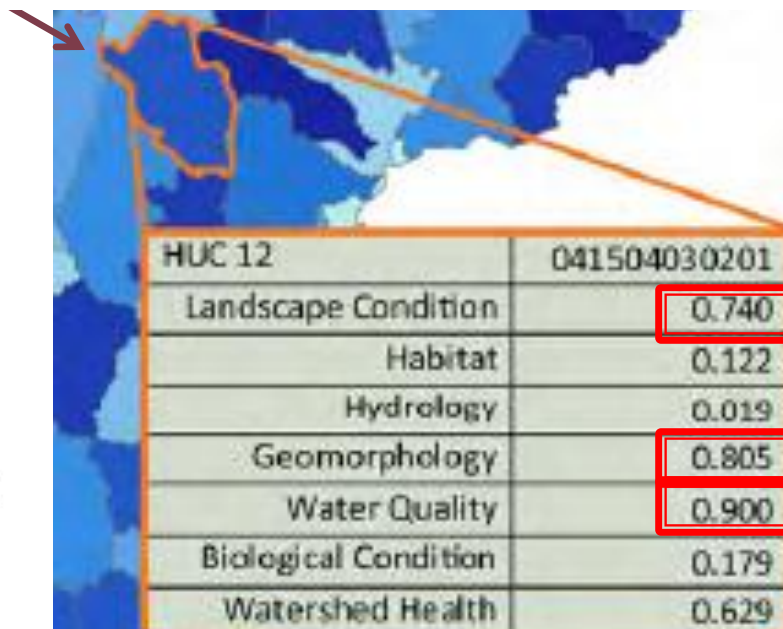


Upper Winooski Headwaters





Recoverability “challenged” watershed  
Some social commitment to implementation



Recoverability certain  
Strong social commitment to implementation

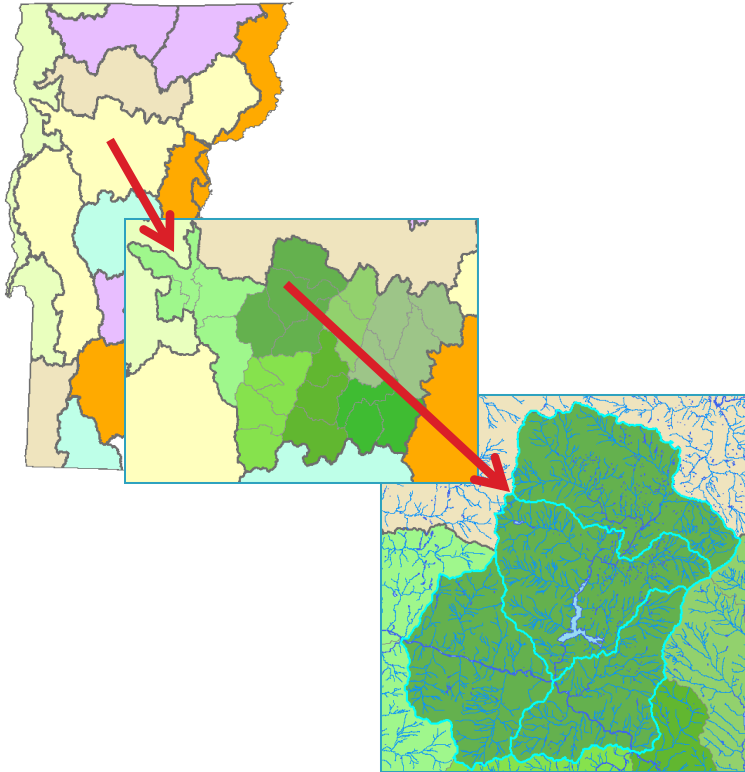


# Using the HW Integration to support Basin Planning



- ▶ VT's Surface Water Management Strategy is designed to protect and restore surface waters
- ▶ Strategy is applied using Tactical Basin Planning to implement specific stressor management approaches, guided by monitoring and assessment results
- ▶ HWI strongly supports this by providing initial maps that Basin Planners can use with stakeholders to secure buy-in and commitment

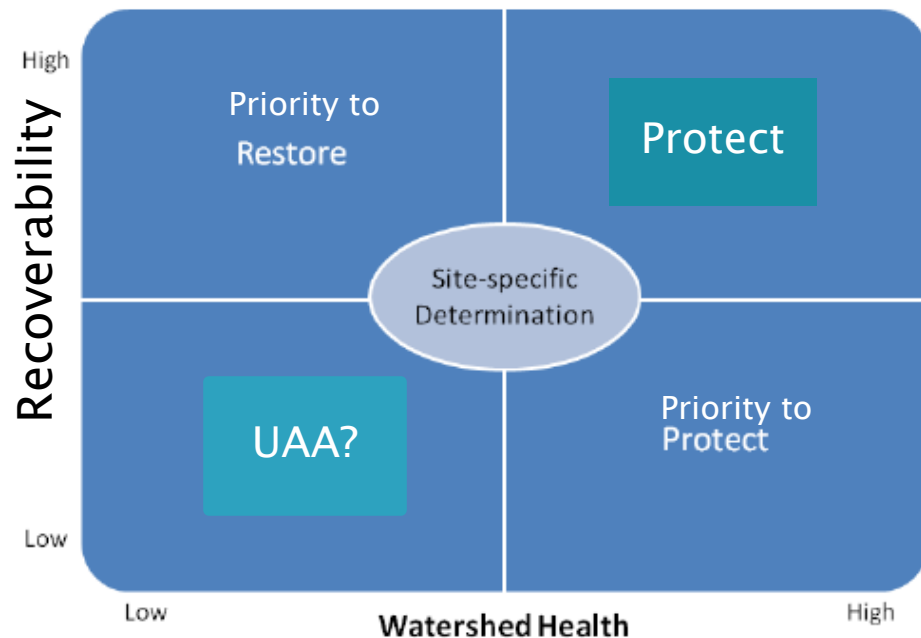
# Implementation guided by Tactical Basin Planning



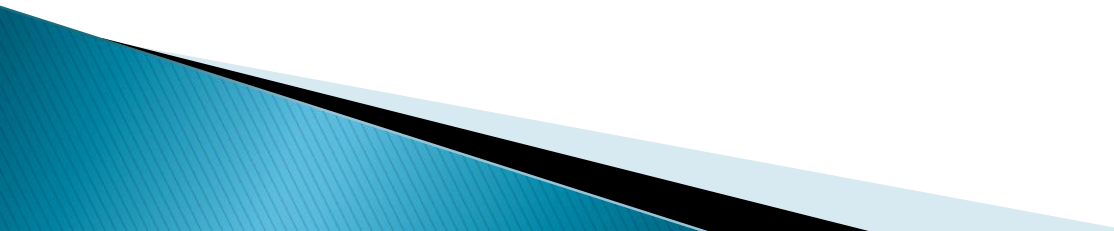
Protection Actions	Project or Action	Lead Partner(s)	Funding Source	Target Implementation	Performance Metric	Completed?
Waterbody A	Easement on Reach 1.2.3	RMP	ERP	2012	A	
Waterbody B	Floodplain Restoration on reach 4.5.6	RMP	ERP	2012	A	
Waterbody C	Conservation acquisition for subwatershed to Frog Pond Lake	VRC	LARC, ERP, Foundation	2013	B	
Waterbody D	Wetland Reserve/CREP Project on Reach 7.8.9 and adjacent wetlands	DU	NRCS-WRP	2011	C	✓
<b>Restoration Actions</b>						
Waterbody E	Corridor beltwidth acquisition and fencing project on Reach 2.3.5	WNRCD, LCA, AAFM	ERP, AAFM, NRCS	2011	A	✓
Waterbody F	Culvert replacement at XYZ Road to reduce sediment at Reach 4.6.4	VYCC, Municipality B	Vtrans Local Roads, ERP	2013	D	
Waterbody F	Fabric/rocklining of ditch along ABC Road draining to Reach 4.6.5	Municipality B	BBR	2013	D	
<b>Mon, Assess., Planning Actions</b>						
Watershed G	Phase 2 Geomorphic Assessment and Corridor Plan	WNRCD, RMP	ERP	2011	E	✓
Watershed H	Ambient Biomonitoring and LaRosa Partnership Monitoring	MAPP	WQD	2013	E	
Watershed I	Comprehensive AEM Evaluation for 6 farms	AAFM, NRCD	AAFM	2013	F	
<b>Municipal Planning Actions</b>						
Municipality A	FEH Zone Delineation and Protection	--	--	2012	G	
Municipality A	Better Backroads Inventory	--	--	2011	E	✓
Municipality A	Bridge and Culvert Inventory	--	--	2012	E	
Municipality B	Revised town road design and maintenance standards	--	--	2012	H	
Municipality B	Revision of DRB Procedure to adhere to new floodplain zoning	--	--	2013	H	
Waterbody A	Easement on Reach 1.2.3	RMP	ERP	2012	A	
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Watershed G	Phase 2 Geomorphic Assessment and Corridor Plan	WNRCD, RMP	ERP	2011	E	✓
Watershed H	Ambient Biomonitoring and LaRosa Partnership Monitoring	MAPP	WQD	2013	E	
Watershed I	Comprehensive AEM Evaluation for 6 farms	AAFM, NRCD	AAFM	2013	F	
<b>Municipal Planning Actions</b>						
Municipality A	FEH Zone Delineation and Protection	--	--	2012	G	
Municipality A	Better Backroads Inventory	--	--	2011	E	✓
Municipality A	Bridge and Culvert Inventory	--	--	2012	E	
Municipality B	Revised town road design and maintenance standards	--	--	2012	H	
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<b>Municipal Planning Actions</b>						
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Municipality A	Better Backroads Inventory	--	--	2011	E	✓
Municipality A	Bridge and Culvert Inventory	--	--	2012	E	
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# Protection and Restoration

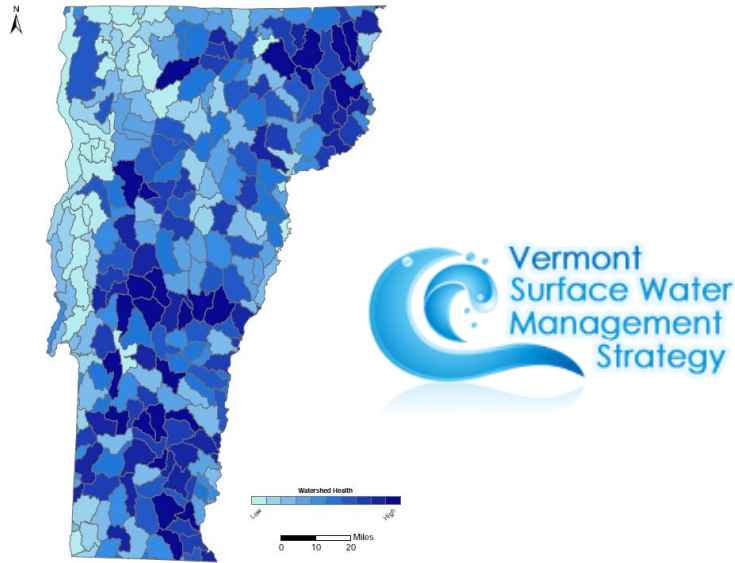
- ▶ HWI can indicate priorities for where to protect *and* where to restore
- ▶ Coupled with an assessment of Recovery Potential, waters can be slotted into four categories



# Next steps

- ▶ Integration of HWI into Tactical Basin Plans
  - ▶ Presentation of HWI results as a “Report Card.”
  - ▶ Identify specific protection or restoration activities that tie directly to identified HUCs.
  - ▶ Prioritize projects and tie implementation funding to highest priority projects.
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# For more information...



[www.vtwaterquality.org](http://www.vtwaterquality.org)

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