

Flooding

VT's

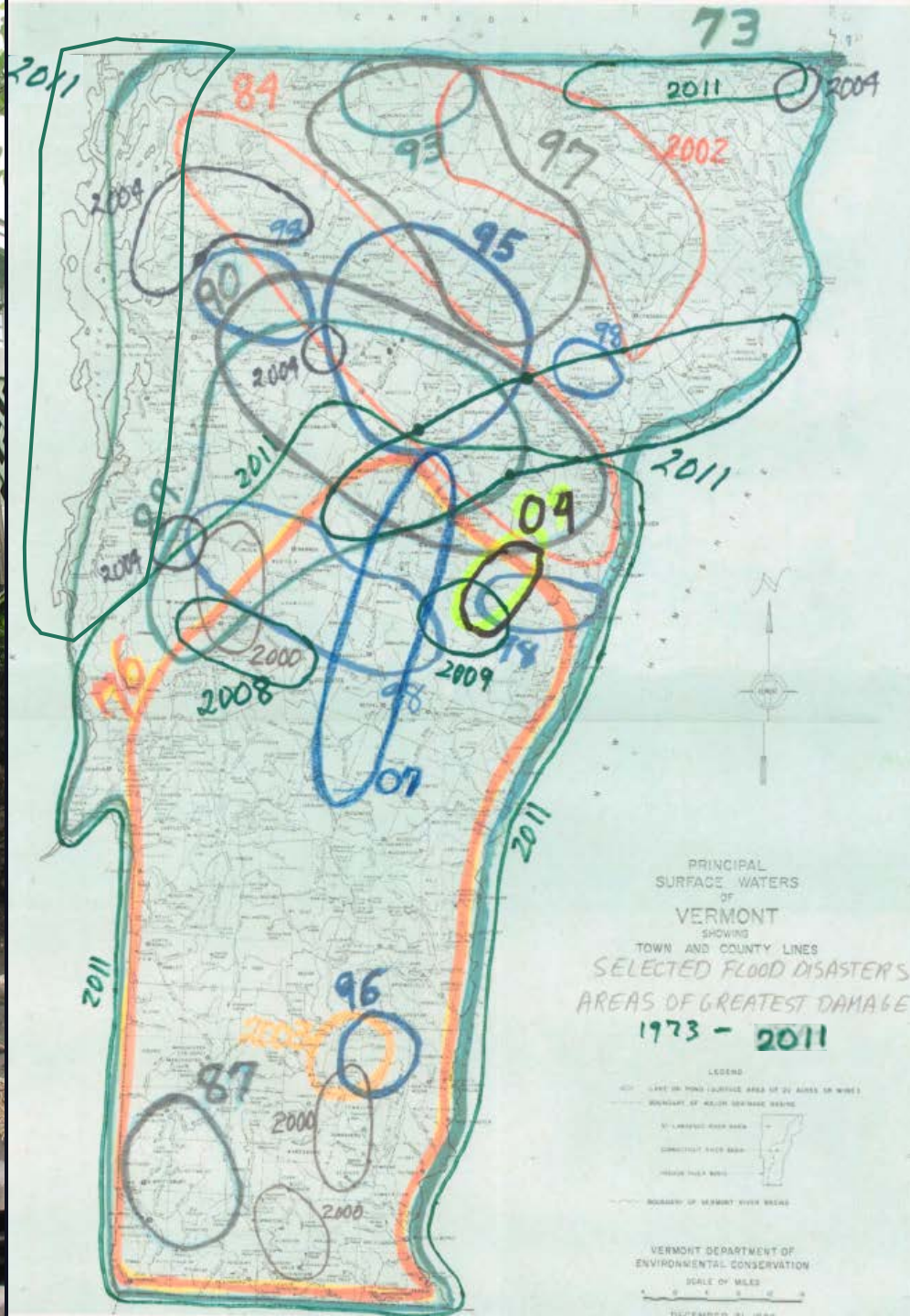
most common type
of natural disaster



Aerial view of the Montpelier 1992 flood.
Cover photo of the *Ice and Water* book.



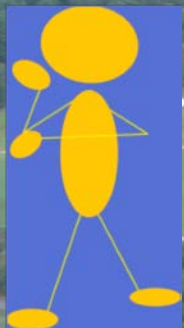
Jim Cole, Associated Press
Copyright 1992 "Ice and Water" Committee



Inundation



cars @ the
Richmond Park &
Ride 8/29/11



Where did my yard
go?!

Erosion



In Vermont, most flood damages are caused by Fluvial Erosion

- Geography & Climate
- Historic Patterns of Human Settlement
- Stream Alterations



Kate Brook, Hardwick, 1995

Traditional Approach to River Management:



Channel Straightening, Armoring, Berming, Dredging



Fluvial Geomorphology

Fluvial

—

Moving Water



Geo

—

Earth



Morphology

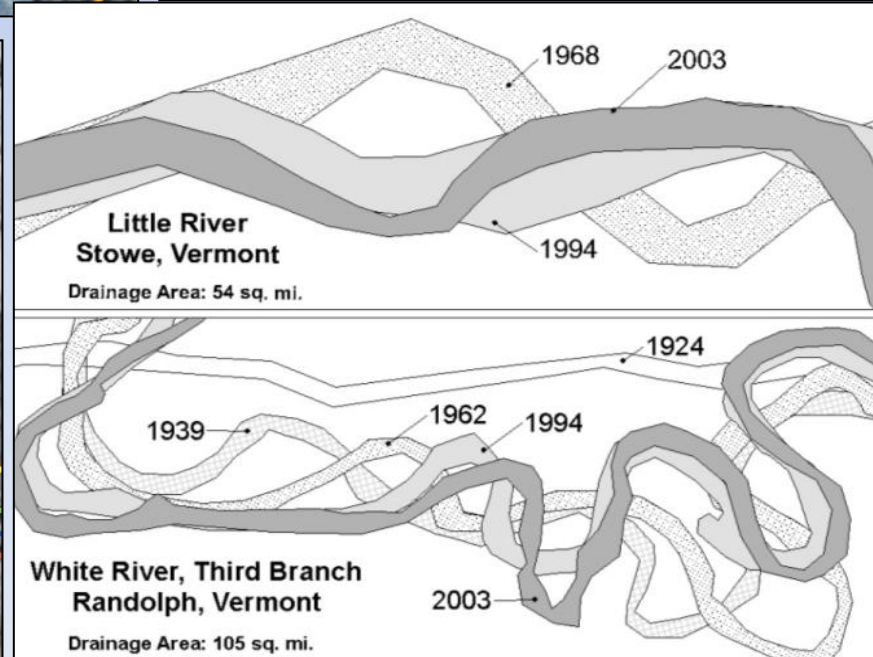
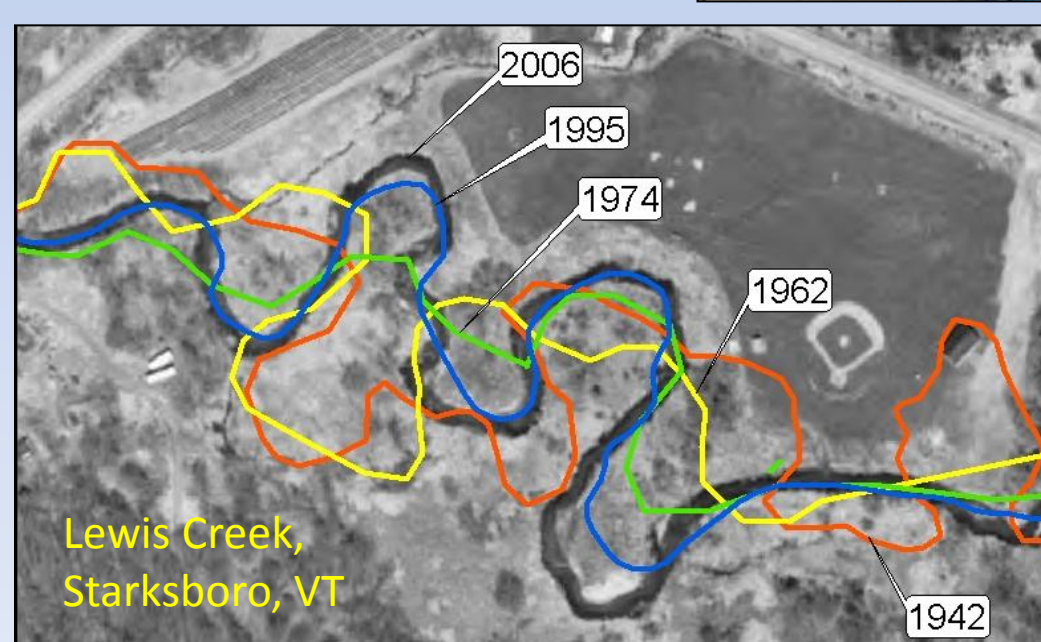
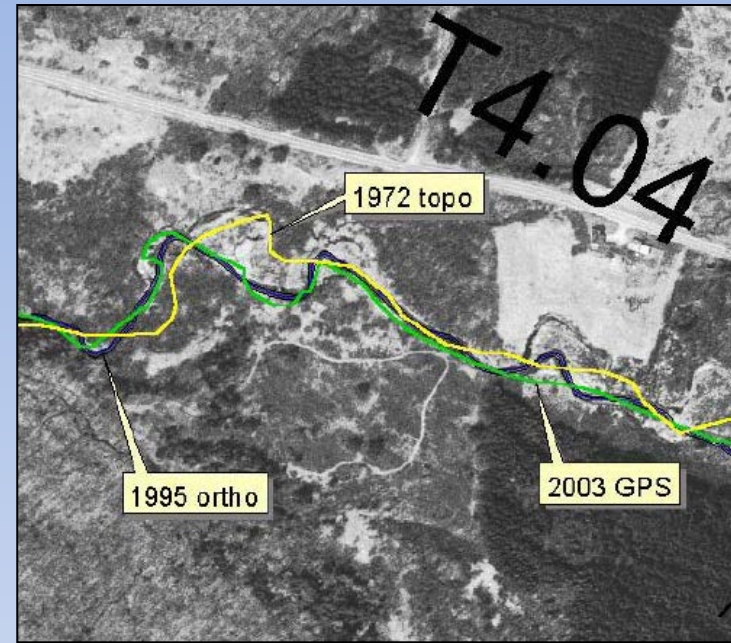
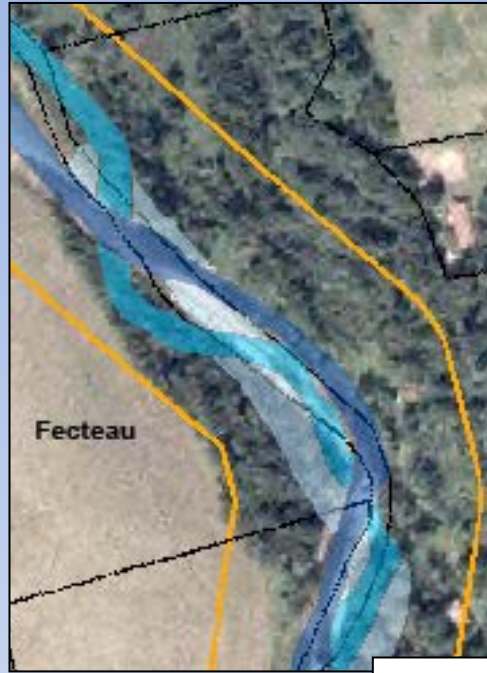
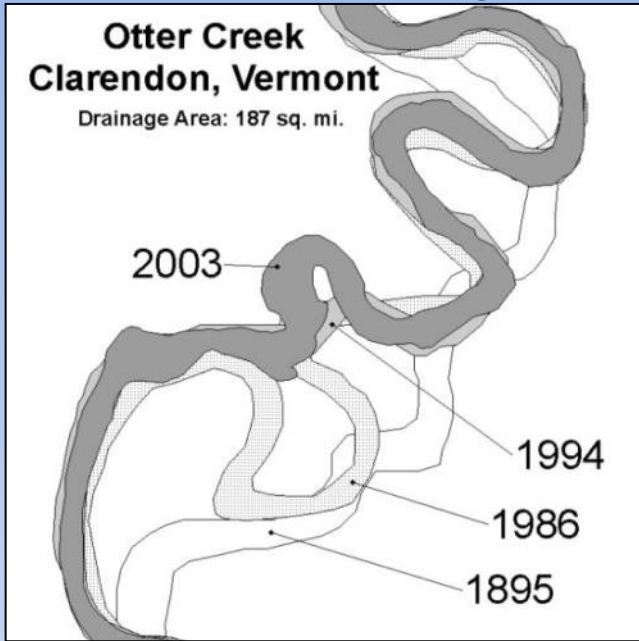
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Shape

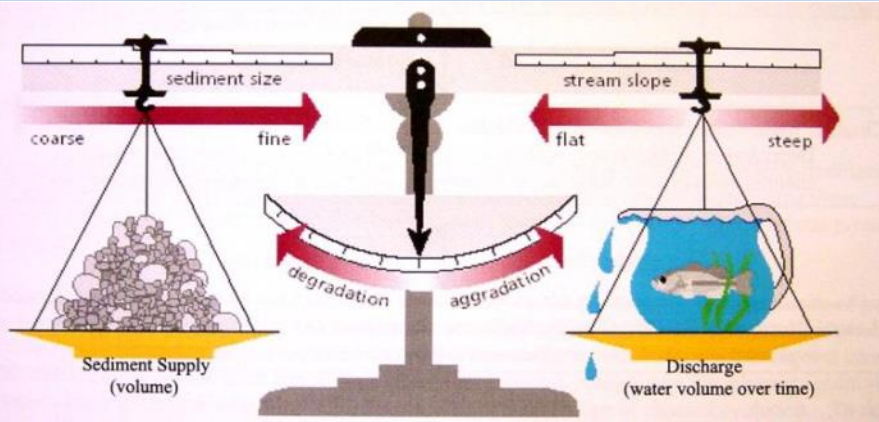


Fluvial Geomorphology = Study of how moving water shapes the land

Rivers Adjust– Stable does not mean Static!

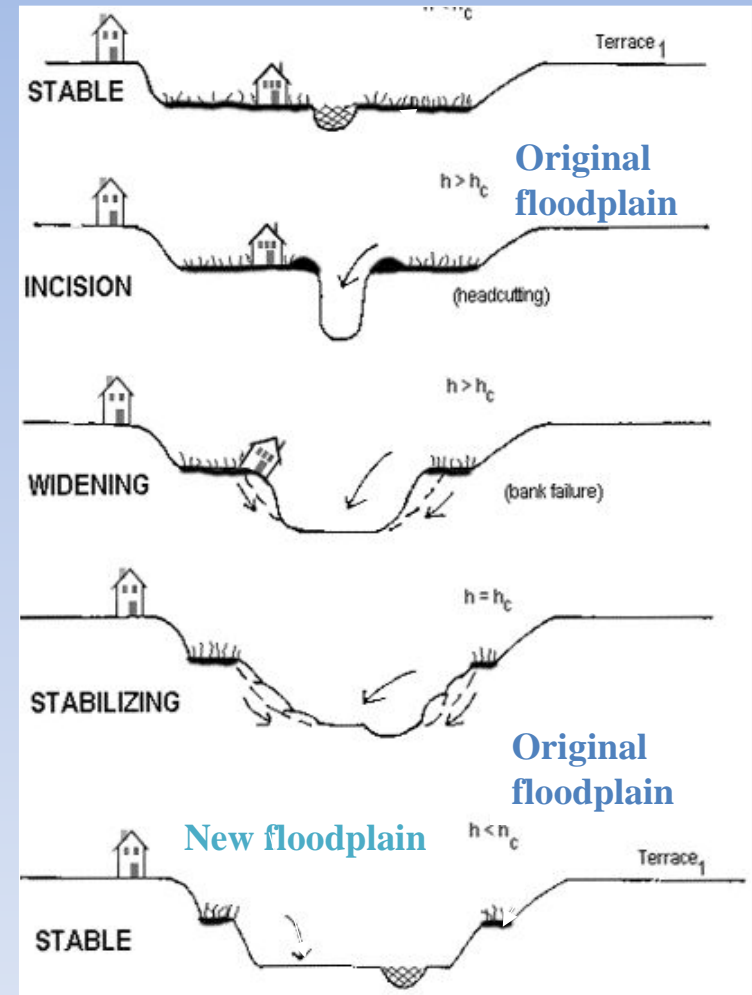


Channel Evolution



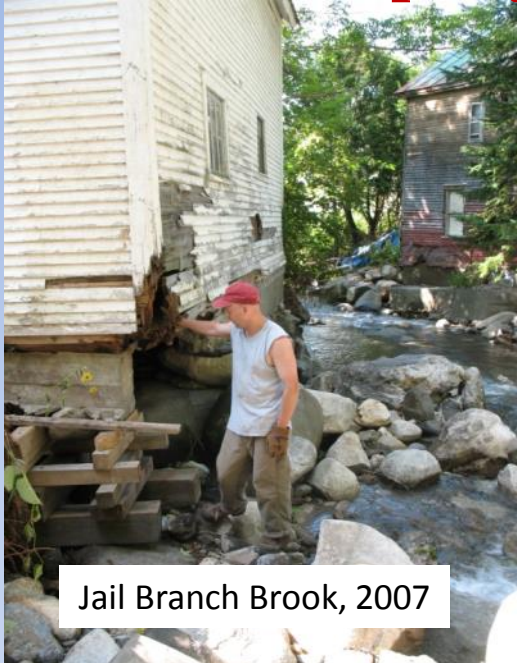
Caused by changes to:

- Flow regime
- Sediment regime
- Slope
- Cross section
- Boundary condition
- Channel Roughness



Channel adjustments during floods can have devastating consequences

Private Property

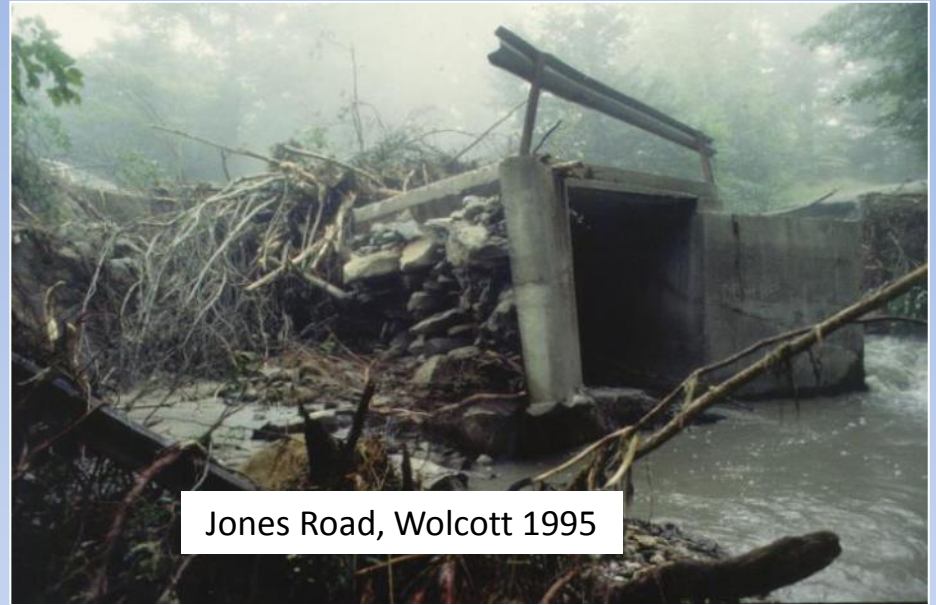


Jail Branch Brook, 2007



Hancock Branch, Hancock, 2008

Public Investments



Jones Road, Wolcott 1995



Honey Brook, Barre 2007



Rochester 2011



Rochester 2011

River Corridor Aspect of Floodplain Protection Efforts



Recent Legislation



Act 110(2010):

- ◆ State policy to protect river corridors
- ◆ ANR - promote river corridors and establish river corridor protection procedures
- ◆ Include a riparian buffer component to the corridor

Act 138(2012)

- ◆ ANR - regulate activities exempt from municipal regulation
- ◆ ANR -develop and make available river corridor maps for all municipalities



**Public Safety and
Property
Protection**

**Protection of
Floodplains
& Stream
Equilibrium**

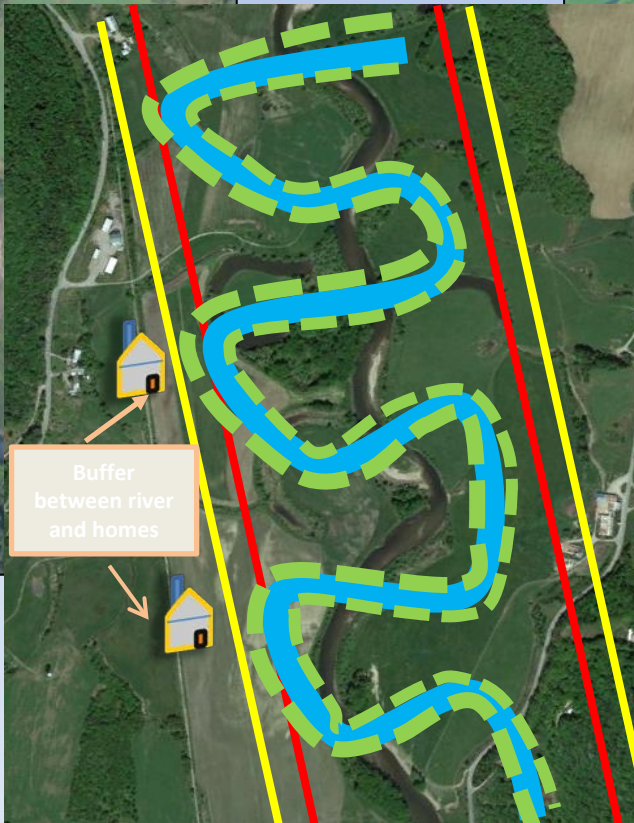
**Ecological
Integrity and
Fish & Wildlife
Resource**

**Water Quality
and Quantity**

River Corridors – What Are They

Area for the stream to move

Provide space for Buffers



Buffer
between river
and homes

Protect current & future development

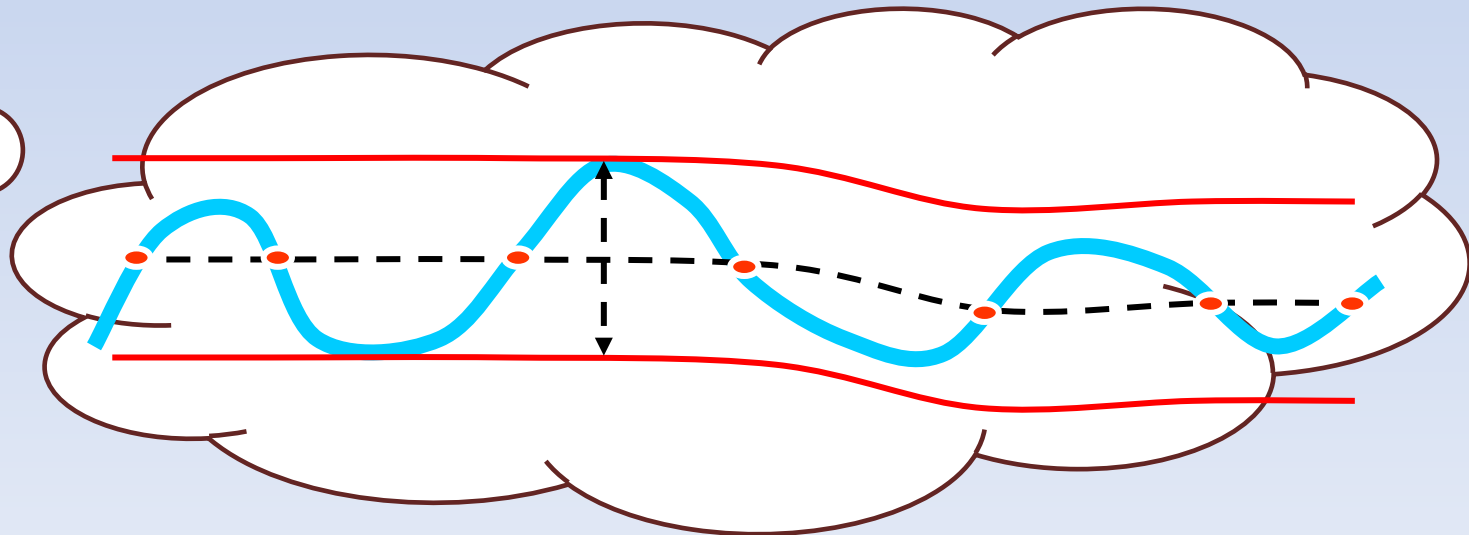
Components of the River Corridor

1) All streams w/ a Watershed size > 2 sq. miles

Width of the corridor based on channel width, valley width, and stream data.

2) Streams ≤ 2 sq. mile watershed –

A standard setback of 50 feet is applied to both sides of the channel



Two options for community to consider

- 1) River Corridor Protection Area
- 2) River Corridor



River Corridor Protection Area

Boundary of the River Corridor Protection Area (RCPA)
(= Fluvial Erosion Hazard Area)

The RCPA is the minimal area required to accommodate the meander geometry and stable slope of the river's least erosive, equilibrium condition (i.e., belt width).

Old meander scars of the Lamoille River affirm the minimal meander belt width.



River Corridor

Boundary of the River Corridor

Boundary of the River Corridor
Protection Area (RCPA=FEH)

Future Lamoille River at
Equilibrium Slope + 50 ft Buffer

Act 110 requires the ANR to create River Corridors that include riparian buffers.

River Corridors provide a set-back area that includes the 50' buffer when the equilibrium slope is achieved and the meanders have become fully extended.



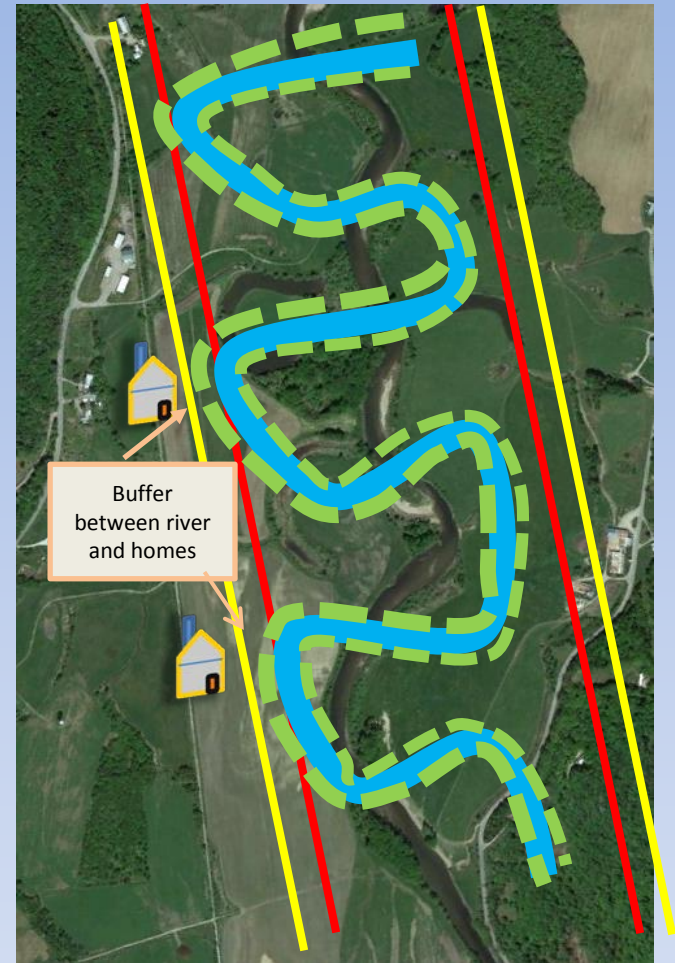
Looking at the Legislative Buffer Requirement



River Corridor Protection Area (RCPA)
provides stream equilibrium needs



Development at edge of RCPA prevents minimum buffer setback when the stream reaches equilibrium at outer edge of RCPA



A **River Corridor** includes an additional 50 ft. either side to provide a minimum buffer setback when the stream reaches equilibrium at outer edge of RCPA

Difference between River Corridor 50' and Town 50' buffer

- **Town Buffer**

- May focus on vegetation management
- Provides for: water quality, habitat and stream stability benefits
- Setback from current stream location

If a house is built at the edge of the current 50' buffer setback, no room for future buffer if stream moves

- **River Corridor**

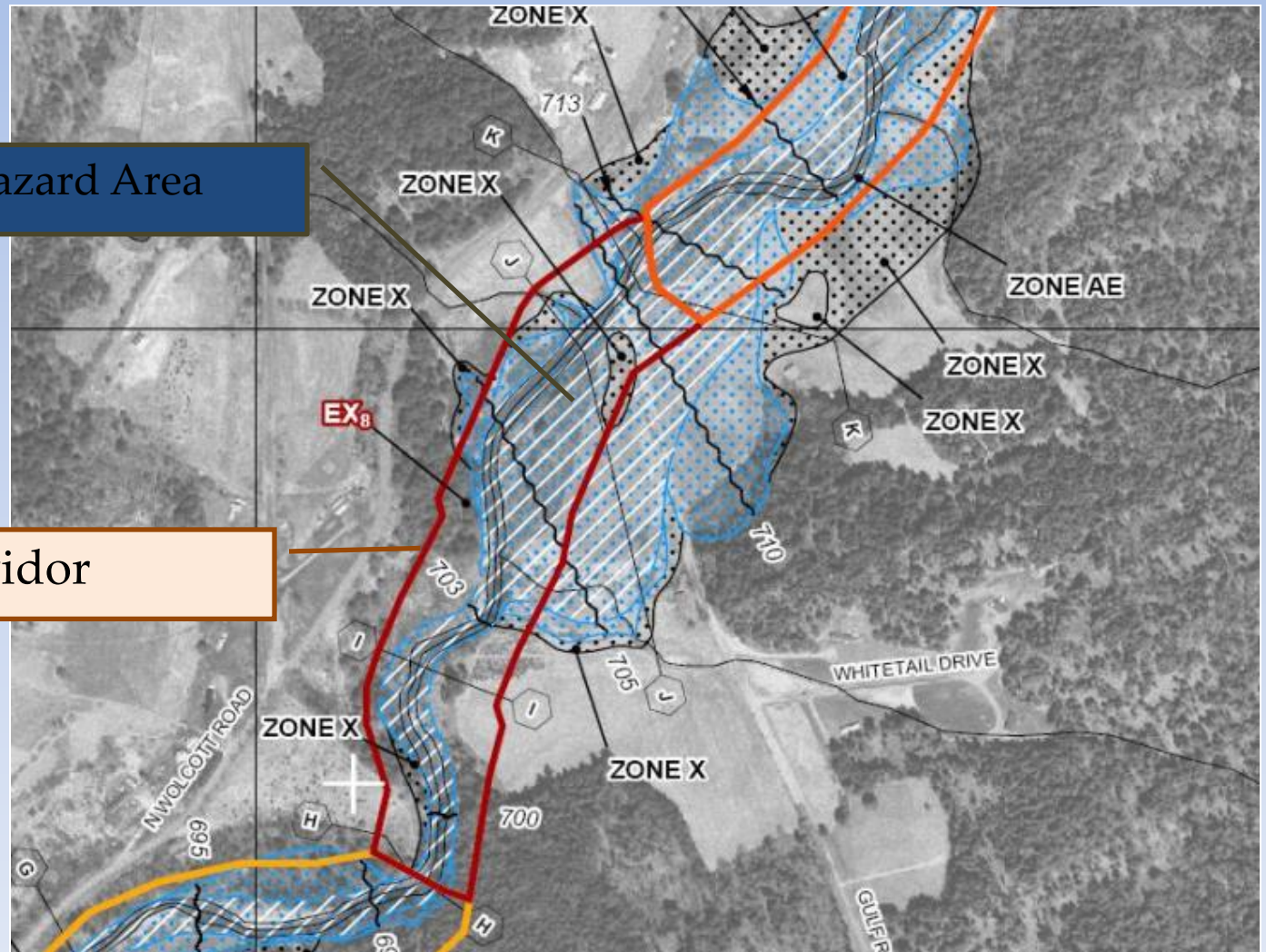
- No management requirements on buffer vegetation
- Provides : water quality, habitat and stream stability benefits
- Provides for current and future buffer needs

Helps maintain area for town buffer regulation needs as stream moves over time

Looking At NFIP and River Corridors

Inundation Hazard Area

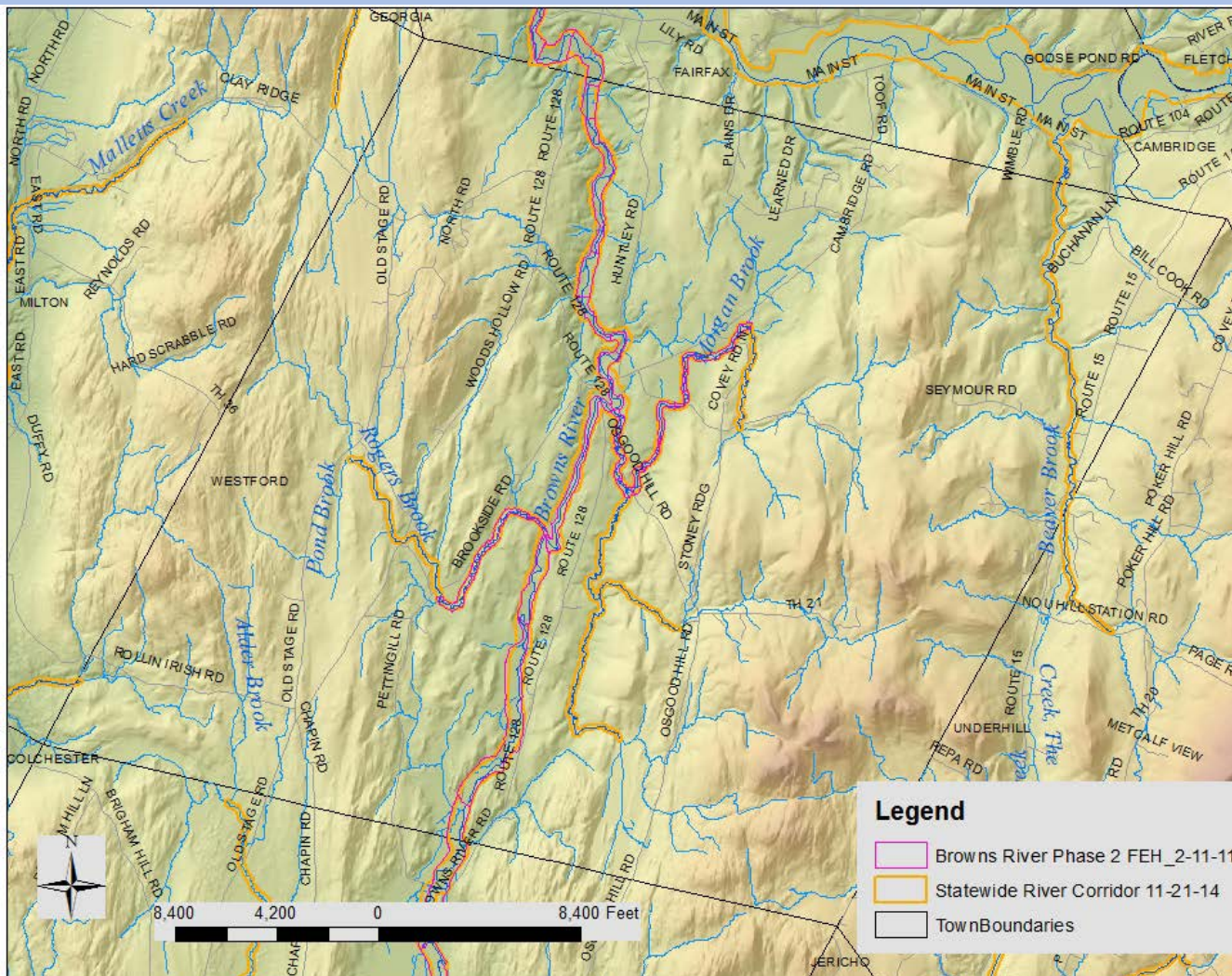
River Corridor



Westford's River Corridors and Small Streams

Streams > 2 sq. mile watershed that would be included in River Corridors

- Browns River
- Rogers Brook
- Morgan Brook
 - * Unnamed tributary to Morgan Brook
- Beaver Brook



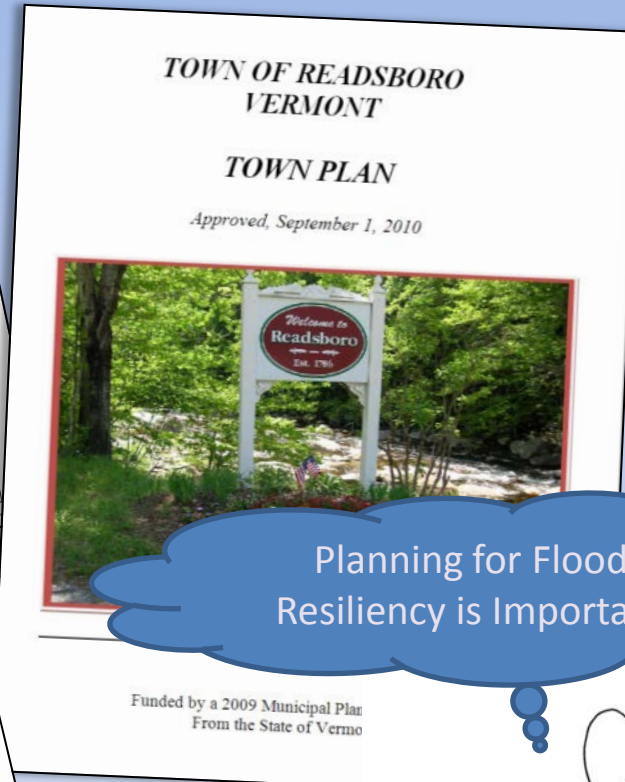
Municipal and Regional Planning

BASIC EMERGENCY OPERATIONS PLAN

City/Town of: _____ in _____ County
Date Approved: _____ Date Updated: _____
Name of Senior Local Official Reviewing this plan: _____
Municipal Business Address: _____ E-mail: _____
Telephone: _____ Fax: _____

Emergency Steps

- 1) Establish an Incident Command Structure and make appropriate local decisions
- 2) Alert Vermont Emergency Management if additional help or resources may be needed (800-347-0488)
- 3) Alert the general population and evacuate as needed. (ex: siren, PA, Door-to-door, etc.)
- 4) Activate your Emergency Operations Center to support the Incident Commander as needed
- 5) Utilize your Delegation of Authority
- 6) Contact the Shelter Coordinator to arrange a shelter opening if needed
- 7) Expand the ICS Structure as needed
- 8) Determine if additional operational shift staffing is needed
- 9) Conduct damage assessment
- 10) Document emergency repairs



**Chittenden County, Vermont
Multi-Jurisdictional
All-Hazards Mitigation Plan**

Prepared by:
Chittenden County Regional Planning Commission
110 W. Canal Street, Suite 202
Winooski, VT 05404
(802) 846-4490

Month 20XX

Planning for Flood
Resiliency is Important



Adopted RC / RCPA become part of the Municipal Flood Hazard Area Regulation

State Providing Financial Incentive for Communities To Become More Flood Resilient

The Emergency Relief and Assistance Fund (ERAF) provides State funding to match [Federal Public Assistance](#) after [federally-declared disasters](#).

Eligible public costs are reimbursed by federal taxpayers at 75%.

Remaining 25% costs to be paid by town and state

As of October 23, 2014, the State of Vermont will contribute:

- **7.5%** - for towns with out minimum 4 criteria
- **12.5%** - Towns with minimum 4 criteria :
 - Participate in NFIP ,
 - Adopted Orange Book Town Road & Bridge Standards
 - Local Emergency Operation Plan
 - Local Hazard Mitigation Plan
- **17.5%** - Town with minimum 4 criteria and has adopted :
 - River Corridor **or** River Corridor Protection Area
 - or** participates in FEMA Community Rating System



To qualify for ERAF increased funding level

A Community may choose to adopt either:

- River Corridor Protection Area
- or
- River Corridor

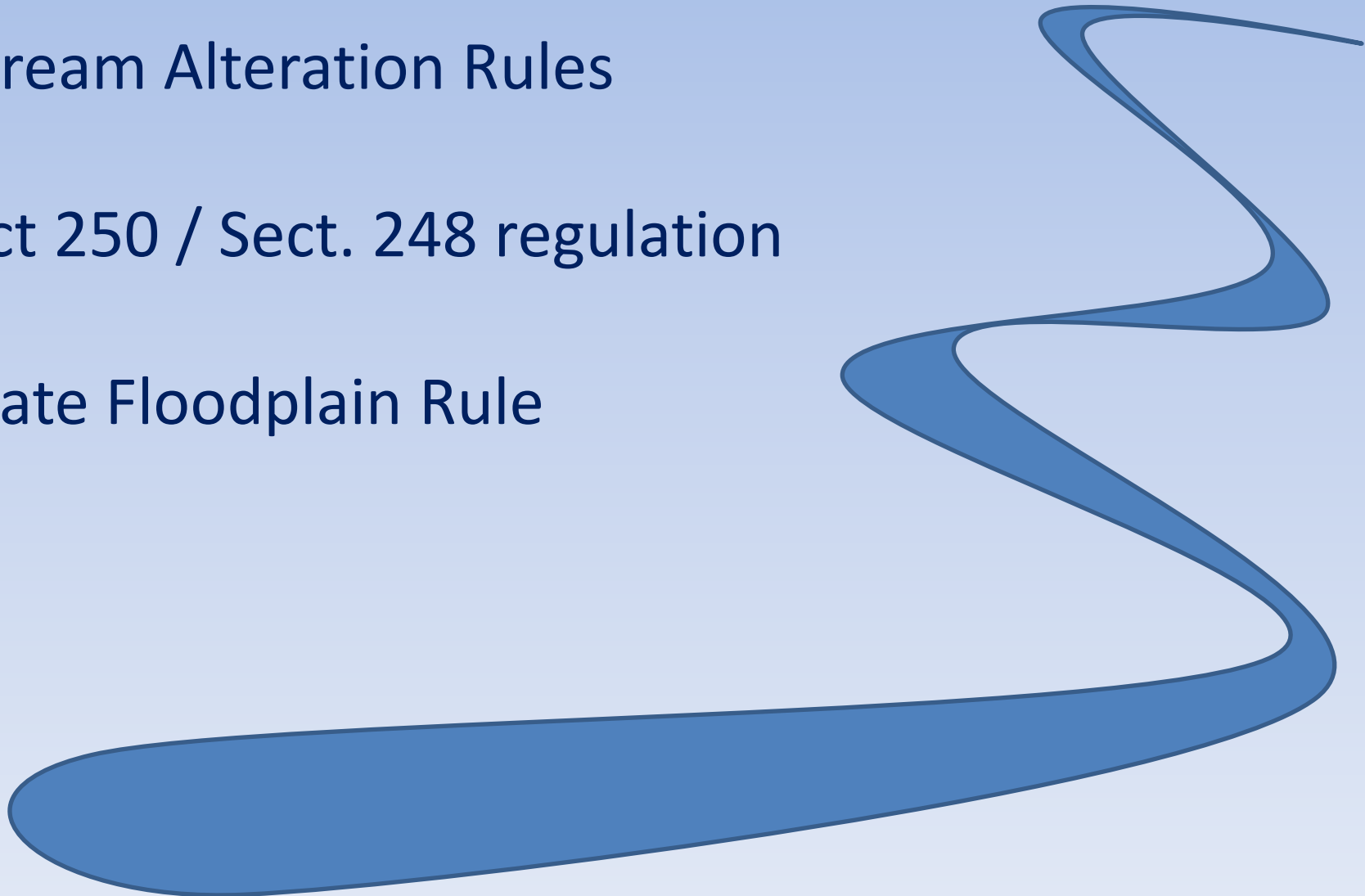
COMMUNITY CHEST



	7.5% ERAF RATE	12.5% ERAF RATE	17.5% ERAF RATE
FEDERAL SHARE	\$750,000	\$750,000	\$750,000
STATE SHARE	\$75,000	\$125,000	\$175,000
MUNICIPAL SHARE	\$175,000	\$125,000	\$75,000
TOTAL	\$1,000,000	\$1,000,000	\$1,000,000

State Regulatory Authority use the River Corridor

- Stream Alteration Rules
- Act 250 / Sect. 248 regulation
- State Floodplain Rule



Is Your Community Flood Ready? Visit Flood Ready Vermont

Vermont Flood Ready Atlas

[Click here to explore the atlas in full screen.](#)

To print the map, your browser must allow popups.

