Supporting New England Communities to Become River-Smart

Policies and Programs That Can Help New England Towns Thrive Despite River Floods

2016

UMASS AMHERST

riversmart communities
This photo illustrates some common river flood processes and dynamics, and illuminates factors that influence the extent of damage during river floods.

During Tropical Storm Irene in late August, 2011, the number of new landslides was unprecedented. These landslides contributed a large amount of sediment to the rivers of Vermont and western Massachusetts. Within Massachusetts, damage from Tropical Storm Irene was most severe in the Deerfield River watershed. Yet, damage was not consistently severe throughout the region.

Here, in this photo, the Chickley River enters the Deerfield on the left. The Chickley had swollen enormously, causing tremendous damage in the town of Hawley. It brought high volumes of water and sediment into the Deerfield. The Deerfield River also flowed far out of its channel, as seen in the light-colored over-wash on the right bank, opposite the Chickley River. Yet structural damage at the confluence of the Chickley and the Deerfield River was limited. Why? For one thing, the river could access its floodplain. The overwash represents an overflow channel through the floodplain, where the river dissipated energy and volume. Structures were built back from the channel. Bridge spans on state Route 2, which was heavily damaged elsewhere, were also large enough here to accommodate flows of water, sediment and debris. The river’s access to its floodplain here may have reduced downstream damage, by reducing the power of the river’s flow.
Supporting New England Communities to Become River-Smart
Policies and Programs That Can Help
New England Towns Thrive Despite River Floods

Lead Author
Eve Vogel
Associate Professor of Geography, University of Massachusetts Amherst

With contributions by:
Nicole Gillett
MS Candidate in Geography, University of Massachusetts Amherst

Christine Hatch
Extension Assistant Professor of Geosciences, University of Massachusetts Amherst

Benjamin Warner
Post-Doctoral Researcher, Geosciences, University of Massachusetts Amherst

Jerry Schoen
Director of Outreach and Education, Water Resources Research Center, University of Massachusetts Amherst

Laurel Payne
BS Candidate in Environmental Science and Policy, Smith College

Daphne Chang
BA Candidate Environmental Studies, Mt. Holyoke College

Peter Huntington
MS Candidate Geography, University of Massachusetts Amherst

John Gartner
Post-Doctoral Researcher, Geosciences, University of Massachusetts Amherst

Noah Slovin
MS Candidate in Geosciences, University of Massachusetts Amherst

Publication Editor: Joe Shoenfeld, Associate Director, Center for Food, Agriculture and the Environment, University of Massachusetts Amherst

Formatting and graphics: Nicole Gillett, MS Candidate in Geography, University of Massachusetts Amherst • Christine Hatch, Extension Assistant Professor of Geosciences, University of Massachusetts Amherst • Aayushi Mishra, BA Candidate Biology and Environmental Studies, Mt. Holyoke College • Joe Shoenfeld, Associate Director, Center for Food, Agriculture and the Environment, University of Massachusetts Amherst • Eve Vogel, Associate Professor of Geography, University of Massachusetts Amherst

The following people helped inform, review or provide comments on all or part: Toby Alexander • Carissa Alza • Carrie Banks • John Bennett • Alison Bowden • Marie Caduto • Tim Chorey • Rick Chormann • Shane Caiki • Bob Dean • Andrea Donlon • Cheryl Dukes • Linda Dunlavy • Kevin Geiger • Jennifer Gilbert • Carl Gustafson • Keith Hartline • Marie-Francoise Hatte • Scott Jackson • Jon Kart • Katie Kennedy • Mike Kline • Ellie Kurth • Lealdon Langley • Michel Lapointe • Kim Lutz • Steve Mabee • Kimberley MacPhee • Joe Manous • Daniel McKinley • Todd Menees • Anita Milman • Guilford Mooring • Sharon Murray • Martha Naley • Carolyn Ness • Gregory Penta • Rebecca Pfeiffer • Ron Rhodes • Tracy Rogers • Greg Russ • Mary Russ • John Sears • Josh Shanley • Debbie Shriver • Amy Singer • Jason Skeels • Ned Swanburg • Jennifer Varin
Funding for this project came from the Army Corps of Engineers Institute for Water Resources and the UMass Amherst Center for Agriculture, Food and the Environment, in cooperation with the U.S. Department of Agriculture.

**Army Corps of Engineers Institute for Water Resources:** Partial funding for this project was provided through a grant awarded pursuant to Section 104 of the Water Resources Research Act of 1984, as amended, which was administered by the U.S. Geological Survey and funded by the Institute for Water Resources (IWR) of the U.S. Army Corps of Engineers (USACE).

The description of the laws and issues contained in this report do not reflect the formal position or legal determination of the United States with respect to any matter discussed herein. USACE intends that the information provided in this report will promote and facilitate education and communication regarding the challenges of water management. Nothing in this report, however, is intended to represent any position of the Federal government in any administrative, judicial or other proceeding to evidence any legal or policy interpretation. As such, statements contained in this report do not, and shall not, represent a legal position or interpretation by the U.S. Federal government.

**UMass Amherst Center for Agriculture, Food and the Environment with USDA:**

This material is based upon work supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, the Massachusetts Agricultural Experiment Station, UMass Extension and the Geosciences department of the University of Massachusetts Amherst, under project number MAS00021.

The contents are solely the responsibility of the authors and do not necessarily represent the official views of the USDA or NIFA. The Center for Agriculture, Food and the Environment and its units are equal opportunity providers and employers, United States Department of Agriculture cooperating. Contact your local Extension office for information on disability accommodations. Contact the State Center Director's Office if you have concerns related to discrimination, 413-545-4800 or see http://ag.umass.edu/civil-rights-information/civil-rights-information-resources

http://extension.umass.edu/riversmart/

The RiverSmart Communities program combines social and river science, institutional and policy research, and community outreach at the University of Massachusetts Amherst to research and address river floods in New England. It is our vision that river management can restore the environmental integrity of rivers while ensuring that New England communities thrive in a world where floods naturally occur. To make this vision possible, our work aims to help New England’s communities become river-smart.

A key goal is to offer ideas and tools that can be used by people and groups across New England – land and river managers, riverside property owners, policy makers, government agency staff, community leaders, grass-roots activists, and others – so they can creatively build and advocate for systems that work for their own states and communities.

We encourage your use of our educational and outreach materials to promote sustainable river management in your community, though ask that you credit our work. In this spirit this report is licensed with a Creative Commons license that allows free use of any information or graphics as long as the source is credited.

**River-smart:** Managing rivers and riverside landscapes, as well as our own actions and expectations, so people and communities are more resilient to river floods. Specifically: reducing flood severity, flood damage, and flood costs by understanding and accommodating the natural dynamics of rivers and river floods.
## Contents

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Preface</strong></td>
<td>7</td>
</tr>
<tr>
<td>I</td>
<td><strong>Introduction: River Floods in New England: Common in History,</strong></td>
<td>9</td>
</tr>
<tr>
<td></td>
<td><strong>Commonly Destructive Today</strong></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td><strong>River Science, River Floods, and River-Smart Management</strong></td>
<td>15</td>
</tr>
<tr>
<td>III</td>
<td><strong>The Challenge of River-Smart Governance in New England</strong></td>
<td>25</td>
</tr>
<tr>
<td></td>
<td><strong>Communities: Lessons for Policy</strong></td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td><strong>Target Recommendations for Federal and State Policy</strong></td>
<td>35</td>
</tr>
<tr>
<td></td>
<td><em>Recommendation 1: Develop Fluvial Hazard Assessments</em></td>
<td>36</td>
</tr>
<tr>
<td></td>
<td><em>Recommendation 2: Upgrade Vulnerable Stream Crossing Infrastructure</em></td>
<td>41</td>
</tr>
<tr>
<td></td>
<td><em>Recommendation 3: Support River-Smart Planning and Mitigation</em></td>
<td>51</td>
</tr>
<tr>
<td></td>
<td><em>Recommendation 4: Provide Outreach and Training on River Dynamics and</em></td>
<td>59</td>
</tr>
<tr>
<td></td>
<td><strong>River-Smart Practice</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Recommendation 5: Designate, Recognize and Support River-Smart Regional</em></td>
<td>65</td>
</tr>
<tr>
<td></td>
<td><strong>Intermediaries</strong></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td><strong>Conclusion</strong></td>
<td>77</td>
</tr>
</tbody>
</table>

## Featured Examples

1. River Floods in New England, Past and Present 11
2. Inundation Versus Fluvial Hazards: Different Kinds of Flood Hazards 16
3. A Model for All New England: Vermont’s Stream Geomorphic Assessment System 38
4. Could Fluvial Hazards Be Put on Already Widely Used Maps Such as FEMA Flood Hazard Maps? 40
5. Upgrading Stream Crossings 43
6. Upgrading Stream Crossings Often Lowers Long-Term Costs, Adds Many Benefits 44
Featured Examples (continued)

7. State Stream Crossing Standards Meet Federal Funding Requirements:
   How to Help Towns Not Get Stuck in the Middle 46

8. Stream Crossing Inventories and Databases 47


10. Vermont Support for Municipal Flood Hazard Planning 56

11. Flood Ready Vermont 56

12. Vermont’s Emergency Relief and Assistance Fund 57

13. Vermont River Corridor Program 58

14. Vermont Rivers and Roads Program 63

15. Community-Friendly Outreach Materials: UMass RiverSmart Fact Sheets 64

16. StormSmart Communities Program 64

17. River Flood Response and Recovery: The Practical Limits of Federal and State Government Aid 68

18. River-Smart Regional Intermediaries Fill the Gaps: Vermont’s Regional Planning Commissions During and After Irene 69

19. Guiding River-Smart Hazard Mitigation Plans: Franklin Regional Council of Governments 71

20. Local Support and Partnerships, From Concept to Completion: Technical Assistance from the Natural Resources Conservation Service 72

21. The White River Partnership: A Nonprofit River-Smart Regional Intermediary Connects Communities to their River and to Government Resources 73

22. Toward Stable Core Funding for River-Smart Regional Intermediaries: Massachusetts Examples 74

Tables

1. Major Federal Agencies and their Contributions to Helping New England Communities Become River-Smart 28

2. Case Studies Investigated as Successful Examples of Efforts to Become River-Smart 33
Preface

This report aims to help New England’s communities and their residents, as well as the governments that serve them, to better deal with and adjust to river floods. It points to practical policy solutions at federal, state and regional levels that can support New England communities to become what we call river-smart.

In considering New England’s communities, we focus on the small towns in the region’s mountainous areas that are most at risk for damage from river floods. These often have scarce resources and limited ability to access help from the state and federal governments. We also recognize the constraints of government agencies that serve New England communities. Budgets are tight, personnel have been cut, and efforts to make new policy through legislation or rulemaking can face gridlock, opposition, or long, complex administrative processes.

Yet our research has given us hope. We have learned that creative people across the region have figured out ways to make positive change happen. We investigated seven case studies in which people, organizations and governments have, despite challenges, figured out ways to help New England communities become more river-smart.

The first three chapters of the report provide background for policymakers, agency staff, community leaders, and members of the public. Chapter I emphasizes that river floods have been common throughout New England’s history, and remain destructive today. Chapter II provides a primer on the science of dynamic rivers, illuminating how and why river floods can be so unexpectedly destructive. It ends with three lessons on how rivers and lands can be managed to minimize and mitigate river flood damage. Chapter III outlines the assistance that New England municipalities need in order to undertake this river-smart management, and summarizes key federal programs that provide some of this assistance. An overview of our case studies shows ways that creative organizations are adding support beyond existing policy.

Building from this background, Chapter IV identifies five policy changes that, with modest fiscal resources and limited regulatory change, can make the most immediate and long-term difference for the future safety and wellbeing of New England communities. Our policy recommendations are:

1: Develop Fluvial Hazard Assessments
2: Upgrade Vulnerable Stream Crossing Infrastructure
3: Support River-Smart Planning and Mitigation
4: Provide Outreach and Training on River Dynamics and River-Smart Practice
5: Designate, Recognize and Support River-Smart Regional Intermediaries

Our report does not spell out exactly who should take on all these tasks; New England is too diverse in the ways it structures its river and flood management, and in the ways federal, state, regional and local governments share their authorities, to offer such prescriptions. Instead, we offer clear ideas and tools that policy makers, government agency staff, community leaders, and grass-roots activists can use to creatively build and advocate for systems that work for their states and communities. For each recommendation, we provide tangible examples of people, places, and institutions in New England that are already making these things happen – examples that show some of the ways these recommendations can be put into practice.

We intend this summary report to be widely comprehensible and useful to people who care about New England’s communities and their abilities to withstand and manage river floods. To make this report more readable, we have included citations only in Chapters I-III. More detailed background, examples, and references for the recommendations and featured case studies of Chapter IV will be provided on the RiverSmart website, https://extension.umass.edu/riversmart.