

Forest carbon project feasibility for private landowners: financial viability and spatially explicit co-benefits

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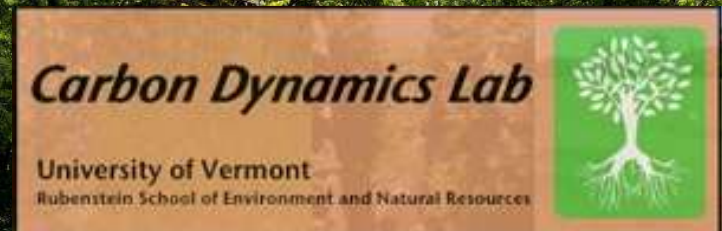
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Charlie Hancock, North Woods Forestry

Charles Kerchner and Bill VanDoren, Spatial
Informatics Group

Nancy Patch, VT Dept. For. Parks & Rec.



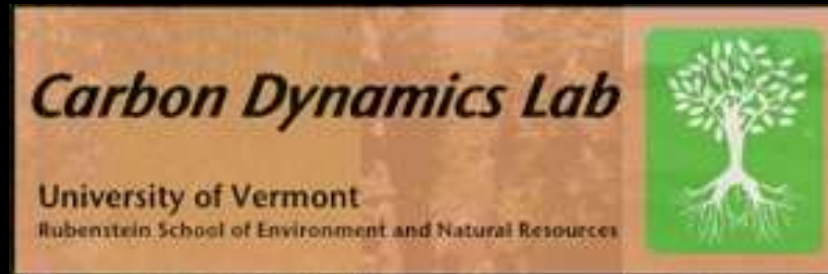
Our Team



COLD HOLLOW
TO CANADA



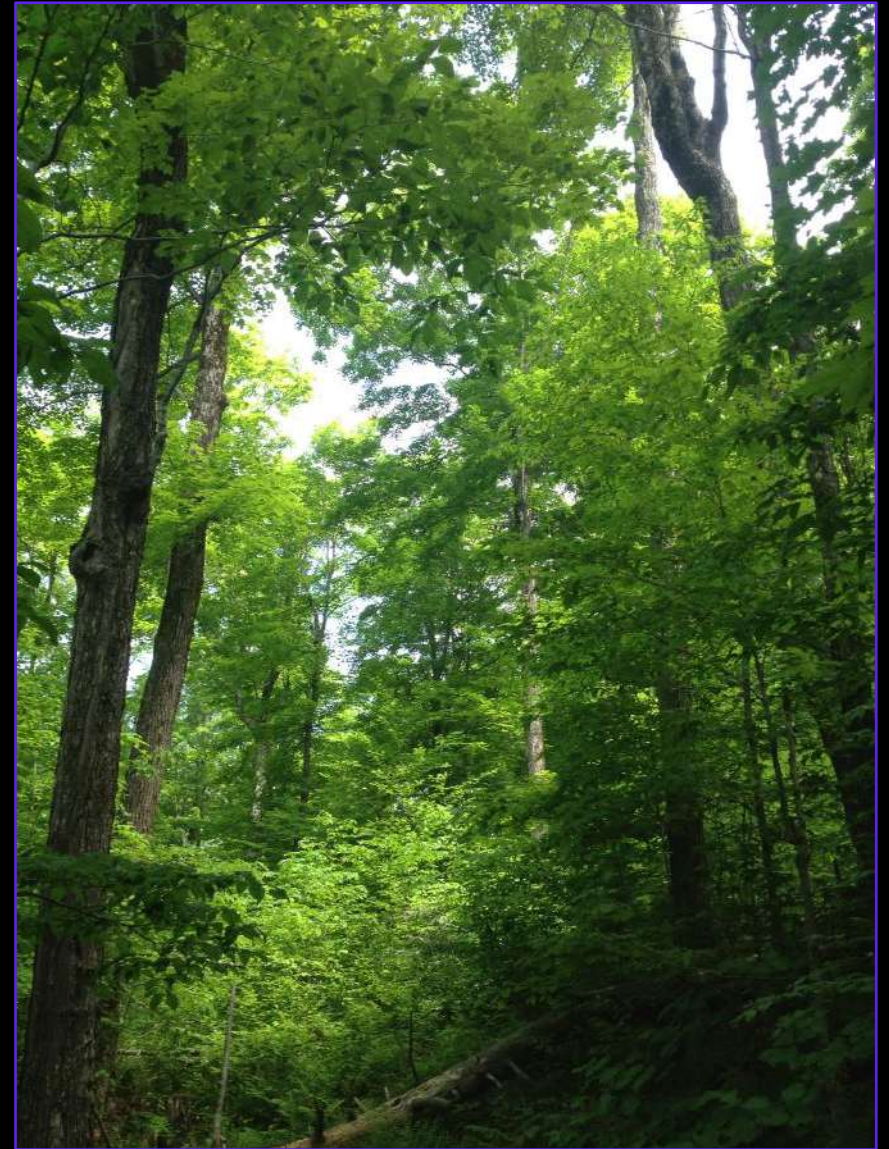
Spatial  Informatics Group



HIGH MEADOWS
FUND
at the Vermont Community Foundation

The Carbon Opportunity in the Northeast

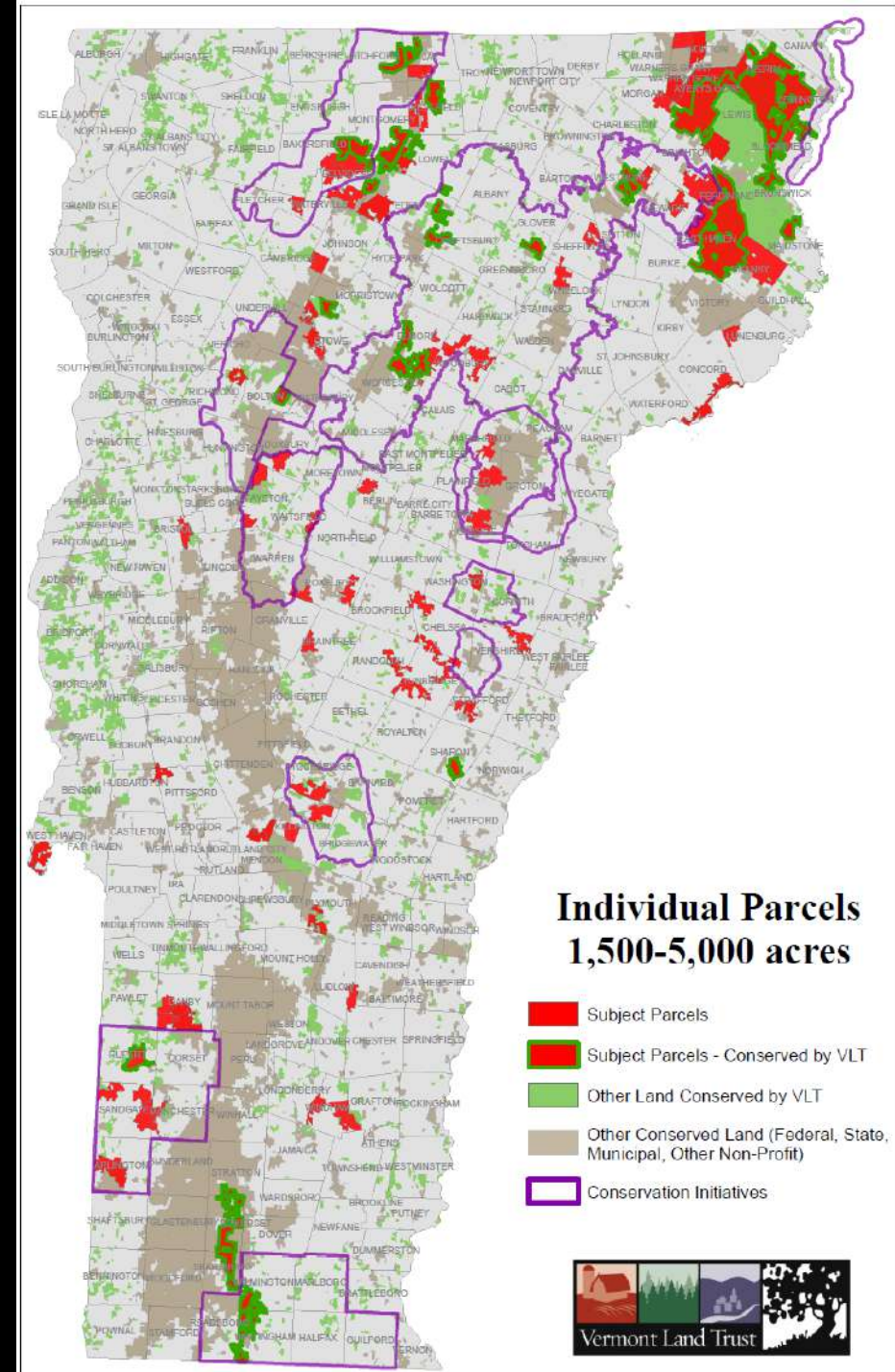
- Carbon = Umbrella for forestland conservation + improved forest management
- Clear science tells us where and how
- Carbon offsets add value to working and conserved forests



Structural Complexity Enhancement experiment at Mt. Mansfield State Forest, VT. Photo credit: William Keeton

The Vermont Forest Carbon Feasibility Study

1. Review of carbon market context, options, and synergy with forest stewardship mechanisms
2. Roadmap for developing a state-wide forest carbon program
3. Spatial analysis of high priority parcels offering feasibility and co-benefits → quantification of available land area
4. Determination of credit yield and financial value for sample Cold Hollow to Canada properties



Vermont Forest Carbon:

A Market Opportunity for Forestland Owners

<https://www.vlt.org/forest-carbon-report-released/>

Or Google “Vermont Forest Carbon”

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Acknowledgements

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Final Report – March 2018


Spatial Informatics Group

Carbon Dynamics Lab

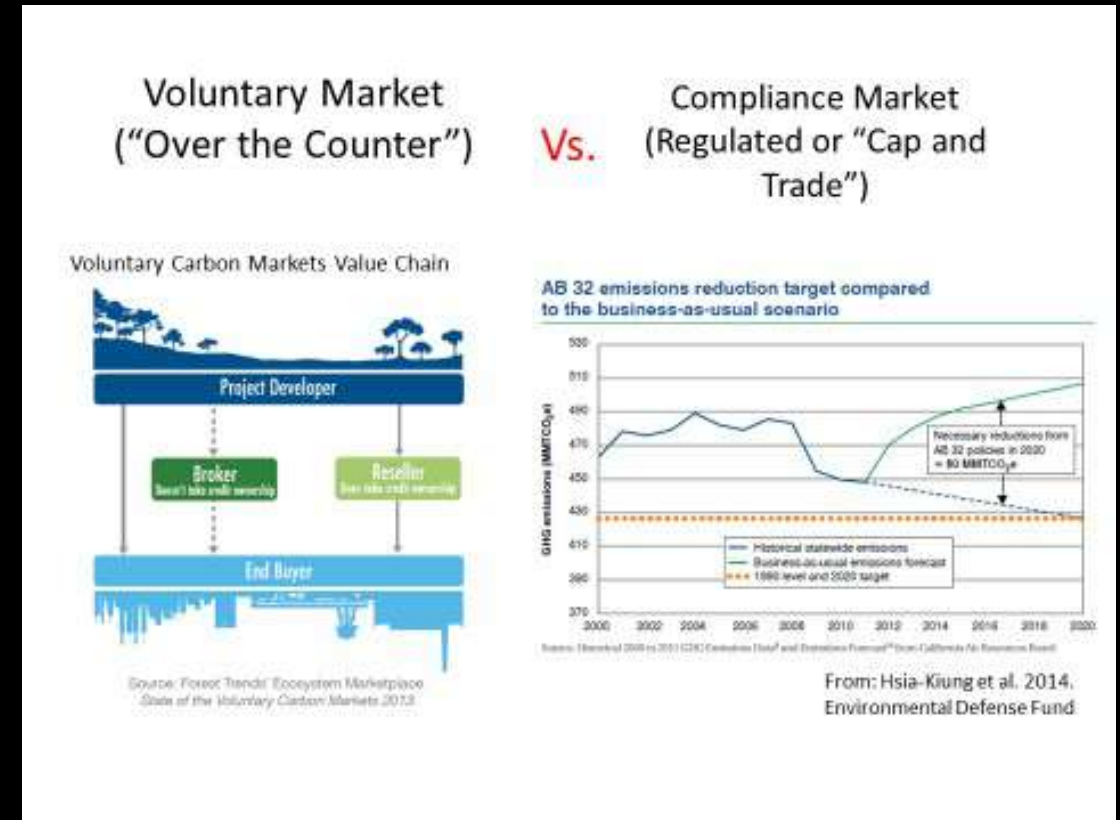
University of Vermont
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 **Vermont Land Trust**
CONSERVING LAND FOR THE FUTURE OF VERMONT

Best Carbon Market Options for Vermont

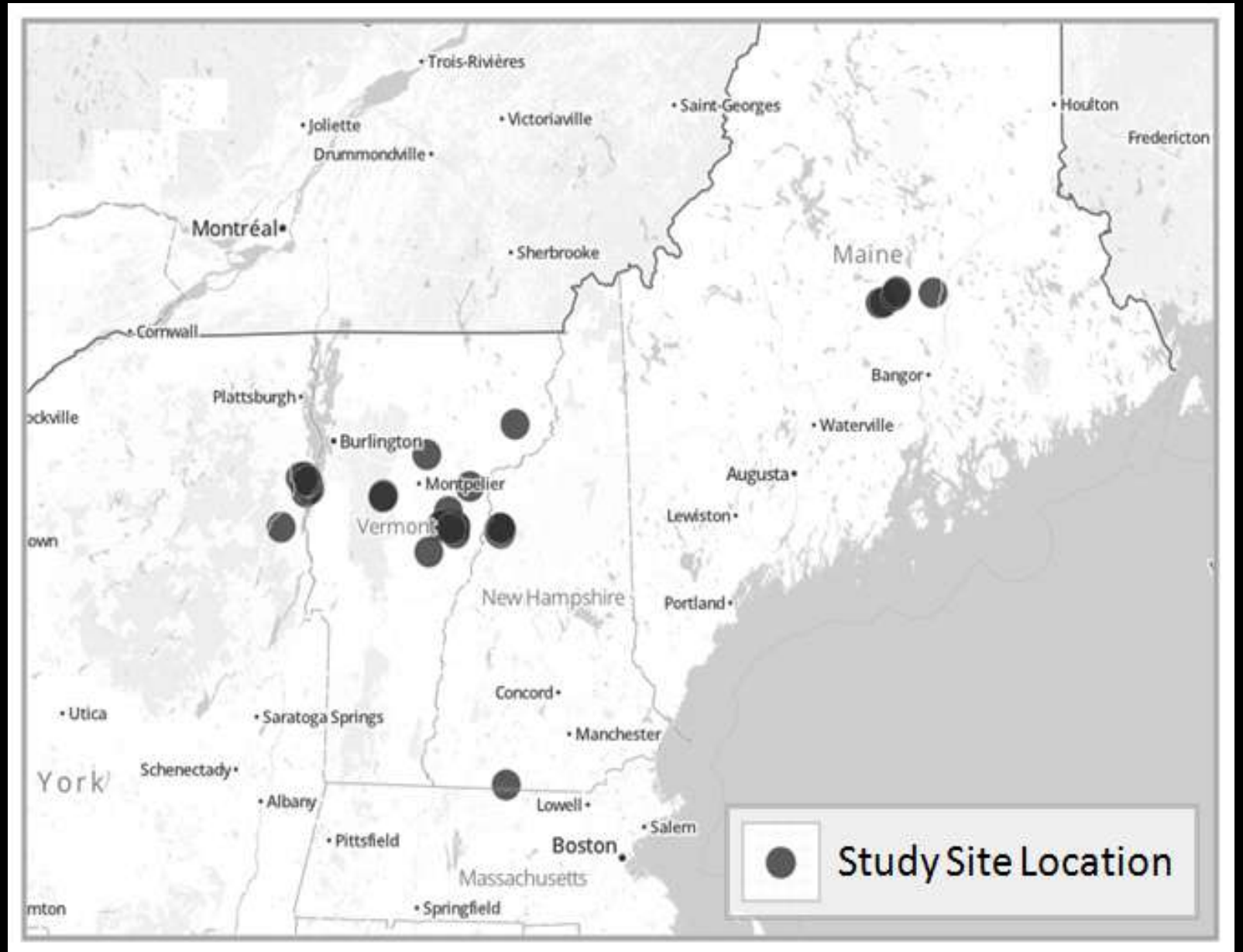
- California Compliance Market (CARB)
 - Viable option as stand-alone projects only for the largest properties (e.g. >1,500 acres)
 - 100 year contract period
 - Aggregation may be possible if contracted through a single project developer
- Voluntary Market
 - Need aggregates of properties 200+ acres in size totaling 1,500+ acres
 - American Carbon Registry
 - Improved Forest Management (IFM) protocol conducive to UVA and certification
 - 40 year contract less burdensome
 - Opportunity to market “Charismatic Carbon” to buyers



Study of Financial Viability of Forest Carbon Projects in the Northeast

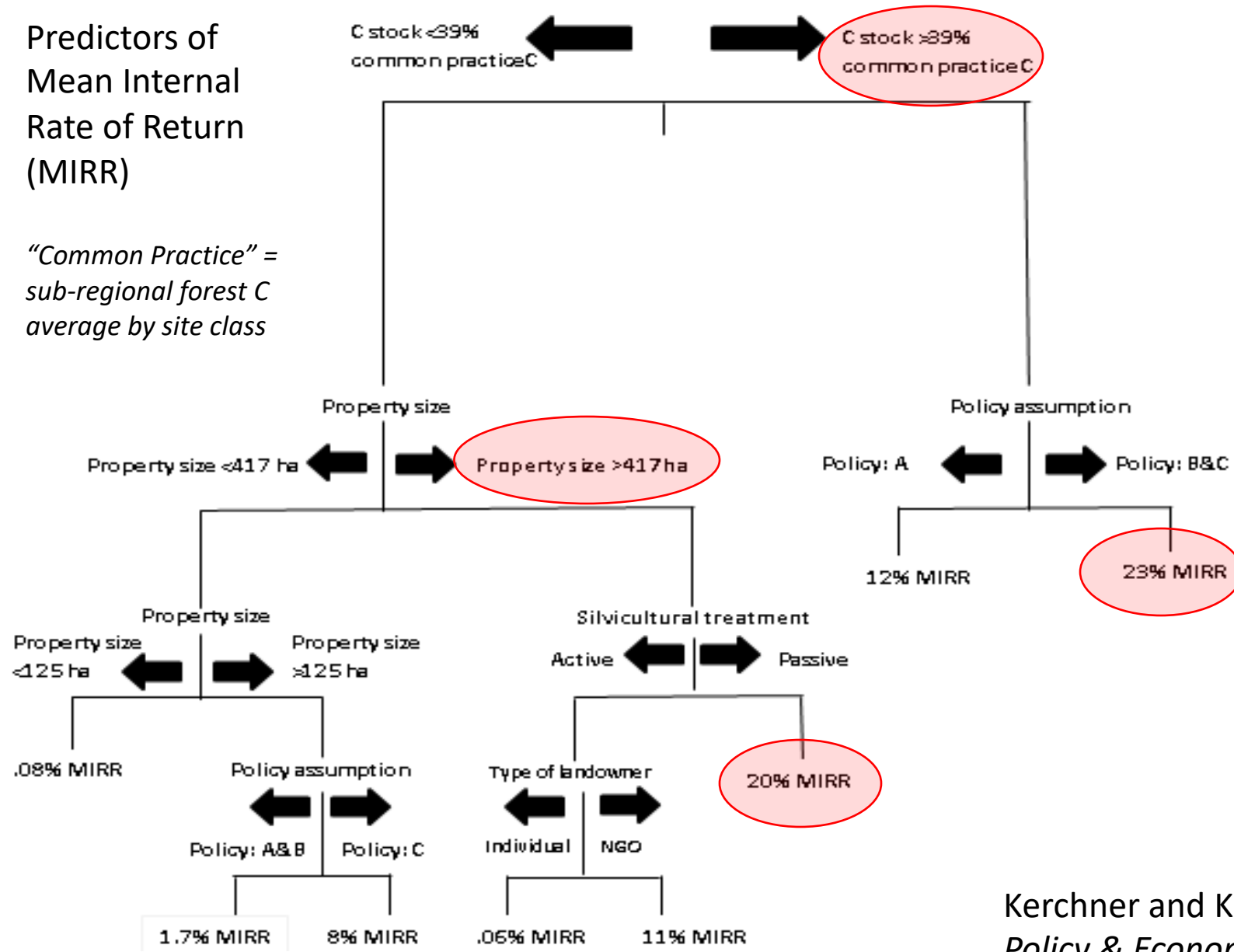
- 25 Properties
- Diverse Ownership, Size, and Management

Kerchner and Keeton . 2015. *Forest Policy & Economics*

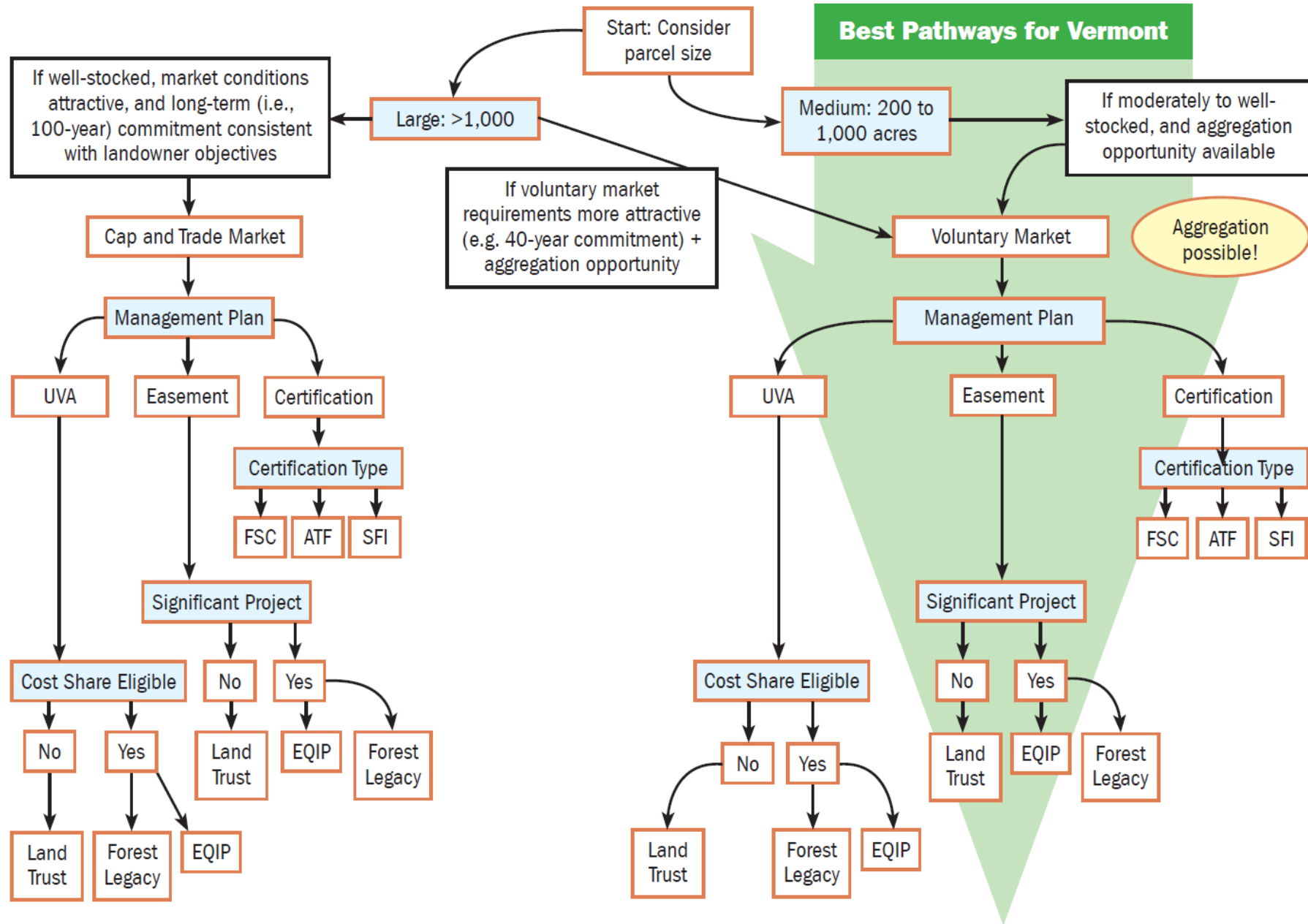


Predictors of Mean Internal Rate of Return (MIRR)

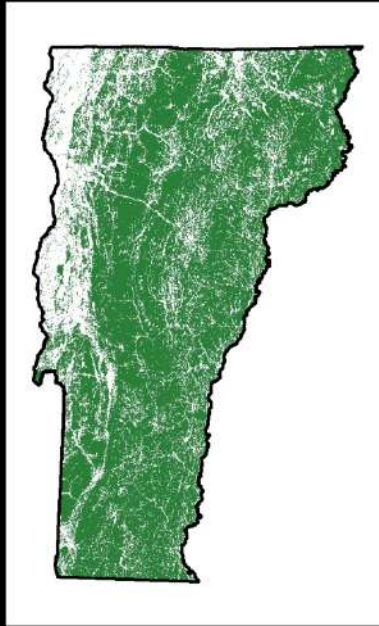
“Common Practice” = sub-regional forest C average by site class



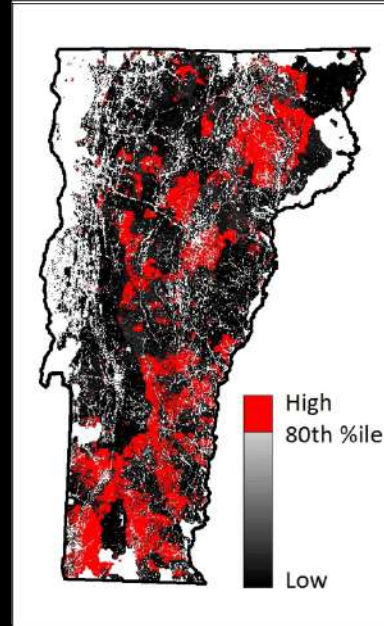
Decision Tree for Integrated Forest Conservation, Stewardship Program Enrollment, and Carbon Project Development in Vermont



Co-benefit identification



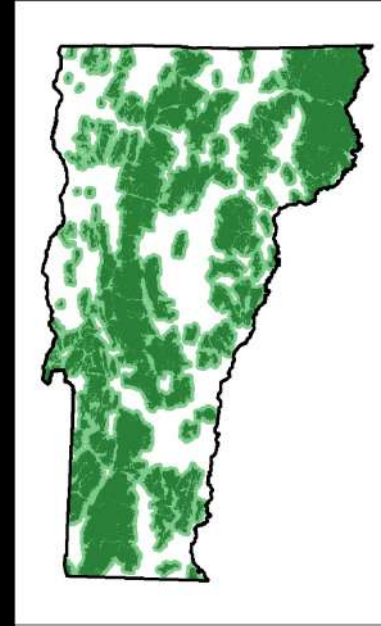
Forest area



Σ FLOOD

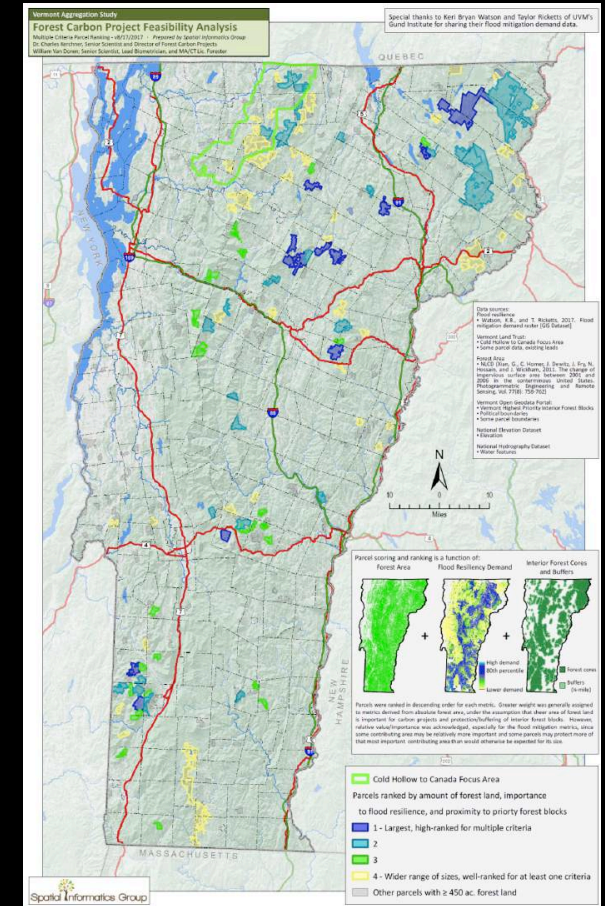
+ Σ FLOOD_{RESID}

Σ FLOOD₈₀



Interior forest
cores

+
Buffers



= 285,00 acres

Flood mitigation demand data credit:

Watson, K.B., and T. Ricketts, 2017. Flood mitigation demand raster [GIS Dataset]

Figure 1. Data sources and algorithm used to identify preliminary parcel ranks/tiers shown on Map 1.

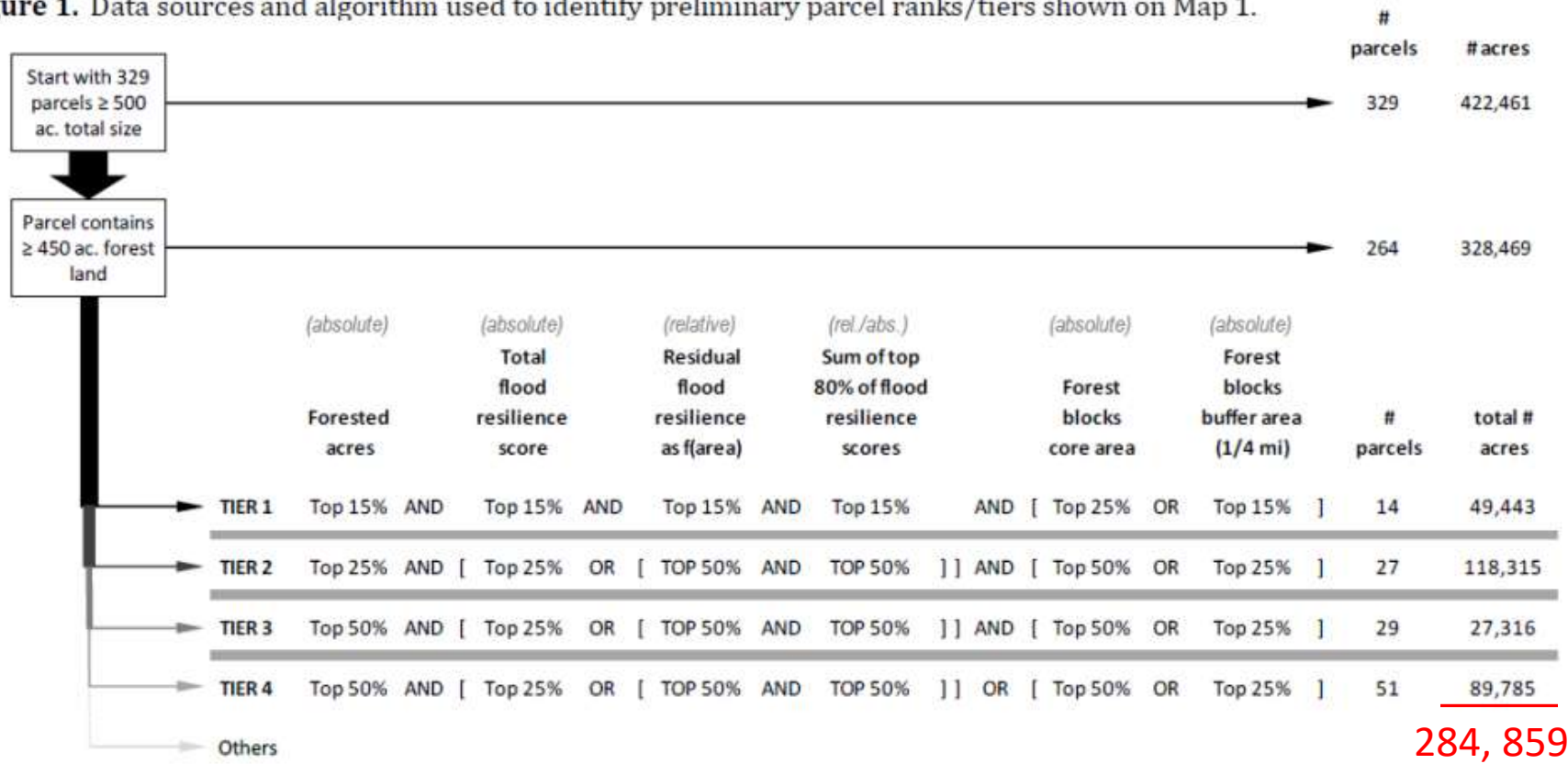
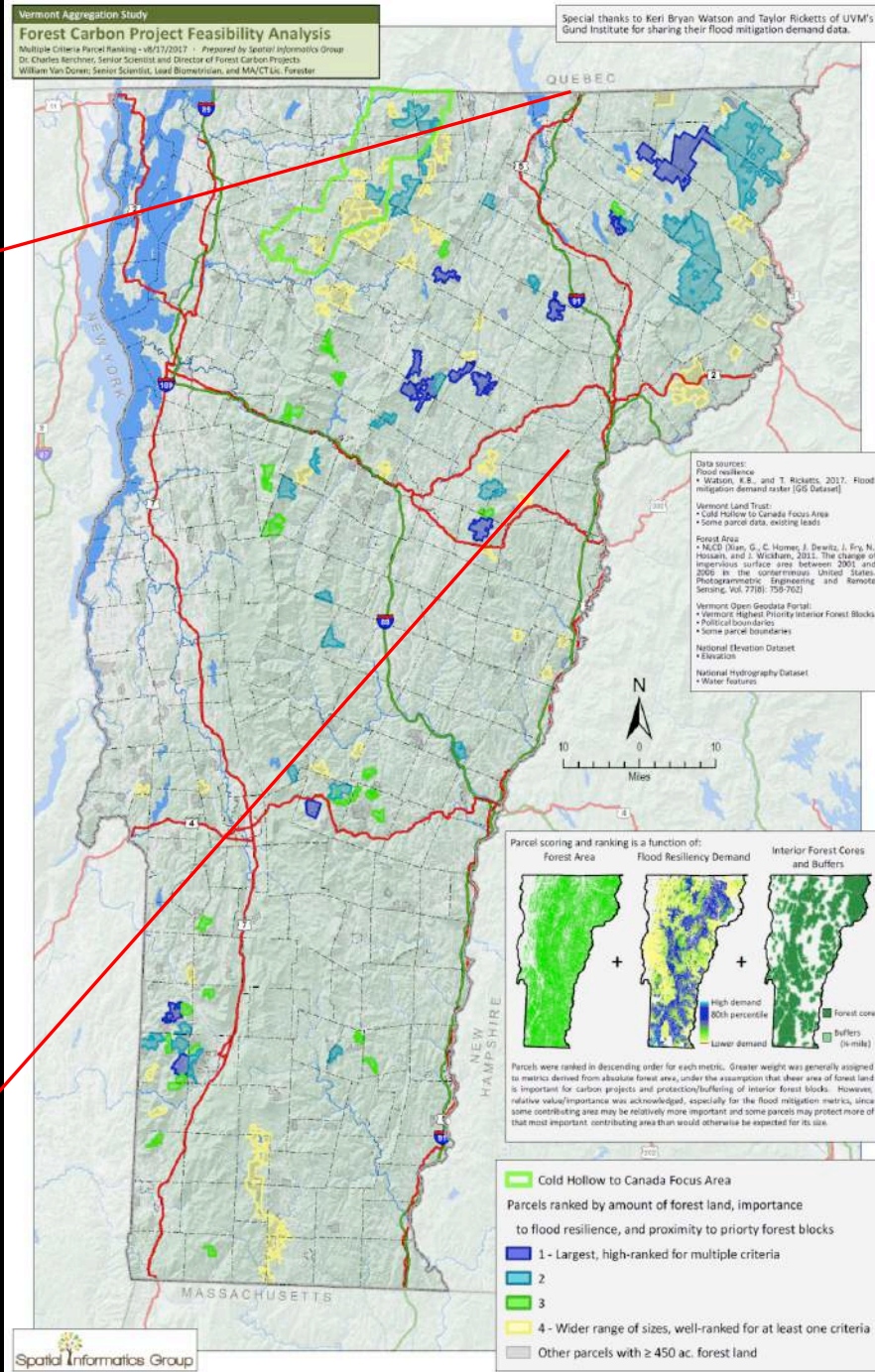
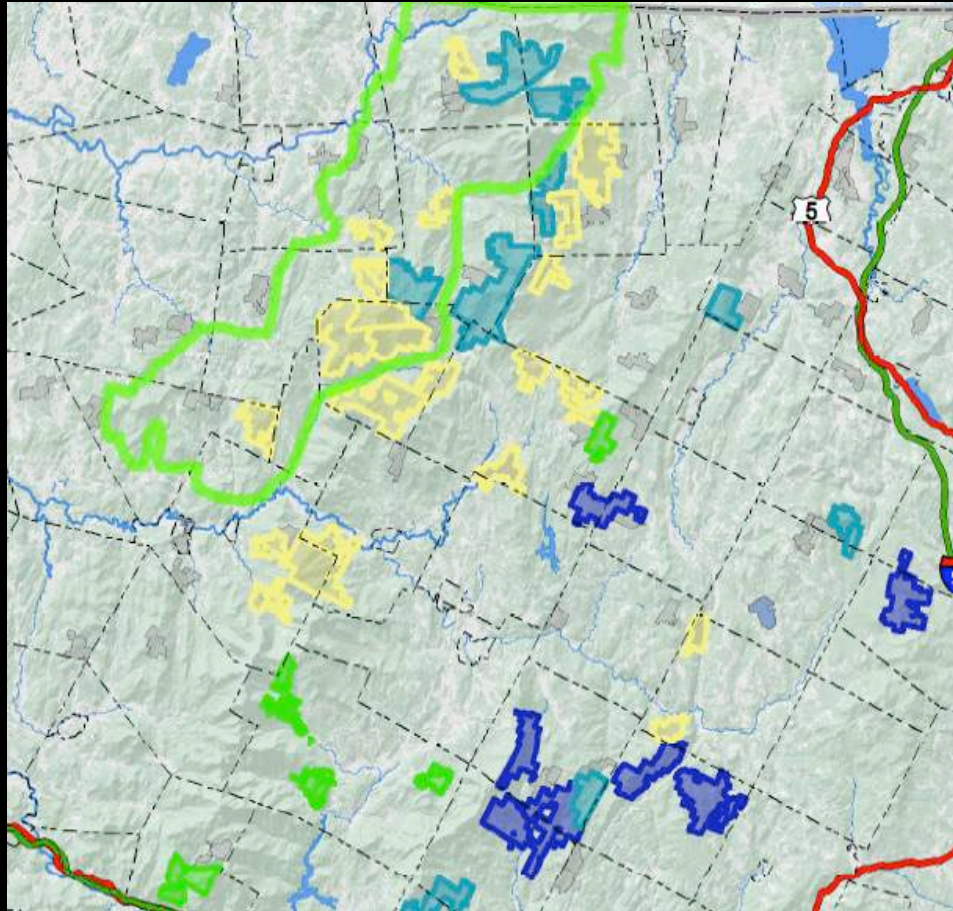


Figure and analysis courtesy of William Van Doran, SIG; Flood resilience data layer courtesy of Keri Watson and Taylor Ricketts, Gund Institute for Environment

No public lands. All privately owned forested parcels > 500 acres in size



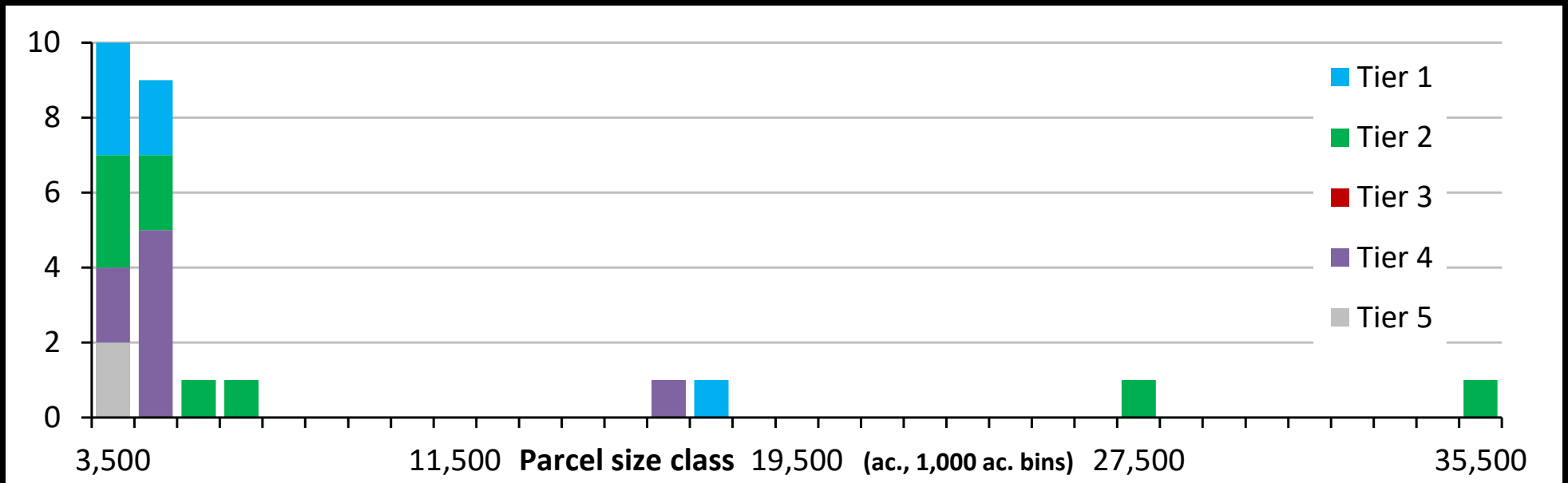
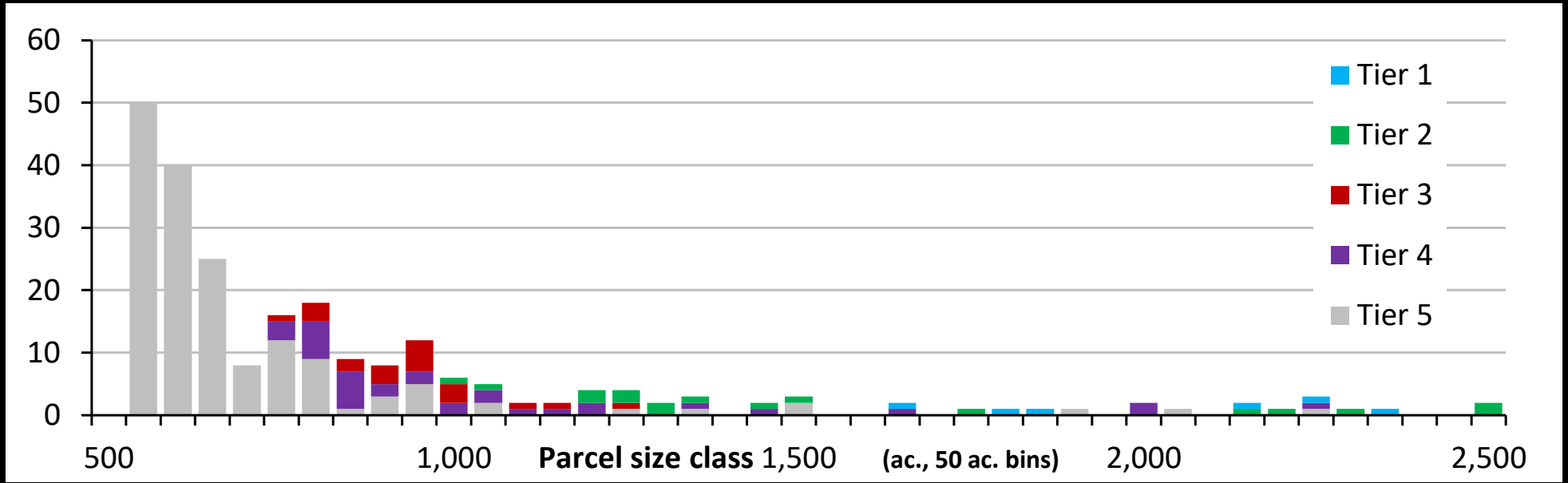
Acres of privately owned parcels in Vermont by size, forest cover, potential to yield co-benefits (forest block conservation/buffering and flood resilience), and conservation easement status.

	CATEGORY OF PRIVATELY OWNED PARCELS IN VERMONT	CONSERVATION EASEMENT ¹	NO CONS. EASEMENT ¹
A	Area in parcels >500 acres	422,461	252,376
B	Area of parcels from row A with >450 forested acres each	328,469	209,658
C	Area of high priority ² parcels from row B	284,859	139,690

¹ Acres. To convert to hectares, divide by 2.47

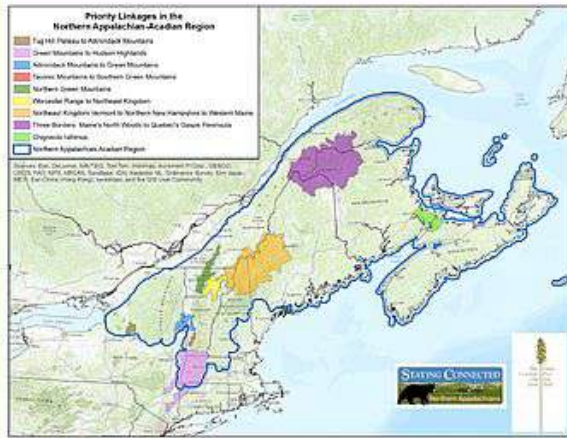
² Priority assigned based on percent forest cover, proximity (within or adjacent) to forest blocks, and flood resilience ranking (see Appendix 1 for methodology), representing potential to provide co-benefits.

Parcel size distribution for top ranked properties



Cold Hollow To Canada

<https://www.coldhollowtocanada.org/>



A CROSS ROADS FOR WILDLIFE AN ECONOMIC ENGINE THE PLACE WE CALL HOME

Cold Hollow to Canada works in seven towns along the northern spine of the Green Mountains reaching from the Cold Hollow range into the Summits of Quebec.

Our forests provide critical habitat for wide-ranging mammals, and the greatest diversity of breeding bird species in the U.S. Our forests act as an economic engine, contributing to an estimated \$3.4 billion annually added to the Vermont economy in both forest-based manufacturing and forest-related recreation and tourism. But Vermont is now losing forest cover for the first time since the mid-1800s. With increased fragmentation we lose the important contributions that working forests make to our economy, our ecology, and our culture. The stage is set for an increase in forestland conservation as a vital part of maintaining Vermont's working landscape and the health of our forests at a scale to sustain functionality in the future.



A VISION FOR CONSERVATION IN THE COLD HOLLOW TO CANADA REGION

Our vision is a healthy and intact forested landscape that supports a strong and sustainable local economy through stewardship, with protection of core wildlife habitat and connectivity across the entire Northern Forest.

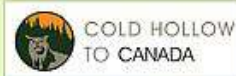
We can achieve this vision when there is:

- ◻ Ongoing stewardship of our regions forests built on a foundation of biological diversity and ecosystem resilience.
- ◻ Permanent protection of the largest unfragmented blocks of contiguous forest in our region.
- ◻ Caring economic use of our forests to sustain their productivity into the future.
- ◻ Connected forests through our region that allow for the movement of wildlife.
- ◻ Communities' appreciation of and commitment to preserving the region's rich forest heritage that defines our home.



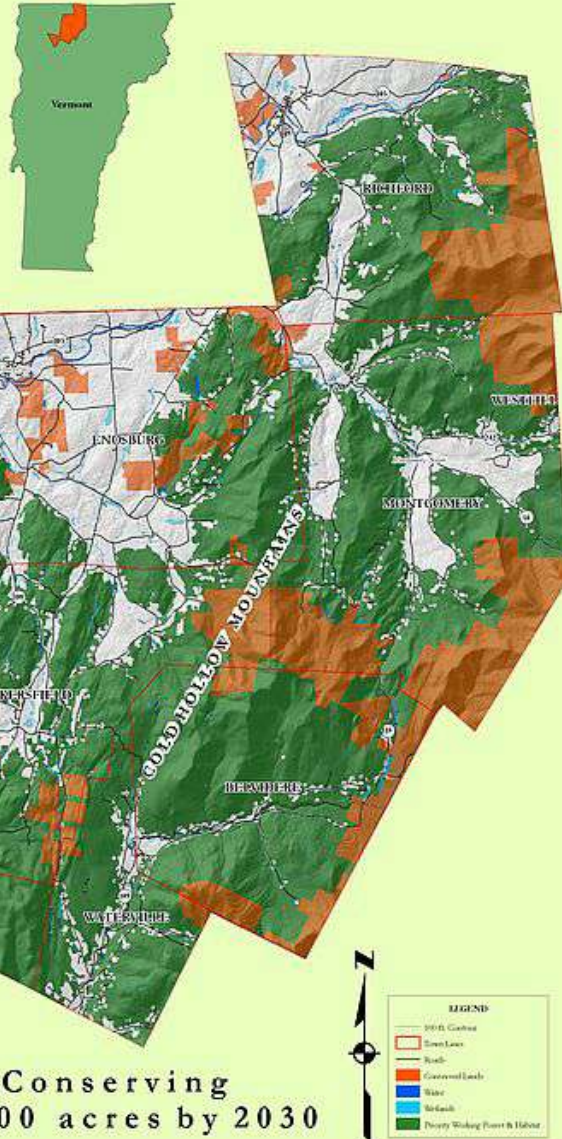
CONSERVATION, BY THE NUMBERS

- ◻ Our region spans nearly 170,000 acres along the northern spine of the Green Mountains
- ◻ Priority Forest Blocks, forming critical habitat and the connections between, account for approximately 117,000 acres, or 70% of the seven town area.
- ◻ Currently 20% of the identified Priority Forest Blocks are conserved, or about 23,500 acres.
- ◻ Our goal is the permanent protection of 40% of the identified unfragmented Priority Forest Blocks in our region by 2030.
- ◻ To achieve our goal by 2030, an additional 23,500 acres will need to be conserved for a total of 47,000 acres

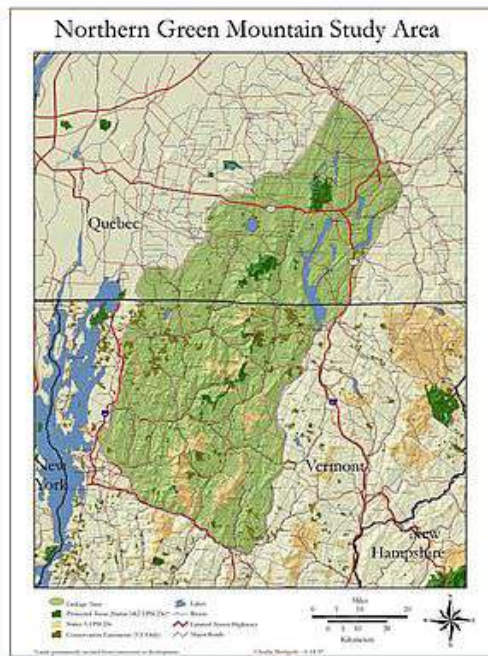


For more information on the work of Cold Hollow to Canada, sign up to receive our quarterly newsletter, or to contribute to the Campaign for Conservation in our region please visit

WWW.COLDHOLLOWTOCANADA.ORG










Conserving
23,500 acres by 2030



Inventory Data and Carbon Calculations

Table 1. Key summary statistics from inventory data for sample tracts in the Cold Hollow to Canada focus area, assuming a project start date at the end of the 2017 growing season. Green line indicates actual stocks; grey indicates theoretical distribution for given q-value and basal area.

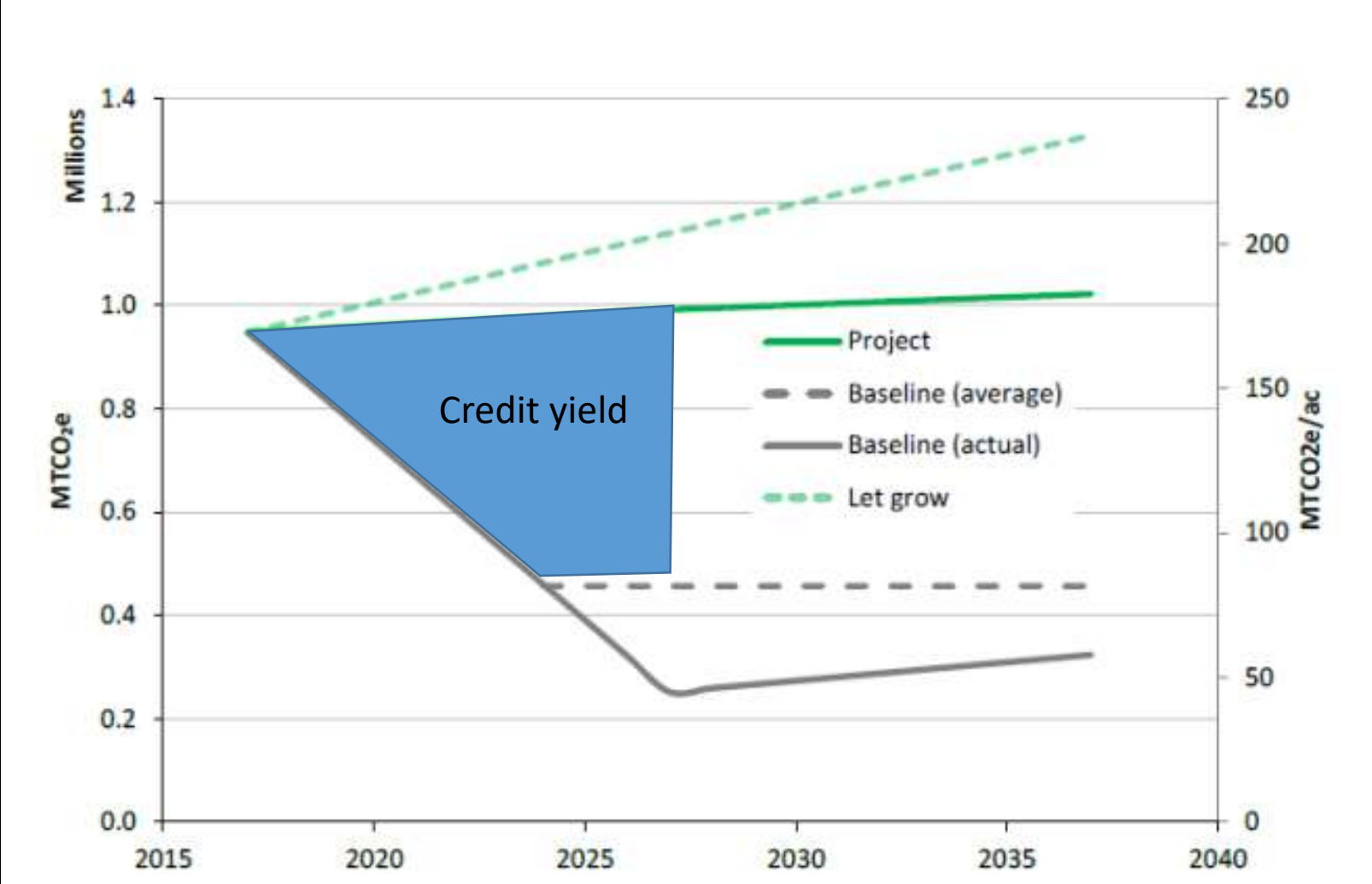
Property	Forested acres	# plots	MBF/ Ac	Cords/ ac	Tons/ ac	BA (ft ² /ac)	TPA	QMD	q	TPA v. DBH	MTCO ₂ e/ac - CRM		MTCO ₂ e/ac - Jenkins/FVS	
											LIVE	DEAD	LIVE	DEAD
ATP	2,099	373	5.3	9.2	1.2	124.6	732.6	5.6	1.2		133.0	1.4	160.1	4.8
GUE	606	121	4.2	10.4	0.6	120.7	735.4	5.5	1.2		126.1	1.3	151.6	4.5
HAI	635	111	8.7	8.6	3.5	144.6	727.3	6.0	1.2		138.5	1.3	174.2	4.7
HAZ	691	108	3.7	8.6	0.5	107.7	772.4	5.1	2.0		110.1	1.5	135.0	4.7
HIV	445	31	5.4	5.8	4.0	110.6	730.5	5.3	1.2		106.1	1.8	133.6	4.8
JOU	289	63	5.2	11.1	2.8	137.8	731.1	5.9	1.2		134.9	1.0	166.5	4.2
MCG	1,165	215	5.7	9.3	2.1	128.1	728.3	5.7	1.2		127.5	1.3	155.1	4.6
TOTAL	5,931	1,022	5.4	9.1	1.8	124.7	735.9	5.6	-	-	127.2	1.4	155.2	4.7

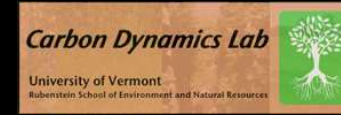
Credit yield analysis

- Assuming:
 - All legal constraints followed

Property	Total Forest		Inoperable areas		AMP Areas		Other sensitive areas	
	Acres	# Plots	Acres	Percent	Acres	Percent	Acres	Percent
ATP	2,099	373	121	5.8%	235	11.2%	234	11.1%
GUE	606	121	0	0.0%	43	7.2%	4	0.6%
HAI	635	111	17	2.7%	30	4.7%	110	17.3%
HAZ	691	108	0	0.0%	50	7.2%	29	4.1%
HIV	445	31	4	1.0%	33	7.4%	0	0.0%
JOU	289	63	0	0.1%	19	6.5%	19	6.7%
MCG	1,165	215	3	0.3%	61	5.2%	83	7.1%
TOTAL	5,931	1,022	146	2.5%	471	7.9%	478	8.1%
Types of encumbrances			Wetlands, slope \geq 45%		Variable-width buffer strips for streams and ponds		Deer wintering area, R/T/E spp. habitat, elevation \geq 2,500 ft.	
Allowed silvicultural prescriptions			Let grow		Let grow, low-intensity uneven-age management		Let grow, uneven-age management	

Credit yield modeling





Preliminary, estimated, projected revenue for 5,900 acres of land in the Cold Hollow to Canada RCP under and aggregated voluntary market project, financed by a project developer

Table 3. Estimated finances given the carbon project conditions and sample tracts as evaluated and described above.

Project year	1	2	3	4	5	6	7	8	9	10	TOTAL
Credits (ERTs)	35,963	35,963	35,963	35,963	35,963	35,963	6,812	2,922	2,922	2,922	231,355
Price/credit	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
Gross revenue	\$287,703	\$287,703	\$287,703	\$287,703	\$287,703	\$287,703	\$54,493	\$23,378	\$23,378	\$23,378	\$1,850,844
Total direct expenses	\$91,394	\$21,394	\$21,394	\$21,394	\$21,394	\$64,394	\$17,022	\$16,438	\$1,938	\$1,938	\$278,703
Net revenue landowners ¹	\$117,785	\$159,785	\$159,785	\$159,785	\$159,785	\$133,985	\$22,483	\$4,164	\$12,864	\$12,864	\$943,284
Net revenue developers ¹	\$78,523	\$106,523	\$106,523	\$106,523	\$106,523	\$89,323	\$14,989	\$2,776	\$8,576	\$8,576	\$628,856

= \$16 per acre per year

¹Net revenue to be used for initial planning purposes only.

Key points:

- Revenue is net → accounts for all project expenses, would be higher if landowner financed
- Revenue is supplementary → sustainable timber harvest continues (75% of net growth)
- Revenue assumes \$8 per tonne of CO_{2e} → price could be higher or lower

Summary: what the study shows

- Substantial opportunities for aggregated carbon projects under voluntary market standards.
- Ecosystem service co-benefits, including flood resilience and forest block conservation
- Carbon project development is complementary other forest stewardship programs.
- No inherent incompatibility between carbon projects and Current Use Value Appraisal; UVA aids with management plan requirements.
- Revenue adds a supplementary financial incentive for working forests

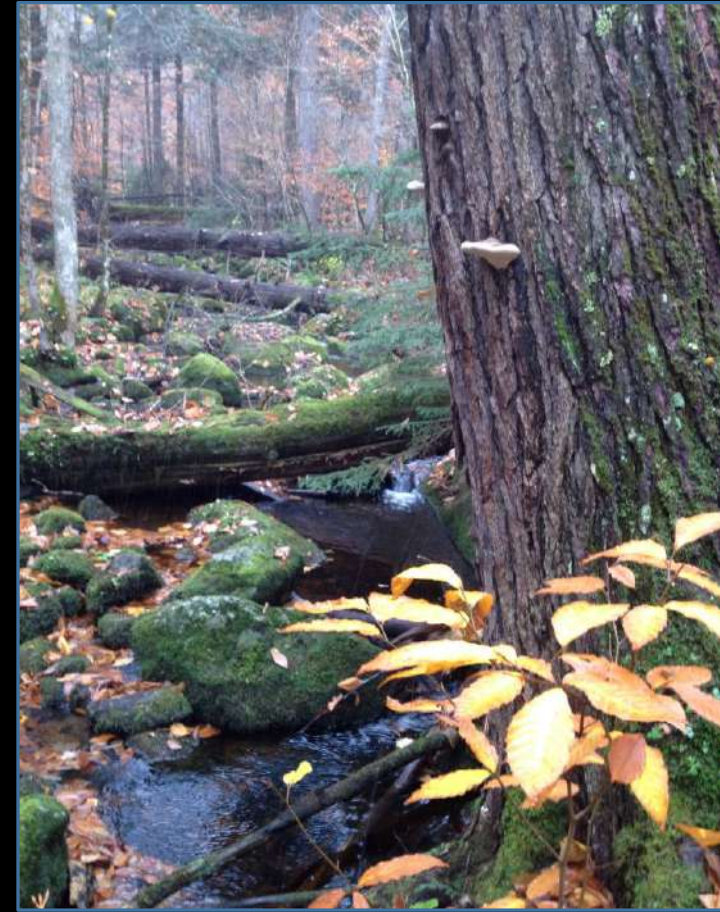
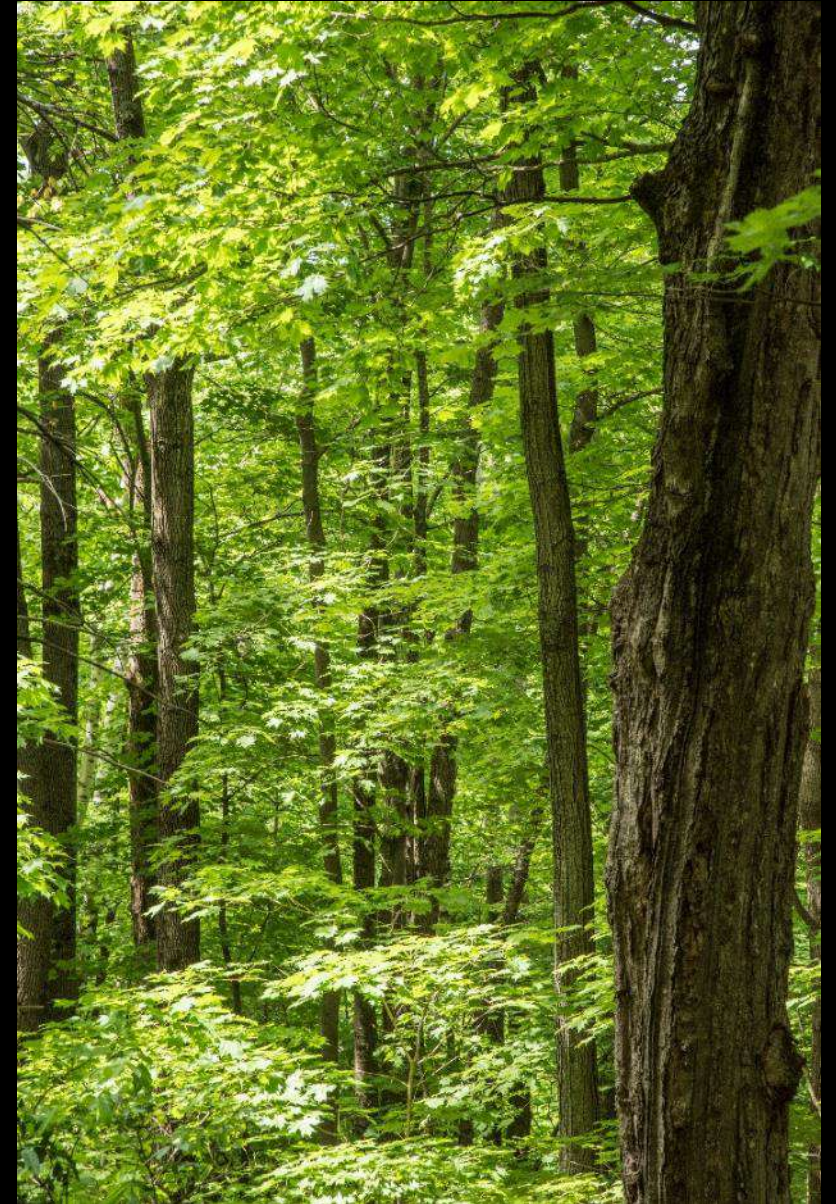


Photo credit: William Keeton

Phase Two (in progress)

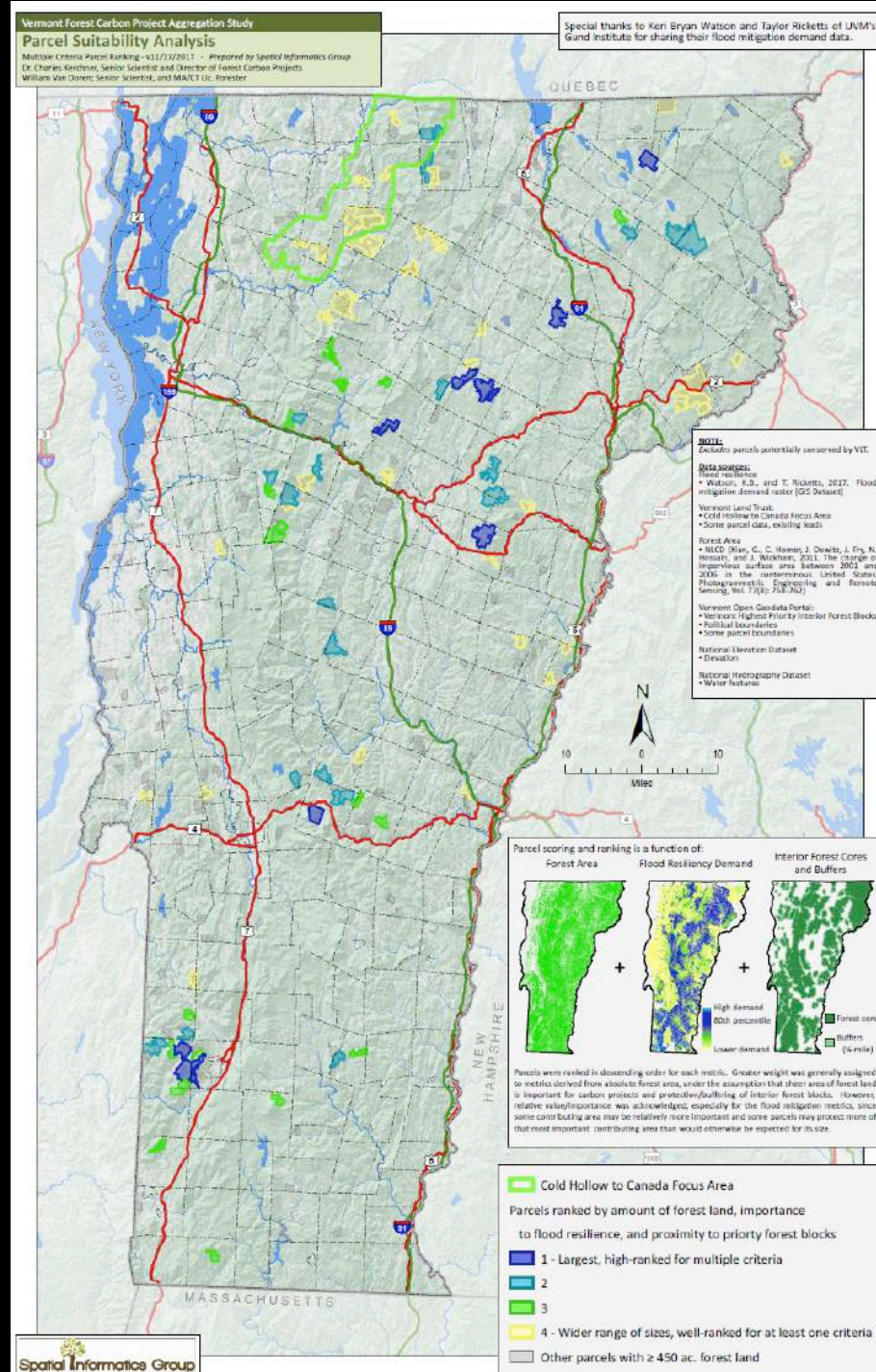
- Demonstration Aggregation Project with CHC
 1. Stakeholder engagement
 2. Transparency
 3. Generate transferrable lessons and information
- Dissemination, Training, and Referrals
 1. For landowners
 2. For county and consulting foresters; others
- Policy Recommendations (State, Regional):
 1. RGGI
 2. Current Use Value Appraisal
 3. Legislative Initiatives on Climate Change
 4. Linkages to fragmentation/land conservation legislation





Questions?

No public lands.
 Privately owned forested
 parcels > 500 acres in size, not
 protected by easement or
 NGO ownership



Parcel rankings:

Federal, state, municipal, and most NGO ownership/protection *excluded*;
VLT owned or protected lands *excluded*

Start with 254
unprotected
parcels ≥ 500
ac. total size

parcels # acres
254 252,376

Parcel contains
≥ 450 ac. forest
land

197 209,658

	<i>(absolute)</i>	<i>(absolute)</i>	<i>(relative)</i>	<i>(rel./abs.)</i>	<i>(absolute)</i>	<i>(absolute)</i>		
	Forested acres	Total flood resilience score	Residual flood resilience as f(area)	Sum of top 80% of flood resilience scores	Forest blocks core area	Forest blocks buffer area (1/4 mi)	# parcels	total # acres

TIER 1 Top 15% AND Top 15% AND Top 15% AND Top 15% AND [Top 25% OR Top 15%] 10 24,102

TIER 2 Top 25% AND [Top 25% OR [TOP 50% AND TOP 50%]] AND [Top 50% OR Top 25%] 21 41,290

TIER 3 Top 50% AND [Top 25% OR [TOP 50% AND TOP 50%]] AND [Top 50% OR Top 25%] 20 18,287

TIER 4 Top 50% AND [Top 25% OR [TOP 50% AND TOP 50%]] OR [Top 50% OR Top 25%] 39 56,011

Others

139,690