West Fairlee, Vermont Flood Resilience
(Addendum to Town Plan Adopted August 28, 2012)

1.0 Background

Mountainous geography influenced the settlement and historical development patterns of our Vermont communities, so that many of our population centers and farms occupy valley floors where there is more gently sloping land with generally richer and less rocky soil. Many of the valley **floors, whose gentle** slopes, rich soils, and diverse ecological resources **made them so attractive for development,** are actually floodplains formed by the meandering movement of streams eroding and re-depositing soil and organic matter. Life in our mountain-and-valley terrain has taught us that our valleys surrounded **by steep hills flood often (at least yearly in some locales) and stream channels frequently change position.**

The movement of the streams along our valley floors is powered by runoff from the surrounding steeply sloping uplands. Surface water runoff from rain and melting snow collects in streams that converge and become progressively larger as they convey water downslope toward the valleys. Each stream valley and floodplain receives water from a distinct "catchment" or "watershed" area. A watershed comprises a dynamic system of flowing water and moving soil **as well as rocks, and trees and other types of debris.** The movement of water, soil, and debris along the main valleys in a watershed is sometimes characterized by the term "valley train". Valley train movements are affected by the size of the watershed, the amount of precipitation onto the land surface, the rate of precipitation, the slope of the land, and the types and amount of land surface cover.

Though seemingly **static and inviting for human development**, valley trains **are** conveyer belts that swerve side-to-side while moving downstream, with pulses of faster **and often catastrophic** movement during periods of intense or sustained precipitation. We don't always pay **attention to them** and it is easy to lose sight of the valley train conveyors because so much of the movement is slow and innocuous, but the trains *are* always moving. We are gently reminded of this movement during seasonal flooding and small-scale collapse of stream banks. Our attention is abruptly and intrusively redirected to it by severe and often catastrophic events **such as ice jams releasing, rapid melt-off and rain while the ground is frozen or thawing, or during intense storm rainfall.**

Flash floods, landslides, stream bank collapses, and stream channel shifts are catastrophic pulses of valley train movements that are often detrimental to human safety and health, and result in **damage** and high **costs to public or private property** and infrastructure. Catastrophic movements are not unusual – they are integral to the natural processes of any valley train system. In short, catastrophic pulses of movement, evidenced by flash floods and mass movements of soil, are as common as the so-called "normal" seasonal flooding and erosion, they just occur less frequently. These movements are characteristic of the very areas that, historically, seemed so attractive to human settlement and community development.

2.0 Flood Hazards

Most Vermont stream **floodplains and, to a lesser degree, upland watersheds** have been altered by human activities including deforestation and farming, channelization, stream bank retaining walls, filling, and **construction of roads, bridges, dams, and buildings, such as homes, schools, and critical facilities.** When development encroaches or stream channels are altered, conditions in the flood erosion hazard zones become more unstable. Dangers to downstream occupants and structures are exacerbated. Removal of vegetation, soil disturbance, and stream channelization increase floodwater depths, flow

velocities, erosion, and sediment deposition downstream. Flow of water and sediments, **and sometimes buildings, vehicles, and other debris,** is diverted to downstream properties and both the **damage** to infrastructure and risks to public safety are magnified.

For more than 200 years we have incurred significant and recurrent **expenses, expenses that are ever-increasing, from** trying to control and stabilize our moving valley trains. We have been reminded repeatedly and severely that the movements of valley trains and tributary streams, and the attendant inundation and erosion hazards, are not within our abilities or our best interests to control. Time and experience make it clear that we cannot hold our rivers and streams in place regardless of the amount of effort and **money we expend.** Our repeated best efforts to actively "control" or "stabilize" streams and rivers have, over the long term, created a cycle of ever increasing safety risks and maintenance costs.

Flood hazards arise from both inundation and erosion – natural processes inherent **to floodplains and valley trains.** Vermont's main streams and rivers flow through narrow valleys that collect water from relatively large and steeply sloping catchment areas, a condition that increases risks for **rapid or "flash" flooding.** Flash flooding occurs not only in areas prone to inundation, such as the known "regulatory floodplains" mapped by the Federal Emergency Management Agency (FEMA), but also along upland slopes and streams that contribute runoff to the valley floors. Floods rarely follow precise boundaries on a map, and flooding often occurs **outside the regulatory floodplain boundaries, referred to by FEMA's as "Special Flood Hazard Areas" or "SFHAs".** This is especially the case in Vermont (based on research by the Vermont Land Use Institute) **up** to two-thirds of **flood damage occurs** outside of FEMA's mapped SFHAs.

Tropical Storm **Irene at the end of August, 2011** demonstrated that, by far, the most catastrophic damage is caused by flowing water and entrained sediments ("fluvial erosion"). During heavy rains or rapid snow melt events, soil in stream drainages and floodplains becomes saturated, making it easier to move. At the same time the amount and rate of runoff increases - breaching stream banks, inundating valley floors and adding enough energy to create a slurry of water and sediment that scours stream banks and uproots trees and vegetation and can destroy homes, septic systems, vehicles, propane tanks, retaining walls, roads, bridges, power lines and anything else in and along the floodplains. Tropical Storm Irene was an exceptional but by no means isolated event.

Floods and **erosion damage** occur at any time of year due to rainfall, ice build-up, snow melt, and soil movement. The continued occurrence of such events is a **given, and** the severity of such events is unpredictable and variable. On average, flood-related **damage, particularly damage from fluvial erosion, costs** Vermont taxpayers millions of dollars annually. **Our experience of recent decades, and particularly of the past few years,** and our best climate science show us that hazardous flood and erosion events are increasing in frequency and severity, and suggest that this trend will continue into the foreseeable future.

3.0 Flood Resilience Management

3.1 Overview

From hard experience, empirical science, and economic data there has emerged a consensus that our wisest, least painful and least costly course over the long term lies in an approach that reduces flood and erosion hazards; minimizes the recurrent costs of trying to control our streams, repairing and replacing community infrastructure and public and private buildings and homes; and allows us to keep our **valuable and irreplaceable soil** resources while improving stream water quality and aquatic habitat. Vermont's **experience,** research efforts, successes in fostering effective public/private collaboration, and legislative

initiatives to promote watershed-scale management have been **at the forefront** of this new understanding. The term widely adopted to describe this new understanding of socially and ecologically responsible, safe, cost-effective, and sustainable management is "flood resilience".

At its core, flood resilience management directs that we as a community manage our interactions with our streams and coordinate our efforts with our neighbors because, ultimately, everyone lives, works and plays downstream. Therefore, flood resilience management is most effective when approached on a watershed scale, both locally and regionally.

Most of Vermont's population centers are clustered within and along river and stream valleys. Flood resilience management recognizes that we cannot undo our historical settlement and land development patterns, nor is it practical to expect relocation of community buildings and homes, nor can we afford the expense and disruption of large scale changes to infrastructure over the short term. But, recognizing our history and current circumstances, our recent experiences provide many lessons pointing to a pragmatic long-term approach to **reducing the risks** and costs of floods and erosion.

We have learned that we can reduce, maybe even avoid, the repeated cost of repairing our communities if **we manage land use so as to** allow our streams and rivers the space to move and return to a natural equilibrium. Experience demonstrates that our repeated efforts to control and contain rivers and streams, by **engineering channels, using flow-constricting bridges and culverts and** altering or removing natural floodplains created a sluice effect that caused most of our streams to incise their floodplains. **Without the natural landforms** and vegetation that dissipate energy and hold soil in place, **the suddenness, the severity, and the cost of erosion and inundation damage increase.**

A central tenet of flood resilience management is to allow the streams and rivers to regenerate a more natural floodplain with the unique landforms, rich soils, and diverse plant and **wildlife communities that** combine to limit and dissipate **flood energy and damage and enhance** the beauty and appeal of our **communities.** The value of natural floodplain areas was **demonstrated in 2011 during Tropical** Storm Irene **when observations along** Otter Creek showed that flooding in Rutland was far for more severe than in the downstream community of Middlebury because much of the floodplain between the two towns is in a more or less natural state with natural levees, wetlands, and diverse woody plant communities.

3.2 Why Flood Resilience Management Makes Sense

The goals of protecting our community and our natural resources are interdependent and mutually supportive. In an important and timely paper published by the Vermont Journal of Environmental Law (Vol. 14, 2013), Vermont's Department of Environmental Conservation (DEC) Commissioner David K. Mears and Sarah McKearnan (Senior Policy Advisor to Commissioner Mears on flood resilience matters) adroitly observe that:

> *…**adjustments** to our community and infrastructure development, river management, and floodplain protection policies can reduce the risk of flood damage to our homes, businesses, and farms, while also enhancing Vermont's natural beauty. In every watershed in Vermont, the goals of protecting our communities and preserving our natural environment are closely intertwined and **interdependent.***

An effective flood resilience management approach considers the whole picture when addressing ways to reduce flood risks and minimize the costs of **responding to and recovering from** flood-related **damage.** Watershed scale management applies both locally and regionally. West Fairlee's boundaries encompass all

or parts of three local watersheds **--Blood Brook**, Middle Brook, and a section of the main trunk of the Ompomanoosuc **River--** each of which is an upstream component of **the regional Ompompanoosuc** River watershed **area, designated by the State as Vermont** Drainage Basin 14).

Again drawing upon a description by Mears and McKearnan (2013), a watershed-scale approach makes sense because:

> ***The*** *volume of water that reaches rivers is closely related to the area of land within the watershed around the river and the type of activities on that land. A change to any variable threatens the equilibrium of* ***the river.***

Within valleys and floodplains, the areas of active stream channel movement are fluvial erosion hazard (FEH) zones. In naturalized floodplains, fluvial erosion is moderated by woody vegetation and landforms that help detain water, debris, ice, and sediment. Unaltered floodplains develop soils of very high quality and support robust, biologically diverse communities. Natural floodplains **reduce water pollution and recharge aquifers and provide downstream** water **resources, including larger streams, ponds, and lakes.**

Because flood resilience management relies on working with rather than against natural stream processes, it decreases the money our community will expend to maintain **infrastructure such as bridges, roads and power lines**. Flood resilience management limits soil loss and allows vegetation to **re-establish, while restoring wildlife habitat corridors at no extra cost. It decreases** flood damage and the economic impact of recovering from **floods, while encouraging land** uses that keep people, property, and community assets out of harm's way. This is a pragmatic and sustainable strategy that yields multiple benefits -- financial, health and safety, environmental, ecological and aesthetic -- to the entire community at the lowest possible cost over time.

Flood resilience is measured by the ability of a town --**or** a local or regional **watershed--** to withstand adverse events. Resilience is created by preparing for reasonably foreseeable flood-related hazards, planning and adapting in ways that avoid or minimize damage, **and by optimizing** social and economic recovery from catastrophic events. The objective of flood resilience management is to enhance our community's ability to anticipate, avoid, withstand, respond to and recover from the **adverse effects of routine and seasonal as well as exceptional** flooding events. Resilience management also works to discourage new development in known flood hazard areas, including both SFHAs and FEH zones.

Actively encouraging, diligently implementing, **and committing to sustain flood** resilient land management practices protects human safety and health, private property, community resources, the natural environment, and our community's economic future. Again borrowing from the words of Mears and McKearnan (2013):

> ***…a*** *safe community is one that can accommodate the natural fluctuation and movement of stream and river levels. Constructed with the foresight and knowledge that river systems are dynamic, not fixed, safe communities protect, where possible, those key natural functions of the landscape, such as lowering peak flows by storing water and reducing* ***erosion.***

Active resilience management requires relatively little capital investment and serves to reduce infrastructure and maintenance costs over time by shifting land use practices to achieve a more economically sustainable equilibrium. Moreover, adoption of practices that are consistent with federal and state policies and guidelines for flood resilience management supports and maintains our eligibility for federal and state

disaster relief funds, positions us to obtain funding from grant programs for community development, and makes us eligible for assistance toward costs of preparing for future flood-related disasters.

Over the long term, West Fairlee's best approach to flood resilience is to implement appropriate, pragmatic and sustainable strategies to achieve the greatest practical benefits at the lowest reasonable **cost** over time, while minimizing impact to existing landowners. A widely recommended way to facilitate this evolution in management of floodplains is to adopt a "no adverse impact" land use policy for our stream and river corridors.

Following are excerpts summarizing the central tenets of "no adverse impact" policy as described in a paper published by the National Association of State Floodplain Managers (2008):

1. ***No Adverse Impact floodplain management takes place when the actions of one property owner are not allowed to adversely affect the rights of other property owners.*** *The adverse effects or impacts can be measured in terms of increased flood peaks, increased flood stages, higher flood velocities, increased erosion and sedimentation, or other impacts the community considers important. The No Adverse impact philosophy can shape the default management criteria: a community develops and adopts a comprehensive plan to manage development that identifies acceptable levels of impact, specifies appropriate measures to mitigate those adverse impacts, and establishes a plan for implementation. No Adverse Impact criteria can be extended to entire watersheds…*

2. *The No Adverse Impact approach will result in reduced flood damage. However, its true strength is seen when proposed development actions that would affect local flooding or the property rights of others are permitted only when they are in accord with a locally adopted plan that identifies the negative impacts the community wishes to avoid and/or mitigate. The plan could be specific to flood damage or be quite robust, encompassing related objectives such as water quality protection, groundwater recharge, or the management of stormwater, wetlands, and riparian zones.*

3. ***[A No Adverse Impact plan] promotes*** *local accountability for developing and implementing a comprehensive strategy and plan. With the flexibility to adopt comprehensive, locally tailored management plans (which would be recognized by FEMA and other federal programs as the acceptable management approach in that community) the community gains control of its land use decision-making process and is supported in adopting innovative approaches it considers appropriate for its situation.*

Adopting a *"No Adverse Impact*" policy allows us to actively direct the process of flood resilience planning according to our unique social circumstances and physical setting characteristics while meeting state and federal criteria, and protecting our community and natural resources. The "No Adverse Impact" approach is cited and recommended both by FEMA and by the State of Vermont.

3.3 Current Regulatory Climate and Trends

Since 1968, FEMA has been providing flood disaster relief funds through the National Flood Insurance Program (NFIP). The NFIP incentivizes municipalities and property owners in known inundation hazard areas to use construction methods that **reduce damage** from flooding. One basis of the NFIP's insurability rating system is FEMA's SFHA maps. The SFHA maps have significant limitations, and these limitations are inherent to local floodplain ordinances that are based on complying with the minimum insurability standards of the NFIP. Continued reliance on floodplain ordinances that only meet the minimum NFIP standards poses risks to communities within and along stream and river corridors.

The SFHA maps, which the NFIP's actuarial calculations have relied upon for the past several decades, provide only a snapshot of flood inundation hazard areas at the time that mapping data was collected and used to define inundation hazard areas. The SFHA maps do not consider shifts in the positions and shapes of streams --shifts that occur gradually and shifts that are sudden and catastrophic. FEMA's maps do not show areas subject to stream **erosion hazards, which are by far** the most frequent, dangerous, and costly type of flood hazard in **Vermont.** In effect, FEMA acknowledges and compensates for these limitations through the Community Rating System **(CRS)** under the NFIP. The CRS encourages comprehensive floodplain management practices and consideration of flood-related factors extending well beyond the limits of FEMA's SFHAs.

The state of Vermont strongly recommends the adoption of new local ordinances based on flood resilience management principles rather than mere compliance with the NFIP standards. Accordingly, Vermont's ANR, Division of Environmental Conservation (**DEC**), Rivers Program has recently published (2013, revised 2014) templates and strong recommendations for updated local floodplain ordinances based on sound flood resilience and no adverse impact management policies.

3.4 Recommendations for Local Regulation

West Fairlee's current floodplain ordinance addresses only the minimum necessary to qualify for participation in the NFIP and allow property owners to obtain flood insurance. It does not plan for mitigation of any flood-related risks except as addressed by NFIP minimum standards, which only apply to effects on insurability related to modification of existing buildings or construction of new buildings in SFHAs. It does not address areas outside of FEMA's mapped SFHAs.

Mere compliance with the NFIP qualifying minimums does not address causes of flooding nor does it consider risks from erosion, the effects of land use practices on flooding and erosion, nor the long-term costs to a community to respond to and repair flood **damage.** Adherence only to the minimum NFIP standards would allow new construction in and alteration of our known floodways and erosion hazard areas, and so would allow land uses that induce greater flood damage downstream.

Stated another way, West Fairlee's existing floodplain ordinance is not adequately protective of our community's residents and property, our public infrastructure, or our natural resources. It does not protect property owners from hazards that increase due to the activities of others in upstream portions of our floodplains. Furthermore, our existing ordinance is out of **date and so does not anticipate** the recent and accelerating evolution of state and federal policy, funding guidelines, and regulations toward managed "smart growth," nor does it comport with concurrent and proactive efforts by state and regional planning agencies and neighboring local communities to adopt and implement science-based watershed scale management and smart growth practices.

Vermont's Act 16, relating to municipal and regional planning and flood resilience, was signed by Governor Peter Shumlin on May 6, 2013. Act 16 requires that, all municipal and regional plans effective after July 1, 2014 include a "flood resilience element" pursuant to the purpose and goals of 24 VSA §4302b (14), including:

- *Avoidance of new development in identified flood hazard, fluvial erosion, and river corridor protection areas, and if new development is to be built in such areas, it should not exacerbate flooding and fluvial erosion;*

- *Encouragement of the protection and restoration of floodplains and upland forested areas that attenuate and moderate flooding; and*

- *Encouragement of flood emergency preparedness and response planning.*

Vermont's Act 138 (relating to regulation of flood hazard areas, river corridors, and stream alteration) was **adopted in May of 2012**, and revised the language of 10 V.S.A. Chapter 32 ("Flood Hazard Areas") *§ 751* as follows:

> ***The*** *purpose of this chapter is to minimize and prevent the loss of life and property, the disruption of commerce, the impairment of the tax base, and the extraordinary public expenditures and demands on public service that result from flooding; to ensure that the development of the flood hazard areas of this state is accomplished in a manner consistent with the health, safety and welfare of the public; to coordinate federal, state, and local management activities for flood hazard areas; to encourage local government units to manage flood hazard areas and other flood-prone lands; to provide state assistance to local government units in management of flood-prone lands; to comply with National Flood Insurance Program requirements for the regulation of development; to authorize adoption of state rules for management of uses exempt from municipal regulation in a flood hazard area; to maintain the agricultural use of flood-prone lands consistent with the National Flood Insurance Program; to carry out a comprehensive statewide flood hazard area management program for the state in order to ensure eligibility for flood insurance under the requirements of the National Flood Insurance* ***Program.***

Vermont's Act 138 works in concert with Act 16 and is directed toward more actively *linking community development funds and funds for disaster relief to* ***local efforts to prevent development*** *in flood hazard areas.* In short, *Vermont is moving toward greater local accountability as criteria* for receipt of state funding.

In keeping with the emphasis on greater local accountability, Vermont's Emergency Relief and Assistance Fund (ERAF) was modified so that as of October 23, 2014 new qualifying criteria will apply to requests by towns for disaster relief funding. ERAF provides State funding to match Federal Public Assistance grants (these are funneled through and administered by the state of Vermont) after federally-declared disasters. After October 23, 2014 the State of Vermont's baseline contribution to disaster relief funding for a town will be an additional 7.5% toward the costs. But, for communities that take specific steps to reduce flood damage, Vermont will contribute 12.5% or 17.5% of the total cost provided the town has previously met certain criteria, as listed below:

- *For funding up to 12.5% of relief costs, communities must meet four mitigation measures:*
  1. *National Flood Insurance Program participation;*
  2. *Annual certification of Town Road and Bridge Standards as described in the current (2014-2016) VTrans Orange Book: Handbook for Local Officials;*
  3. *Adoption of a Local Emergency Operations Plan (**to be adopted annually** after the town meeting);*
  4. *A FEMA-approved Local Hazard Mitigation Plan (valid for five years) **or submission of a draft** plan to FEMA Region 1 for review.*

- *For funding of up to 17.5% of relief costs, communities must meet the 12.5% funding criteria and:*

  5. *Protect river corridors from new encroachment or protect mapped flood hazard areas from new encroachments and participate in the FEMA Community Rating System (CRS).*

West Fairlee's eligibility for many types of funding would benefit from an improved rating classification under FEMA's NFIP CRS, and compliance with Vermont's recent and evolving flood resilience recommendations and rules. These objectives would be served by prohibitions on land development and/or building of new structures in mapped flood hazard zones. West Fairlee can improve its flood **resilience and secure it access to emergency relief funding by** adopting a revised and updated river corridor protection **bylaw that meets or exceeds current** and forthcoming regulations and the Vermont DEC Rivers Program's guidelines. Based on West Fairlee's current circumstances, our best course would be to adapt the Rivers Program's Model **6 template, a free-standing ordinance for towns without existing zoning bylaws, in** order to arrive at appropriate regulation of activities affecting our floodplains.

4.0 West Fairlee's Flood Resilience Action Plan

With this flood resilience element West Fairlee is amending our 2012-2017 Town Plan in fulfillment of the relevant requirements of Vermont's Act 16 and **Vermont's Act 138. We have done this in reasonable** anticipation of state policy decisions and rule making that will limit future floodplain development activities and require, among other things, advance notification and both state and local permits for construction and land surface disturbances in and along floodplains and stream buffer zones. **West Fairlee also seeks to align its land use guidance and enforced restrictions progressively, based** on the relevant criteria set forth by FEMA's CRS.

The requirements and objectives of Vermont's Act 16, Vermont's Act 138, and FEMA's CRS are complementary and mutually supportive. **It is West Fairlee's objective to continue to evolve policies consistent with smart growth and land use** by coordinating our **efforts with present and ongoing efforts by our neighboring communities and the Two Rivers-Ottauquechee Regional Commission (TRORC)** to promote concerted watershed scale management of the Ompompanoosuc River drainage catchment area.

4.1 Local Physical Setting and Land Use Characteristics

Except for the far northeastern-most portion of our **town, which drains to Rowell Brook and is part of the Waits River drainage basin, West Fairlee** is entirely within the Ompompanoosuc River catchment **area –also designated as Vermont's Drainage Basin 14.** West Fairlee comprises three local watersheds **including, from east to west,** the Blood Brook watershed, the Middle Brook watershed, and the watershed for the upper part of the main trunk of the Ompompanoosuc River. Blood Brook and Middle Brook each convey and discharge surface water runoff directly to **Lake Fairlee. Lake Fairlee drains into the Ompomapnoosuc River via a dam at its western end in Thetford.** The main stem of the Ompompanoosuc River flows **from Vershire to the west, through** the western portion of West Fairlee and into **Thetford to the south.**

In general, most of the upland areas in each of West Fairlee's three local watersheds are forested and steeply sloping. The upland areas are drained by streams that are confined in channels incised to bedrock, have steep gradients, and converge to form larger flows before discharging directly to the primary streams. Blood Brook, Middle Brook, and the Ompompanoosuc River occupy narrow valleys characterized by relatively **low, gentle gradients** that decrease and have correspondingly wider **floodplains southward and downstream.**

Land uses in the Blood Brook and Middle Brook watersheds are almost entirely agricultural, rural residential, and conservation/recreation. Most of the **non-forested and cleared** land areas in these watersheds occupy the valley floors and adjoin or are near the main stream corridors. Within these areas, woody vegetation is absent from long segments of the main stream banks. Paved town roads run north **and south, more or less**

following the valley floors and are largely within **or adjacent to the stream** floodplains. Accordingly, there are more residential dwellings, agricultural and commercial buildings, and community buildings along or near the valley floors and floodplains than in the upland areas.

In terms of flow volume and channel width and depth and catchment area, the Ompompanoosuc River is the largest drainage course in West Fairlee. Vermont Route 113 follows the course of the Ompompanoosuc River along the edge of the Ompompanoosuc River floodplain. The Route 113 and Ompompanoosuc River corridor encompasses the largest and densest concentration of residential dwellings, **commercial and institutional buildings in our town.** Notably, all of our essential services centers, including municipal and emergency response facilities, **and our public school** are within this corridor, along the mapped Ompompanoosuc River floodplain and floodplain fringe.

4.2 Mapped Flood and Erosion Hazard Areas in West Fairlee

As part of its state-wide program to prompt and assist Vermont communities in collective movement toward greater flood resilience, the Vermont ANR Rivers Program collaborated with local **communities, TRORC**, consulting agents, and other stakeholders to make a watershed scale assessment of stream geomorphology in the Ompompanoosuc River **drainage basin or Vermont Basin 14.** These studies provide a body of useful baseline data **for managing land use toward** greater flood resilience.

Phase I and Phase II assessments of Blood Brook, Middle Brook, and the Ompompanoosuc River from Vershire downstream through West Fairlee and Thetford were completed between 2009 and 2011. The stream geomorphic assessment data was used to develop a corridor management plan for the Ompompanoosuc River in West Fairlee and Thetford. The stream geomorphic assessments and river corridor management plan are documented in:

- *"Ompompanoosuc Watershed Phase I Geomorphic Assessment Orange and Windsor Counties, Vermont" (April 16, 2009) prepared by Bear Creek Environmental, LLC for the Thetford Conservation Commission (with support from the VANR River Management Program); and*

- *"Ompompanoosuc River Corridor Plan West Fairlee to Thetford, Vermont" (April 28, 2011) prepared by Bear Creek Environmental, LLC in partnership with the West Fairlee Conservation Commission, Thetford Conservation Commission, Vermont ANR, Ompompanoosuc River Watershed Council, and the White River Natural Resources Conservation District (with support from the Upper Connecticut Mitigation and Enhancement Fund).*

These stream geomorphic studies added to prior work **by TRORC** to assess infrastructure installations affecting drainage along the major streams and tributaries in the Ompompanoosuc River watershed. TRORC's work on this aspect of watershed assessment is documented in:

- *"Bridge and Culvert Survey Ompompanoosuc River and Major Tributaries Fairlee, Norwich, Thetford, Vershire, and West Fairlee, Vermont" (April 2007)*

These studies provide extensive and high quality baseline data of local stream and river corridor conditions, and help to identify and direct ongoing stream corridor stabilization and hazard mitigation projects.

Vermont's Rivers Program team has been working on and is nearing completion of maps of West Fairlee's main stream and river **corridors: Blood Brook**, Middle Brook, and the Ompompanoosuc River and Schoolhouse **Brook.** These **maps outline both FEMA's** SFHAs and FEH **zones, identified through** field

assessments by Rivers Program scientists. West Fairlee's Planning Commission was provided **draft -- and** as yet **unpublished--** copies of these maps during the latter part of 2013. Final copies of these stream and river corridor hazard maps will comprise an integral part of this Flood Resilience Element of West Fairlee's town plan, and serve to facilitate understanding of the geographic purview of our updated floodplain ordinance.

4.3 Consistency with State and Regional Flood Resilience Initiatives

As is documented in preceding sections of this flood resilience action plan, West Fairlee has for the past several years been actively collaborating with neighboring **communities, TRORC**, the Vermont ANR Rivers Program, and **other stakeholders** in watershed-scale management efforts toward flood hazard mitigation and flood resilience. Some examples of our recent resilience planning and enhancement work are listed below:

- Guided by observations from the TRORC bridge and culvert survey (2007) and the stream geomorphic assessment and river corridor planning documents (2009-2013), West Fairlee's Conservation Commission has promoted and actively engaged in stream bank stabilization and riparian corridor re-establishment **projects that, among other efforts, include** plantings in cooperation with volunteer landowners along the Ompompanoosuc River.

- West Fairlee's Conservation Commission is collaborating with Vermont's Division of Water Quality to identify ways to mitigate ongoing sources of pollution within the Ompompanoosuc River corridor.

- West Fairlee's conservation commissioners and planning commissioners are actively dialoguing on integration of short term and long term planning and conservation strategies to enhance floodplain naturalization and, thereby, flood resilience

- West Fairlee's Planning Commission is actively engaged in conversations with Vermont's River Program team to facilitate understanding of State initiatives to promote flood resilience and obtain and update maps of flood hazard areas based on FEMA FIRMs and on field assessments by Rivers Program scientists.

- West Fairlee's Planning Commission has initiated the process of local floodplain and watershed assessment, with emphasis on identifying and inventorying existing landowners, residents, buildings, and facilities within or along the fringes of flood and erosion hazard zones.

- West Fairlee's **Selectboard** has pursued and obtained grants for projects to improve the resilience of Town infrastructure in accordance with Vermont Agency of Transportation recommendations and standards

- West Fairlee is working to build momentum toward promoting a more robust recreational economy, including floodplain naturalization through sustained collaboration between our Conservation Commission and our Planning Commission. To date, West Fairlee has preserved **nearly 1,200 acres** of forest and wetlands in the upland portions of our Blood Brook and Middle Brook watersheds. We are actively considering ways to work creatively with community residents to promote re-establishment of more continuous and ecologically diverse naturalized riparian corridors along Blood brook, Middle Brook, and the Ompomanoosuc River.

- Two West Fairlee **citizens, who** have also served as town **commissioners, recently** initiated a periodic

news publication that is **used, among other things,** to inform residents of flood hazards and the ongoing evolution of initiatives to enhance public knowledge and safety, and protect **our public and private property** and natural resources.

- West Fairlee's town website is actively updated to provide residents and visitors easy access to current information and can be used to inform the town of ongoing flood resilience efforts.

4.4 Consistency with FEMA's CRS Guidelines

Although West Fairlee has participated in FEMA's NFIP since its initiation in the 1980s and our current floodplain ordinance is designed to comply with the minimum NFIP standards, we now recognize the need for and community protective benefits of efforts exceeding the NFIP minimums. Reduced flood insurance premiums in response to state and community activities that exceed the NFIP minimum of simply regulating construction of new buildings to the minimum national standards serve as incentives for improving community rating scores under the CRS. The CRS uses a scoring system to recognize work exceeding the NFIP minimums, pursuant to three goals, which are:

- to reduce and avoid flood damage to insurable property;
- strengthen and support the insurance aspects of the NFIP, and
- foster comprehensive floodplain management.

A community's CRS rating is based on a scoring system that provides points for work that helps to minimize flood losses both inside and outside of mapped floodplains. Communities are encouraged to reduce the exposure of existing **buildings, as well as their contents, to flood damage, especially** properties that are subject to repetitive **flood losses. New buildings** and their contents **should also** be protected from known and future local flood hazards. FEMA emphasizes that standards higher than those described by the minimum NFIP criteria may be necessary.

The CRS encourages communities to map and provide regulatory flood data for all flood hazards, use the maps and data in local regulatory programs, and make the data publicly available. The scoring system rewards communities that generate and contribute data enabling accurate actuarial rating of flood insurance. The focus is on encouraging the use of mapping and information programs that help assess individual property risk and reduce repetitive flood losses. Also, the scoring system rewards efforts to expand the flood insurance policy base by increasing residents' awareness of their flood risk, with the hope that more residents will purchase and maintain flood insurance policies.

Under the CRS, FEMA recognizes that flood hazard concerns extend beyond simply protecting insurable property, and so encourages communities to implement comprehensive local floodplain management programs. The CRS is structured to reward local efforts that: protect lives and public health, safety, and welfare; minimize damage and disruption to infrastructure and critical facilities; preserve and restore the natural functions and resources of floodplains **and shore land** areas; and ensure that new development does not cause adverse impacts elsewhere in the watershed or on other properties.

The *"National Flood Insurance Program Community Rating System Coordinator's Manual"* (FIA-15/2013) recommends that:

> ***A community's*** *staff should understand the physical and biological processes that form and alter floodplains and watersheds and take steps to deal with flooding, erosion, habitat loss, water quality, and special flood-related hazards. A comprehensive approach includes planning, public information, regulations, financial support, open space protection, public works activities, emergency management, and other* ***appropriate techniques.***

Although it is beyond the scope of this document to describe in detail specific CRS scoring criteria, West Fairlee's efforts **to date, as described** in preceding sections of this **document, have** positioned **the Town well** to obtain a rating that will lower insurance premiums for our residents and businesses. West Fairlee **is also well** positioned for additional credits if we elect to prepare and submit an application to FEMA for a revised CRS classification**. Such requests are voluntary, but West Fairlee** plans to prepare and submit a CRS **classification request as part of its** ongoing, and evolving, flood resilience enhancement efforts.

4.5 Flood Resilience Enhancement Strategy and Actions

4.5.1 Goals

1. Consistent with sound principles of flood resilience and no adverse impact floodplain management, this flood resilience element of West Fairlee's Town Plan is intended to facilitate sustainable land use and development policies and rules that reduce risks to human safety, property, and infrastructure, and decrease recurrent costs to the community related **to damage** from inundation and erosion.

2. In general, we seek to integrate the core elements **of the best available regulation**, conservation, and emergency preparedness to enhance flood resilience. Accordingly, our efforts are directed toward consistency with relevant guidelines under both state and federal programs.

3. West Fairlee's flood resilience enhancement efforts shall continue to comport with Vermont's Act 138 and Act 16, and evolving shore lands protection efforts to promote improved water quality in Vermont's lakes and streams.

4. West Fairlee's flood resilience management efforts also continue to comport with the goals and general recommendations of FEMA's CRS for exceeding the minimum requirements under the NFIP pursuant to maximizing insurability and reducing flood insurance premiums for town residents and businesses.

4.5.2 Recommendations

West Fairlee shall continue to pursue a flood resilience management approach whose essential components are as follows:

1. Identify and map known and likely flood hazard areas, fluvial erosion hazard areas, and river corridor protection areas based on stream geomorphic assessment studies and maps provided by the Vermont ANR Rivers Program, and designate those areas for protection to reduce the risk of flood damage to infrastructure and private property.

2. Identify all existing structures, waste facilities, water supply facilities, and infrastructure in and along West Fairlee's river and stream corridors.

3. **Enact an updated** town ordinance concerning our stream and river corridors, and include provisions for advance notification of and specific limits on new development activities in identified flood hazard areas, fluvial erosion areas, and/or stream corridor protection areas, based on regulatory templates developed by the ANR DEC Rivers Program for communities without existing zoning ordinances.

3. Rely upon and reference Vermont Department of Public Safety and Agency of Natural Resources rationale and guidance set forth in *"State of Vermont Hazard Mitigation Plan"* (November 2013) in specifying appropriate advance **notification of** changes in land uses and appropriate restrictions on land use and construction standards in floodplains and erosion hazard areas.

4. Regulate any new development in identified fluvial erosion hazard areas, flood hazard areas, or stream corridor protection areas to ensure that development does not exacerbate flooding and fluvial erosion, and extend these provisions to development activities that might increase the amount and/or rate of runoff and soil erosion upland areas.

5. Encourage the protection and restoration of our river corridors, floodplains, wetlands, and upland forested areas that attenuate and moderate flooding and fluvial erosion.

6. Engage in focused efforts to inform town residents of policies, strategies, and resources to protect the identified and designated hazard areas and to mitigate risks to public safety, critical infrastructure, and municipal investments, including:

    a. Contact with property owners and residents within and near stream corridors;
    b. Lists of published planning and land **use guidelines, relying on** state publications;
    c. Summaries of emergency response notification procedures, contacts, and resources;
    d. Apprise property owners of flood insurance and insurance rate reduction incentives; and
    e. Provide information on flood damage and disaster recovery funding and financial incentives.

7. Promote future land use planning that facilitates sustained hazard mitigation efforts, including:

    a. Naturalizing river corridor and floodplain establishment and conservation;
    b. Defining critical areas for upland storm water runoff limitation and management;
    c. Enacting assessment and pre-development notification requirements to facilitate advance identification of potential problems that may arise from changes in the density of development, determination of appropriate development densities, and allow re-direction of development away from protected areas and high-hazard areas.
    d. **Using easements** and **acquisition, when possible, to** prevent inappropriate land uses.

8. Actively encourage flood emergency preparedness and develop contingency plans for emergency responses to natural disasters, and appropriately integrate the town's emergency response, infrastructure, and flood resilience planning, including:

    a. Development of an updated Local Emergency Operations Plan based on the Vermont Department of Public Safety's LEOP Base Plan 2014 template.
    b. Planning to promote consistency with State of Vermont Hazard Mitigation Plan 2013

9. Work to update and integrate West Fairlee's planning and regulatory efforts with parallel or corresponding efforts by adjoining towns, and with local and regional stake holders in the larger Ompompanoosuc River watershed (Vermont Drainage Basin 14).