Assessment Report

Vermont Manufactured Home Communities Flood Risk Assessment



June 15, 2023

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About the Project Team

This assessment report is the result of a collaboration between faculty and staff members at the University of Vermont's Department of Community Development and Applied Economics and the Rubenstein School of Environment and Natural Resources Spatial Analysis Lab with staff members at the Mobile Home Program at the Champlain Valley Office of Economic Opportunity.

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Note: This is a draft version of the report and should not be further distributed at this time. Please direct questions to Kelly Hamshaw at Kelly.Hamshaw@uvm.edu

Acknowledgments

The authors of this report would like to share our gratitude to the residents who participated in the community workshops – sharing their experiences, perspectives, and concerns for their homes and communities. Their contributions during this assessment work will inform future efforts for deeper engagement with manufactured housing communities going forward.

Special thanks to Scott Hamshaw for providing key guidance for the mapping analysis component.

This report was commissioned by the Vermont Rivers Program of the Department of Environmental Conservation in the Vermont Agency of Natural Resources with funding from the Federal Emergency Management Agency's Community Assistance Program.

About this Report

This report details the process and key findings from a flood risk assessment of manufactured housing communities across the state of Vermont conducted between March 2023 and June 2023. The Vermont Rivers Program of the Department of Environmental Conservation at the Vermont Agency of Natural Resources commissioned this study to deepen awareness and understanding of these communities where most residents own their homes while leasing the land upon which their home sits. The unique nature of this housing model provides thousands of Vermonters with an affordable housing option in communities that span the state. However, it is widely recognized that these communities can often be found in areas prone to risk.

Following the State of Vermont's adoption of the Environmental Justice policy in 2022, state agencies have invested in identifying actions that can lessen the burden of environmental inequities that members of vulnerable and marginalized communities face. Manufactured housing communities (MHCs) are one of those communities where socio-economic vulnerabilities intersect with physical proximity to hazards.

Using the best available geospatial data, this assessment characterizes flood and erosion risks for Vermont's 238 manufactured housing communities. It also features key insights from hosting community workshops within three communities better to understand resident experiences, perspectives, and concerns. The findings from those workshops can be used to inform future activities to engage manufactured housing communities in similar efforts moving forward.

Project Objectives

The Vermont Rivers Program of the Department of Environmental Conservation commissioned this assessment project with the following objectives:

1. Characterize flood and erosion risks at manufactured home communities in Vermont.
    a. Compile available spatial data for registered MHC parcels, including lot locations, First Floor Height (FFH), infrastructure, flood risk, and erosion risk data.
    b. Ground-truth estimates for FFH so as to extrapolate to other MHCs were possible.
    c. Identify ownership/decision-making structure, contact information, general community characteristics, shared communication tools, and key partner organizations.

2. Compile and analyze the information.
    a. Summarize the flood and erosion risks for each MHC statewide.
    b. Provide for the publication of the non-privacy protected information in an accessible online location with the Vermont Department of Environmental Conservation Rivers Program.
    c. Consult and characterize the representation of MHC residents and owners regarding their perceptions of flood and erosion risks and perceived options.

d. Consider and summarize strategies and opportunities to appropriately communicate flood and erosion risks and opportunities to reduce such risks for individual residents and MHCs.
e. Identify methods and tools to enable MHCs and residents to effect changes to substantially improve safety and wellbeing as part of an equity-centered approach to hazard reduction.

Project Background

Manufactured housing communities (MHCs) are a critically important source of affordable housing for over 7,000 Vermont households. The Vermont Department of Housing's Mobile Home Park 2022 Registry lists 238 MHCs across the state. Most homes are owned by individual residents who lease the land upon which their homes sit from a park owner (ACCD, 2022). The majority of MHCs are owned by private landlords, with 20% of communities owned by non-profit housing organizations and another 7% resident-owned cooperatives (ACCD, 2022) A statewide survey conducted by researchers from the University of Vermont (UVM) in partnership with the Champlain Valley Office of Economic Opportunity (CVOEO) Mobile Home Program in 2011 found that the median income for an MHC resident was $30,000 compared to the statewide median household income of nearly $49,500.

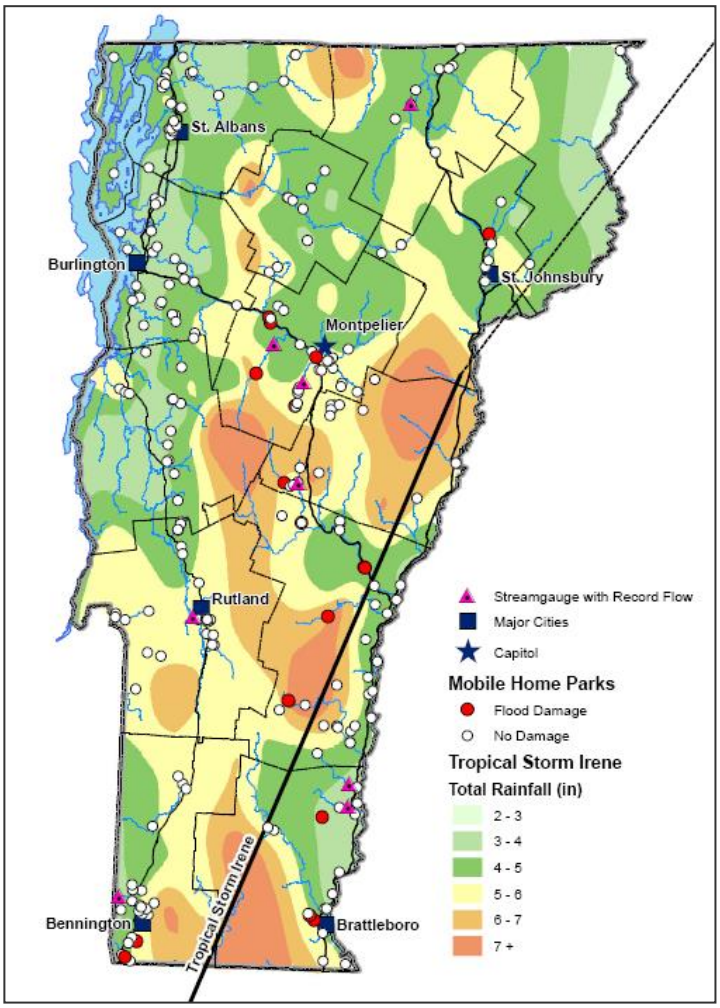

Figure 1. Tropical Storm Irene and Vermont's Manufactured Home Community Impacts. Figure from Baker et al. 2014

Tropical Storm Irene highlighted the vulnerability of many of Vermont's MHCs—flooding 218 manufactured homes in 17 park communities. More than 135 of those homes were completely destroyed, and two park communities were permanently closed. Figure 1 provides an illustration of Tropical Storm Irene's total rainfall amount and storm track relative to the MHCs located across the state (Baker, Hamshaw, and Hamshaw, 2014).

Vermont's MHC housing stock was found to be disproportionately impacted by this storm event, with mobile homes accounting for over 15% of impacted households by the number of FEMA registrations for Individual Assistance despite manufactured homes in parks representing only 7% of the state's total housing stock

(Baker, Hamshaw, & Hamshaw, 2014). In a rapid geospatial analysis completed in Irene's aftermath, Baker, Hamshaw, and Hamshaw (2014) found that mobile homes located on leased lots within park communities (11.7%) were more vulnerable and at risk to flooding compared to mobile homes located on privately-owned land (6.3%) and single-family homes (4%).

MHC Ownership Structure

Understanding the unique characteristics of MHCs is important when considering and designing resilience-building strategies and actions. The majority of all MHC residents in Vermont are homeowners (90%), while that figure increases to 99% in non-profit and cooperatively owned communities (ACCD, 2022). This dynamic of homeowners leasing the land upon which their home sits has implications when considering what resilience-building activities homeowners and park owners may be able to take.

Vermont has three primary park ownership structures: 1) private, 2) non-profit housing organizations, and 3) resident-owned cooperatives. Table 1 provides a summary of the number of owners and parks by ownership structure. From a hazard mitigation and planning standpoint, ownership structure is a key consideration for several reasons. Ownership clearly determines both the contact point for outreach to the community and the locus of decision-making power. Less obvious initially is that in most privately-owned parks there is little incentive for residents to organize, making it more difficult to determine how to engage with residents or who represents all residents in the MHC. A further complication in private parks is that unorganized or newly organized resident committees lack training and experience in managing meetings or engaging with outside groups. In contrast, cooperatively owned MHCs have elected board members who host regular meetings, have generally received training, and are familiar with working with outside groups. Resident organization in non-profit owned MHCs tends to be more similar to privately owned parks than cooperatives, though residents generally have more experience with outreach and engagement than in private parks.

Table 1. Park Ownership Summary Table.

Ownership Structure	Number of Owners	Number of Parks
Cooperative	18	20
Non-Profit	11	48
Private	139	170
All MHCs	168	238

Private owners can range from small park operators who may live locally to larger, investor-owned companies based out of state. There are 139 different private owners listed as owning 170 of the total 238 park communities in the 2022 Mobile Home Park Registry. In most cases, a park owner has a designated park manager responsible for resident communication, maintenance services, and other management duties. This park manager could be a resident within the park or a professional property management company.

Vermont has 11 different non-profit housing organizations that own and operate MHCs across the state (ACCD, 2022). These mission-driven organizations own approximately 18.5% of Vermont's total MHCs and began acquiring parks in the early 1990s when many communities were facing uncertain futures as private owners retired or wanted to sell parks.

Table 2. Non-Profit Parks by Park Name, Town, County, and Year of Conversion

Mobile Home Park	Park Owner	Municipality	County	Purchase Date/Date of Conversion
Mountain View	Housing Foundation Inc.	Hinesburg	Chittenden	December 1989
Cooper's Bay	Housing Foundation Inc.	Grand Isle	Grand Isle	January 1990
Riverside	Housing Foundation Inc.	Woodstock	Windsor	January 1990
Windy Hill Acres	Housing Foundation Inc.	Springfield	Windsor	April 1990
Sandy Pines	Housing Foundation Inc.	E. Montpelier	Washington	October 1990
Deepwood#	Housing Foundation Inc.	Brattleboro	Windham	1991
Fernwood Manor	Housing Foundation Inc.	Bolton	Chittenden	January 1991
Otter Creek	Addison County Community Trust	Vergennes	Addison	January 1991
French Hill Manor	Champlain Housing Trust	Williston	Chittenden	January 1991
Lazy Brook	Addison County Community Trust	Starksboro	Addison	January 1992
Whistlestop	Downstreet Housing & Community Development	Bradford	Orange	February 1992
Coburn's	Housing Foundation Inc.	N. Clarendon	Rutland	May 1992
Windemere	Housing Foundation Inc.	Colchester	Chittenden	June 1992
Sunset Terrace	Champlain Housing Trust	Swanton	Franklin	October 1992
Mussey Street#	Housing Trust of Rutland County	Rutland	Rutland	1993
Hillside Manor	Addison County Community Trust	Starksboro	Addison	March 1993
Olcott Falls	Housing Foundation Inc.	Hartford	Windsor	October 1993
Riverbend	Twin Pines Housing Trust	S. Royalton	Windsor	November 1993
Northwind#	Housing Foundation Inc.	Williamstown	Orange	1994
Willows	Shires Housing	Bennington	Bennington	June 1994
Haven Meadows	Housing Trust of Rutland County	Fair Haven	Rutland	November 1994
Limehurst	Downstreet Housing & Community Development	Williamstown	Orange	June 1995
St. Albans	Champlain Housing Trust	St. Albans	Franklin	September 1995
Kountry Trailer Park	Addison County Community Trust	Bristol	Addison	May 1996
Locust Hill	Windham & Windsor Housing Trust	Putney	Windham	October 1996

Mountain View Court	Housing Foundation Inc.	Bennington	Bennington	December 1996
Lauritsen's	Addison County Community Trust	Bristol	Addison	April 1998
Derby MHP	Housing Foundation Inc.	Derby Line	Orleans	November 1998
Verd-Mont	Downstreet Housing & Community Development	Waitsfield	Washington	January 1999
Shattuck Hill MHP	Rural Edge	Derby	Orleans	April 1999
Jacob's Mobile Court	Randolph Area Community Development Corporation	Randolph	Orange	August 1999
Charette's MHP	Housing Foundation Inc.	Dummerston	Windham	December 1999
Maple Ridge*	Addison County Community Trust	Middlebury	Addison	December 1999
Birchwood Manor	Housing Foundation Inc.	Milton	Chittenden	December 2000
Brookside MHP	Addison County Community Trust	Starksboro	Addison	February 2001
Bridge Street MHP	Downstreet Housing & Community Development	Barre Town	Washington	May 2001
Evergreen Manor	Lamoille Housing Partnership	Hardwick	Caledonia	October 2001
Shady Pines	Housing Foundation Inc.	Westminster	Windham	January 2003
Mobile Acres	Housing Foundation Inc.	Braintree	Orange	April 2003
Lindale MHP	Addison County Community Trust	Middlebury	Addison	October 2004
Maple Ridge MHP	Rural Edge	Lyndon	Caledonia	February 2007
Vaughan's MHP	Addison County Community Trust	Monkton	Addison	August 2007
Evergreen*	Windham & Windsor Housing Trust	Rockingham	Windham	November 2012
Red Maple*	Windham & Windsor Housing Trust	Springfield	Windsor	November 2012
Tuckerville*	Housing Trust of Rutland County	Ludlow	Windsor	March 2013
Roy's MHP	Housing Foundation Inc.	Swanton	Franklin	August 2013
Armstrong MHP	Windham & Windsor Housing Trust	Randolph	Orange	November 2016

** Maple Ridge was purchased by Addison County Community Trust from Addison County Community Action Group who purchased the park in 1985 before Act 252; Evergreen was acquired by Rockingham Area Community Land Trust in 1993, Red Maple was acquired by Rockingham Area Community Land Trust in 1998 and both were sold to Windham & Windsor Housing Trust in 2012; Tuckerville was acquired by Rockingham Area Community Land Trust in 1998 and sold to Windham & Windsor Housing Trust in 2013 (ACCD, 2022).*

 # New parks developed by non-profit organizations.

At the time of this assessment, there are currently 20 individual park communities owned by 18 different cooperative entities. These resident-owned communities (ROCs)—commonly referred

to as cooperatives, comprise 8.4% of Vermont's total MHCs (ACCD, 2022). There has been a significant increase in ROCs since 2011, as park acquisitions by non-profit organizations have decreased.

Table 3. Cooperative Parks by Park Name, Town, County, and Year of Conversion

Mobile Home Park	Municipality	County	Purchase Date/Date of Conversion
Mountain Home Park*	W. Brattleboro	Windham	November 1987
Black Mountain Park*	Brattleboro	Windham	November 1987
Glen Park*	Brattleboro	Windham	November 1987
Williston Woods	Williston	Chittenden	September 1993
Bunker Hill MHP	Windsor	Windsor	June 2011
Homestead Acres MHP	Swanton	Franklin	December 2011
Milton Mobile Home Co-op	Milton	Chittenden	February 2012
ANDCO MHP	Highgate	Franklin	December 2013
Shelburnewood MHP	Shelburne	Chittenden	September 2015
North Avenue Co-op	Burlington	Chittenden	November 2015
Triangle Court	Brandon	Rutland	April 2016
Weston's MHP	Berlin	Washington	December 2017
Windy Hollow MHP	Castleton	Rutland	February 2018
Lakeview MHP	Shelburne	Chittenden	February 2019
Westbury Park	Colchester	Chittenden	March 2019
Sunset Lake	Hinesburg	Chittenden	March 2019
St. George Villa	St. George	Chittenden	April 2019
Sterling View MHP	Hyde Park	Lamoille	April 2021
Hillcrest MHP	Colchester	Chittenden	February 2022
Breezy Acres	Colchester	Chittenden	February 2022

* *Mountain Home Park, Black Mountain Park, and Glen Park comprise the Tri-Park Cooperative. This co-op was established before Act 252 was enacted in 1988 (ACCD, 2022).*

Communication with MHCs

Communication with manufactured housing communities can be challenging for organizations seeking to engage residents, managers, and owners in conversations about flood risk and resilience. It is important for agencies and organizations to be aware of the ownership structure as that can inform initial steps for reaching residents. For example, if looking to reach residents in a resident-owned community, the cooperative board would be a logical first point of contact. For private or non-profit owned communities, contacting the designated park manager may be a solid starting point. It is important to keep in mind that residents may have limited high speed

internet access in rural areas of the state and the "digital divide" for low- and moderate-income Vermonters can be a significant barrier for accessing online information.

The CVOEO Mobile Home Program specializes in resident engagement strategies. Program staff have undertaken door-to-door canvassing efforts and operate a resident hotline. They provide outreach materials that have been specifically designed for MHC residents that are accessible from their website and in a printed format. The CVOEO Mobile Home Program is a trusted partner that offers experience and existing networks within MHCs across the state.

Key Manufactured Housing Community Stakeholders in Vermont

The number of stakeholders involved in planning to increase the resiliency of MHC's is substantial and has been expanding in recent years as more local, state, and federal partners have become aware of the vulnerability of these communities and how the risks they face from flooding intersects with the mandates of these varied agencies. Stakeholder analysis should be approached as a dynamic exercise that begins with established players and considers whether additional interests related to the specific MHC, locality, or flood risk situation invite engagement with additional voices. Effective community engagement requires partners committed to promoting equity and dignity within a resident-centered process. Careful consideration of power dynamics between stakeholders, residents' previous experiences related to hazards, and the design of engagement processes should be part of any engagement planning process.

MHC Residents and Resident Representatives

Priority consideration should be given to MHC residents as they lived valuable lived experience and firsthand knowledge of their communities. Depending on the specific MHCs, there may be an existing informal or formal network of residents to engage. Cooperatively owned MHCs will have an elected board of representatives who meet regularly to make decisions about park matters. In communities without existing informal or formal networks, organizations may consider contacting the park owner, advocates, or technical assistance providers as a first step.

<u>Advocates and Technical Assistance Providers</u>

Local trusted partners, organizations and individuals that provide services to park residents and have experience working with MHCs have important connections and knowledge to offer in planning and implementation of engagement processes. In addition to individual consultants with expertise in infrastructure development, key organizational partners include:

- CVOEO Mobile Home Program *(statewide MHC advocate and community organizing experts)*
- Cooperative Development Institute *(technical assistance to parks for cooperative transitions)*
- Department of Community Development & Applied Economics, University of Vermont *(applied research, assessment, engagement partner)*
- Efficiency Vermont *(technical assistance and research for energy efficient manufactured housing units)*

MHC Non-Profit and Private Owners

Funders and Supporting Agencies

The Vermont Affordable Housing Coalition's Manufactured Housing Community Sub-Committee brings together a diverse group of funders, non-profit owners, academics, state, and federal housing agencies on monthly basis. This relatively new group under the umbrella of the Vermont Affordable Housing Coalition has been actively and energetically engaging in critical issues related to park resiliency. In particular, the MHC Sub-Committee provides a network that can help MHCs access the substantial funding necessary for critical infrastructure projects whose cost exceed the ability of park owners to manage with their own resources. Some key stakeholders represented within the MHC Sub-Committee include:

- Vermont Housing Finance Agency
- Vermont Housing and Conservation Board
- USDA Rural Development
- Champlain Housing Trust

Vermont Government Agencies

ACCD Mobile Home Park Program

The Agency of Commerce and Community Development's Mobile Home Parks Program in the Housing Division provides oversight and enforcement capacity for MHCs pursuant to Chapter 153 of Title 10. The program gathers data about the state's MHCs directly from owners through its annual registration process and publishes updated data about the communities each year. This registry data provides important information for understanding trends in MHCs over time as well as serves as an essential foundation of knowledge that provides data for hazard vulnerability assessments. The program regularly updates a "Mobile Home Park Risk Assessment Tool" database with the best available data related to lot rents, park vacancy rates, water and wastewater infrastructure, permitting, and water violations. It also included flood hazard data from an analysis completed by the University of Vermont in 2013 using the best available data at that time.

Additional State Agencies

The intersection of flood resilience planning and the scope of responsibilities from a wide variety of agencies within Vermont state government is substantial. Several key state agencies commonly considered key stakeholders when planning for flood resiliency or mitigation in MHC include:

- Agency of Natural Resources Department of Environmental Conservation
- Vermont Emergency Management
- Agency of Transportation
- Vermont Department of Health

Regional Planning Commissions

The engagement of Vermont's Regional Planning Commissions in MHC planning varies, however their interests in particular projects should be considered, particularly in light of their knowledge of local municipal plans, mapping expertise and resources, as well as their concerns about adaptation to climate change.

Municipal Commissions

Similar to regional planning commissions, the interest and engagement of municipal planners varies widely. Their roles and influence over MHCs can be substantial, ranging from decisions about zoning, density, vehicular access, park demographics, support for grant applications and emergency response. Municipal planners willing to join in the discussion of park issues can be important and influential stakeholders.

Vermont's Congressional Delegation

The offices of Vermont's Senators and Representative have staff focused on issues and opportunities related to Vermont affordable housing, economic development and natural resources. They often have an active interest in learning about and assisting issues facing Vermonters living in MHCs.

MHC Flood Risk Analysis

Developing a deeper understanding of flood and erosion risks to Vermont's mobile home park using the most current data available is essential for engaging community members, park owners, and other key stakeholders in meaningful conversations about risk management and community resilience strategies. This section details the approach taken to conduct the geospatial assessment, including an overview of the available data sets, technical activities, and quality assurance and quality control steps. Limitations and special notes are also discussed.

Data Sets Inventory

The UVM Spatial Analysis team reviewed a number of data sets relevant to assessing MHC flood risk. These data sets ranged from tabular data, such as the Agency of Commerce and Community Development's Annual Mobile Home Park Registry, to spatial data sets, such as E-911 site locations published by the Vermont Center for Geographic Information. Table 4 below provides a listing of the data sets that were assessed as part of this effort.

Table 4. MHC Flood Risk Data Set Inventory

Data Set	Type	Description	Source
Vermont Mobile Home Park Registry	Tabular	Annual statewide registry containing address, lot numbers, vacancy rate, lot rents	Agency of Commerce and Community Development
Park Water and Sewer Infrastructure	Tabular	Water and sewer types with violation data between 2019-2021	Agency of Commerce and Community Development
Statewide Standardized Parcel Data	Spatial	Current parcel used to update MHC boundaries	Vermont Center for Geographic Information
Flood Hazard Areas	Spatial	Depicts likely extent of 100-yr and 500-yr flood events based on FEMA digital flood insurance maps (published by FEMA on 12/2/2015)	Agency of Natural Resources
DFIRM Floodways	Spatial	Identifies primary floodways within FEMA flood hazard areas (originally published on 12/2/2015)	Agency of Natural Resources
River Corridors	Spatial	Depicts areas along rivers and streams where active fluvial processes are most likely to occur (erosion, deposition, channel migration, etc.) (published on 10/1/2019)	Agency of Natural Resources
Flood Inundation Modeling	Spatial	Recent modeling that predicts flood inundation areas along rivers/streams in the Champlain Basin for various storm severity intervals (2, 5, 10, 25, 50, 100, 200, 500-year events)	Vermont Center for Geographic Information
E-911 Building Footprints	Spatial	General outlines of building footprints	Vermont Center for Geographic Information
E-911 Site Locations	Spatial	Point locations of buildings, hydrants, and public phones	Vermont Center for Geographic Information
2022 Color Leaf-Off Imagery	Imagery	Color Imagery for Addison, Bennington, Chittenden, Franklin, Grand Isle, Lamoille, Rutland, Windham and Windsor Counties	Vermont Center for Geographic Information

		(0.3m) used to refine building footprints, capture ingress/egress, etc.	
2021 Color Leaf-Off Imagery	Imagery	Color Imagery for Essex, Orleans, Caledonia Counties (0.3m) used to refine building footprints, capture ingress/egress, etc.	Vermont Center for Geographic Information
Digital Elevation Model	LiDAR	High-resolution Digital Elevation Model (DEM)	Vermont Center for Geographic Information
New FEMA Flood Insurance Rate Maps	Spatial	Forthcoming FEMA update for the state of Vermont that is expected to become effective beginning in 2025	Federal Emergency Management Agency

Methodology

The following describes the process for updating all MHC ("park") parcel boundaries and a focused assessment on parks with identified flood risk. The MHC Registry and 2012 shapefile of MHP parcel boundaries formed the basis and starting point for this update. Mapping work was completed in ESRI Arc Pro software. A final geodatabase (VT_MHP_UPDATE) for this project was produced that captures all spatial layers summarized below. These layers can be updated over time as new and additional information becomes available.

MHC Parcel Boundaries

Updated spatial data layers were stored in a feature dataset (ALL_MHPs) within the primary geodatabase for the project (VT_MHP_UPDATE). Using the 2012 shapefile of MHCs ("parks"), the previous extent of each park was zoomed in to and the statewide parcel layer was then used to capture updated boundaries coded by each unique corresponding MHP_ID. Any park comprised of more than one parcel was coded with an attribute field to preserve this information (ALT_ID). Any rights-of-way (ROW) within park boundaries were also captured as polygons and given a unique attribute. The current registry (downloaded April 2023) was used to identify each park flooded during Hurricane Irene and/or identified as having flood risk. The final layer with this level of detail for each park is stored in the ALL_MHPs feature dataset (_1_DETAILED_MHP_PARCEL_BOUNDARIES).

All parks were further dissolved by their unique MHP_ID and saved as a new layer (_2_ALL_PARCELS_DISSOLVED_BY_MHP_ID). Parcel shapes independent from parks were removed to create a new layer representing overall park boundaries (_3_PRIMARY_GENERALIZED_PARK_BOUNDARIES). Independent polygons removed in the previous step were saved to preserve their spatial information (_4_PARCELS_SEPARATED_FROM_GENERALIZED_MHP_BOUNDARIES). The park names, town, and county were joined from the park registry to reference layers. Parks missing these attributes were likely removed from the registry and are likely closed or under a different form of use or management. Updated park boundary layers can be spatially joined to statewide parcel data to extract assessor database information.

E911 Points and Footprints

E911 points and footprints were clipped to generalized park boundaries to capture address information, structure types and approximate building locations. For the focused assessment of flood risk parks, any footprints were deleted for structures no longer present and added when missing. Each footprint was assigned the MHP_ID and a unique footprint ID. Residential points classes (mobile homes, single family homes, multifamily homes, other residential) from E911 data were manually centered on top of structures and within building footprints. Any residential points for structures no longer present or labeled as a development site was given an attribute indicating it is vacant for tracking purposes. All points were assigned corresponding MHP_ID and any residential points with associated footprints were assigned the footprint ID using spatial join. This allows for data between layers to be joined and cross referenced as needed (e.g., address information for residential footprints). Building footprints were manually corrected (Figure 2 and 3) to capture residential structures in parks using recent orthoimagery downloaded from the Vermont Center for Geographic Information (primarily from the spring of 2022).

Figure 2. Buildings within MHC before correction and updating. False color 2022 orthoimagery used as a reference layer is shown.

Figure 3. Buildings within MHC after correction of building footprints and updating. False color 2022 orthoimagery used as a reference layer is shown.

Flood Hazard Park Base Layers

Base layers for parks identified as having flood risk were extracted into their own feature dataset ("FLOOD_HAZARD_MHP_BASE_LAYERS") within the project geodatabase. Boundaries of flood risk parks were extracted and stored in their own layer ("FLOOD_RISK_MHP_GENERALIZED_BOUNDARIES").

Flood Hazard Analysis

Parks identified as having flood risk were overlaid with the various flood hazard data layers: [FEMA DFIRMS, FEMA Digitized FIRM (data from 2012 study compiled from subset of local government lacking DFRIM that had available), ANR River Corridor and Stream Buffers, and Dam Inundation Areas]. The area of overlap of each flood layer within each park was analyzed using union and clip tools and exported as individual layers (see the feature dataset PARK_BOUNDARY_FLOOD_HAZARD_ANALYSIS). The area of overlap within each park boundary was estimated in acres. The percentage of overlap within each park was calculated using the area estimate of each park boundary (MHP_GIS_ACRES). This information was summarized in the final flood analysis spreadsheet.

Additionally, each building footprint was overlaid with flood hazard data layers and assigned attributes where they intersected (Figure 4). This information was summarized for each park as a percentage of the total homes within each flood hazard category. Where more than one category intersected a footprint (floodway vs 100 Year Floodplain) the highest risk category was maintained (floodway).

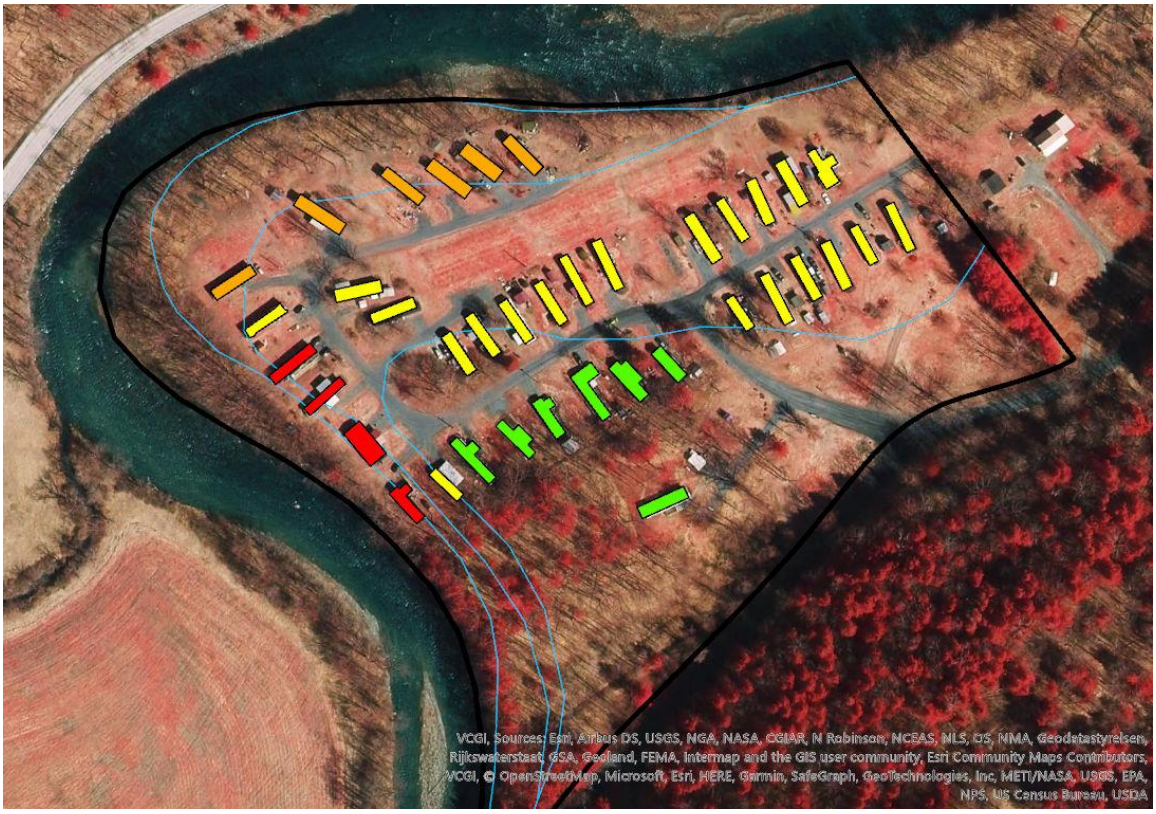

Figure 4. Example of flood hazard analysis for a MHC showing building locations categorized by highest FEMA flood hazard zone (red = floodway, orange = 100 year floodplain, yellow = 500 year floodplain).

Assessment of Elevation Data

The project team tested the use of data collected by Unoccupied Aerial System (UAS) techniques at a pilot MHC location (Weston's Cooperative in Berlin) to improve flood mapping, visualization, and communication with stakeholders (Figure 5). The quality of the images captured by the UAS is important to note as it provided a clearer sense of the relationship of the river relative to the park. As part of the UAS mapping exercise, the team capture a set of representative survey (GNSS) reference points using Real-Time Kinematic (RTK) positioning at the pilot MHC location (Weston) to verify elevation from past airborne LiDAR.

Key Findings

Having an organized and updatable spatial database of MHCs and flood risk is an important step towards better serving these communities. A total of 247 MHC boundaries have been updated since the start of the project. Of these, 11 have been recently removed from the MHC registry. The parcel boundaries have been maintained in this update with MHP_ID listed as the only attribute. After reviewing these locations, it appears that five have been converted into other residential uses (MHP 128, 173, 183, 222, 236), three are now mostly undeveloped/vacant (MHP 182, 223, 295), one has been converted to industrial use (MHP 245), and two appear to have mobile homes present (MHP 152, 209). There have also been seven new additions to the registry that have been added to the updated spatial database (MHP ID 318, 319, 325, 326, 327, 328,

329). Additionally, the boundary of MHP 281 (Oak Hill Trailer Park) park could not be deciphered from the parcel layer and needs to be updated. Also, MHP 328 (Dorr Mobile Home Park 2) could not be separated from MHP 225 (Dorr Mobile Home Park 1) based on the parcel layer, so they are both captured as MHP 225.

The focused assessment of flood risk characterized 70 MHC locations. At these MHCs, there was a total of 2,060 residential structures, 103 residential sites without a structure, and 61 locations labeled as development sites. A further analysis of flood risk at each of the 167 unoccupied locations would add relevant information to the results of this study.

Table 5. Summary of residential point locations at parks with mapped flood risk.

Type	Total	% with Structure Footprints
Mobile Homes	1981	95%
Multi-Family Dwellings	4	100%
Single Family Dwellings	45	92%
Other Residential	1	100%
Development Sites	61	N/A
***Camp**	29	100%

*This type was restricted to MHP 320, Hideaway Campground, and appeared to be manufactured housing units from aerial imagery

The flood hazard assessment using GIS data allowed for an updated analysis of MHC flood risk that provides timely and detailed information compared to the 2013 study. The 2013 study identified 55 MHCs with potential flood hazards based on FEMA flood map data, VT ANR Fluvial Erosion Hazard (FEH) mapping, and dam inundation area mapping that was available at the time. Three of the 55 MHCs identified in 2013 have since closed. This analysis identified 70 MHCs with potential flood hazards based on current available data (Table 6). The analysis for building locations is based on footprint of structures. Additional flood hazard results are included in the Appendix and supporting spreadsheet and GIS data files.

Table 6. Summary of number of MHCs with parcel area and building locations within different flood hazard related data layers

Map layer	Number of MHC with land within mapped area (highest risk area)	% of MHC with land within mapped area (highest risk area)	Number of MHC with building locations within mapped area	% of MHC with building locations within mapped area
Floodway	20	8.4%	10	4.2%
100-Year Floodplain	48	20.2%	28	11.8%
500-Year Floodplain	26	10.9%	14	5.9%
River Corridor	44	18.5%	36	15.1%
Small Stream 50' Setback	20	8.4%	10	4.2%
Dam Inundation Area	18	7.6%	18	7.6%

*** No DFRIM or digitized FIRM data was available for three MHCs (MHP 74, 196, 199). All of these locations have land within the ANR River Corridor and two (196, 199) have homes within this zone***

Ground Survey Analysis

We found that the elevation difference between the GNSS ground surveyed points and the most recent airborne LiDAR was 0.16 meters, slightly higher than the 0.10-meter accuracy specification for the LiDAR (Figure 6). Given the likelihood that the gravel surface the measurements were taken on was subject to use and potential modification since the LiDAR survey was collected, the intended use of the LiDAR data, and the nearly decade-long temporal difference, our assessment is that readily available LiDAR data are suitable for flood analysis. Newer LiDAR, acquired in the spring of 2023, is expected to be available in the fall of 2023. The new LiDAR will improve the ability to map updated structure locations and better reflect the topographic surface in areas where it has been modified in the past decade.

Figure 5. UAS (drone) images of Weston's Mobile Home Park in Berlin, VT.

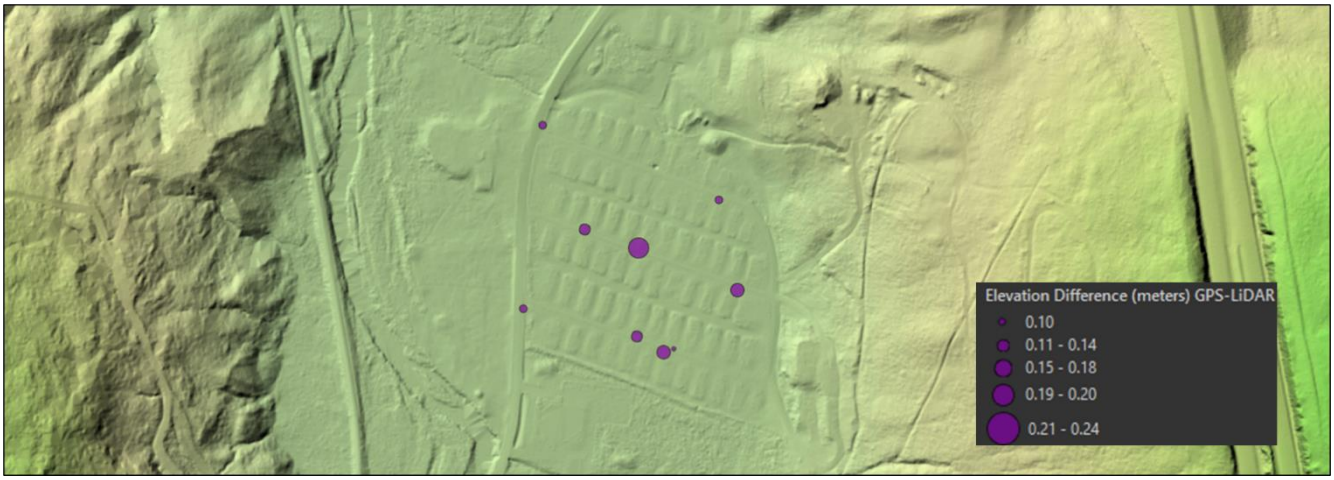

Figure 6. Ground elevation difference, in meters, calculated by subtracting the 2014 LiDAR DEM elevation from the recorded GPS elevation.

MHC Flood Hazard Maps

Individual MHCs that had potential flood hazards identified were individually processed to create a static pdf map (Figures 7 and 8). We created park maps featuring park boundaries, building locations, FEMA flood hazard information, River Corridor areas, and color ortho imagery. Maps were produced size for printing up to a 22 x 34" size. Printed versions of these maps were piloted in the resident engagement effort (See Engaging with Manufactured Housing Communities section).

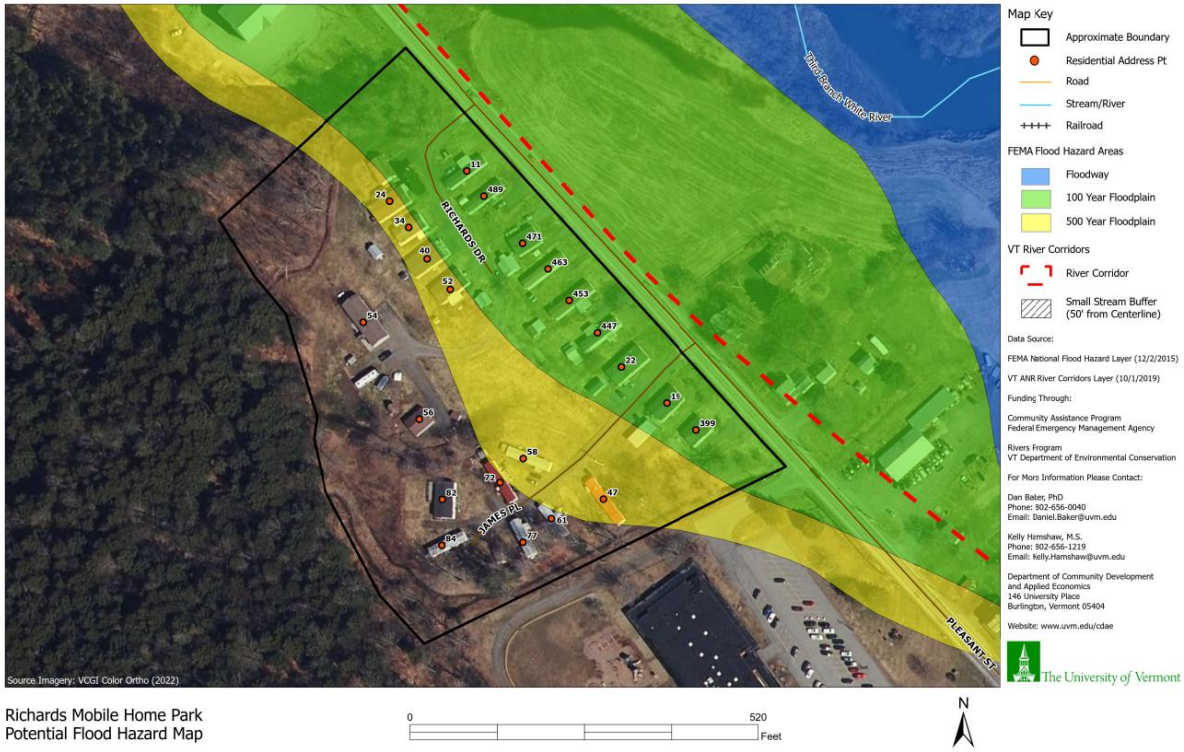

Figure 7. Example MHC potential flood hazard map showing a MHC with nearby FEMA FHA areas and VT ANR River Corridor

Figure 8. Example MHC potential flood hazard map showing a MHC with nearby FEMA FHA area and ANR Small Stream setback layer

In addition to orthoimagery maps, use of recent lidar elevation and building location data that has become available since the 2013 DEHCD study was explored for flood visualization and simulation. Figure 9 shows a simple inundation depth simulation that can be run using a terrain analysis software such as Quick Terrain Modeler to provide more interactive potential flood visuals with perspective.

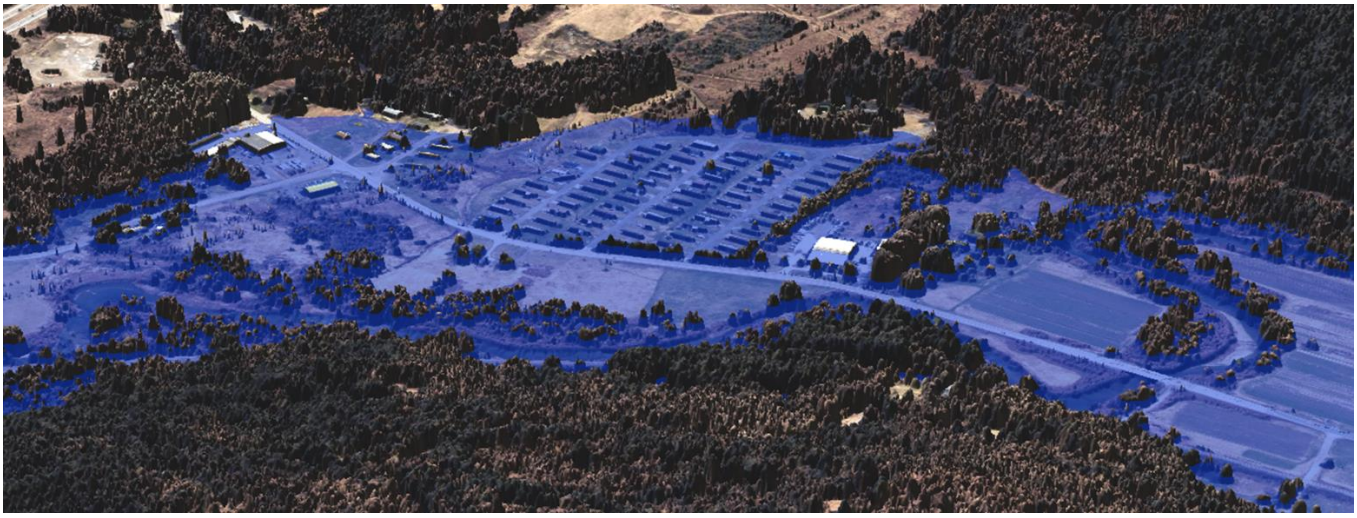

Figure 9. Sample visualization of flood depth simulation that can be used for community engagement and planning

Engaging with Manufactured Housing Communities

This assessment effort featured a resident engagement component to explore concerns, challenges, and opportunities for improving community resilience to flood risk using a resident-centered approach. Resident organizers from the CVOEO Mobile Home Program led the outreach efforts and co-facilitated community workshops with the UVM Project Team.

Community Engagement Approach

The three communities located in Central Vermont were selected for this effort as they had some degree of flood risk based on the geospatial analysis and previously known flood concerns. Table 7 identifies the three parks that were engaged in this process.

Table 7. MHCs Selected for Community Engagement Workshops

MHC Name	Location	Highest Known Flood Risk
Berlin Mobile Home Park	Berlin, VT	Homes located in Floodway; experienced flooding and susceptible to ice jams
Verd-Mont Mobile Home Park	Waitsfield, VT	No homes in flood hazard area; experienced flooding previously
Weston's Mobile Home Cooperative	Berlin, VT	Homes in 100-Year Floodplain; experienced significant flooding during Tropical Storm Irene.

CVOEO Mobile Home Program staff members canvassed each of the three parks in advance of two workshops held within each of the three parks. Two workshops were offered for each park on both a weekday and a weekend day to maximize the opportunity for resident participation. Each resident received a $50 participation stipend for sharing their experiences and taking the time to attend the workshop provided by the CVOEO Mobile Home Program. The workshops were held at high-visibility locations within each park, and refreshments were provided. Materials for supporting emergency preparedness and resident rights were made available.

Outreach to residents of the three parks was completed by the CVOEO Mobile Home Program team during the week prior to the workshops. One-to-one conversations were had with residents or postcards were left with the details about the workshops. The workshops were co-facilitated by CVOEO Mobile Home Program team members and the UVM Dept. of Community Development and Applied Economics. The workshops began with a round of introductions and a short overview of the project's aims. Residents were provided with an opportunity to ask the team any questions or share any concerns before an audio-recording device was used for notetaking purposes. The facilitators then guided the group conversation through a structured set of questions developed to surface resident experiences and perspectives about flood risk perceptions and concerns. Each park workshop featured large-formatted printed maps that depicted the mapped flood risk using FEMA floodplain data for discussion and visualization purposes. The workshops ranged in length from one hour to 90 minutes. A total of 14 residents participated in the scheduled in-person workshops held within the three communities. In addition to hosting the in-person workshops, the CVOEO Mobile Home team created short, 20-minute

video recordings that provided a "DIY" option for residents with time conflicts, mobility issues, or health constraints to make the engagement process as inclusive as possible. One video recording was developed for each of the three communities to include the specific flood maps used in the presentations and were meant to be completed on residents' own time at their own pace. Residents were provided with a questionnaire to respond in writing to the questions.

This option was provided to about ten residents who expressed interest in participating but had time conflicts with the in-person workshops. Unfortunately, even with the participation incentives, it was difficult to obtain written feedback from residents within the tight timeline for this assessment. This approach could be explored further as a potential option if there was capacity for follow-up telephone interviews in a future effort.

Limitations & Challenges

Resident engagement is an important yet resource-intensive endeavor. The three-month timeframe for this assessment project provided a limited window of opportunity to generate mapping deliverables in advance of the resident engagement efforts. Best attempts were made to reach community members at least 10-14 days in advance through door-to-door canvassing by CVOEO Mobile Home Program staff members. Additional resources and a longer timeframe can enable more communities and residents to be reached in future efforts.

Key Insights from Resident Engagement

This sub-section presents key insights drawn from the six in-person workshops held in the three selected manufactured housing communities – each representing a different park ownership structure and having different levels of mapped flood hazard risk.

- **Awareness of health concerns and socio-economic vulnerabilities heightening flood risks to MHC residents:**

Since MHCs are a critical affordable housing option in a state where housing costs, especially for low- and moderate-income Vermonters are especially challenging, it is not surprising that residents acknowledged socio-economic vulnerabilities when discussing flood risk. Residents shared their concerns for neighbors "living near the edge" in terms of their limited financial resources to "weather a storm." Limited financial resources are a barrier for emergency preparedness and mitigation steps, such as lot improvements and the ability to anchor one's home.

Many residents who participated in the community workshops were older Vermonters. They felt it was important to emphasize that agencies and response organizations must consider that many older adults find MHCs to be the best option for single-story living within their fixed incomes. One resident commented, "As a senior, this is reasonable. This is an expensive state to live in. As a senior, all of a sudden, your perspective on stuff totally changes, because you don't have all this (money) coming through, and then they want to raise this, they want to do that. This is feasible on social security." Another resident shared that they have hearing difficulties and fears that they might sleep through a storm event, saying "sometimes I don't hear that there's a lot of rain going on. If there's a long, slow, steady rain, unless I've got a radio on or something like that, I might

not even be aware of it. I have quite literally slept through hurricanes." One resident expressed interest in participating in the workshop, but they were providing care for their spouse with chronic health issues and were unable to leave them unattended.

- **Internal communication between residents is variable by community:**

There was a range of internal communication and social connections within the three communities. Some residents were fairly new to their communities within the past six months and appreciated the workshop as an opportunity to meet their neighbors. Several residents expressed a desire to have strengthened communication within their communities so that information about hazards could be more easily shared. A resident shared her wish for more inter-park communication to reduce flood risk, "I know that I'm not connected with everybody here, but it would be nice to be connected amongst ourselves. Because you might not even be home. You might be away for a week, and is there anybody keeping an eye on your place to realize that there's a problem if it's gonna flood?"

Another resident shared that they had suggested to their park owner the installation of a community bulletin board as a simple solution. Small community gatherings were also mentioned as a strategy to build stronger connections between residents that could be helpful in an emergency situation. The residents from the cooperatively owned park shared that they do have the ability to share information within the park and contact residents—an important distinction from the privately owned and non-profit owned communities.

- **Communication from external agencies and organizations is a challenge:**

When asked to share their thoughts about how external agencies and organizations could more effectively communicate with park residents about important information related to flood hazards, there were several suggestions. Residents felt that sending official letters via the postal service was an important primary step that could then be followed up by other outreach methods such as distribution of flyers, door-to-door canvassing, or phone calls. Several relatively new residents suggested that municipal offices could play a role as a key point of contact for learning about valuable information and resources specific to new MHC residents.

A resident in the cooperatively owned park suggested that state agencies could engage with their park by first reaching out to the board and then reaching out to the larger community from there. "If they started with the board and came to a board meeting, put it to the board as to what they're thinking of doing or want to do, and then come to the community or have the community get together. If they don't show up, they don't get a voice." This is a unique organizational characteristic of cooperatively owned communities that can be an asset in planning or mitigation activities.

- **Residents have a variety of concerns about homes, park infrastructure, and hazards:**

Conversations with residents at all three communities surfaced a variety of concerns related to homes, park infrastructure, and hazards beyond flooding. Concerns related specifically to homes included the potential for roof damage due to falling limbs from hazardous or diseased trees

within the park. Healthy trees can provide shade for heat mitigation and streambank stabilization when properly maintained. Additionally, residents shared structural concerns about snow loads, high wind damage, and power outages affecting their health and safety in their homes. One resident shared their challenges with needing to upgrade their roof to carry the snow loads at great financial expense. Another resident shared their concerns about high winds, "I always head to Wal-Mart. That big parking lot up there at the Berlin Mall has been my tornado safe haven. You go there, at least you know there's a building you can tuck in behind even if they're not open. Either the grade school or Walmart, you go somewhere if there's a severe storm, because even though these (mobile homes) are tied down, these (mobile homes) are not going to withstand them."

There was discussion about current lot improvement requirements for newer homes with bank financing requirements necessitating the installation of new slabs and anchoring for homes. There was confusion about whether park owners or homeowners were responsible for the lot improvements. While residents recognized the importance of having improved lots, there were questions about how to afford such improvements and concerns over being considered ineligible for certain grant programs for home improvements without being placed on an improved lot. For example, one resident shared their experience of applying for a grant to anchor their home (an effective mitigation strategy) yet unfortunately was deemed ineligible because their home was not placed on a slab.

A resident shared their concerning experiences with sinkholes and hollow ground in their park community, explaining:

> "Where my mobile home is and the one that's next to me, we've got, if you drill holes, you can have a hollow and hit nothing under there right next to the mobile home. That tells me that that river's slowly washing out stuff underneath- sinkholes. I had fixed a sinkhole at the very end of my trailer, but it was after we flooded out. Not Irene, but after that flood (in 2008-2009). There was such a sinkhole that I literally put three wheelbarrows of sod and I kept patching it up."

There was discussion at two of the communities about having only one egress option that could be a challenge in any emergency situation should it become unpassable or blocked for residents trying to leave and emergency personnel trying to respond.

Within each of the three community meetings there was a broad range of conversation regarding residents' views about the river. A resident shared their perspective on being so close to the river: "I do appreciate having a river view, I will admit that it's quite nice. It's like it's your best friend and your worst enemy at the same time… It's quite natural and beautiful at times, and other times with the dead trees and the river vines and the icebergs, there's a lot of stress that comes with it that living there over the years has produced." With this in mind, one must be sensitive to and understanding of the fact that many communities and residents enjoy being in close proximity to rivers, but that same proximity may also pose a threat.

- **Tropical Storm Irene raised awareness about potential impacts to MHCs yet memories have faded over time:**

Tropical Storm Irene served as a major focusing event for many Vermonters about the flood risks facing the state's MHCs. Residents who had been living in their homes within their current MHCs shared their firsthand experiences with needing to evacuate their communities during Irene. Residents in Verd-Mont reported learning too late that they were advised to leave their park and encountering many roads being closed but sustaining only minor damage to their properties. Residents at the Berlin Mobile Home Park shared that while they had serious flooding earlier in the year, flooding from Irene wasn't as serious as it was in other communities across the region with one resident commenting, "Irene did not affect us, but we had already been monstrously flooded. We had muck all the way from the river into our yards."

The Weston's Cooperative, then a privately-owned community, sustained the most serious damage of the three MHCs engaged in the workshops. Some residents shared that family members had lost their homes and belongings while others shared harrowing accounts about neighbors being evacuated in the Town of Berlin's bucket loader during the storm. While more than 80 homes were damaged or destroyed by Tropical Storm Irene's floodwaters from the nearby Dog River, the majority of the residents who participated in the workshop felt that the storm was a fluke event. One resident commented, "It was a freak thing. It never flooded before. Places that had never flooded, flooded during Irene. I think if they widened the river or deepened it, it would prevent some of that flooding, even the yearly flooding into the farm fields."

It is common for risk perceptions to decrease over time with natural hazards following significant events. Additionally, there was shared perception that significant flooding in Vermont is a fluke event. Some residents shared comments such as, "It's just one of those things, and the chances of it ever happening again are slim," as well as, "we're not having another flood, so let's not even go there." One resident recounted from their experience, "a lot of the debris came downriver from Northfield. You had propane tanks and all that binding up the river. So, would it have flooded otherwise? Who knows… We haven't had any bad storms like that since."

It is important to consider strategies for engaging residents in MHCs with higher degrees of flood risk in dialogue to raise awareness and encourage preparedness while recognizing that many households may lack financial resources for preparedness or mitigation strategies without assistance.

- **Residents may have limited or incomplete information about past flooding impacts to their communities:**

Residents were asked to share their past flooding experiences in their communities. This prompting question led to dynamic conversations as residents reported their length of residency in their communities from less than 24 hours to well over 30 years. The newest residents shared they had difficulty finding solid information about their communities' flood history besides searching past news media stories. A newer resident commented they would have found it helpful to have access to flood history in the park to inform their decision-making when making

a home purchase, sharing, “as someone who just bought here, it would've been really useful to find a history somewhere of what happened. I had to wait until today to find out.”

- **Opportunity for education about flood risk and best practices for flood hazard mitigation:**

There is ample opportunity to design and provide education about flood risk and current best practices for flood hazard mitigation for MHCs identified as having some degree of flood risk. At each of the workshops residents shared their perspectives and suggestions about river management and flood hazard mitigation strategies that could be seen as counterproductive for current best practices. Tropical Storm Irene was often cited as a focus of such statements. For example, one resident shared, “I heard a lot of people talking about at the time just shortly after the flood, was that both the Winooski running through Montpelier and the Dog River wasn't deep enough. So, it only took six or eight feet to get over the banks in those places.” Referring to blockages specifically in the Dog River affecting Weston’s during Tropical Storm Irene, one resident asked about who is responsible for maintaining rivers from being filled with debris. Residents shared ideas about ditching to re-direct water away from homes and towards the river.

Residents were curious about how decisions are made about river management. One resident cited an example of concrete blocks being placed in the river near Hardwick to hold back the ice, commenting “I always wondered why they don't do that in some of these rivers. Every mile, put in some of those, to hold the ice back so it doesn’t keep pushing the ice and jamming up.”

- **Interest in flooding warning mechanisms and information about what do if evacuation is necessary:**

There was a fair amount of discussion about different warning mechanisms and gaps in information about evacuation locations by MHC residents. One resident stated that all residents in MHCs, regardless of flood hazard status, should sign up to receive emergency notifications from Vermont Alert. Another resident voiced that they wish for the existence of a community-to-community warning system regarding flood events and other extreme weather events. They remembered having minimal warning about Tropical Storm Irene heading in the direction of their park, noting, “I don't recall any warnings with Irene. You know, the water came from Northfield. If it's flooding in Northfield, you know it's gonna flood down this way. We could have been alerted long before it got here.” With this in mind, there is opportunity to expand emergency communication networks in Vermont’s MHCs.

A resident who lives in close proximity to a river near the park mentioned that they closely monitor the river and have great concerns regarding the dangers of ice jams. They noted, “I call the River Watch whenever the ice stops because it’s like, ‘Hello… we are going up!’ It’s like an elevator, you just watch that level of the river rise.” While individual residents monitoring inter-park hazards can serve as a flooding warning mechanism in itself, it is crucial to remember that many private and nonprofit-owned parks may not have strong communication networks. Additionally, outside organizations might not always listen to the concerns of residents.

There was conversation regarding evacuation planning and where residents could seek shelter in case of an emergency. Due to historical weather patterns in Vermont, many areas statewide offer warming shelters in winter months, but not traditional storm shelters as seen in the southern United States. One resident voiced concern about where they could seek safety in the event of a future flood, stating, "I'm used to knowing where all the storm shelters are. They don't have storm shelters here." Future planning could take place to ensure that residents are aware of where to seek shelter and to create more thorough evacuation plans for individual parks.

- **Maps are an important yet imperfect tool for conversations about risks with MHC residents:**

The Spatial Analysis Lab team produced a series of detailed maps for each of the three parks in advance of the workshops. These maps included orthoimages with E911 addresses and park boundaries, FEMA FIRM data, River Corridor data, and a regional flood risk snapshot for context. Residents appreciated seeing the best available data and raised important questions relative to their own lived experiences within their communities. One resident who had recently moved into their community commented that he would like access to the flood maps before making the decision purchase their home, sharing "it would've been really helpful to me to have that map in particular before I bought and to understand where to find things."

Residents at the Berlin Mobile Home Park provided feedback that countered the information displayed on the FEMA map, indicating where water tends to pool in the spring or following storms. Notations were made on the large flood map as residents shared their experiences and an open discussion about how FEMA maps and the River Corridor maps were created was had. One resident with emergency management experience made an observation about their neighbors' flood risk perceptions:

> "What's scary is when you see these maps, which clearly show that you can flood, there's a whole lot of people in our state that really believe that if they weren't hit by Irene, they won't get flooded. It's this real thought out there which is just like, seriously? Even though this park wasn't hit by Irene, we were talking earlier about how it *was* flooded, but that's just scary how you could show a bunch of people (the map) and they'd be like 'Eh, but I wasn't hit by Irene, I'm sure I'm fine'."

When residents were asked about the usefulness of the maps, a resident shared that they found the maps to be helpful because they make it easier to visualize and understand flood risk in the park, "Now I can see where it [the river] goes. The color map is easier to read. For the co-op to have that map, now you can pick out where things are." Presenting maps to community members should be approached with sensitivity knowing that some communities and residents many have had negative experiences and anxiety about this topic.

- **Residents have varying views about usefulness and necessity of flood insurance:**

As previously mentioned, each of the three parks has, in some capacity, experienced a flood event in the past. During the community conversations, many residents brought up the topic of flood insurance. Residents expressed concerns about the costliness of flood insurance, with one

resident noting that they believe that most people in their park do not have flood insurance given limited and fixed incomes. While this could be due to the costly nature of this form of insurance, it is also important to factor in that some residents may be doubtful that they are at risk of another flood event as risk perceptions commonly decrease over time with natural hazards.

Some residents expressed a significant amount of concern about the cost of flood insurance and worries about municipalities and government agencies potentially "forcing" them to purchase flood insurance in the future. When looking at the flood maps, one resident noted, "so all this FEMA [explicit], are they trying to say we now all need flood insurance? Because that ain't gonna happen." Another resident reflected on their experience with their insurance company wanting them to do an elevation study to assess flood risk. They mentioned, "my insurer wanted me to spend almost $1,000 to get some elevation study or something done before they would even give me a quote [for flood insurance]."

While some residents seemingly had doubts about the necessity and usefulness of flood insurance, one resident shared that they have, "never had any trouble (with the company). When we were flooded, they were right there and they covered me." When considering these differing perspectives, it is evident that there are varying perspectives regarding flood insurance within Vermont's MHCs. This is an area that residents expressed interest in having more detailed information provided by a reputable source to inform their decision-making.

- **Residents would like more information about concrete flood hazard mitigation strategies that could improve flood resilience:**

After reviewing and discussing the maps, the conversations moved towards generating ideas for actions that could be taken to improve resilience within MHCs determined to be at risk to flooding. Two commonly asked questions were simply: "what can be done?" and "who is responsible?". Residents expressed interest in knowing what actions they could do within their own homes. However, residents remarked they were uncertain about responsibilities were theirs' versus the park owners' responsibilities for mitigation strategies that would be of benefit to the whole community. One resident shared that they would be curious to learn more about if the park owner would do anything for flood mitigation, even if within the realm of the owner's responsibility:

> "I guess knowing even if, even if the landlord was aware of anything that could be done for mitigation if he could or would do it. The park lot rent keeps going up and I'm hard pressed to see. Right now, putting in new water lines and I'm finally seeing something that's like, oh, you're doing something! You know, there might be stuff you can do to mitigate, like is it required? Is he paying for it? Is there a deadline? Will it happen?"

Residents shared ideas about preventing floods and erosion that ranged from tree planting as part of streambank stabilization and increasing size of nearby culverts to elevating at-risk homes, re-locating beavers, and removing debris from rivers. When discussing long-term and short-term plans for dealing with flooding, one resident shared that is resources weren't a factor, perhaps relocation should be considered in order minimize any future losses to flooding, "if housing

wasn't so tight, I'd say they should buy everybody out and they should move out and this (park) would be allowed to flood. That would be the logical thing."

Several residents mentioned an interest in having support for developing emergency plans specific to their communities as a risk reduction strategy. A resident from the cooperatively owned community felt an emergency plan in case of future flooding events or other types of hazards, like extended power outages, would be a valuable resource for the board to explore.

While these suggested strategies may be more lor less feasible or impactful depending upon the context of the communities in practice, the overall discussion highlighted the need for information about tangible strategies that could improve flood resilience specifically tailored for MHCs.

- **Residents appreciated dialogue-based format for engaging in flood risk conversations:**

When conducting this series of six community meetings with the three MHCs, the project team received community input that the format of the meetings was particularly engaging, useful, and informative. One resident complimented the format and atmosphere of the meeting, implying that future meetings hosted by agencies and organizations could be most engaging if held in a similar community-centered style where the residents' voices are prioritized and used to inform decisions. The resident stated, "you folks have run the most useful type of meeting. I used to work for the Agency of Transportation, and it was a one-way discussion in our meetings. We were telling them what we were going to do, and your attitude of soliciting and drawing out thoughts is very, very admirable."

Resident Feedback on the Community Engagement Process

At the close of each workshop, participating residents were asked to provide written feedback via a three-question feedback form. The combined results are summarized as follows:

- Residents seem to have major concerns about the maintenance and stability of mobile/manufactured homes. Residents have a strong desire for detailed data and information, especially concerning individual home elevations and flood levels as it would help inform them of individual and collective risk on a community level. Through the feedback form, residents identified the need for community-specific emergency planning in the events of a future flood event or another emergency. Residents also expressed that they gained new insights and helpful information about flood/erosion threats in their parks.
- Suggestions for future workshop improvement include integrating multimedia elements and enhancing aspects of pre-event communication. Residents mentioned that being provided a short video overview of the meeting topic prior to coming out would be helpful in preparing for the conversation. Residents also mentioned that it could be helpful to include more historical context for each community in future meetings going forward.

- Residents expressed gratitude towards the CVOEO Mobile Home Program and University of Vermont project team for their care, attentiveness, and appreciation for the informative nature of the community meetings. A common theme was the approachability and openness of the project team, which fostered an atmosphere of meaningful engagement and open communication. Residents mentioned that they felt "listened to" during the community meetings and specifically highlighted that the presentation of maps and historical information was useful and informative.

Key Recommendations and Opportunities for Future Engagement

This three-month assessment project was completed in the span of three months and has generated a significant amount of mapping deliverables and key insights from community engagement efforts. It is clear that much work remains to support flood risk awareness within communities, engage community stakeholders in strategic conversations, and identify opportunities for concrete hazard mitigation actions. This conclusion provides an outline of key recommendations and opportunities for future engagement to support the resilience of Vermont's vitally important manufactured housing communities.

MHC Flood Risk Mapping & Data:

The Spatial Analysis Lab has identified a number of recommendations and next steps that would improve the workflows for future flood risk analysis, enhance accessibility of the mapping products generated through this assessment, and leverage the latest technology to characterize risk:

- Communicate with Enhanced-911 board about identifying building points for manufactured homes within MHCs separately to enable consistent data coding and analysis.
- Update flood hazard analysis when new FEMA flood map products are released or when the probHand flood inundation layers are available statewide.
- Publish a point layer of MHP locations statewide to the VT Center for Geographic Information using the MHP ID identifier to link each location to the publicly available registry.
- Provide MHC location information in Vermont Center for Geographic Information's (VCGI) Map Applications, such as the VT Interactive Map Viewer.
- Determine the risk of park roads/driveways to become inundated during flooding and if only a single-point of entry/exit is present for MHCs with potential flood hazards.
    - Create emergency ingress/egress plans for all parks, especially those within mapped flood hazard
- Work with hydraulic scientists and researchers to incorporate MHC spatial information into dynamic, 2-D HEC-RAS flood simulations for visual hazard planning aids
- Create a map-based inventory of MHC infrastructure vulnerable to flooding and/or that could exacerbate the effects of a severe flooding event (e.g., culverts, storm drainages, wastewater systems, etc.). This could be used to prioritize critical upgrades to MHCs and help build resilience to the effects of future flooding events.
- Continue updating and mapping all residential footprints and E911 point locations to create a detailed spatial layer for all MHCs.
- Create a timely and standard practice for updating boundaries and flood hazard analysis for new MHCs added to the registry (i.e., identifying a lead entity responsible for hosting and maintaining the spatial database).
- Explore partnerships with conservation organizations along key stretches of river corridors along and near MHCs to identify, prioritize, and implement ecological

restoration projects that improve bank stabilization and natural floodplain function, where appropriate. Mapping can be used to examine restoration potential, highlight potential areas, and identify key stakeholders.

Engaging with Manufactured Housing Communities:

One of the key elements for engaging with MHCs is to structure the meeting to promote dialogue and exchange of views rather than a one direction flow from expert to resident. This requires early engagement with the community prior to making decisions that will affect them. It also requires bringing issues or materials that are accessible and interesting to residents, resident boards or park owners. Understanding the history and status of decision-making within the park is helpful and can be opportunity to begin the conversation with a learning mindset. Engaging with park residents often requires greater effort than meeting with other professionals. Being sensitive to resident work schedules may require meeting times that are mid-day, evening or weekends. Many parks do not have community meetings spaces, so finding a local, accessible and comfortable space is often part of the initial discussion. Outreach to the park may require multiple avenues, including surface mail, email, and flyers on the park notice board, door-to-door canvassing ahead of the meeting. If the reason residents should attend your meeting is primarily to fulfill your agencies obligation to have "resident participation" your engagement is likely to fail. There needs to be a reason meaningful to residents that motivates them to attend.

Project team members from the Department of Community Development and Applied Economics and the CVOEO Mobile Home Program have identified a number of recommendations and future opportunities to continue to deepen engagement with MHCs about flood risk and hazard reduction strategies.

- Support trusted local partners in developing education and outreach materials specifically tailored for MHC residents and owners.
    - Materials that can accessed online, in print, and in-person
- Invest in efforts to support community organizing and networking in the MHCs identified as having some degree of flood risk.
- Support resident-centered initiatives to explore individual MHC flood risk using the best available analytical tools, including UAS-generated imagery, available using a dialogue-based approach.
- Encourage and support park communities and trusted partners in emergency planning efforts that can prepare MHCs for future flood events.
- Residents are often juggling multiple commitments, such as working one or more jobs or have caregiving responsibilities. Bear in mind that professional staff are being paid for their time and residents are being asked to volunteer their time. Carefully consider the incentives for residents to participate, whether it is the ability to solve a problem they perceive, such as recurring flooding, culvert replacement or eroding land. Consider providing participant incentives, including financial compensation, for their time and contributions.

- Follow-up with park residents in some way, either by returning a product such as a map, a report, or thank you letters for their engagement. As with most communities, reciprocity is greatly appreciated.
- Work with key stakeholders to identify concrete hazard mitigation strategies with supporting resources to improve flood resilience for MHCs.
    - Provide examples of best practices from Vermont and beyond

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Appendix A – Summary Tables of Flood Hazard Analysis

Table A1. List of MHCs with land area within FEMA flood hazard area

MHP ID	Name	County	% In Floodway	% In 100-Yr Floodplain	% In 500-Yr Floodplain
3	Catamount Mobile Home Park	Bennington	0.0%	4.1%	0.8%
6	Green Mountain Mobile Home Park	Bennington	0.0%	68.8%	2.1%
13	Richards Mobile Home Park	Windsor	0.0%	33.0%	22.2%
15	Skunk Hollow Mobile Home Park	Windsor	0.0%	58.3%	0.0%
21	Cowdrey MHP	Orange	10.1%	2.5%	0.0%
29	Royalton Terrace	Windsor	13.4%	15.6%	2.5%
35	Tenney's Trailer Park	Windham	0.0%	0.0%	0.0%
37	Black River Mobile Court	Windsor	43.1%	48.7%	0.0%
42	Benson's Park	Windham	16.6%	50.0%	0.0%
43	Kings Plot, LLC	Windham	0.0%	0.0%	0.0%
45	Colonial Manor	Windsor	0.0%	0.0%	0.0%
50	Halls Mobile Home Park	Windsor	0.0%	0.0%	0.0%
51	Cozy Meadow	Bennington	0.0%	0.0%	0.0%
52	Royal Pine Villa Mobile Home Court	Bennington	0.0%	5.9%	0.0%
54	Burdick and Burdick Trailer Park	Bennington	0.0%	49.9%	41.2%
56	Vernon Estates Inc.	Windham	0.0%	28.7%	0.0%
59	Mountain Home Park	Windham	8.3%	16.0%	1.5%
60	Black Mountain Park	Windham	0.0%	0.0%	0.0%
61	Glen Park	Windham	34.4%	49.4%	16.2%
71	Pine Haven Estates A	Franklin	0.0%	76.1%	0.0%
74	Concord Estates MHP	Essex	0.0%	0.0%	0.0%
78	Mobile Acres Mobile Home Park	Orange	0.0%	5.5%	0.0%
81	Woodland Shores Park RLLP	Chittenden	0.0%	1.6%	0.0%
97	Blaises Riverside Rentals, LLC	Addison	0.0%	4.2%	0.0%
114	Brookside Mobile Home Park	Addison	0.0%	8.9%	0.0%
118	Brierwood Mobile Home Park	Franklin	0.0%	0.0%	37.9%
120	Riverside Mobile Home Park	Washington	0.0%	0.0%	0.0%
121	Highland Heights MHP	Lamoille	0.0%	46.2%	0.0%
127	North Shore Trailer Park	Windham	23.0%	74.2%	0.3%
133	Whistle Stop Mobile Home Park	Orange	0.0%	0.0%	0.0%
134	Weston Mobile Home Park	Washington	3.4%	38.8%	16.0%

137	Deepwood Mobile Home Park	Windham	0.0%	0.8%	0.1%
143	Riverside Mobile Home Park	Windsor	11.4%	17.6%	35.2%
146	Pownal Estates MHP	Bennington	0.0%	67.9%	0.0%
150	Forest Dale Mobile Home Park	Rutland	11.5%	88.5%	0.0%
151	White Birches Mobile Home Park	Bennington	0.0%	1.0%	0.0%
154	Berlin Mobile Home Park	Washington	99.5%	0.5%	0.0%
155	River Run Mobile Home Park	Washington	53.4%	46.6%	0.0%
156	RMC Mobile Home Park	Washington	0.0%	0.0%	7.7%
158	Eastwood Manor Mobile Home Park	Washington	0.0%	0.0%	0.0%
167	Johnson Mobile Home Park	Lamoille	0.0%	47.0%	0.0%
171	94 North Main Mobile Home Park	Washington	0.0%	0.0%	0.0%
172	Tucker Mobile Home Park	Washington	30.5%	37.6%	2.8%
176	Patterson MHP	Washington	7.5%	92.5%	0.0%
186	Lakes End Mobile Home Park	Rutland	0.0%	0.0%	0.0%
196	Riverview Estates	Caledonia	0.0%	0.0%	0.0%
199	Begin Riverside Park	Essex	0.0%	0.0%	0.0%
204	Bunker Hill Community Co-op	Windsor	0.0%	100.0%	0.0%
206	Mears Mobile Home Park	Bennington	0.0%	79.9%	0.0%
207	Brookside Mobile Home Park	Rutland	0.0%	11.8%	0.0%
209	Cove Point Mobile Home Park	Addison	0.0%	3.8%	0.0%
211	FWMHP, LLC	Rutland	7.4%	1.1%	7.9%
215	Dorr Drive Mobile Home Park	Rutland	0.0%	4.0%	11.3%
217	Hillside Manor Park	Addison	0.0%	0.9%	0.0%
218	Lazy Brook Park	Addison	0.0%	0.0%	0.0%
219	Otter Creek Park	Addison	0.0%	19.5%	0.0%
228	Allen Street Mobile Home Park	Rutland	0.0%	0.0%	0.0%
233	Willows Mobile Home Park	Bennington	0.0%	0.0%	94.6%
234	Merrimac Mobile Home Park	Windsor	8.4%	8.6%	0.5%
238	Riverview Commons	Chittenden	0.0%	6.9%	2.1%
248	Wilkins Trailer Park	Windham	0.0%	13.2%	2.7%
285	Martin Court MHP	Windsor	0.0%	19.2%	3.8%
306	Jamieson MHP	Orange	0.0%	0.0%	0.0%
307	99 North Main Mobile Home Park	Washington	17.3%	10.4%	46.6%
311	Smith's Way	Bennington	0.0%	68.2%	8.9%

Table A2. List of MHCs with land area within ANR River Corridor areas

MHP ID	Name	County	Total Acres In River Corridor	Acres In 50' Stream Buffer	% In Inundation Area
3	Catamount Mobile Home Park	Bennington	3.0	0.0	0.0%
6	Green Mountain Mobile Home Park	Bennington	0.0	0.0	0.0%
13	Richards Mobile Home Park	Windsor	0.0	0.0	0.0%
15	Skunk Hollow Mobile Home Park	Windsor	2.3	0.0	0.0%
21	Cowdrey MHP	Orange	3.4	0.0	0.0%
29	Royalton Terrace	Windsor	5.4	0.0	0.0%
35	Tenney's Trailer Park	Windham	2.3	0.8	0.0%
37	Black River Mobile Court	Windsor	2.0	0.0	0.0%
42	Benson's Park	Windham	5.7	0.4	0.0%
43	Kings Plot, LLC	Windham	0.0	0.0	82.6%
45	Colonial Manor	Windsor	0.0	0.0	100.0%
50	Halls Mobile Home Park	Windsor	0.0	0.0	99.5%
51	Cozy Meadow	Bennington	0.0	0.2	0.0%
52	Royal Pine Villa Mobile Home Court	Bennington	0.0	5.5	0.0%
54	Burdick and Burdick Trailer Park	Bennington	2.2	0.0	0.0%
56	Vernon Estates Inc.	Windham	0.0	5.6	0.0%
59	Mountain Home Park	Windham	14.9	3.0	0.0%
60	Black Mountain Park	Windham	0.0	0.1	0.0%
61	Glen Park	Windham	2.3	0.0	0.0%
71	Pine Haven Estates A	Franklin	2.6	0.0	0.0%
74	Concord Estates MHP	Essex	0.2	1.6	0.0%
78	Mobile Acres Mobile Home Park	Orange	3.0	0.0	0.0%
81	Woodland Shores Park RLLP	Chittenden	0.0	0.0	0.0%
97	Blaises Riverside Rentals, LLC	Addison	2.2	0.0	0.0%
114	Brookside Mobile Home Park	Addison	8.4	0.0	0.0%
118	Brierwood Mobile Home Park	Franklin	0.0	0.0	0.0%
120	Riverside Mobile Home Park	Washington	1.8	0.2	79.0%
121	Highland Heights MHP	Lamoille	0.3	1.0	65.6%
127	North Shore Trailer Park	Windham	0.0	0.0	100.0%
133	Whistle Stop Mobile Home Park	Orange	0.0	0.0	100.0%
134	Weston Mobile Home Park	Washington	0.0	3.5	0.0%
137	Deepwood Mobile Home Park	Windham	0.0	7.5	0.0%
143	Riverside Mobile Home Park	Windsor	15.9	0.0	0.0%

146	Pownal Estates MHP	Bennington	0.0	0.0	0.0%
150	Forest Dale Mobile Home Park	Rutland	1.1	0.0	0.0%
151	White Birches Mobile Home Park	Bennington	0.6	0.0	0.0%
154	Berlin Mobile Home Park	Washington	11.4	0.0	100.0%
155	River Run Mobile Home Park	Washington	4.9	0.0	100.0%
156	RMC Mobile Home Park	Washington	1.8	1.7	99.7%
158	Eastwood Manor Mobile Home Park	Washington	0.0	0.0	100.0%
167	Johnson Mobile Home Park	Lamoille	3.6	0.0	100.0%
171	94 North Main Mobile Home Park	Washington	0.2	0.0	0.0%
172	Tucker Mobile Home Park	Washington	17.6	0.0	0.0%
176	Patterson MHP	Washington	3.5	0.0	100.0%
186	Lakes End Mobile Home Park	Rutland	0.0	0.0	0.0%
196	Riverview Estates	Caledonia	15.6	0.0	0.0%
199	Begin Riverside Park	Essex	13.1	0.0	0.0%
204	Bunker Hill Community Co-op	Windsor	0.0	0.0	100.0%
206	Mears Mobile Home Park	Bennington	0.1	0.0	0.0%
207	Brookside Mobile Home Park	Rutland	2.1	0.0	0.0%
209	Cove Point Mobile Home Park	Addison	0.0	0.0	0.0%
211	FWMHP, LLC	Rutland	2.6	0.0	0.0%
215	Dorr Drive Mobile Home Park	Rutland	0.0	0.0	0.0%
217	Hillside Manor Park	Addison	0.0	4.5	0.0%
218	Lazy Brook Park	Addison	3.0	0.0	0.0%
219	Otter Creek Park	Addison	1.7	1.2	0.0%
228	Allen Street Mobile Home Park	Rutland	0.0	0.0	0.0%
233	Willows Mobile Home Park	Bennington	0.0	0.0	0.0%
234	Merrimac Mobile Home Park	Windsor	12.5	4.4	38.5%
238	Riverview Commons	Chittenden	0.0	1.6	0.0%
248	Wilkins Trailer Park	Windham	12.3	2.3	17.0%
285	Martin Court MHP	Windsor	0.0	0.0	100.0%
306	Jamieson MHP	Orange	1.9	0.9	0.0%
307	99 North Main Mobile Home Park	Washington	2.4	0.0	0.0%
311	Smith's Way	Bennington	1.6	0.0	0.0%

Table A3. List of MHCs with individual structures within FEMA Flood Hazard Areas or River Corridor Areas

MHP_ID	Name	Town	Total Res Structures	Homes In Floodway	Homes In 100 YR Floodplain	Homes In 500 YR Floodplain	Homes In Riv Cor	Home In 50' Str Buf
6	Green Mountain Mobile Home Park	Pownal	33	0	24	0	0	0
13	Richards Mobile Home Park	Bethel	22	0	13	4	0	0
15	Skunk Hollow Mobile Home Park	Hartland	9	0	6	0	7	0
21	Cowdrey MHP	Randolph	12	0	0	0	12	0
29	Royalton Terrace	Royalton	28	0	4	1	5	0
35	Tenney's Trailer Park	Athens	10	0	0	0	6	3
37	Black River Mobile Court	Ludlow	15	7	8	0	14	0
42	Benson's Park	Rockingham	9	0	7	0	8	0
52	Royal Pine Villa Mobile Home Court	Pownal	40	0	12	0	0	2
54	Burdick and Burdick Trailer Park	Pownal	14	0	9	5	12	0
56	Vernon Estates Inc.	Vernon	11	0	6	0	0	3
59	Mountain Home Park	Brattleboro	261	21	49	0	24	5
60	Black Mountain Park	Brattleboro	24	0	0	0	0	2
61	Glen Park	Brattleboro	22	1	21	0	8	0
71	Pine Haven Estates A	Richford	10	0	0	0	10	0
78	Mobile Acres Mobile Home Park	Braintree	84	0	0	0	1	0
97	Blaises Riverside Rentals, LLC	Bristol	9	0	0	0	9	0
120	Riverside Mobile Home Park	Moretown	12	0	0	0	10	0
127	North Shore Trailer Park	Rockingham	23	0	23	0	0	0
134	Weston Mobile Home Park	Berlin	83	3	48	15	0	8
143	Riverside Mobile Home Park	Woodstock	38	4	6	21	37	0
146	Pownal Estates MHP	Pownal	56	0	52	0	0	0
150	Forest Dale Mobile Home Park	Brandon	6	0	6	0	6	0
151	White Birches Mobile Home Park	Bennington	52	0	0	0	1	0
154	Berlin Mobile Home Park	Berlin	32	32	0	0	32	0
155	River Run Mobile Home Park	Berlin	7	4	3	0	7	0
156	RMC Mobile Home Park	Berlin	22	0	0	4	11	4
167	Johnson Mobile Home Park	Johnson	33	0	0	0	5	0
172	Tucker Mobile Home Park	Northfield	33	1	28	0	18	0

176	Patterson MHP	Duxbury	11	0	11	0	11	0
186	Lakes End Mobile Home Park	Wells	25	0	0	0	1	0
196	Riverview Estates	Lyndon	29	0	0	0	28	0
199	Begin Riverside Park	Canaan	18	0	0	0	4	0
204	Bunker Hill Community Co-op	Windsor	16	0	16	0	0	0
206	Mears Mobile Home Park	Arlington	2	0	2	0	1	0
207	Brookside Mobile Home Park	Rutland	26	0	0	0	4	0
211	FWMHP, LLC	Castleton	45	0	1	6	13	0
215	Dorr Drive Mobile Home Park	Rutland	16	0	1	1	0	0
217	Hillside Manor Park	Starksboro	26	0	0	0	0	3
218	Lazy Brook Park	Starksboro	49	0	0	0	9	0
233	Willows Mobile Home Park	Bennington	22	0	0	22	0	0
234	Merrimac Mobile Home Park	Hartford	47	0	0	0	0	1
238	Riverview Commons	Richmond	147	0	37	7	0	0
248	Wilkins Trailer Park	Jamaica	11	0	11	0	11	0
285	Martin Court MHP	Springfield	6	0	1	0	0	0
306	Jamieson MHP	Williamstown	12	0	0	0	6	3
307	99 North Main Mobile Home Park	Northfield	7	0	0	5	6	0
311	Smith's Way	Bennington	3	0	1	0	1	0

Appendix B: Summary Table for MHC lots

Table B1 Summary of MHC lots by FEMA Flood Zone and River Corridor Areas.

Based on 7,094 total MHC lots in the 2022 ACCD Mobile Home Park Registry (August Version)

Flood Zone	# of MHC lots by highest risk	% of all MHC lots
Floodway	78	1.1%
100 Year Floodplain	423	6.0%
500 Year Floodplain	106	1.5%
River Corridor (not including FEMA Flood Hazard Area)	137	1.9%
River Corridor	375	5.3%
Any FEMA Flood Hazard Area	607	8.6%
Any FEMA Flood Hazard Area or River Corridor	744	10.5%