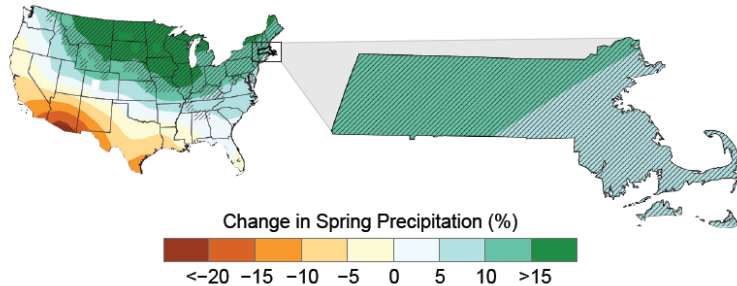


Watershed Scale Climate Resiliency Planning

Projected Change in Spring Precipitation

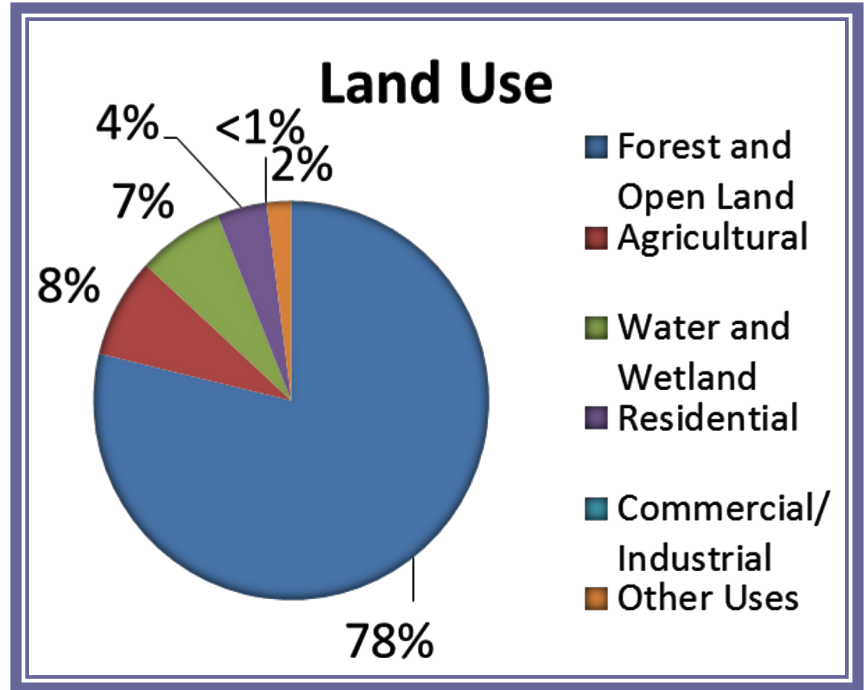
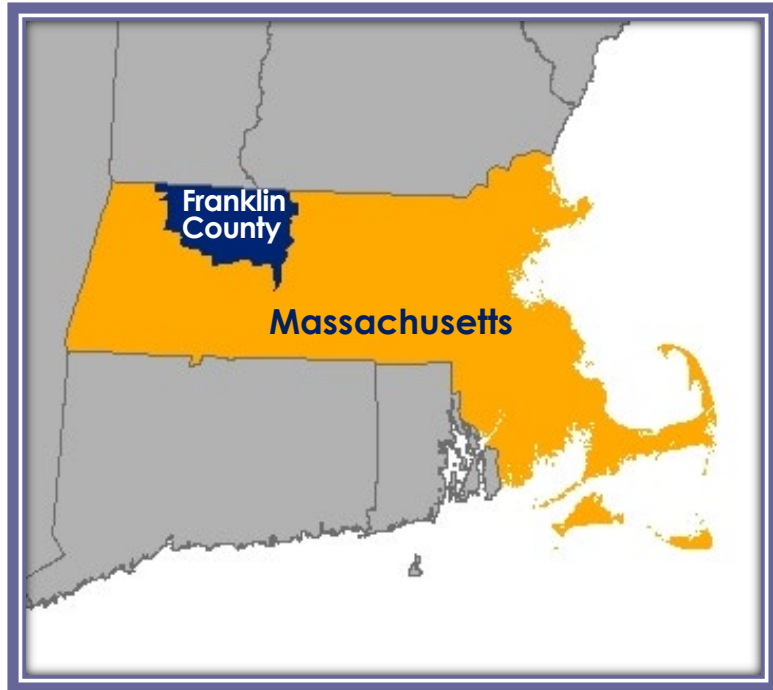


Kimberly Noake MacPhee, P.G., CFM
Land Use & Natural Resources Program
Manager



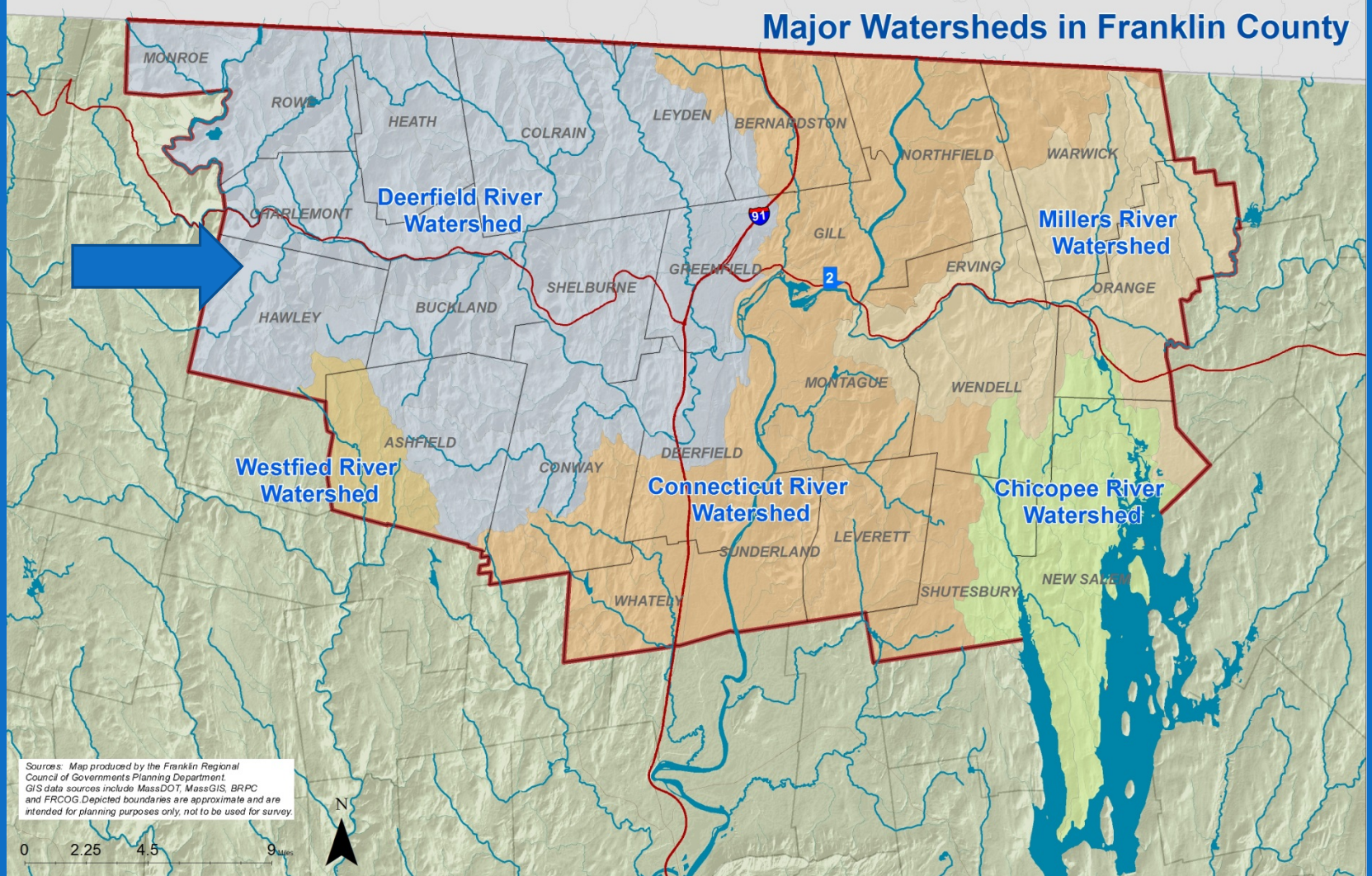
Franklin Regional
Council of Governments

Franklin County



- ❖ 70,382 population (2016)
- ❖ 724 square mile area
- ❖ 97 people/mile², most rural area of the state
- ❖ FRCOG provides services to 26 member towns
- ❖ Regionalization and shared services common practice

Major Watersheds in Franklin County



Deerfield River Watershed

- One of the healthiest watersheds in the state....
- Outstanding water quality, Cold Water Fisheries Resources, hundreds of acres of intact forests and BioMap2 habitat.
- **But – we're grappling with an ongoing cycle of storm damages and repairs.**





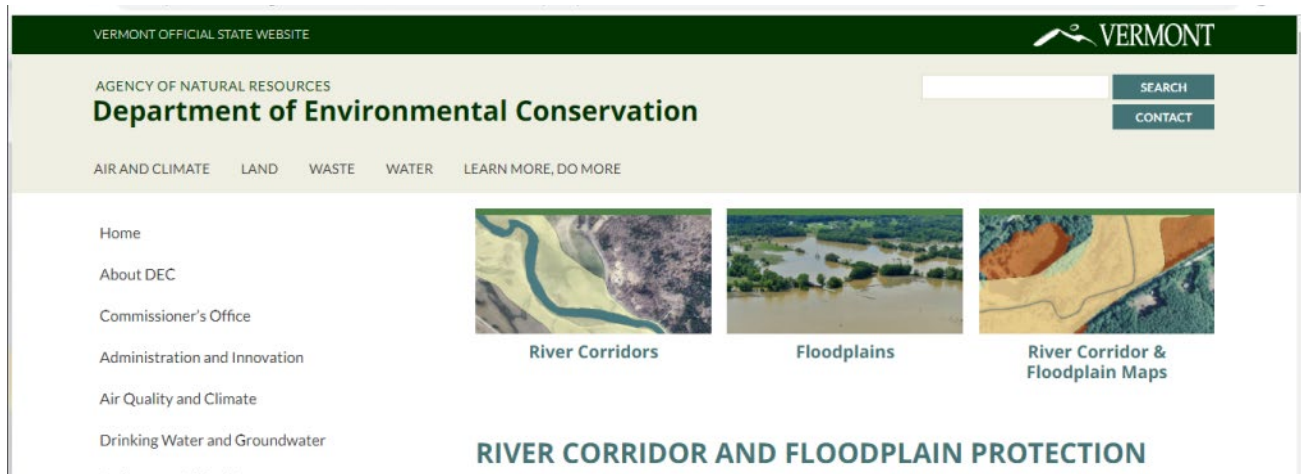
Healthy and Climate Resilient Watershed?

- Almost all of the Deerfield Watershed's rivers meet this definition ***if we define healthy as not listed on the Integrated List of Waters.***
- What are the attributes of a healthy and resilient river and watershed?
- How can we answer this question?



Vermont Rivers Program

The Vermont Rivers Program has assessment protocols and model management strategies that help protect and restore natural river and floodplain processes to enhance water quality, ecological health, and flood resilience.



The Wonderful World of Fluvial Geomorphology!

The study of the form and function of rivers and the interaction between rivers and the landscape around them.



According to the USGS, “understanding river -channel responses to various human-caused and natural disturbances is important for effective management, conservation, and rehabilitation of rivers and streams to accommodate multiple, often conflicting, needs.”

Fluvial Geomorphic Assessments

findings

Natural Influences:

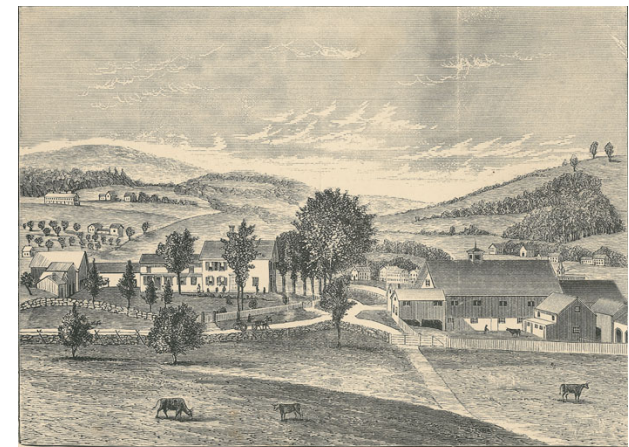
- Narrow, steep valleys
- Silt & clay-rich glacial sediment

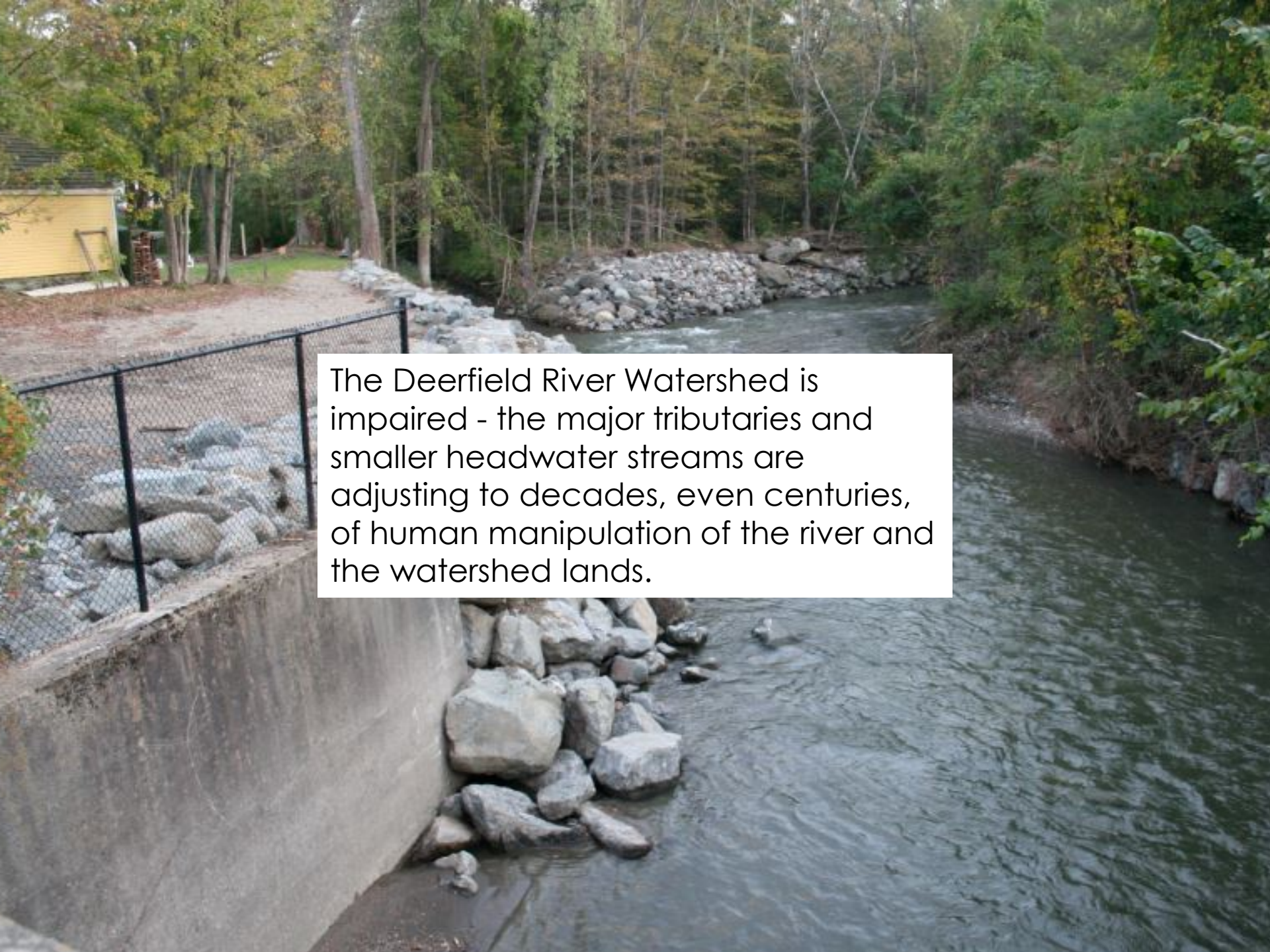
Historic and recent land use:

- Land clearance
- Development
- Loss of riparian buffers

Channel modification:

- Channel straightening
- Mill dams, ponds, and channels
- Encroachments & berming



A photograph of a river scene. In the foreground, a concrete wall runs along the left side of the river, topped with a black chain-link fence. Large grey rocks are piled up against the wall and in the water. The river flows from the background towards the right. In the background, a yellow building is partially visible behind a line of trees. The water is dark and has some ripples.

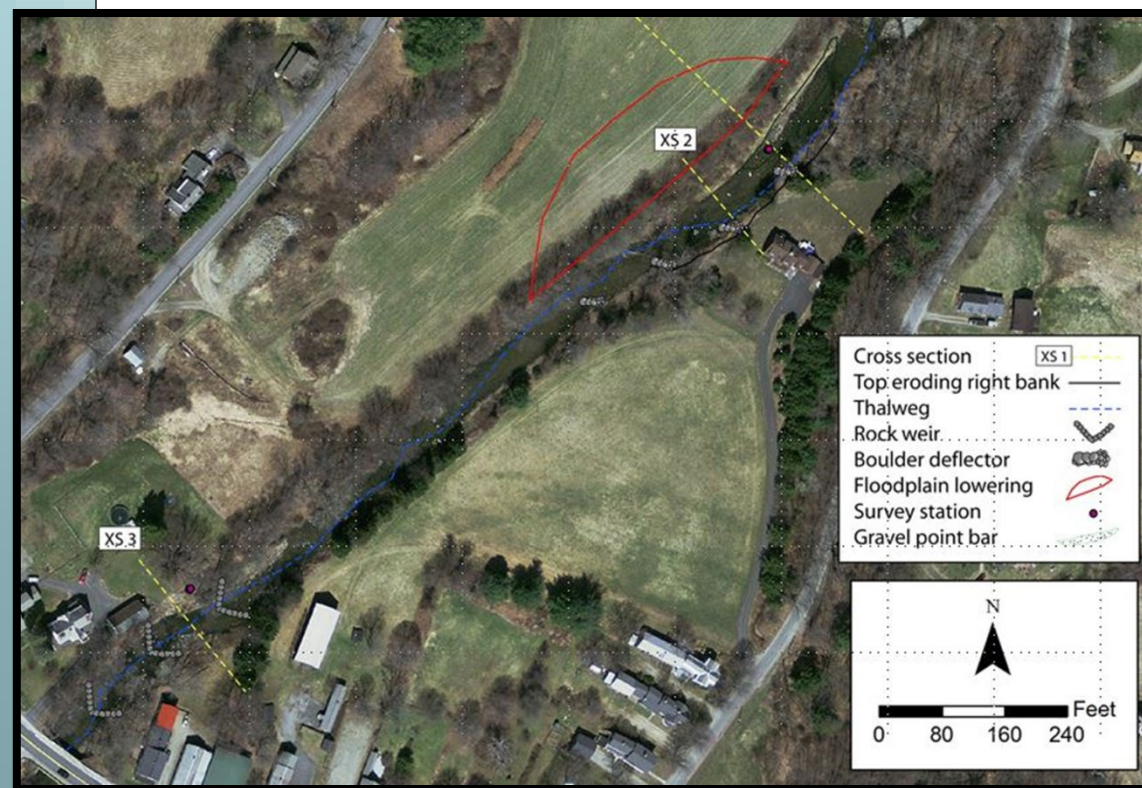
The Deerfield River Watershed is impaired - the major tributaries and smaller headwater streams are adjusting to decades, even centuries, of human manipulation of the river and the watershed lands.

South River Project

Conceptual designs represent a range of geomorphic needs and treatment types.

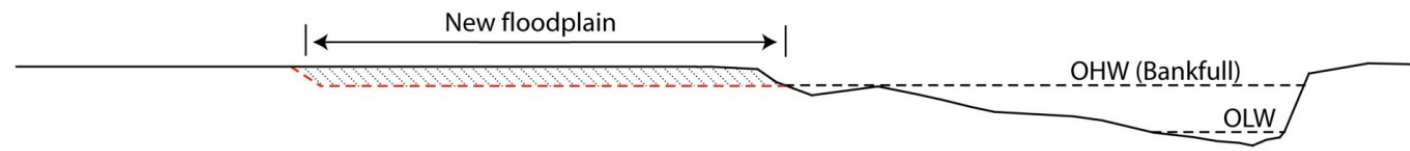
A watershed-based holistic approach where each project is designed to move the river system towards equilibrium by restoring river functions (geomorphic processes).

Structures that mimic natural conditions and use native materials provide flood resiliency, restore habitat and improve water quality.



Reconnecting the river to its floodplain

Cross section view



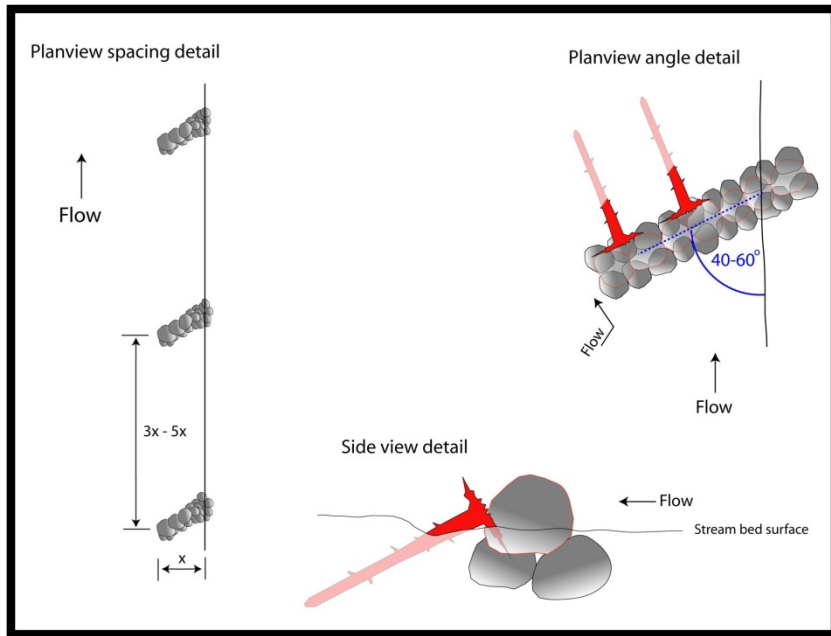
V.E. = 1.6x

Excavation / New Floodplain

New floodplain area provides a safety valve which reduces velocities and allows sediment deposition.

bank stabilization and habitat improvement structures

Boulder Deflectors



Woody Materials





money money money money, MONEY!



The O'Jays

- Identified over 40 projects in the South River and North River watersheds.
- Is this achievable?
- What are other strategies that will improve river functions and flood resilience?

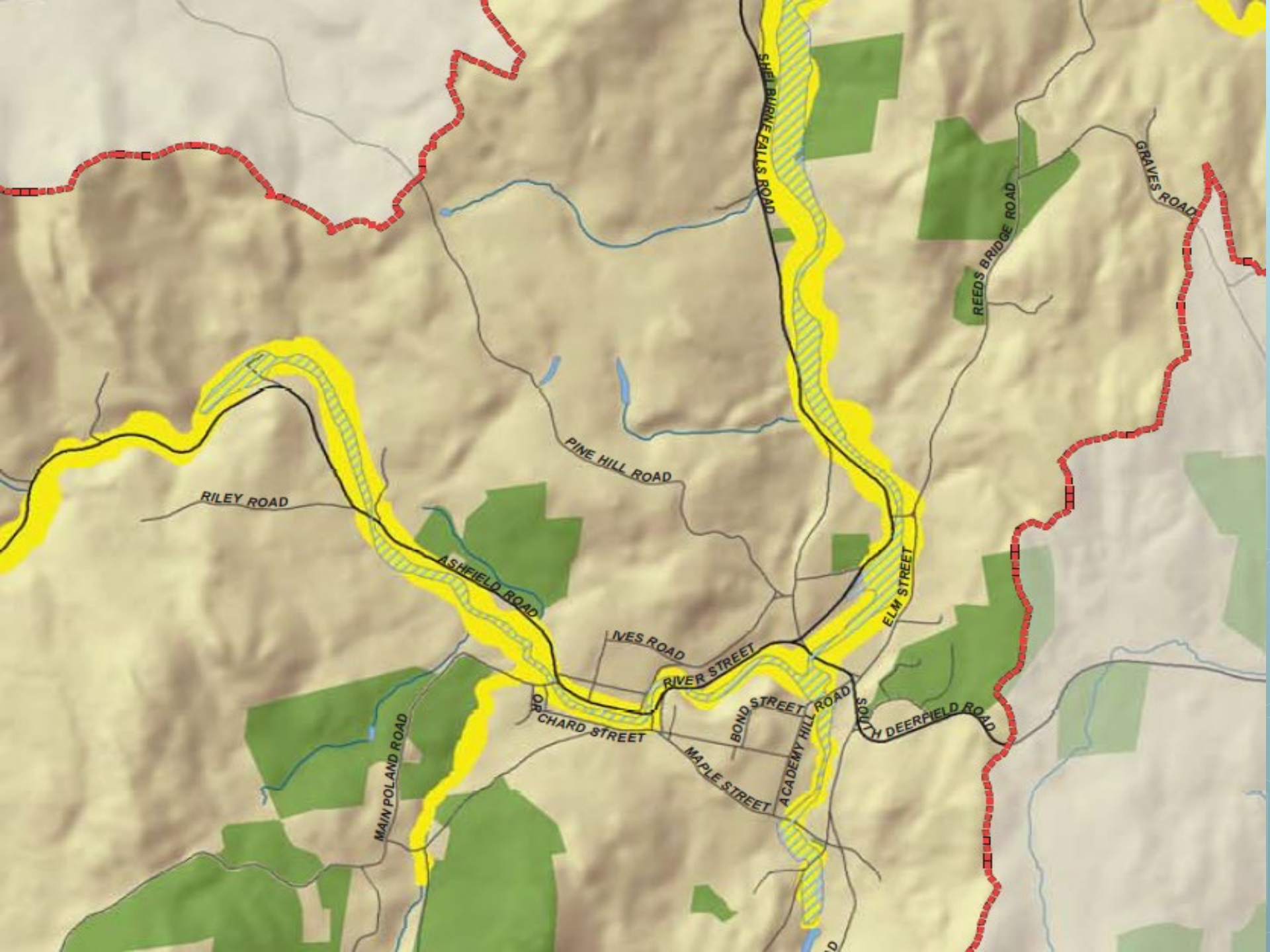


A more sustainable strategy is:

Avoidance of the risks posed by flooding and fluvial erosion by **limiting new development** in the river corridor and **managing the lands** in the river corridor to improve river functions.

What is a River Corridor?





River Corridor Map - North River



River Corridor Map - Topographic map (USGS) - Plate 3 of 3.

✓ River Corridor Mapping Tool

- ❑ Develop and pilot a cost-effective protocol for Massachusetts towns to identify flood and erosion hazards and the river corridor

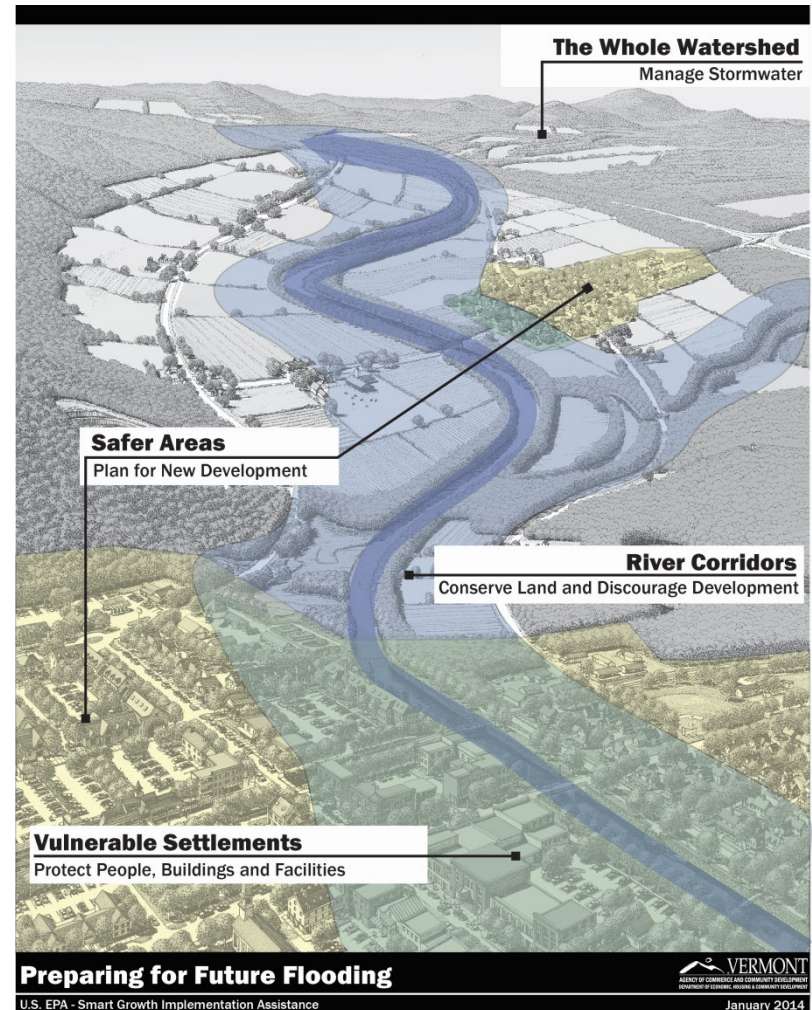
✓ River Corridor Management Toolkit

- ❑ River Corridor Management Overlay District
- ❑ River Corridor Easement

✓ ***These river management tools address a need that river restoration projects can't address.***

Watershed Resiliency

- Assessment, restoration and management techniques based on the science of Fluvial Geomorphology are a new paradigm for climate resiliency and watershed management in Massachusetts.
- This approach identifies resiliency projects and strategies that cross town boundaries and have multiple benefits.
- FRCOG's cost-effective model fluvial geomorphic and habitat assessment methodology and river corridor mapping protocols can be applied in other similar watersheds.



Looking to the Future

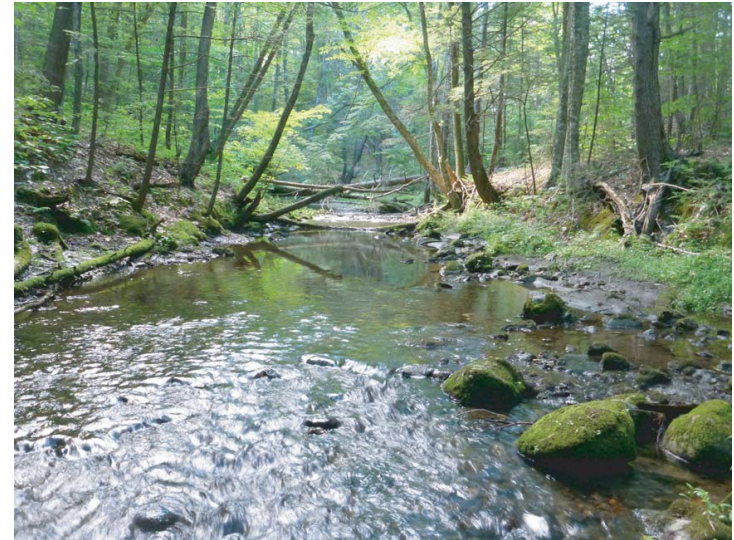
- ✓ Implement recommendations of the Deerfield Watershed-Based Plan developed by FRCOG.

Conservation with River Corridor Easement and Geomorphic Restoration (“chop & drop”)

These predominantly forested parcels contain historically-altered stream channels in the upper portions of the watershed.

Benefits of wood addition projects

- trap sediment
- depress flood peaks
- increase base flow
- enhance habitat
- protect downstream infrastructure



Looking to the Future

- ✓ Continue to encourage a watershed approach to resiliency – *MVP Plan for the South River Watershed*.
- ✓ Finalize a Climate Resilience Plan for the Deerfield River Watershed.
- ✓ Incorporate Climate Change Resiliency strategies into Multi-Hazard Mitigation Plan Updates.



Looking to the Future

- See an untapped opportunity to incorporate Green Infrastructure (GI) into transportation projects to improve flood resiliency and water quality.
- Develop a cost-effective and replicable assessment protocol and a set of templates for incorporating GI stormwater management techniques into transportation projects.



CONWAY

Map ID	83
Road / Surface	Shelburne Falls Rd / Paved
Stream	Trib South River
Crossing Type	Single Culvert
Jurisdiction	Local
Overall Risk of Failure	High
Structural Risk	✓
Geomorphic Risk	✓
Hydraulic Risk	
Aquatic Passability	Severe Barrier
Observation Date	8/18/2014
GPS Coordinates	Latitude: 42.527561 Longitude: -72.701171
Crossing ID	xy4252756172701171



Map ID	84
Road / Surface	Maple St / Paved
Stream	Pumpkin Hollow Brook
Crossing Type	Single Culvert
Jurisdiction	Local
Overall Risk of Failure	High
Structural Risk	
Geomorphic Risk	✓
Hydraulic Risk	✓
Aquatic Passability	Moderate Barrier
Observation Date	7/24/2014
GPS Coordinates	Latitude: 42.50243 Longitude: -72.699013
Crossing ID	xy4250243872699013



Thank you!



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