A Framework for Resilience:

Responding to Climate Change in the Deerfield River Watershed

frcog Franklin Regional
Council of Governments

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https://frcog.org/program-services/climate-resilience-land-use/

Building Resilience in Rural Communities

Observed increase in very heavy precipitation* from 1958 to 2012
(* the top 1% of storm totals)

11%
12%
16%
37%
71%
5%
27%
-12%
33%

Change (%)

<0   0-9   10-19   20-29   30-39   40+

Observed increase in heavy precipitation **is highest in the Northeast**

Photo courtesy of the Greenfield Recorder/Paul Franz

Climate resilience

The ability to recover after disturbances or significant, unpredictable changes in the environment, such as those caused by a fire, flood, or blizzard.

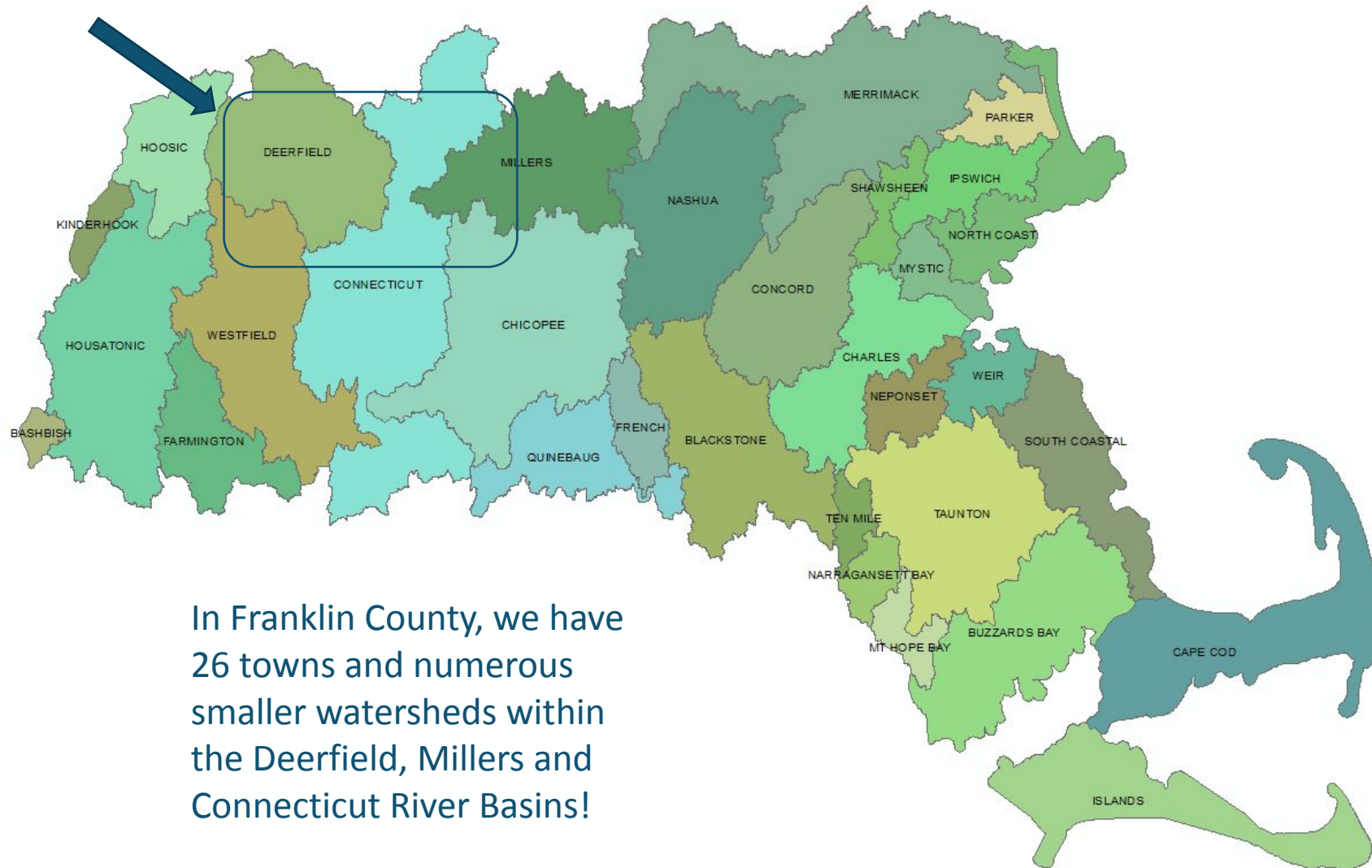Different actions can increase climate resilience of communities and ecosystems.

What is a watershed?

A **watershed** is the area of land that "sheds water" to a common outlet.

Water that falls on the land (rain and snow) drains downhill, so ridges and high points define the boundaries of the watershed. Water flows underground and over the land's surface, converging into streams, rivers, ponds, lakes, and eventually, the ocean.

Watersheds don't conform to our political boundaries

In Franklin County, we have 26 towns and numerous smaller watersheds within the Deerfield, Millers and Connecticut River Basins!

A Framework for Resilience

A Framework for Resilience is the **first watershed-based climate change resiliency plan** in the Commonwealth
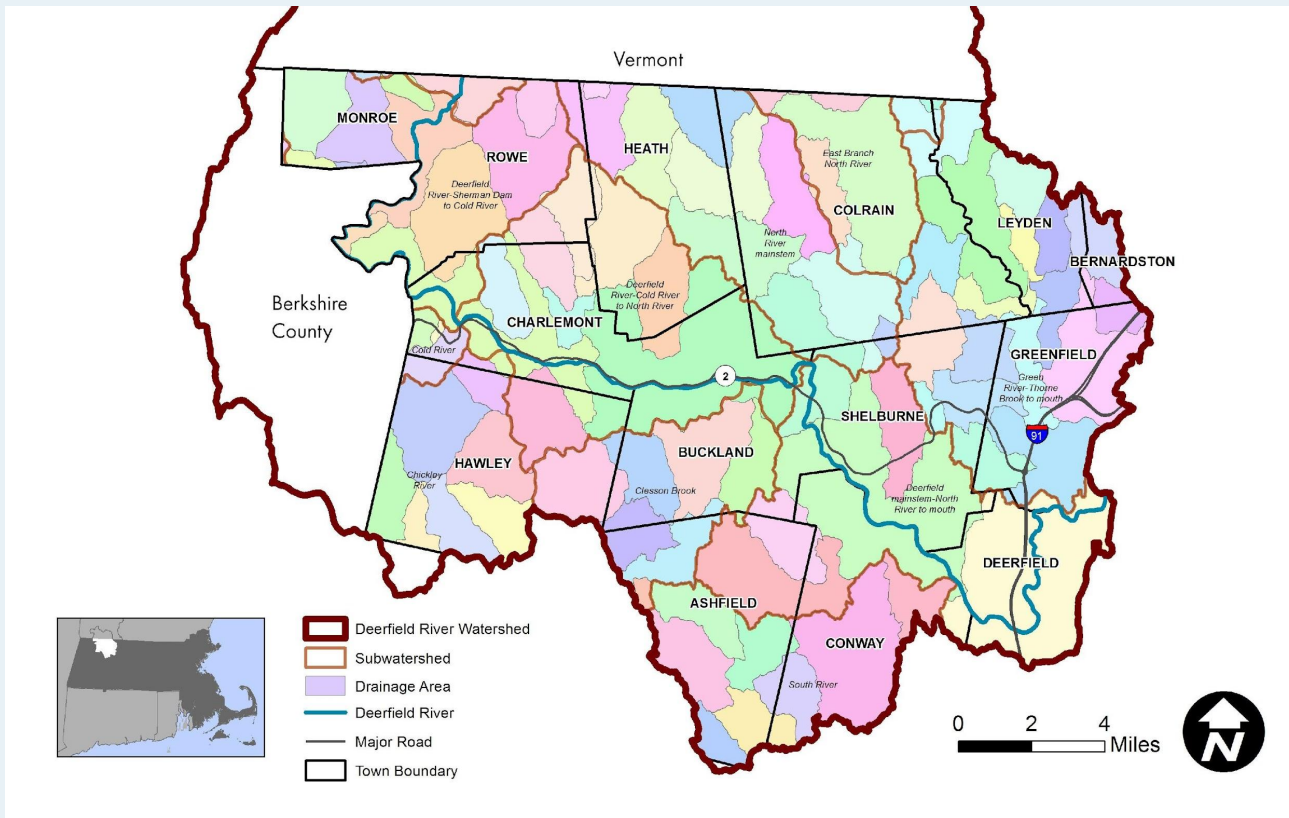
Build resilience at the municipal and regional watershed scale

► What we do affects those living downstream.

► How can we better understand how our actions and decisions impact our watershed neighbors?

► How can we work collaboratively across the watershed - pool resources, networks and ideas - to make our towns and the watershed more climate resilient?

A Framework For Resilience

Recommendations were developed specifically to be implemented by watershed towns:

✔ Achievable – within the power of towns and individuals to implement

✔ Address multiple climate change stressors

✔ Benefit multiple sectors

✔ Build resiliency at multiple scales

Watersheds & Resilient Infrastructure

Goal: Reduce flood risks by planning and working at the municipal and watershed scale

- Gather Data
    - Inventory culverts and bridges, including drainage culverts
    - Map critical infrastructure in floodplains & river corridors
    - Collaborate with watershed neighbors to complete a watershed assessment
        - Hydrologic & hydraulic (H&H) study
        - Fluvial Geomorphic (FGM) study
        - Inventory of stream crossings
        - List of prioritized projects
- Use the Built Environment to Build Resiliency
    - Nature-based solutions in public projects
    - Culvert and bridge right-sizing
    - Integrate climate resiliency into municipal planning and construction projects
    - Resilient roads
        - BayState Roads - Rivers & Roads training
        - Prioritizing projects that address river/infrastructure conflicts – these could cross municipal boundaries

Thinking Like a Watershed

Watersheds don't conform to municipal boundaries.

How many watersheds are in your town?

Who are your watershed neighbors?

By working at the watershed scale, the neighboring towns of Ashfield, Buckland and Hawley can **build a framework of actions that not only improve the climate resiliency of each town**, but over time, create a more resilient Clesson Brook Watershed.

Collaborative Watershed Assessments = Resilient Infrastructure

Watershed Assessment Scope of Work

- **Fluvial geomorphic assessment** of the Clesson Brook watershed to provide information on the causes of erosion, channel instability, and habitat degradation

- **Hydrologic and Hydraulic Model** of the Clesson Brook to estimate peak flow rates and evaluate flood water surface elevations and flow paths under current conditions and projected future conditions considering climate change

- **Database of road-stream crossings** along the Clesson Brook to be used for prioritizing replacements

- **Database of prioritized parcels** within the Clesson Brook watershed to be used for conservation initiatives

- **List of restoration projects** and conceptual designs
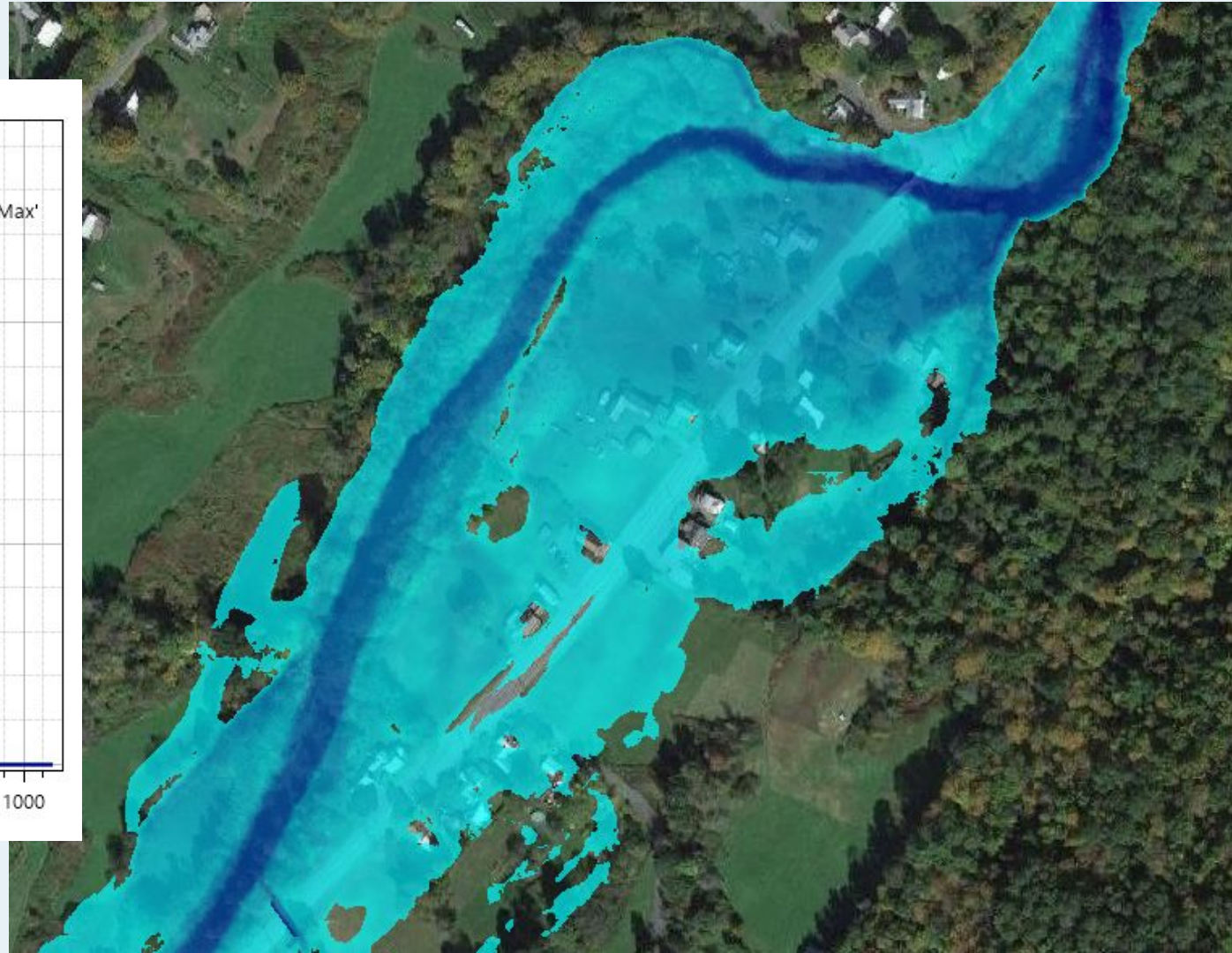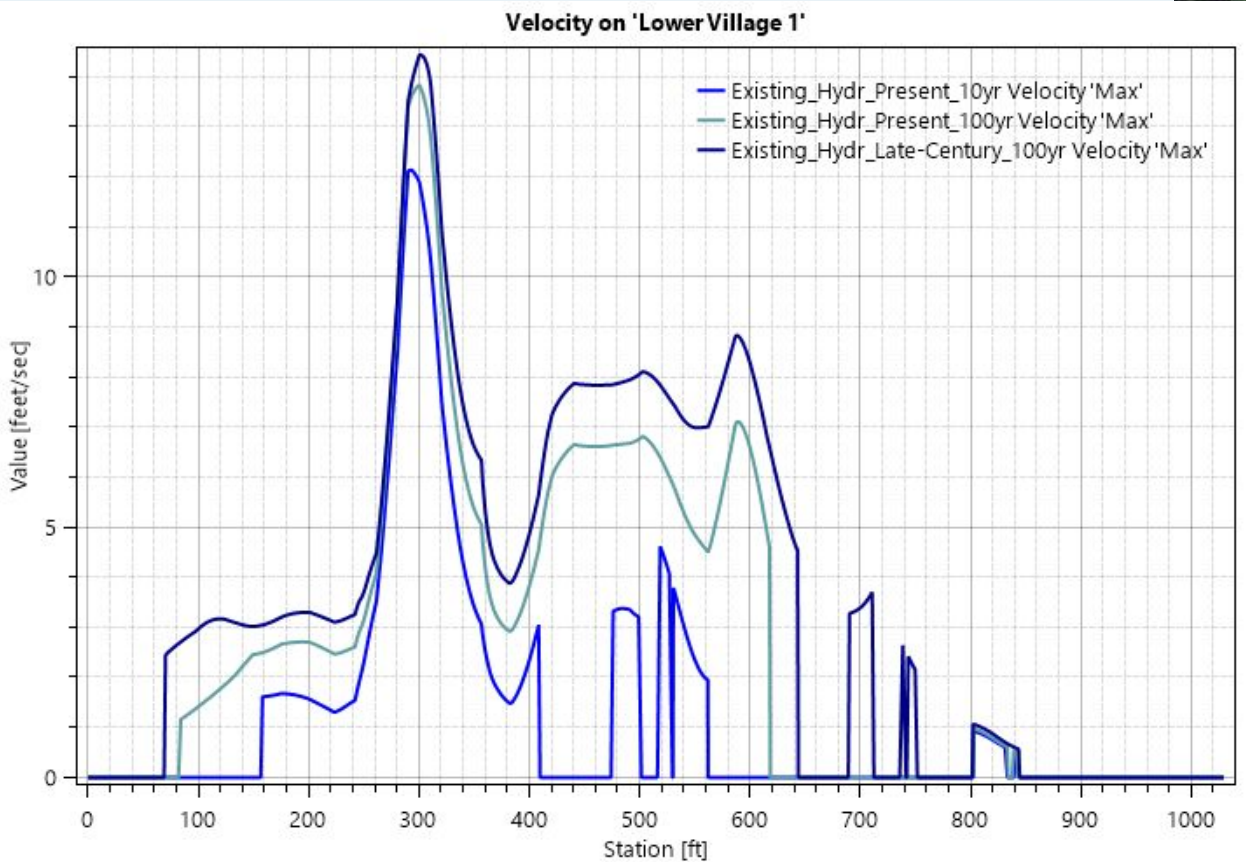
Road Stream Crossing Assessment
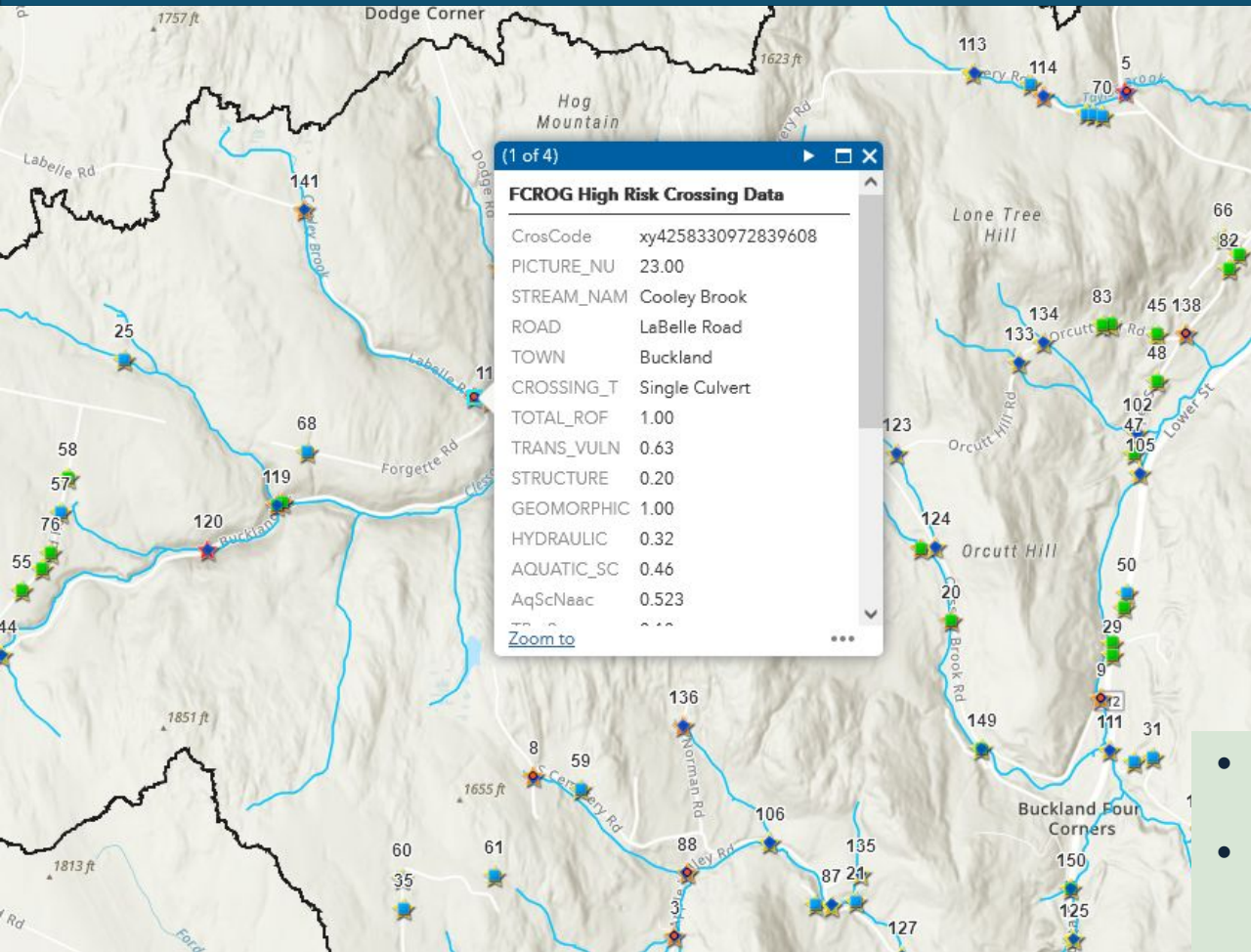
- Prioritized 152 culverts and bridges in the watershed

- Results published to Clesson Brook Watershed Crossing App, which is available to town staff

- Final app includes priority projects, vulnerable river segments, and prioritized parcels for conservation

Hydraulic Modeling

Hydraulic modeling of Clesson Brook

- 2D HEC-RAS model

Velocity on 'Lower Village 1'

- Existing_Hydr_Present_10yr Velocity 'Max'
- Existing_Hydr_Present_100yr Velocity 'Max'
- Existing_Hydr_Late-Century_100yr Velocity 'Max'

Fluvial Geomorphic Assessment

What are the historic and current watershed characteristics?

How is the river interacting with the surrounding landscape?

Where and what are the river/infrastructure conflicts?

Restoration Projects – Examples

Uplands / headwaters –
- Wood additions, wetland restoration, culvert upgrades/crossing removal
- Limit sediment mobilization/maximize storage (ie. stabilize mass failures)
- Land conservation

Valley bottom (agricultural, residential, commercial land uses) –
- Floodplain reconnection (floodplain lowering, berm breaching/removal)
- Removing constraints (bridge and culvert upgrades, dam removal)
- Riparian buffer establishment/enhancement (invasive species mitigation)
- Encourage meanders and complexity with instream structures
- Flow deflection as alternative to hard armoring
- Land conservation (and soon…River Corridor Easements)

Aerial view of a floodplain reconnection project at the South River Meadow in Conway. Photos by Allison Bell.

Holistic Watershed Approach – Project Examples

Clesson Brook - Route 112 Bridge Site (MassDOT B28004). Conceptual Design Plan View (Modeled Late Century 100-year flow event).

NEXT STEPS

The implementation of this plan can best be accomplished with the formation of a **Resilient DRW Coalition.**

✔ Resilient DRW can work to set goals and a timeframe for implementation of the plan, as well as identify the projects and recommendations to achieve these goals incrementally, as funding, public support, and other considerations permit.

✔ Resilient DRW can help coordinate efforts, keep track of successes and problems, identify opportunities for leveraging other projects, and work with other stakeholders to secure project funding.