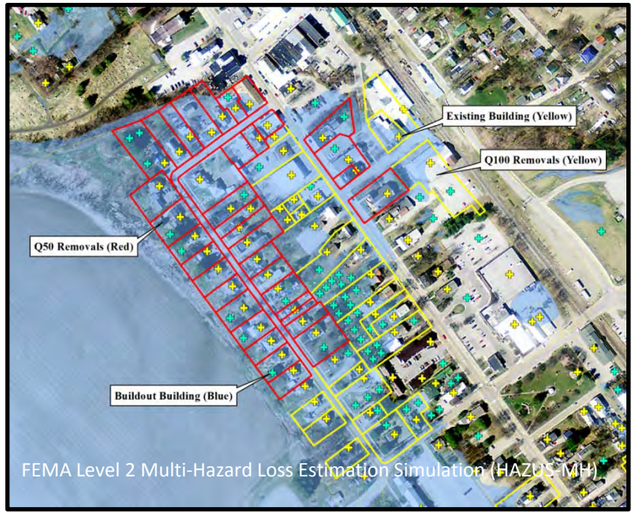
FLOODPLAIN MANAGEMENT ECONOMICS FACT SHEET
WATERBURY, VERMONT

Evaluating the Costs and Benefits of Floodplain Protection Activities in
Waterbury, Vermont and Willsboro, New York, Lake Champlain Basin, U.S.A.
April 17, 2015

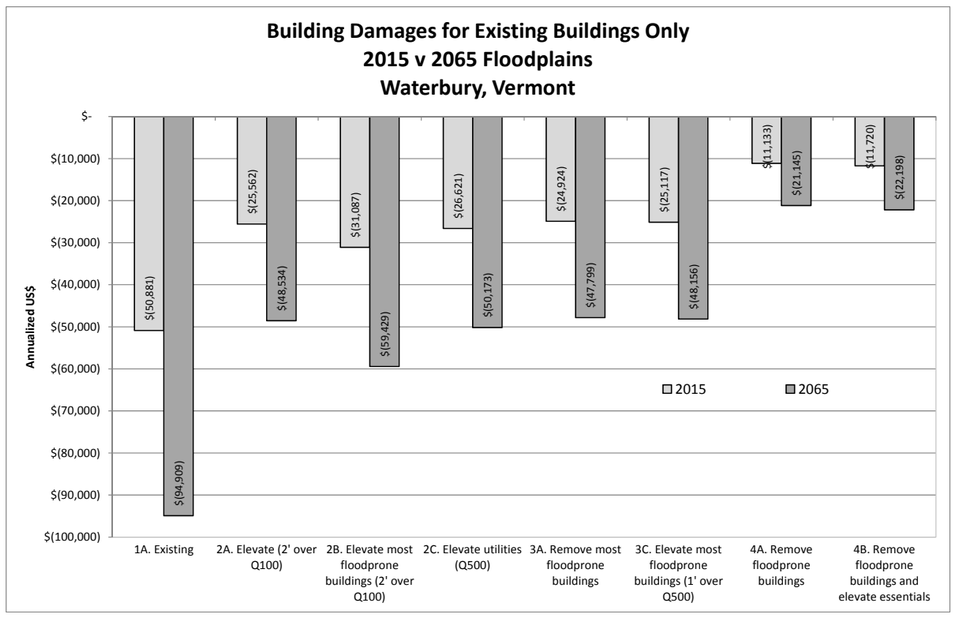


This project included the following primary elements:

- Ecosystem service valuation for the Lake Champlain Basin region (benefit-transfer analysis and Earth Economics Ecosystem Valuation Tool Kit);
- Buildout/conservation analysis for the subject floodplains;
- Hydrologic calculations of current and predicted future flood flows;
- Hydraulic modeling (HEC-RAS) of floodplains and water depth;
- Building damage simulations due to flooding (HAZUS-MH); and
- A cost-benefit accounting that considers ecosystem service change, changes in tax revenue, the cost of flood mitigation activities, flood damages, and changes in flood insurance premiums.

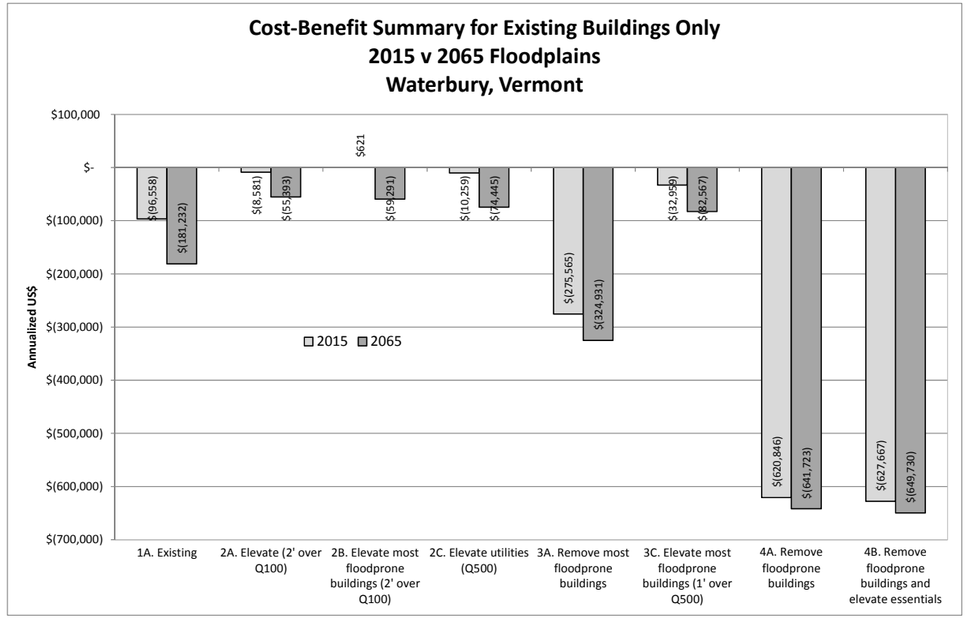
The ultimate goal of the project was to determine what level of floodplain protection makes sound economic sense.

Waterbury, Vermont "pays" thousands of dollars in annualized damages to live in the floodplain and may pay larger amounts in the future due to the potential for increasing floods. Simulated damages increase as more buildings are placed in the floodplain.

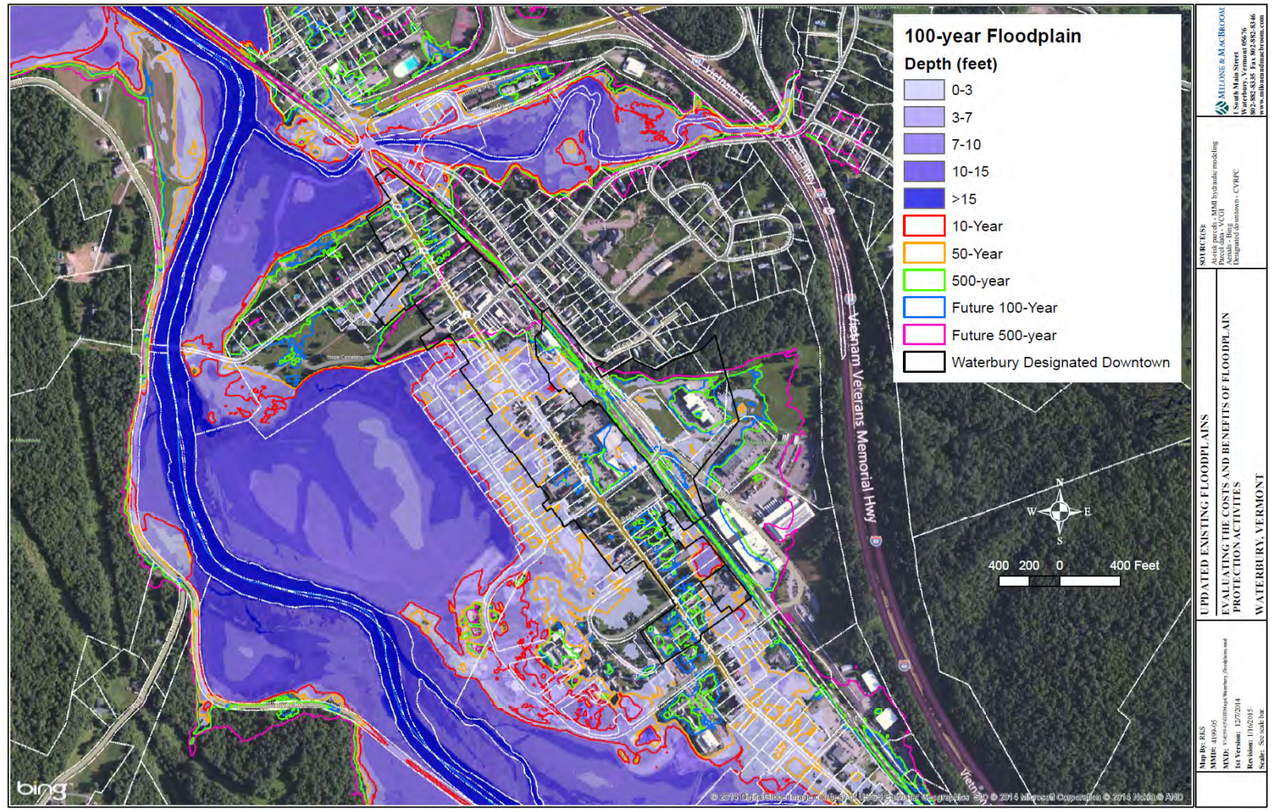


- Existing annualized building damages are $51,000 and future annualized building damages are $95,000.
- Building damages, along with loss of contents and inventory (not shown here), decrease as mitigation strategies get more aggressive such as from elevating to removing floodprone buildings. Avoidance is the best way to limit building damages.
- Future damages increase due to predicted larger floodplains and deeper flood levels under all mitigation strategies.

Elevating the most floodprone buildings shows the largest benefit, yet the analysis suggests that utility elevations should be implemented during flood recovery to existing buildings given the lower cost compared to other mitigation strategies.



- Living in the floodplain today costs $97,000 per year while living in the floodplain in 2065 will cost $181,000 per year.
- Elevating the most floodprone buildings to 2 feet above the 100-year flood level (2B) leads to a net benefit of $620 per year.
- Removal of floodprone buildings results in a net increase in cost mostly due to the loss of tax revenue. Removals would show a larger benefit if buildings were relocated or new construction took place outside of the floodplain yet remained in town to sustain the tax base.



Waterbury Village has endured damaging floods due to their riverine setting and is now grappling with difficult decisions to improve economic opportunities while increasing flood resiliency.

Engineering, Planning, Landscape Architecture and Environmental Science
MILONE & MACBROOM

NEIWPCC
New England Interstate Water Pollution Control Commission

Lake Champlain Basin Program

For full report contact Lake Champlain Basin Program
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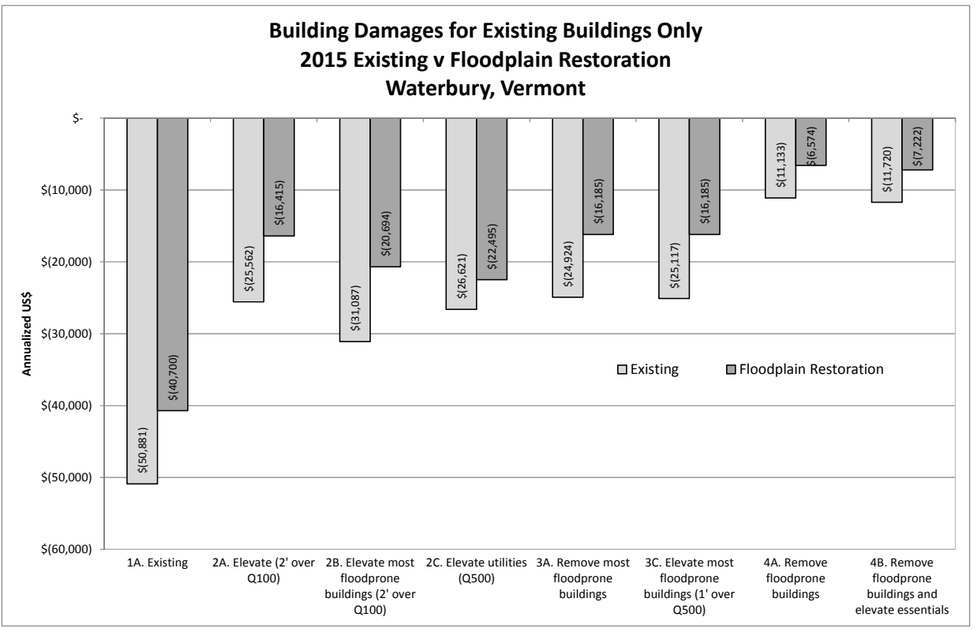
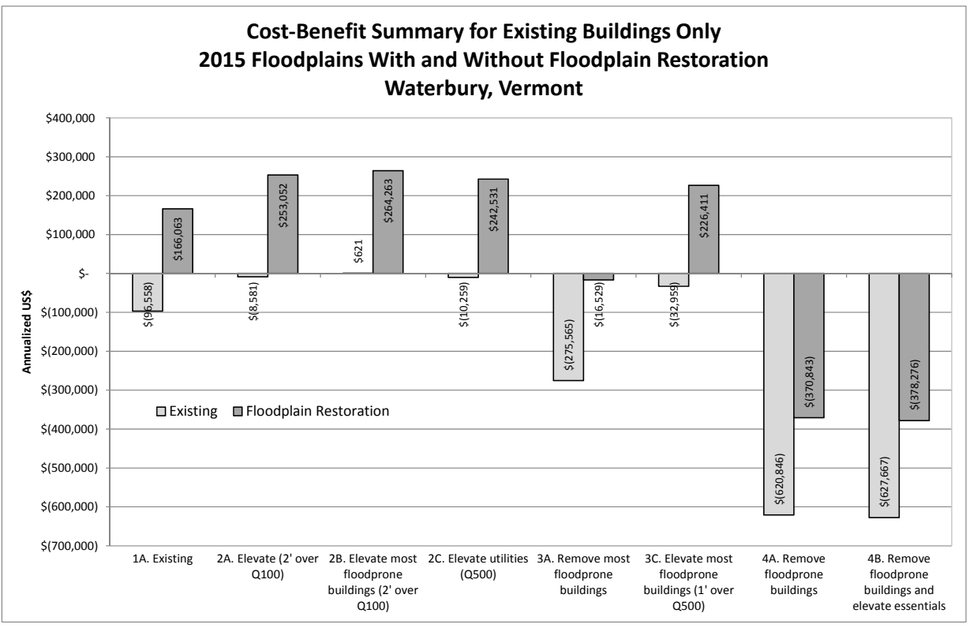
Connected floodplains and floodplain restoration can save thousands of dollars in annualized building damages and millions of dollars in a single extreme flood event.



- The proposed floodplain restoration decreases existing annual building damages from $51,000 to $41,000 (~20% damage reduction).
- The proposed floodplain restoration reduces annual damages across all flood mitigation activities, and improves the effectiveness of each mitigation approach.
- Floodplain restoration leads to a reduction of $2.6 million dollars in simulated damages for a single modeled Tropical Storm Irene flood event.

Restored ecosystem services (i.e., flood storage, erosion reduction, and water quality protection) and reduced damages associated with connected floodplains and floodplain restoration can lower or eliminate the cost of living in the floodplain, especially in conjunction with targeted building removals in the most floodprone locations.



- Under existing conditions it costs $97,000 to live in the floodplain, while living in the floodplain results in a net benefit of $166,000 with floodplain restoration, or an increase of 270%.
- The improvement in natural function of 38 acres of restored floodplain creates a current and future benefit that pushes the annualized balance of living in the floodplain positive for existing conditions and building elevations.
- Elevating the most floodprone buildings 2 feet above the 100-year flood level (2B) leads to a net current benefit of $264,000 per year.

FINDINGS AND RECOMMENDATIONS

- Building damages, loss of contents, and loss of inventory decrease as mitigation strategies get more aggressive, such as from elevating to removing select buildings in the most floodprone areas to removing buildings in a larger area across the floodplain.
- Avoidance is the best way to minimize future damages. However, the reduction of damages and increase in ecosystem function value are often outweighed by the projected maximum loss of tax revenue. For building removals to make financial sense, moving existing buildings or building new structures out of the floodplain yet in the Village and Town is needed to maintain tax revenue.
- Elevating utilities across the entire floodplain to the 500-year flood level and elevating the most floodprone structures to 1 foot above the 500-year flood level lead to the largest benefits.
- Cost-benefit data suggest that utility elevations should be implemented following flood damages to existing buildings given the lower cost compared to other mitigation strategies and the ability to implement utility elevations as part of flood recovery.
- Future building construction should be located outside of the 500-year floodplain (preferred), be elevated to 1 foot above the 500-year flood level if within the floodplain, or at a minimum have elevated utilities.
- The proposed floodplain restoration at three locations reduces current and future damages and improves the effectiveness of each mitigation approach. The project should be implemented when possible due to its large financial benefit.
- With floodplain restoration in place, elevating the most floodprone buildings 2 feet over the 100-year flood level provides good benefits.
- The future costs of floodplain living will likely increase due to the expectation of larger floods, yet the increase in cost with floodplain restoration as seen over 50 years is less than if floodplain restoration was not performed.
- Waterbury has a large base of naturally functioning land that provides ecosystem services such as flood mitigation benefits that is of high value and important to preserve and expand for the future viability of the Village and Town.

2011 flooding during Tropical Storm Irene
(Looking southeast along Main Street.)
Source: V. Starinskas, Rutland Herald

FLOODPLAIN VALUES IN WATERBURY, VERMONT

<u>Social</u>

- Maintain vibrant Village
- Help establish housing and businesses
- Grow tax base
- Create flood-safe community
- Support state government presence
- Maintain historic downtown
- Create tourism hub
- Support local arts

<u>Environmental</u>

- Establish connections between Village and recreation / natural areas
- Highlight river setting
- Maintain open space for recreation
- Create outdoor recreation tourism economy
- Support local agriculture

The technical content of this project is a collaboration between Milone & MacBroom of Waterbury, Vermont, Fitzgerald Environmental of Colchester, Vermont, Earth Economics of Tacoma, Washington, and dkcarlton & associates of Lake Forest Park, Washington. The project was led by the Lake Champlain Basin Program, and was supported by funds awarded to the New England Interstate Water Pollution Control Commission by the U.S. Environmental Protection Agency.