

Vermont's Geographic Information System

4/21/2021

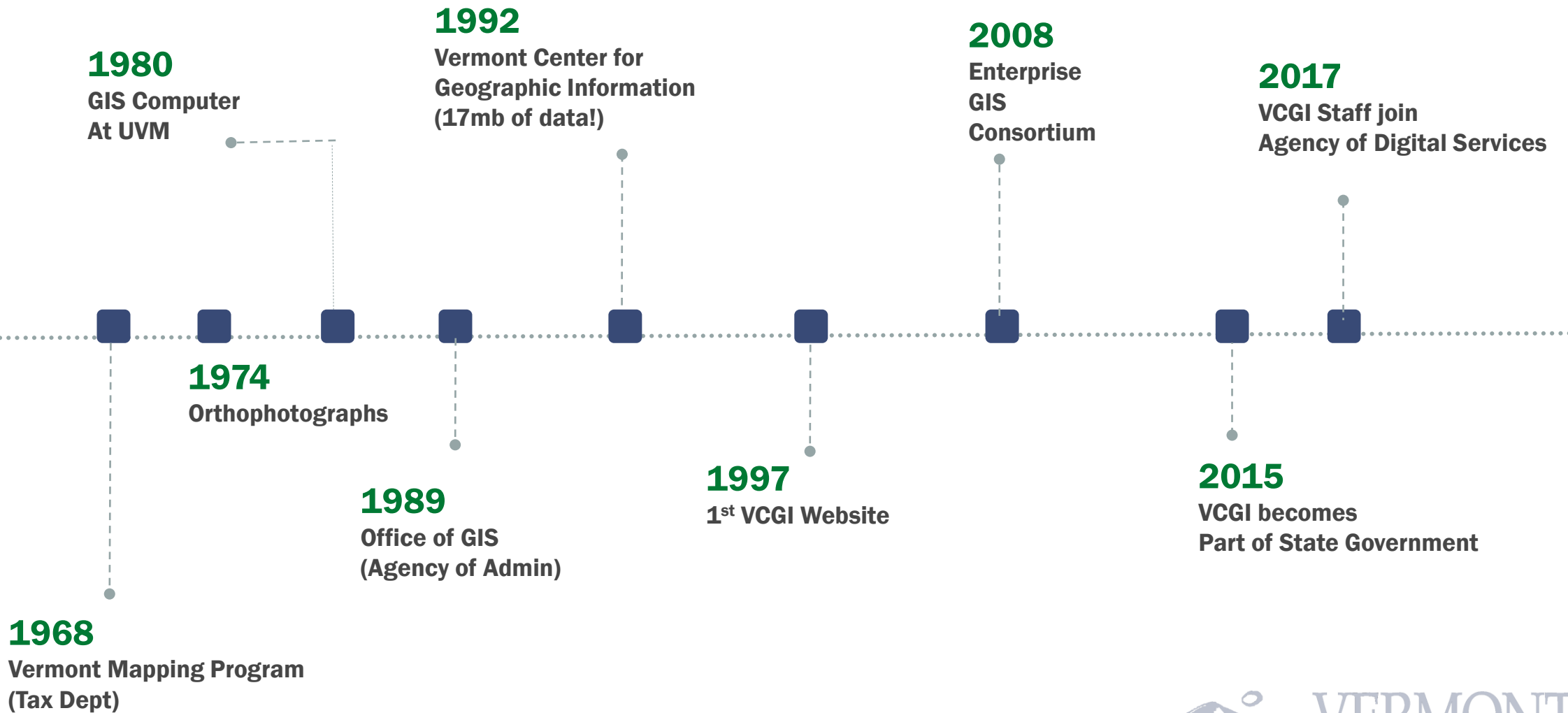
John E. Adams, VCGI Director

Agency of Digital Services

House Committee on Appropriations



Bedrock Geologic Map (Mt. Mansfield) courtesy of cartographer Sean Conway

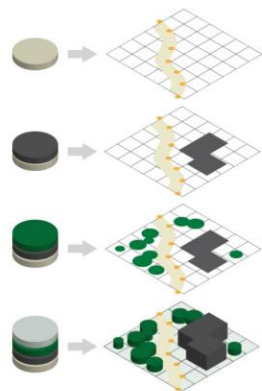




Geographic Information System?

WHAT IS GIS?

A geographic information system (GIS) combines data with its location, allowing people to visualize, study, analyze, question and interpret this spatial information to understand patterns, relationships, and trends.



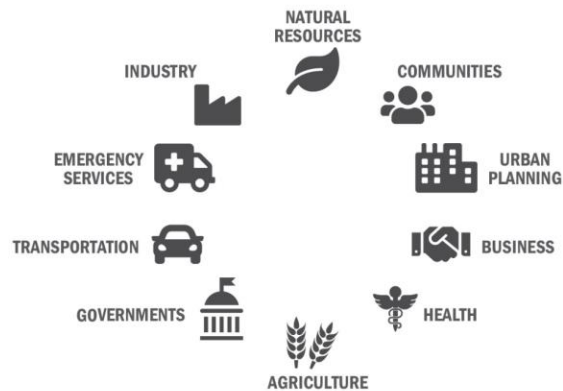
LAYERS UPON LAYERS

GIS allows people to combine layers of spatial information to examine how they relate with one another.

Layers may refer to a variety of human and non-human subjects, all mapped in space and time with their associated attributes.

WHO USES GIS?

Coordination among user groups is a key aspect of GIS. As a system, how well it functions reflects how its constituent parts are resourced, work, relate, and serve which goals.



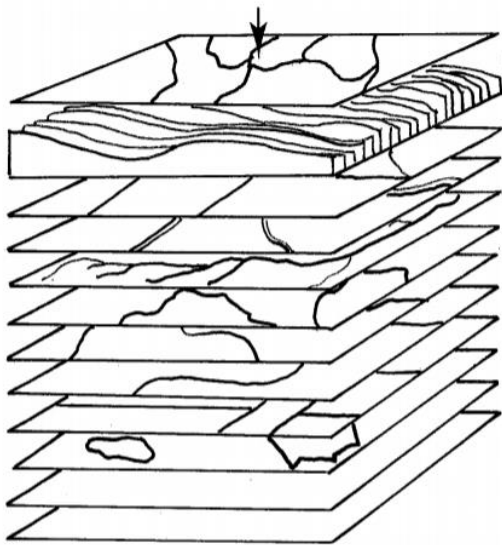
HOW IS GIS USED IN VT?

GIS in Vermont serves myriad uses, from stewarding foundational datasets such as parcels, aerial imagery, and lidar, to supporting advanced analyses of impacts and policy on natural resources and human health, to the management of transportation infrastructure and emergency services, and many more. Much of these data are freely available at the [VT Open Geodata Portal](#). Data stewardship is 'federated' among different agencies, each with responsibility for maintaining their respective content. The Enterprise GIS Consortium (EGC) serves to coordinate these activities.

Statewide QL2 lidar data is now freely available for all to use as of 2019.



A GEOGRAPHIC INFORMATION SYSTEM for VERMONT

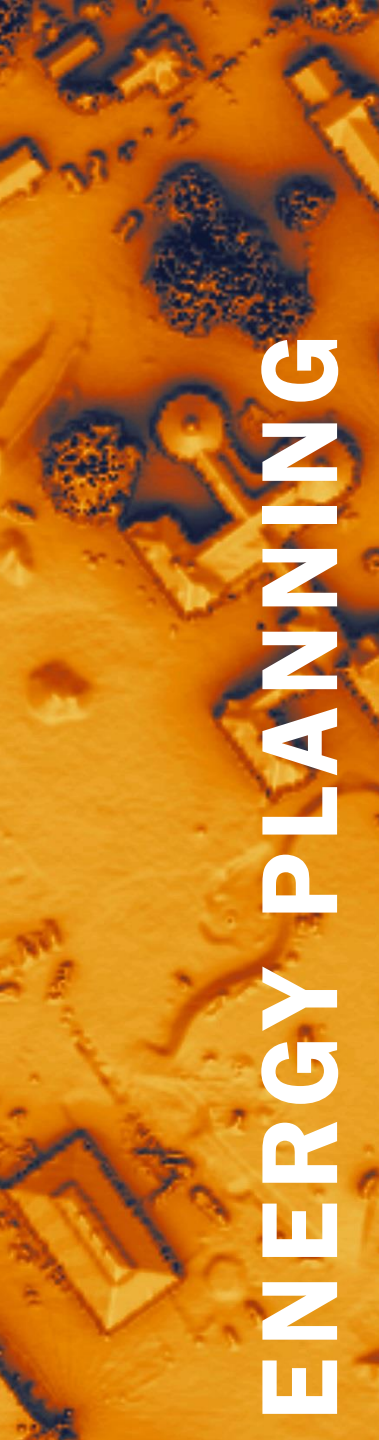


SOILS
TOPOGRAPHY
slope, aspect, elevation
POLITICAL BOUNDARIES
TRANSPORTATION
STREAM COURSES, WATERSHEDS
LAND COVER/USE
GROUND WATER
GEOLOGY
SOCIO-ECONOMIC FACTORS
HISTORICAL/ARCHAEOLOGY
FUTURE EXPANSION
FUTURE EXPANSION

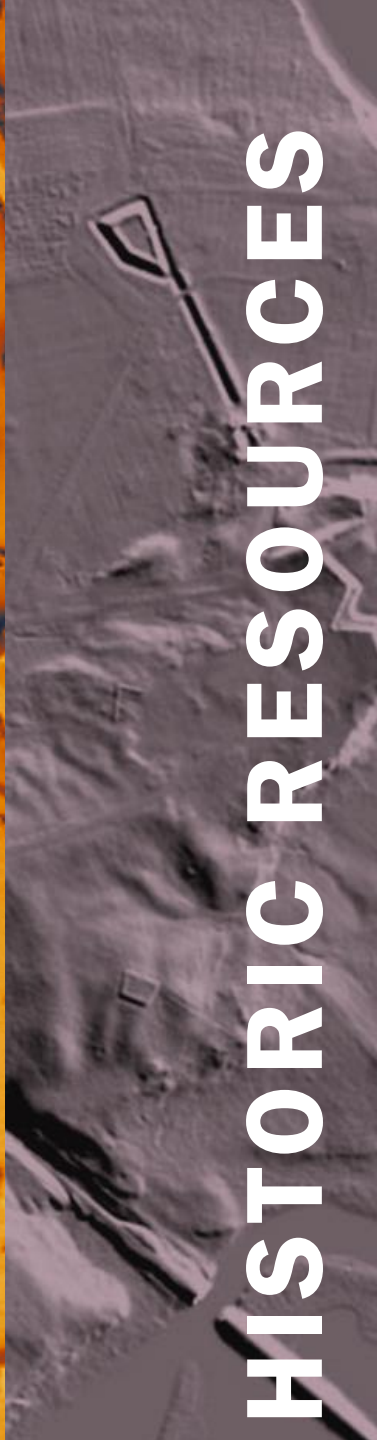
The Creation of the
Vermont State Data Base

A Program of Work
April 1983

School of Natural Resources
University of Vermont



ENERGY PLANNING



HISTORIC RESOURCES



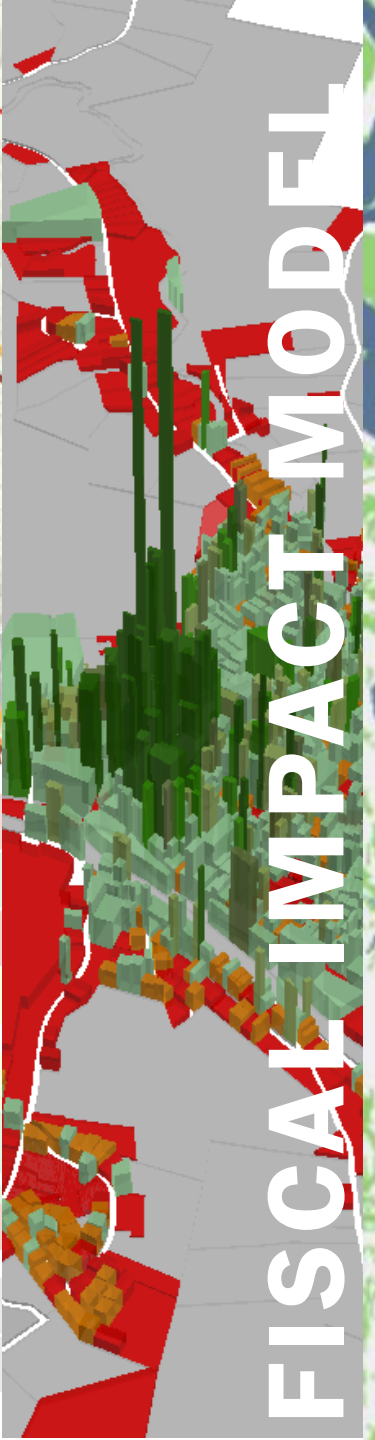
WATER QUALITY



SERVICE DISTRICTS



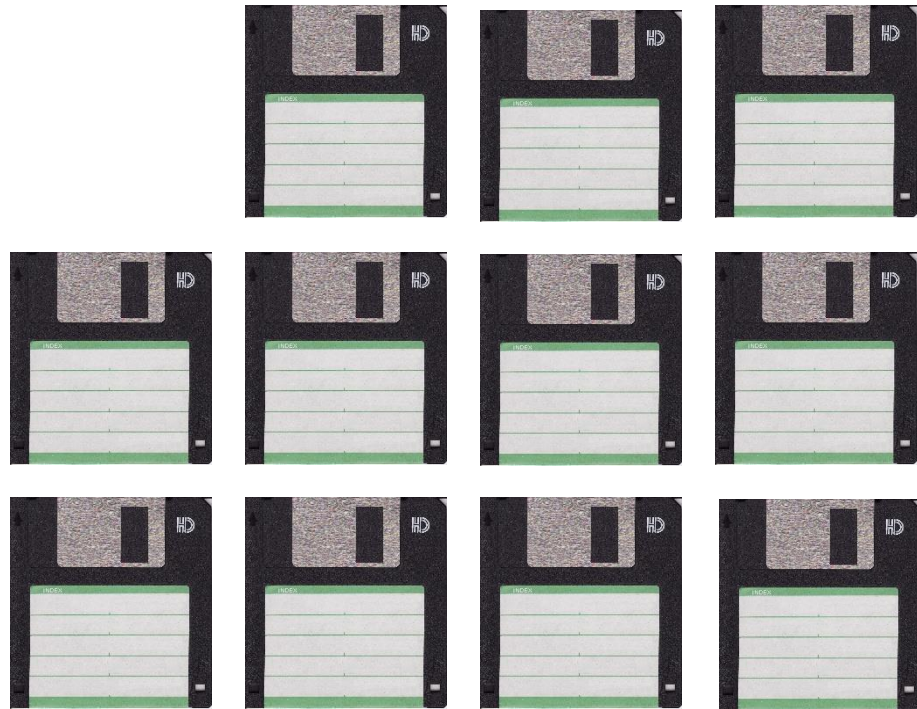
ASSET MANAGEMENT



FISCAL IMPACT MODEL



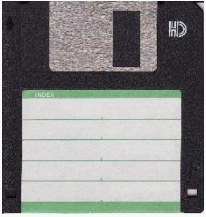
DEVELOPMENT SUITABILITY



MB

1992

How many 3.5 inch HD floppy disks would we need?



2020

17

~~TB~~ TB

FEDERATED DATA



APPS



DATA DOWNLOAD

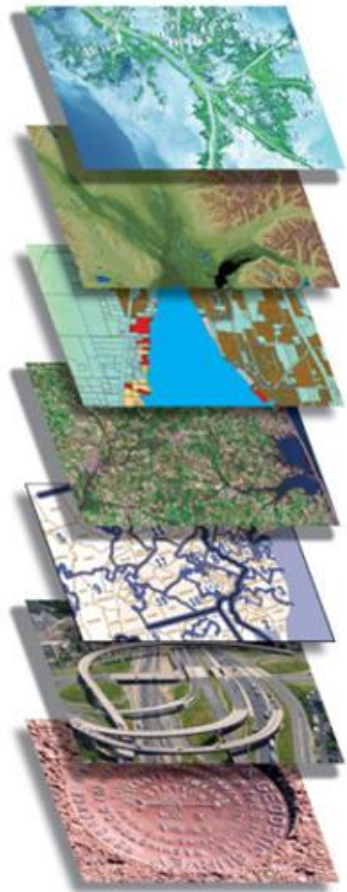


SERVICES



Photo Credit: Taylor Vick

Spatial Data Infrastructure



Digital Orthoimagery

Elevation

Governmental Units

Cadastral (Parcels)

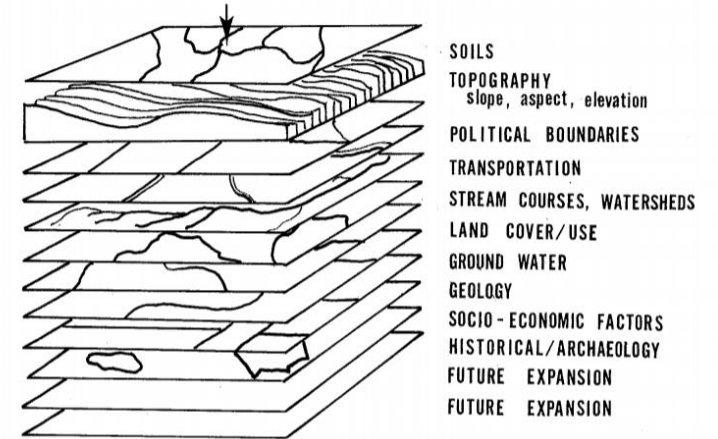
Land Cover

E911 Addresses (E911)

Transportation (VTrans)

Hydrography (ANR)

A GEOGRAPHIC INFORMATION SYSTEM for VERMONT



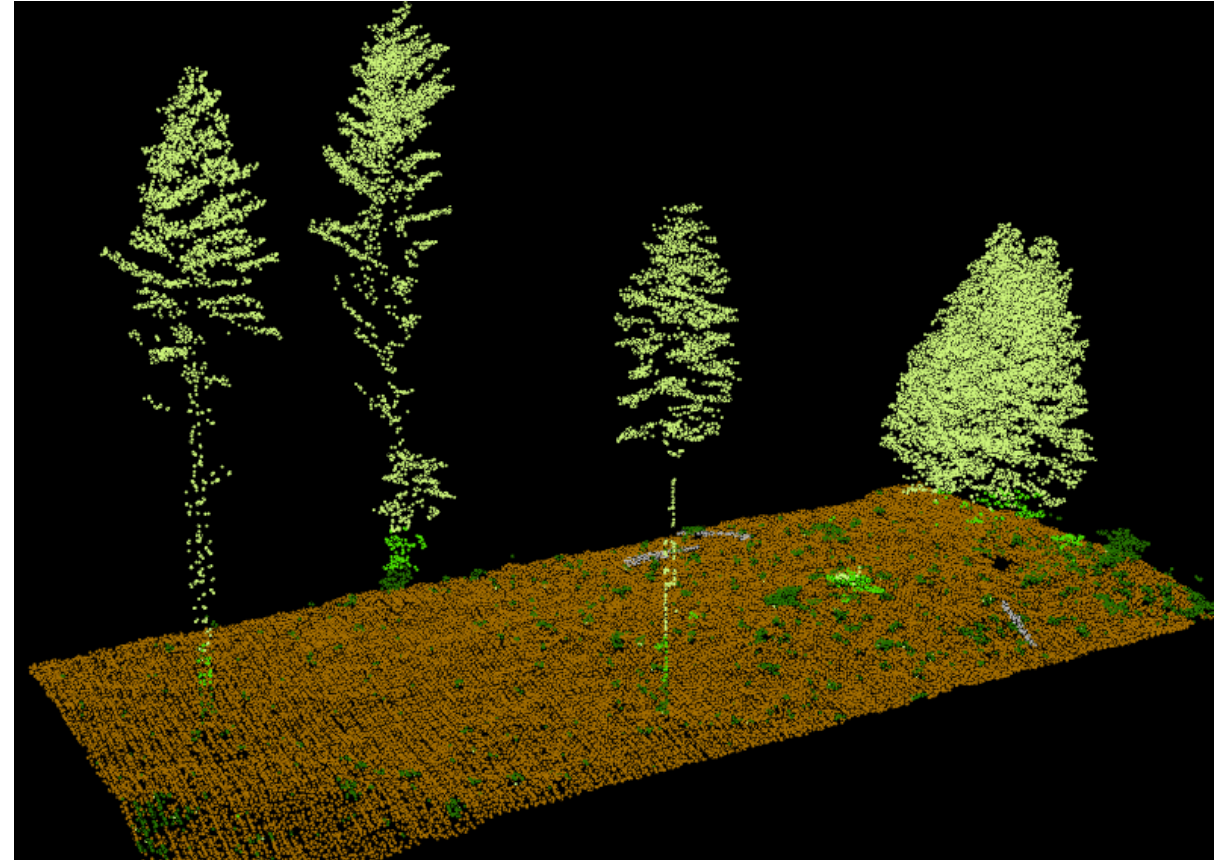
FGDC.GOV
FEDERAL GEOGRAPHIC DATA COMMITTEE



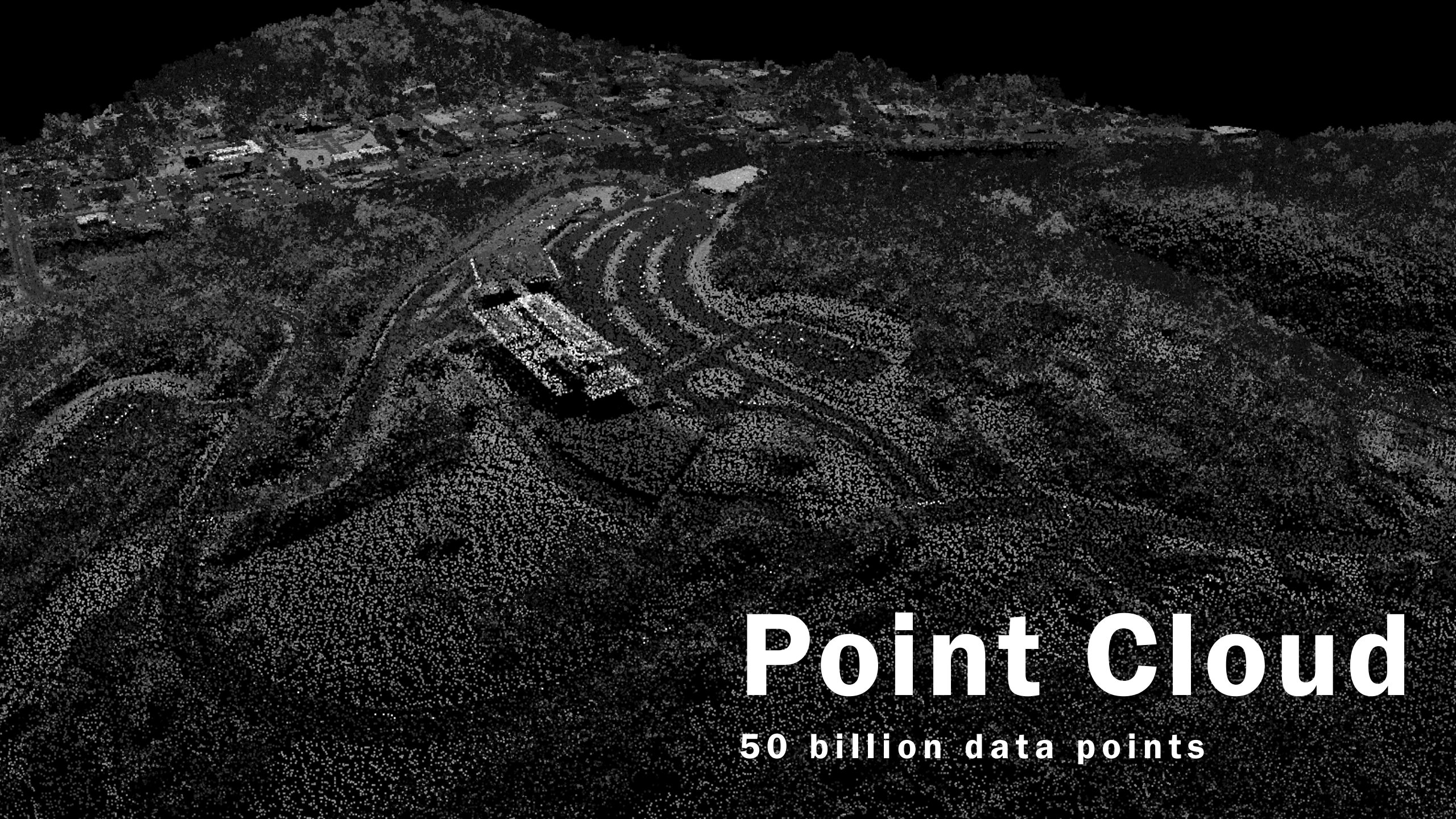
 **NSGIC**
National States Geographic Information Council

See Geospatial Maturity Assessment Report Card

LIDAR: Light Detection And Ranging

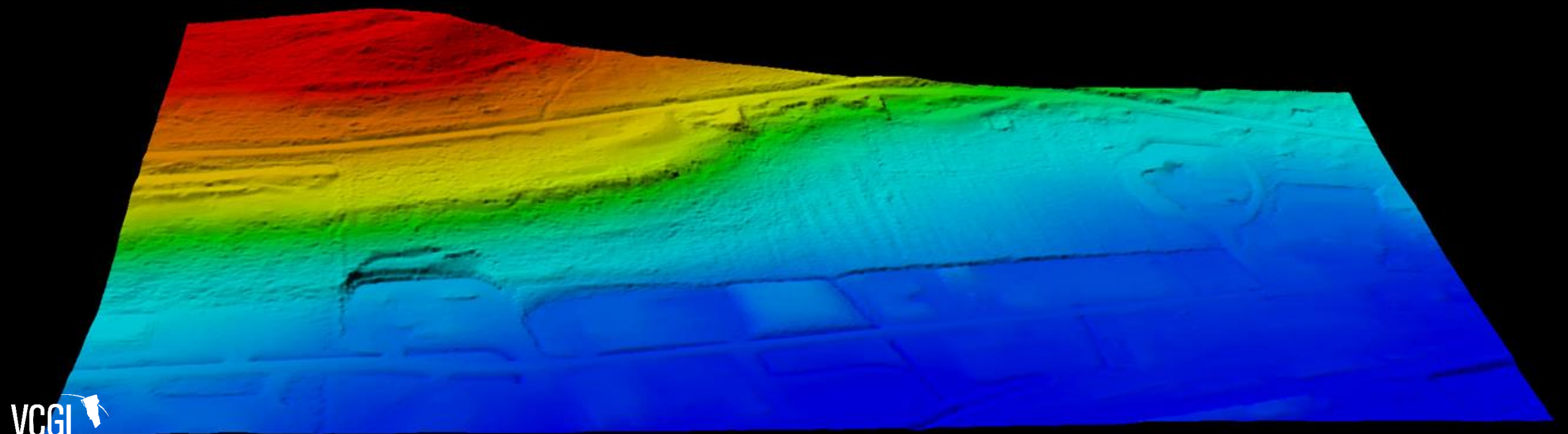
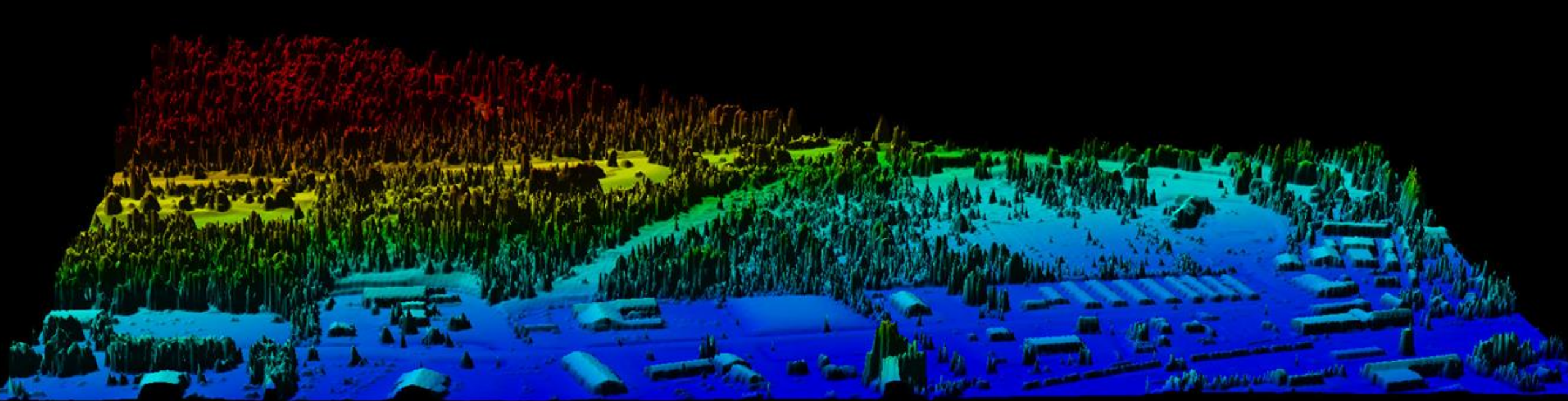


For more information on how lidar works, watch [this video](#) by the National Ecological Observatory Network.



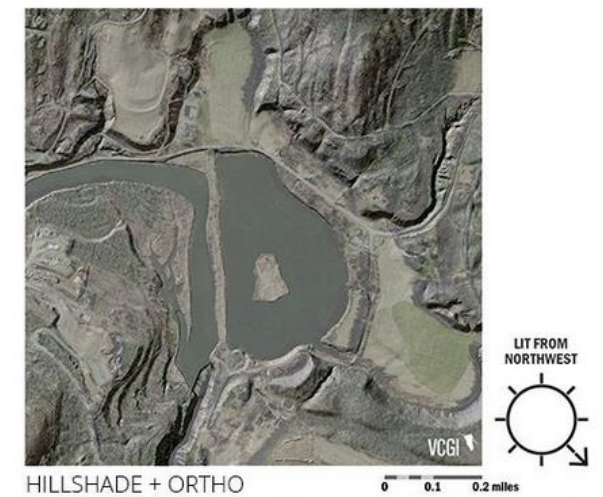
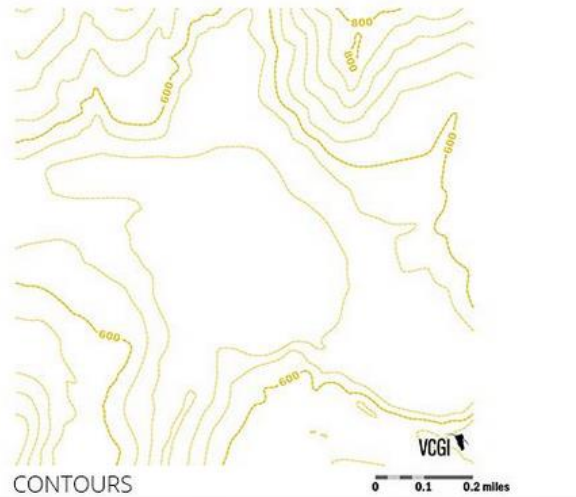
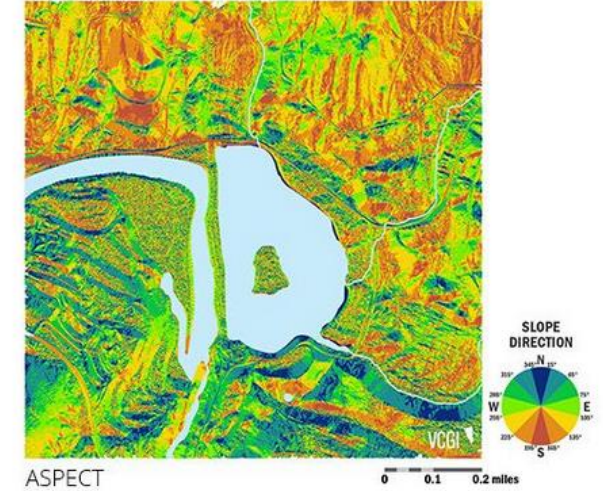
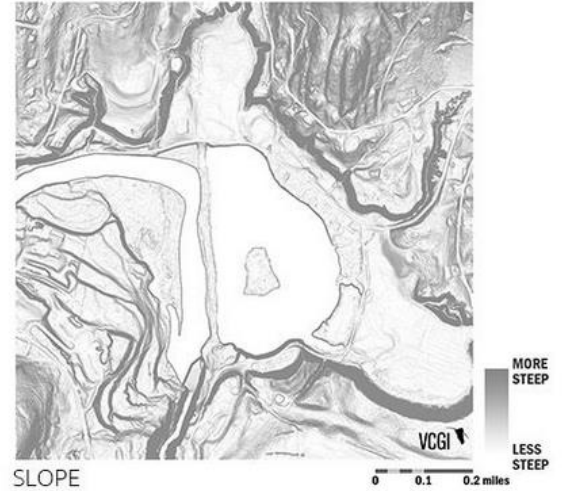
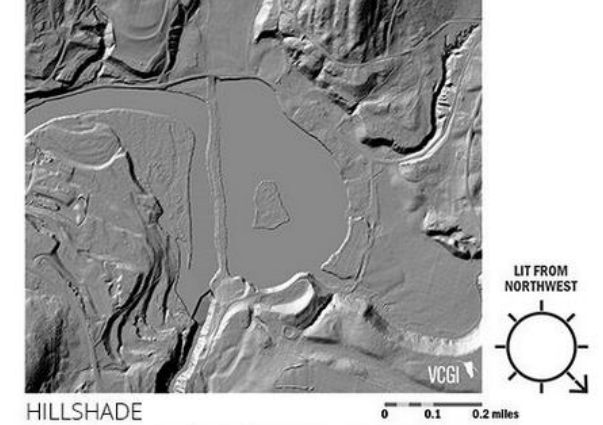
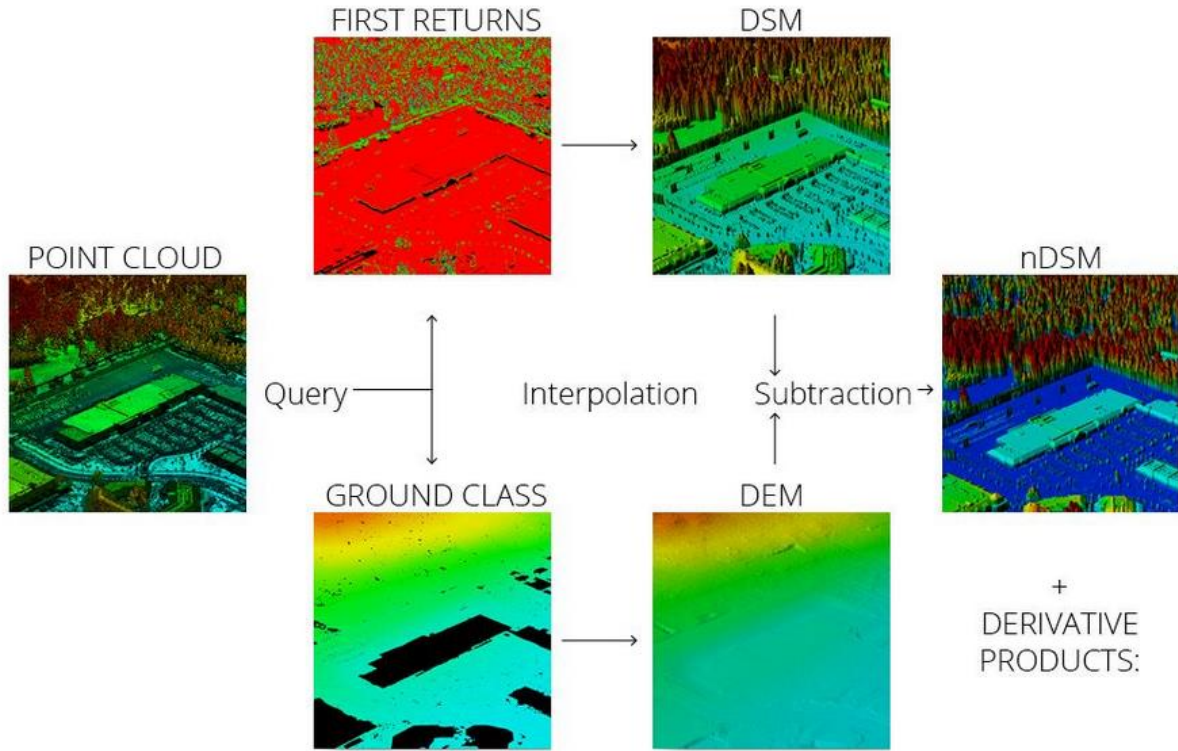
Point Cloud

50 billion data points



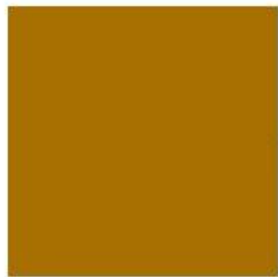
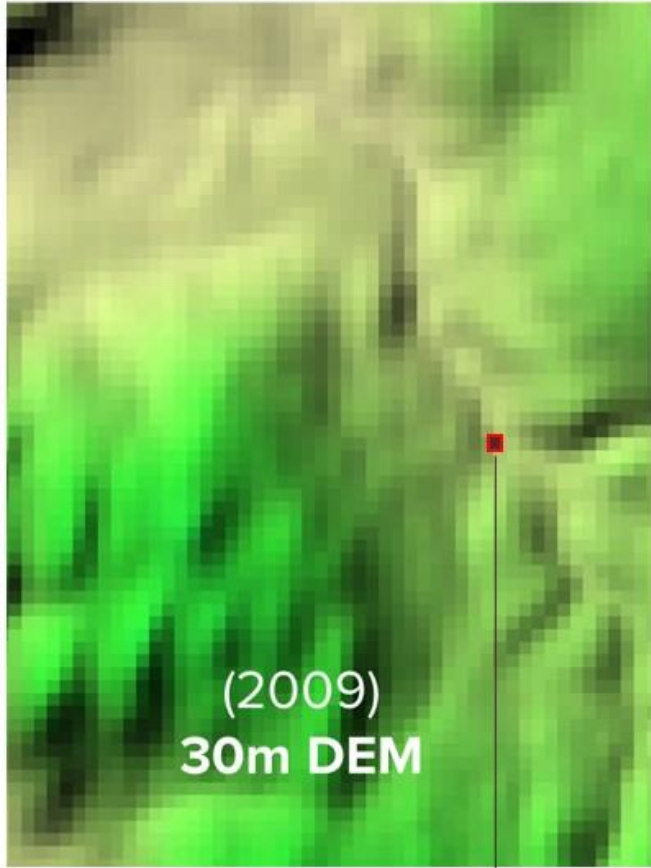
Derivative products that can be made from these elevation models include hillshades, slope, aspect (direction of slope), and contours. These data can be combined with other spatial information such as orthoimagery.

Lidar Collection and Processing

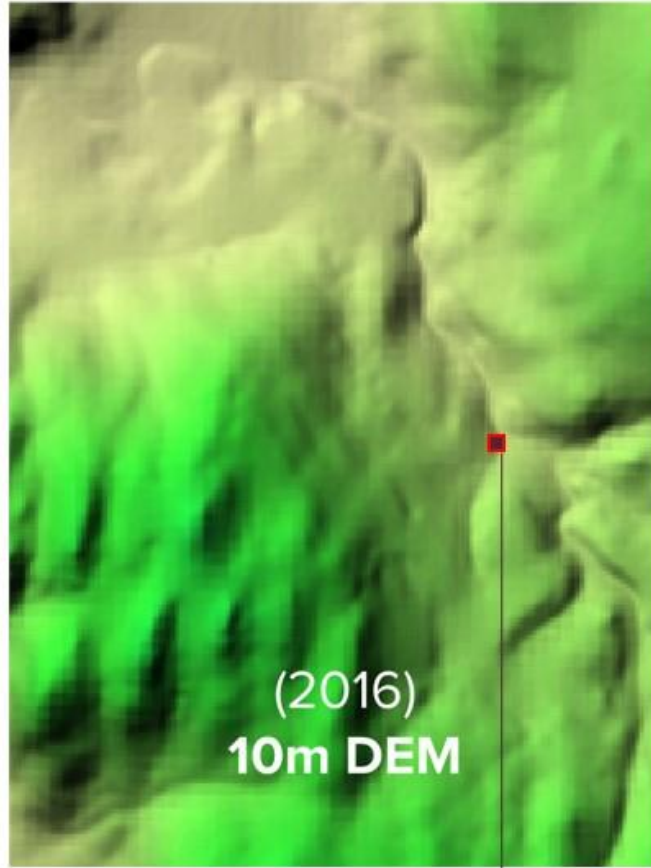


National Elevation Dataset: Reported vertical accuracy= 8 ft.

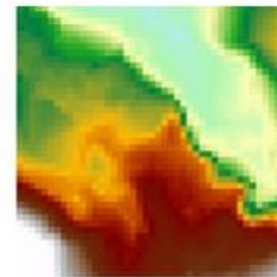
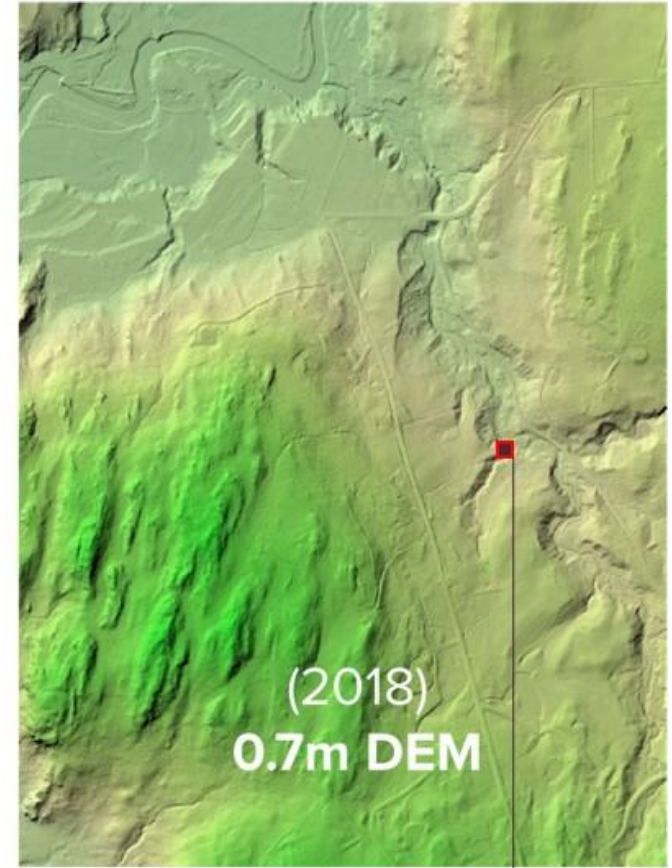
LIDAR: Vertical accuracy= 3.6 in.



Cell size: 9688 sq ft



Cell size 1078 sq ft



Cell size 5.27 sq ft

Like 340

Tweet

Pin it

Email

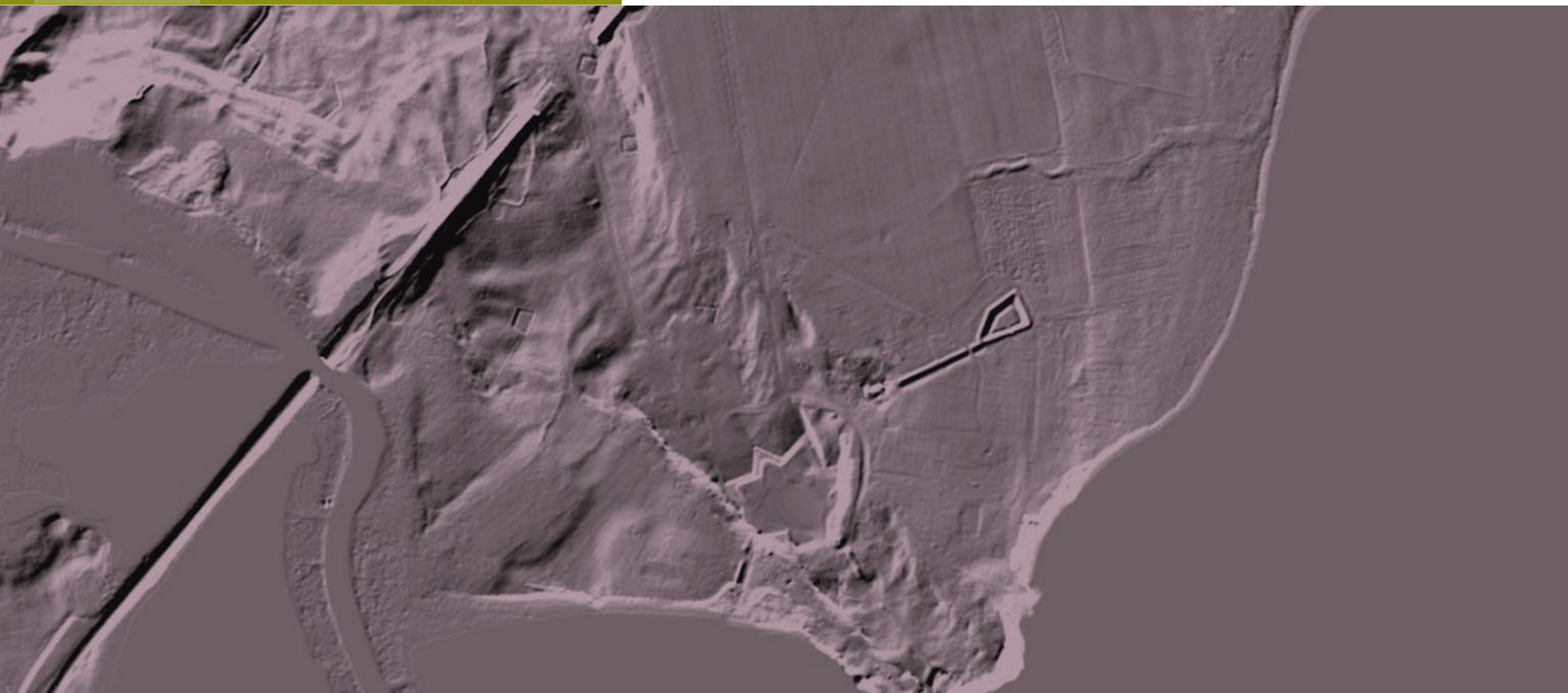
Print

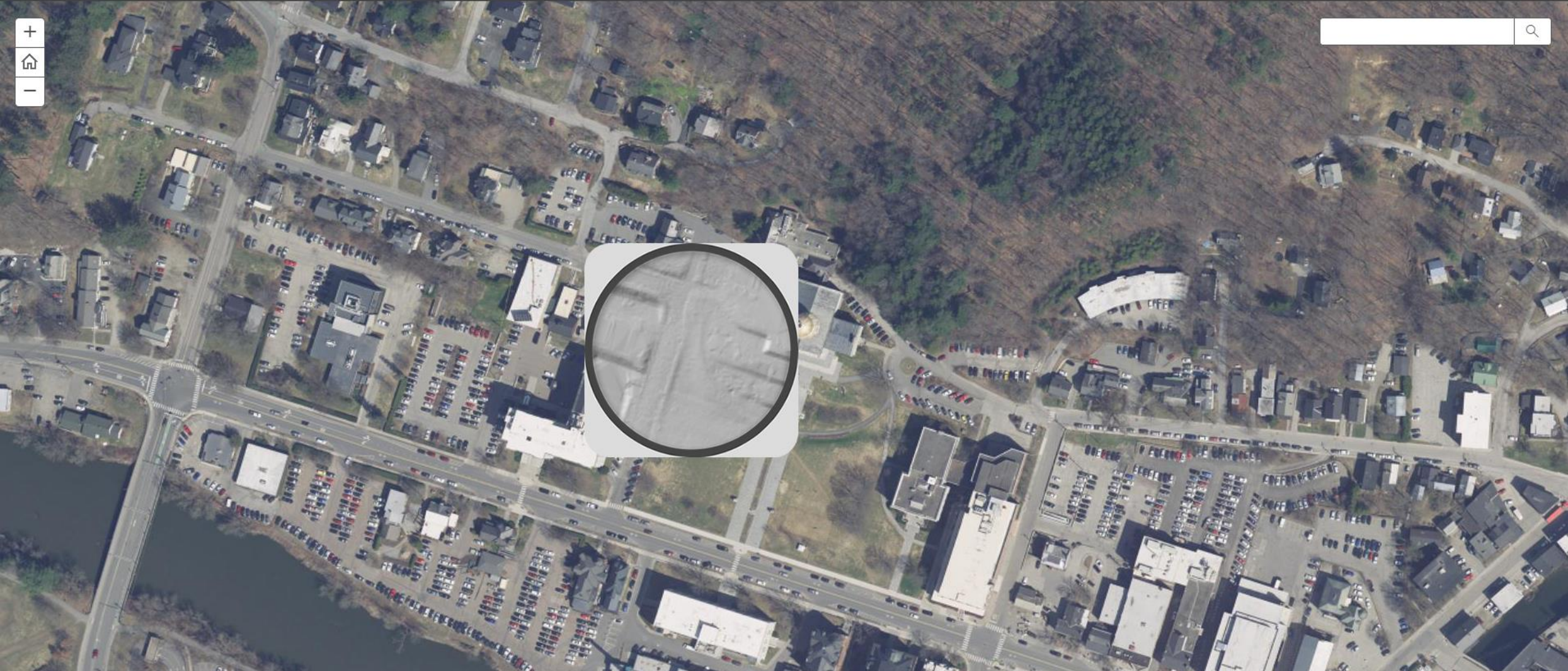
Favorite

Share

news+opinion arts+life home+design food music

For Archaeologists, New Tech for Old Sites



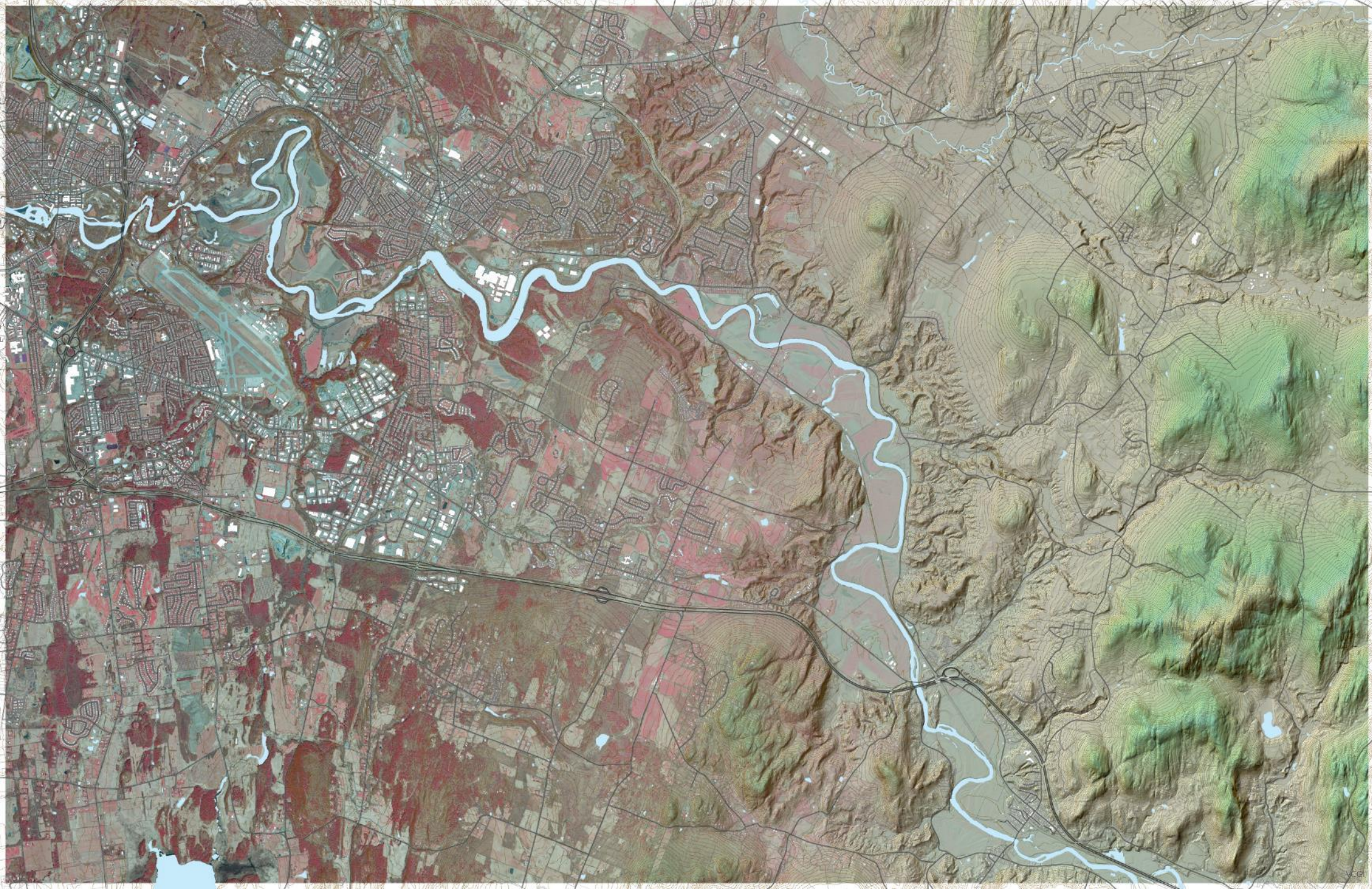


Explore VCGI's 'beneath the trees' app.

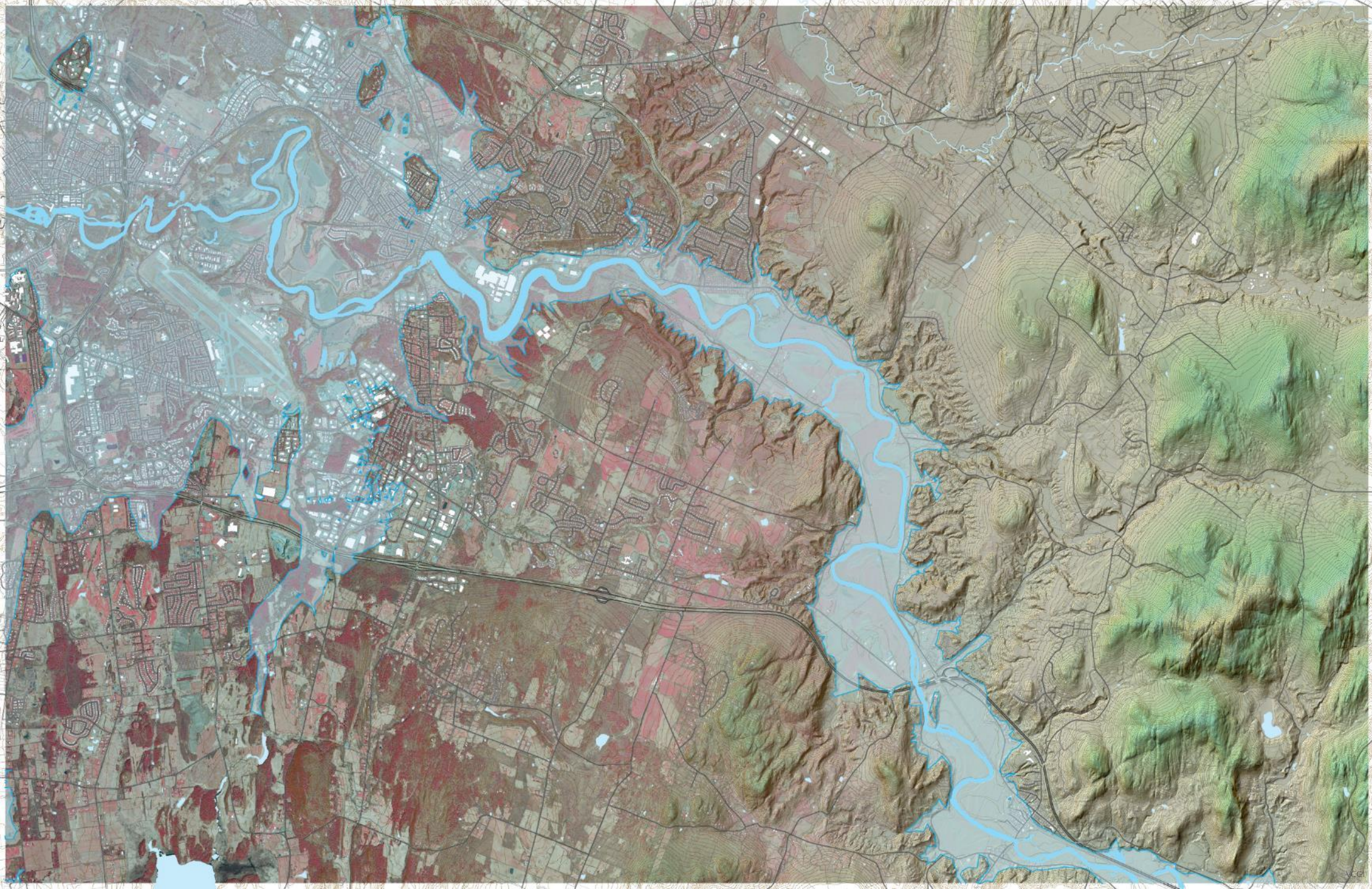


**What used to be in this
South Burlington location
east of Dorset Street?**

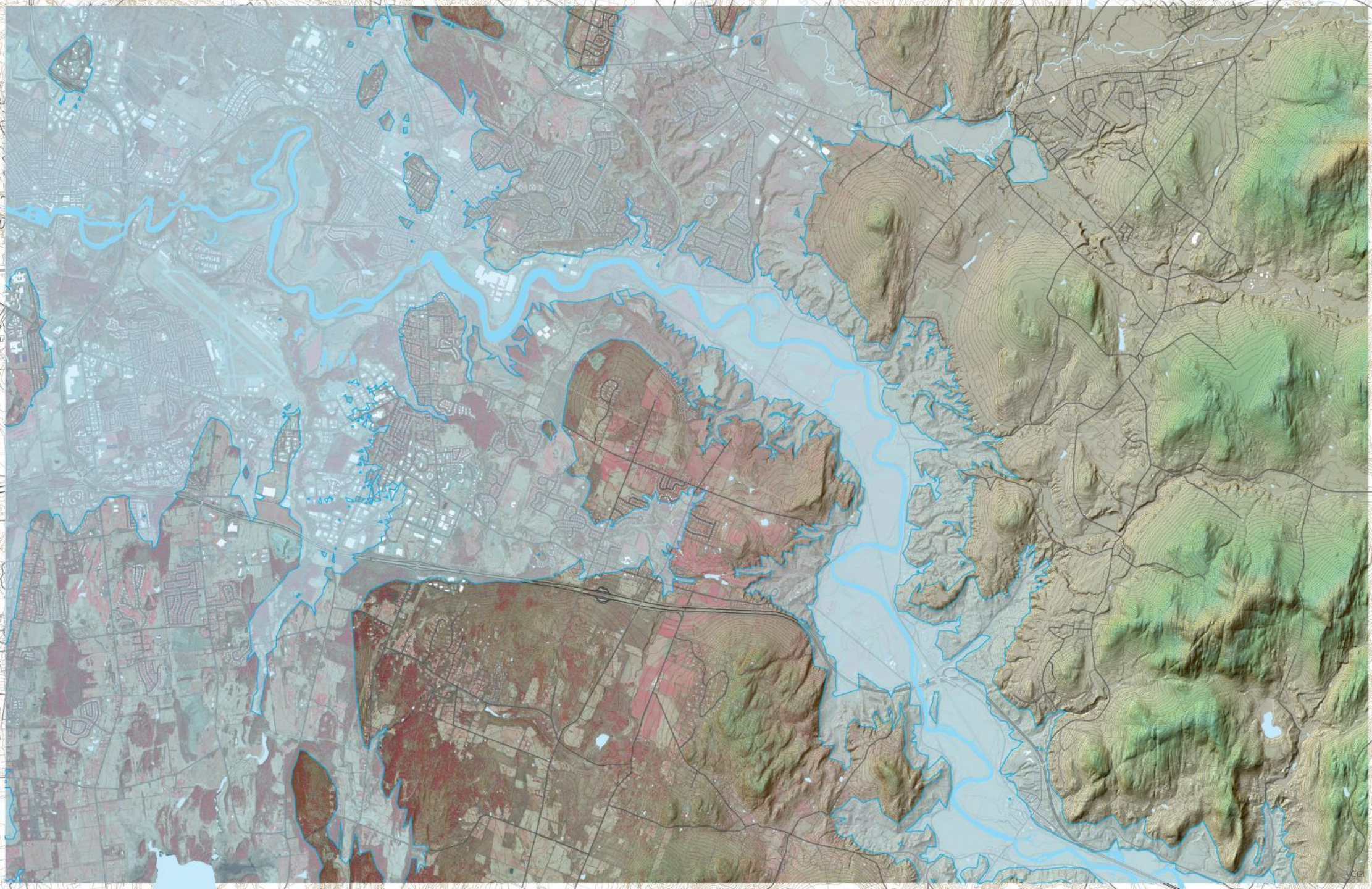




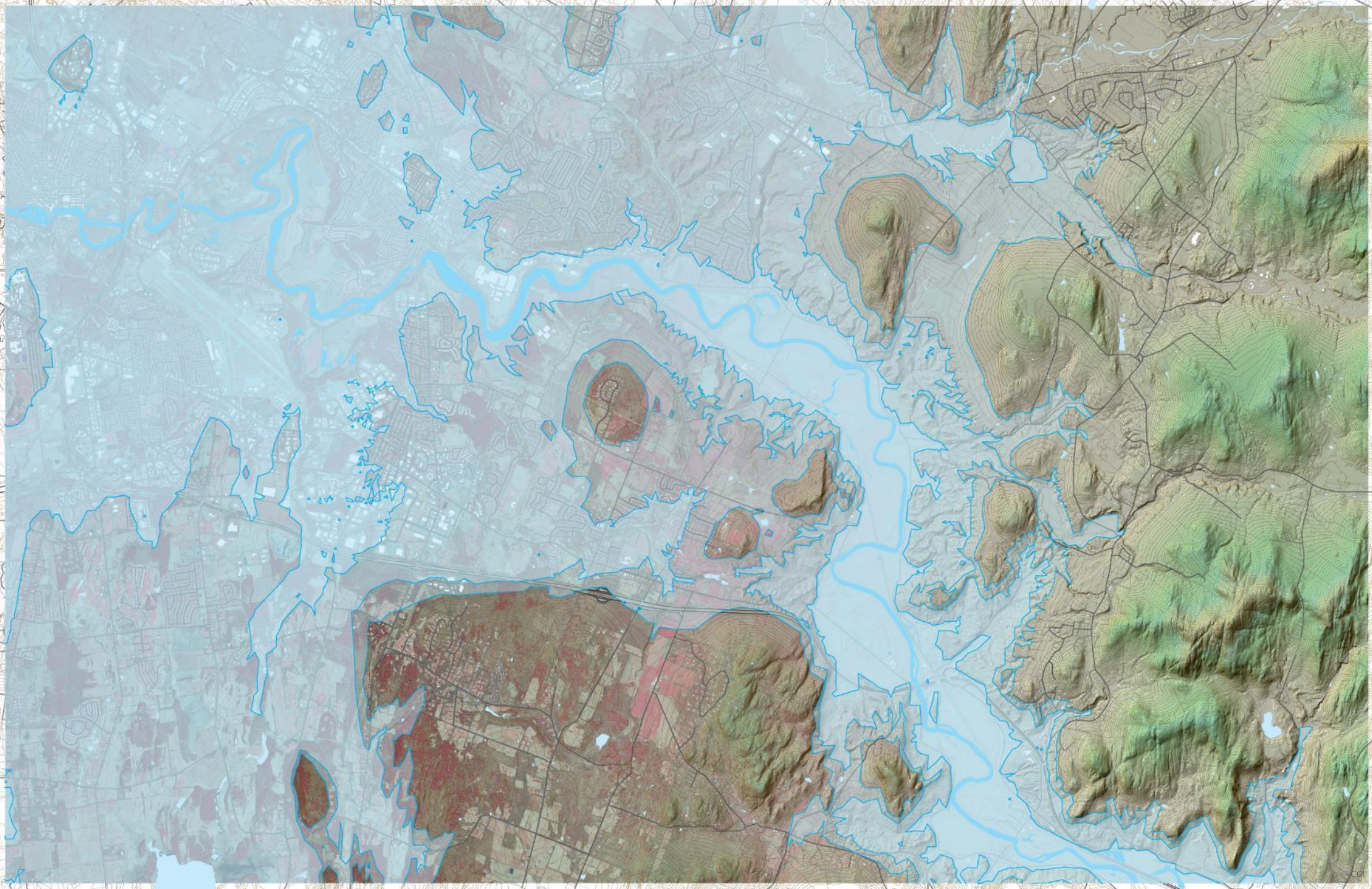
CIR + DEM +
Hydro + Contours
+ Infrastructure



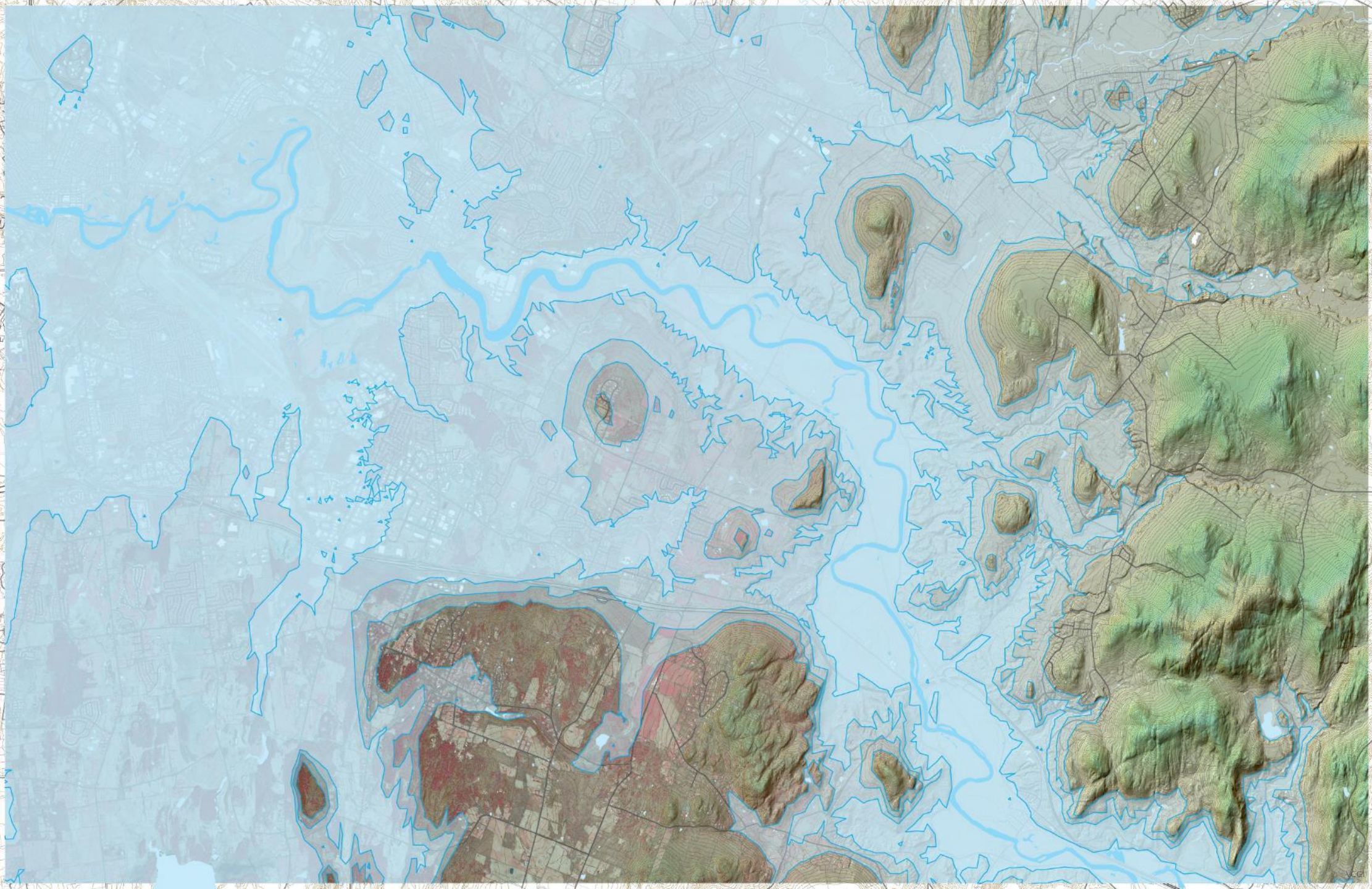
Former Extent
Champlain Sea



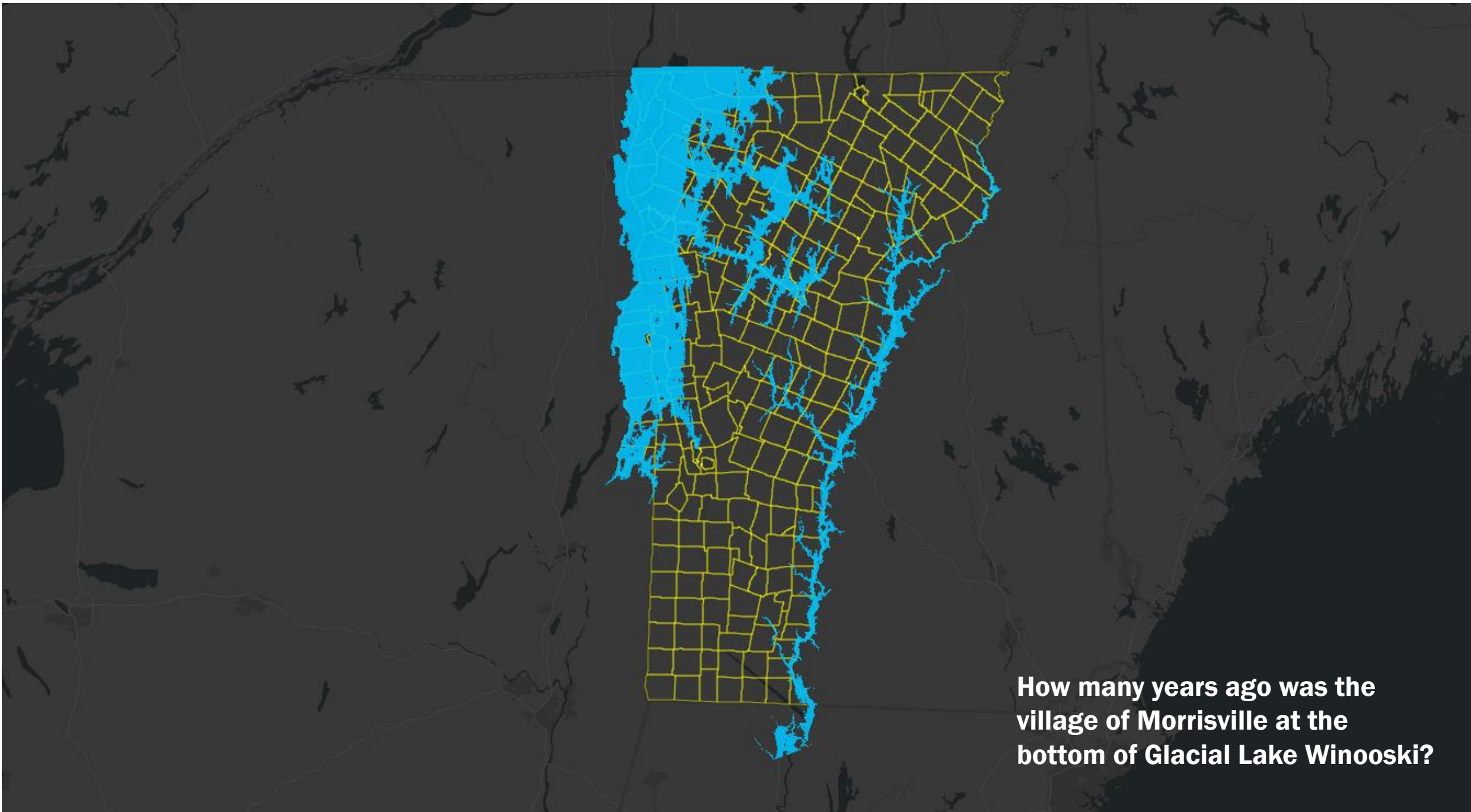
Former Extent
Lower Fort Ann



Former Extent
Upper Fort Ann



Former Extent
Lake Coveville



How many years ago was the village of Morrisville at the bottom of Glacial Lake Winooski?

Orthophotographic Imagery

An orthophoto is an aerial photograph or geometrically corrected ("orthorectified") such that the scale is uniform: the photo or image follows a given map projection. Unlike an uncorrected aerial photograph, an orthophoto can be used to measure true distances, because it is an accurate representation of the Earth's surface, having been adjusted for topographic relief, lens distortion, and camera tilt.

What town is this corn maze located in?

Historic Imagery



[Learn more & access 1962 imagery](#)





1962



2018





1939



1962



2016

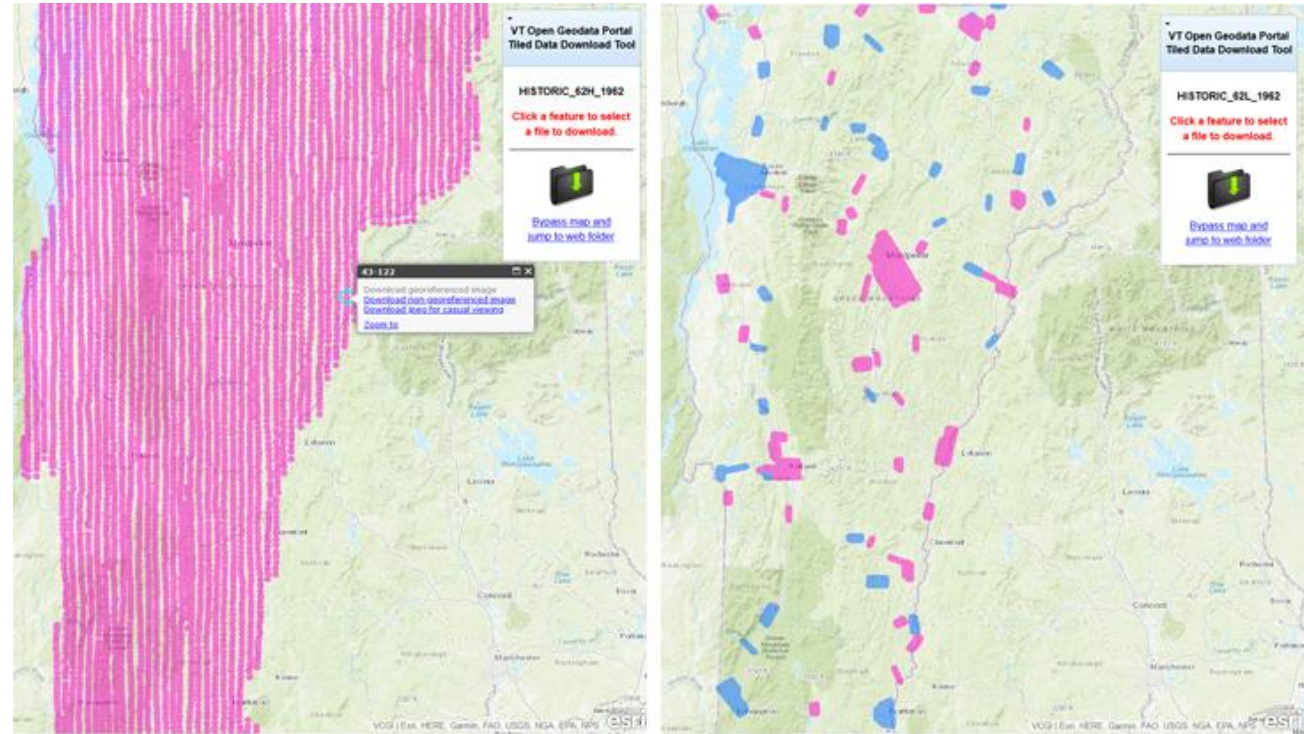
Historic Imagery

The [1962 "H" collection](#) (left) consists of 5,895 scanned, non-georeferenced 1:18,000 scale black-and-white aerial photos with coverage of the entire state.

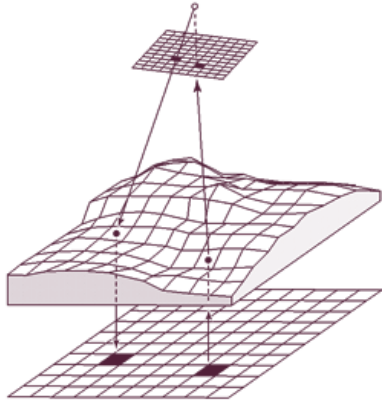
The [1962 "L" collection](#) (right) is comprised of select areas of the state with 2,339 scanned black-and-white aerial photos available at 1:6,000 scale. These 2,339 photos are provided in addition to the 957 scanned and georeferenced 1962 aerial photos already available in the "L" collection.

[Learn more & access 1962 imagery](#)

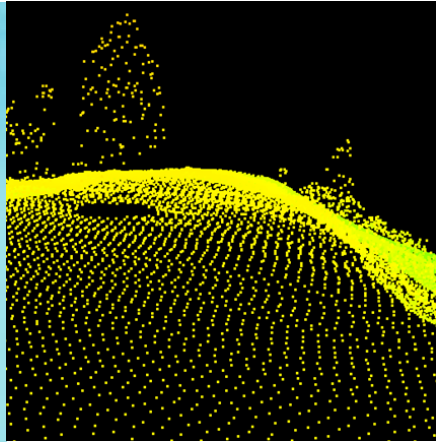
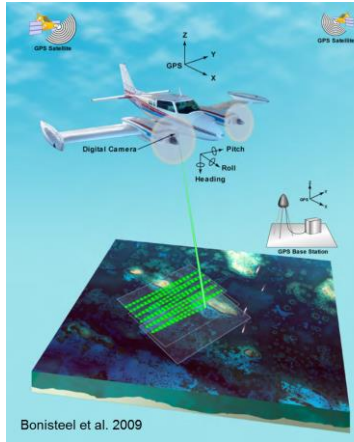
(Some 1942 imagery available [here](#) and [here](#).)



The Vermont Agency of Transportation's Highway Mapping Unit has scanned these 1962 photo prints, now available for download.

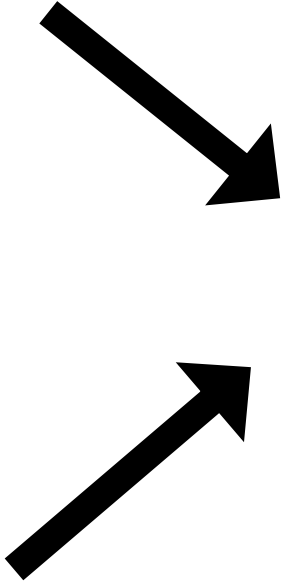


ORTHOIMAGERY



Bonisteel et al. 2009

LIDAR



Land Cover



Building Footprint Extraction



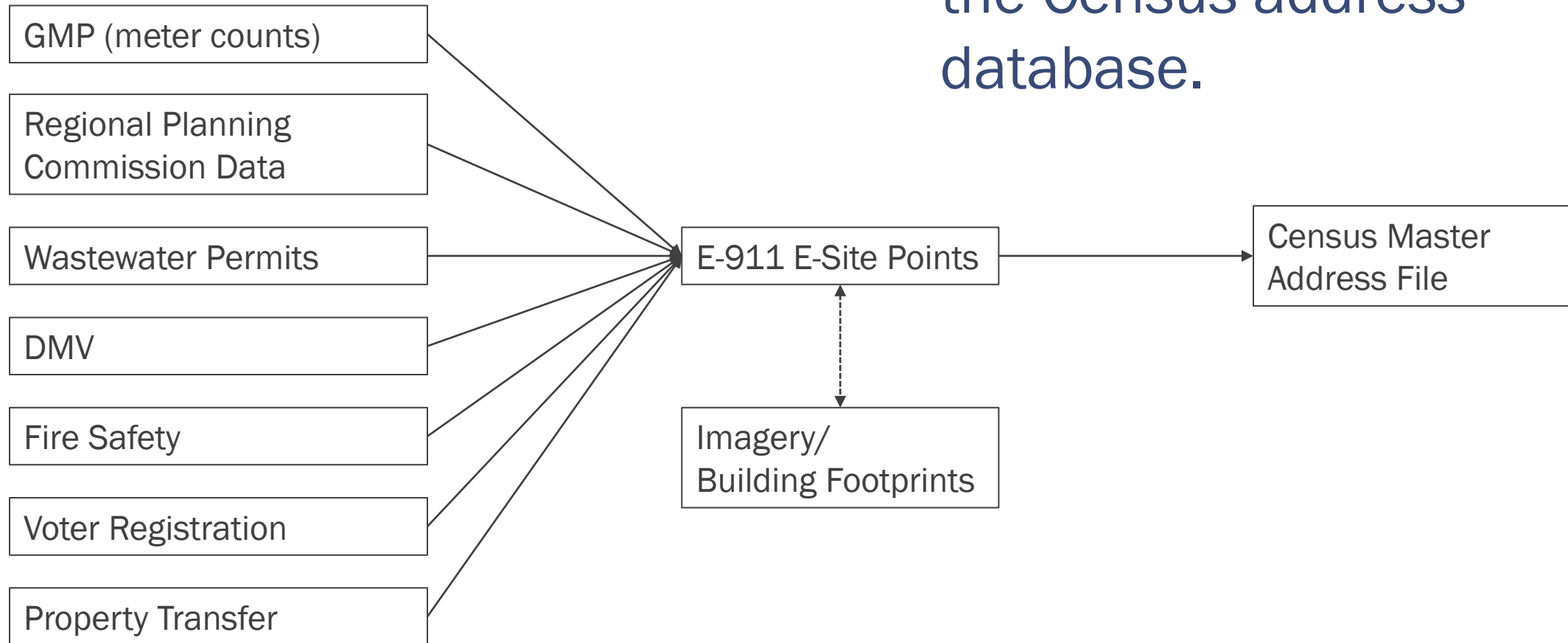




**Missing E-911
Points**

Process

Address Databases



8634 homes added to the Census address database.

Counting for Dollars 2020

The Role of the Decennial Census in the Geographic Distribution of Federal Funds

COUNTING FOR DOLLARS 2020: VERMONT

Allocation of Funds from 55 Large Federal Spending Programs
Guided by Data Derived from the 2010 Census (Fiscal Year 2016)

Total Program Obligations: **\$2,482,076,315**

Program	Dept.	Obligations	Program	Dept.	Obligations
Financial Assistance Programs		\$2,442,326,777			
Medical Assistance Program (Medicaid)	HHS	\$1,072,721,000	Community Facilities Loans/Grants	USDA	\$12,643,300
Federal Direct Student Loans	ED	\$294,458,824	Supporting Effective Instruction State Grants	ED	\$10,640,019
Supplemental Nutrition Assistance Program	USDA	\$116,470,075	Crime Victim Assistance	DOJ	\$4,718,903
Medicare Suppl. Medical Insurance (Part B)	HHS	\$108,274,201	CDBG Entitlement Grants	HUD	\$724,881
Highway Planning and Construction	DOT	\$216,999,341	Public Housing Capital Fund	HUD	\$1,860,000
Federal Pell Grant Program	ED	\$36,600,000	Block Grants for the Prevention and Treatment of Substance Abuse	HHS	\$6,459,874
Section 8 Housing Choice Vouchers	HUD	\$53,056,000	Water and Waste Disposal Systems for Rural Communities	USDA	\$18,557,004
Temporary Assistance for Needy Families	HHS	\$47,353,181	Social Services Block Grant	HHS	\$3,095,990
Very Low to Moderate Income Housing Loans	USDA	\$75,986,637	Rural Rental Assistance Payments	USDA	\$11,110,509
Title I Grants to LEAs	ED	\$34,509,182	Business and Industry Loans	USDA	\$12,000,000
State Children's Health Insurance Program	HHS	\$29,299,000	Career and Technical Education - Basic Grants to States	ED	\$4,004,816
National School Lunch Program	USDA	\$15,358,000	Homeland Security Grant Program	DHS	\$3,981,689
Special Education Grants	ED	\$28,386,923	WIOA Dislocated Worker Grants	DOL	\$823,490
Section 8 Housing Assistance Payments Program	HUD	\$27,660,019	HOME	HUD	\$3,407,339
Federal Transit Formula Grants	DOT	\$26,249,000	State CDBG	HUD	\$6,418,887
Head Start	HHS	\$18,673,824	WIOA Youth Activities	DOL	\$2,139,306
WIC	USDA	\$13,591,000	WIOA Adult Activities	DOL	\$2,028,449
Title IV-E Foster Care	HHS	\$14,273,473	Employment Service/Wagner-Peyser	DOL	\$2,499,791
Health Care Centers	HHS	\$20,637,961	Community Services Block Grant	HHS	\$3,756,915
School Breakfast Program	USDA	\$5,700,000	Special Programs for the Aging, Title III, Part C, Nutrition Services	HHS	\$3,348,608
Rural Electrification Loans and Loan Guarantees	USDA	\$0	Cooperative Extension Service	USDA	\$2,399,454
Public and Indian Housing	HUD	\$3,472,000	Native Amer. Employment & Training	DOL	\$74,480
Low Income Home Energy Assistance	HHS	\$18,987,983			
Child and Adult Care Food Program	USDA	\$6,447,000	Federal Tax Expenditures		\$34,984,331
Vocational Rehabilitation Grants to the States	ED	\$11,990,345	Low Income Housing Tax Credit	Treas	\$16,786,224
Child Care Mandatory and Matching Funds	HHS	\$6,603,000	New Markets Tax Credit	Treas	\$18,198,107
Unemployment Insurance Administration	DOL	\$8,590,000			
Federal Transit - Capital Investment Grants	DOT	\$584,400	Federal Procurement Programs		\$4,765,207
Child Care and Development Block Grant	HHS	\$3,591,000	HUBZones Program	SBA	\$4,765,207
Adoption Assistance	HHS	\$9,109,704			

Prepared by Andrew Reamer, the George Washington Institute of Public Policy, the George Washington University. Spending data analysis provided by Sean Moulton, Open Government Program Manager, Project on Government Oversight. | January 30, 2019

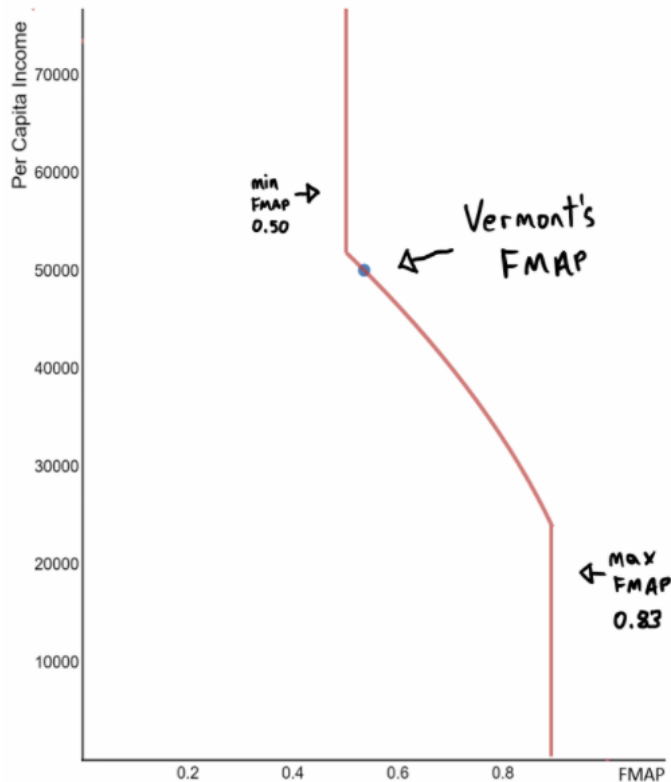
Note: The sequence of the above programs is consistent with U.S. rank order by program expenditures. (See U.S. sheet in series.)

Counting for Dollars 2020 publications and spreadsheet with above data available at <https://gwipp.gwu.edu/counting-dollars-2020-role-decennial-census-geographic-distribution-federal-funds>

Federal Medical Assistance Percentage (FMAP)

U.S. Code › Title 42 › Chapter 7 › Subchapter XIX › § 1396d

$$FMAP = 1.00 - 0.45 \times \left(\frac{StatePCI}{U.S.PCI} \right)^2$$



State Per
Capita
Income

=

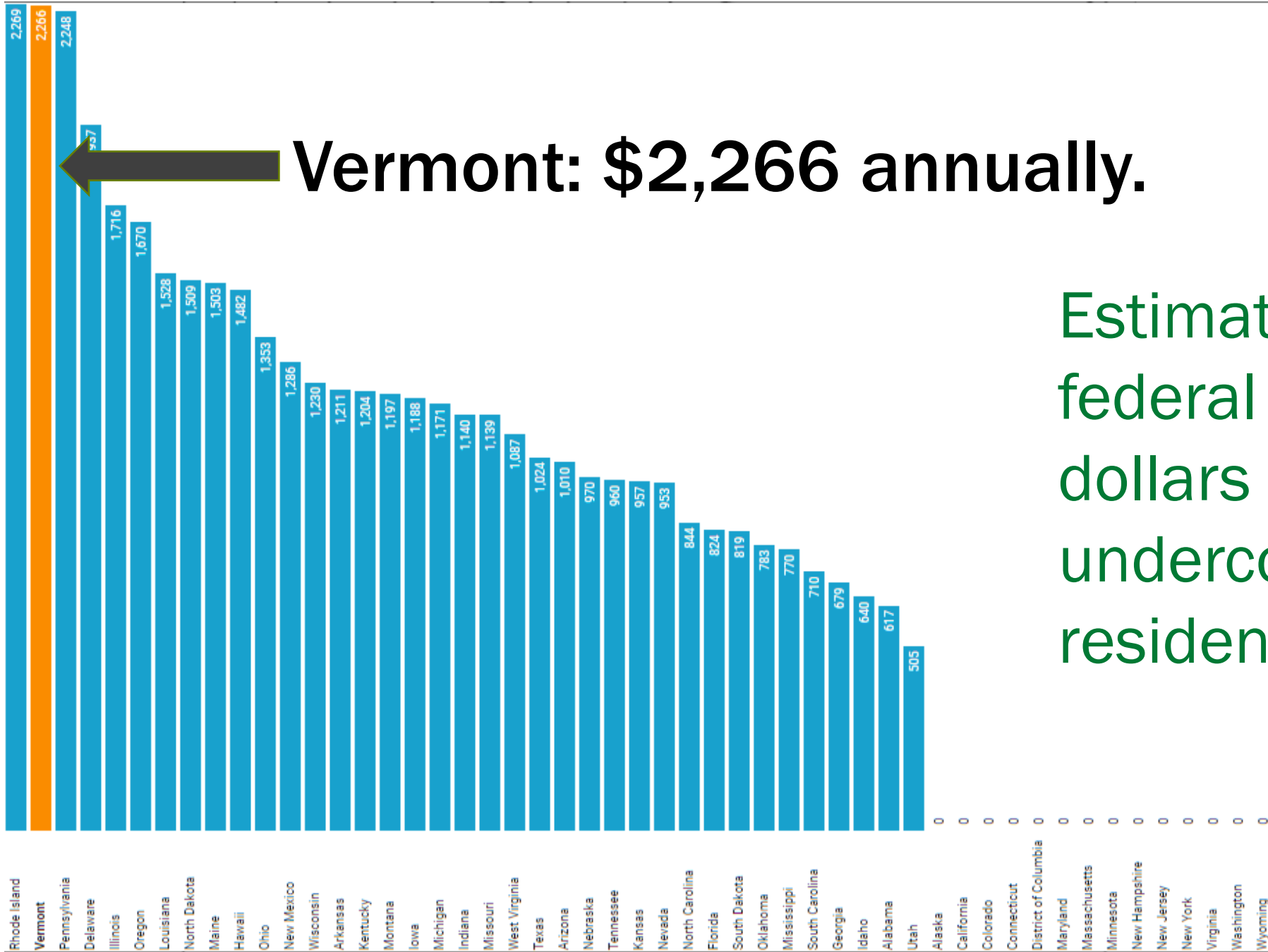


Personal Income



Population





Vermont: \$2,266 annually.

Estimated cost in federal Medicaid dollars resulting from undercounting one resident

Estimated difference in federal Medicaid funds to Vermont resulting from the 8634 homes added to the census address database:

\$318 million dollars over ten years.

Read more here: <https://maps.vcgi.vermont.gov/HighCostLowCount>

ARTS + LIFE › VISUAL ART

NOVEMBER 11, 2020

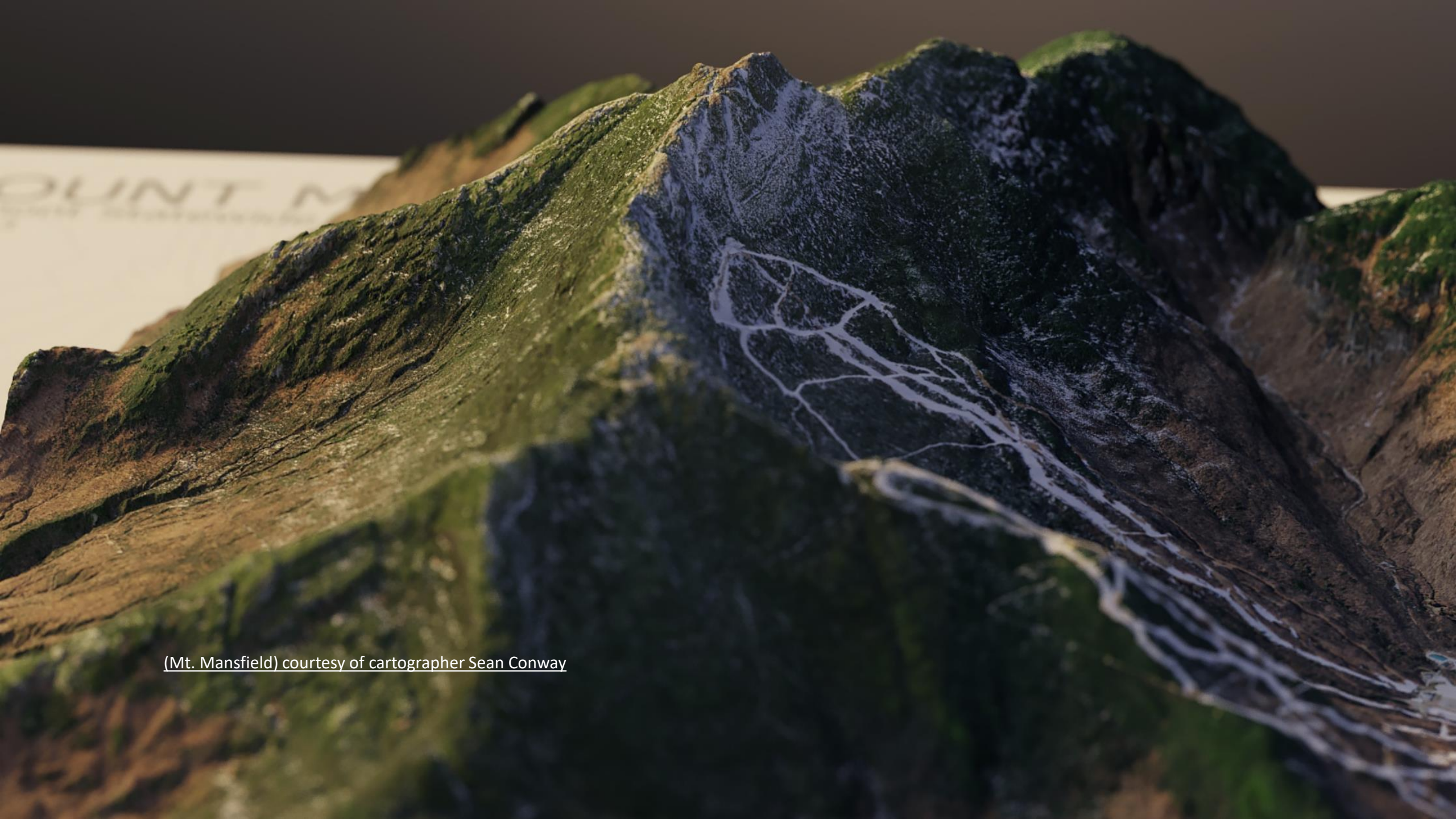
Ramble Maps Turns Geographic Data Into Wall Art

By MARGARET GRAYSON [@MGRAYSON11](#)



One of the benefits of making Vermont's imagery and data assets available to the public is coming across the interesting work people do - like Matthew Parrilla and his Ramble Maps project - which uses lidar derived elevation and land cover data generated by UVM's Spatial Analysis Lab.

[Read about 'Ramble Maps' in Seven Days.](#)



(Mt. Mansfield) courtesy of cartographer Sean Conway

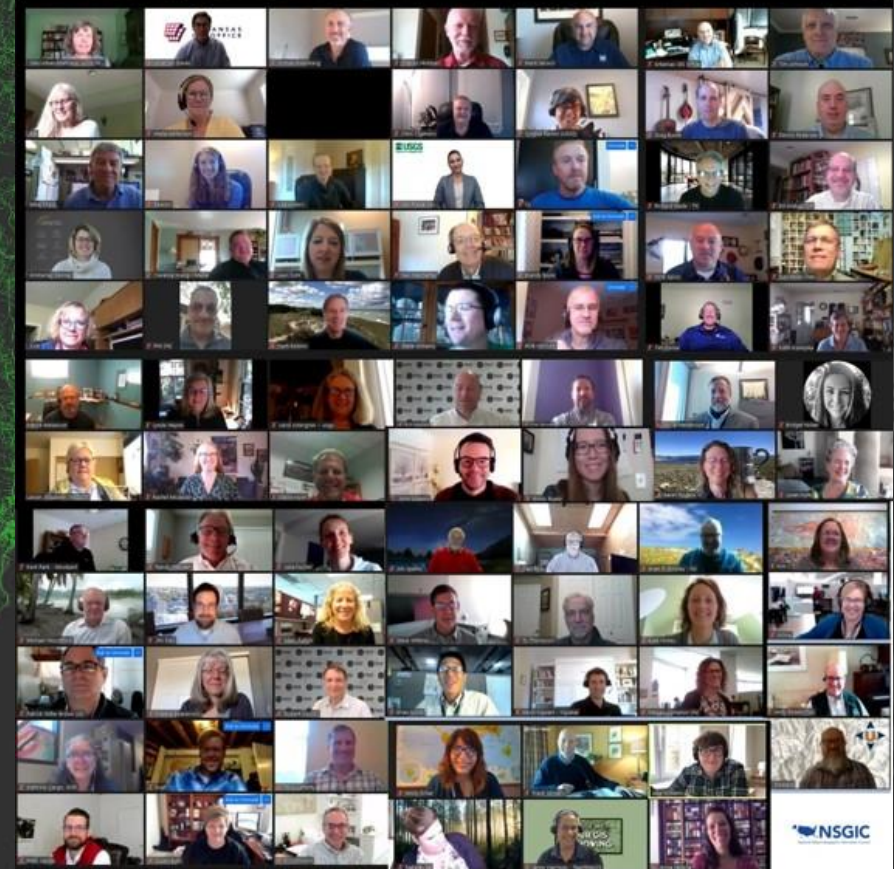
An aerial photograph of a coastal region, likely a large island or peninsula, with a dense network of green lines overlaid on the land. These lines represent individual land parcels, creating a complex grid-like pattern across the terrain. The background is a dark, muted color, possibly representing water or a dark overlay on the map.

Tax Parcel Data

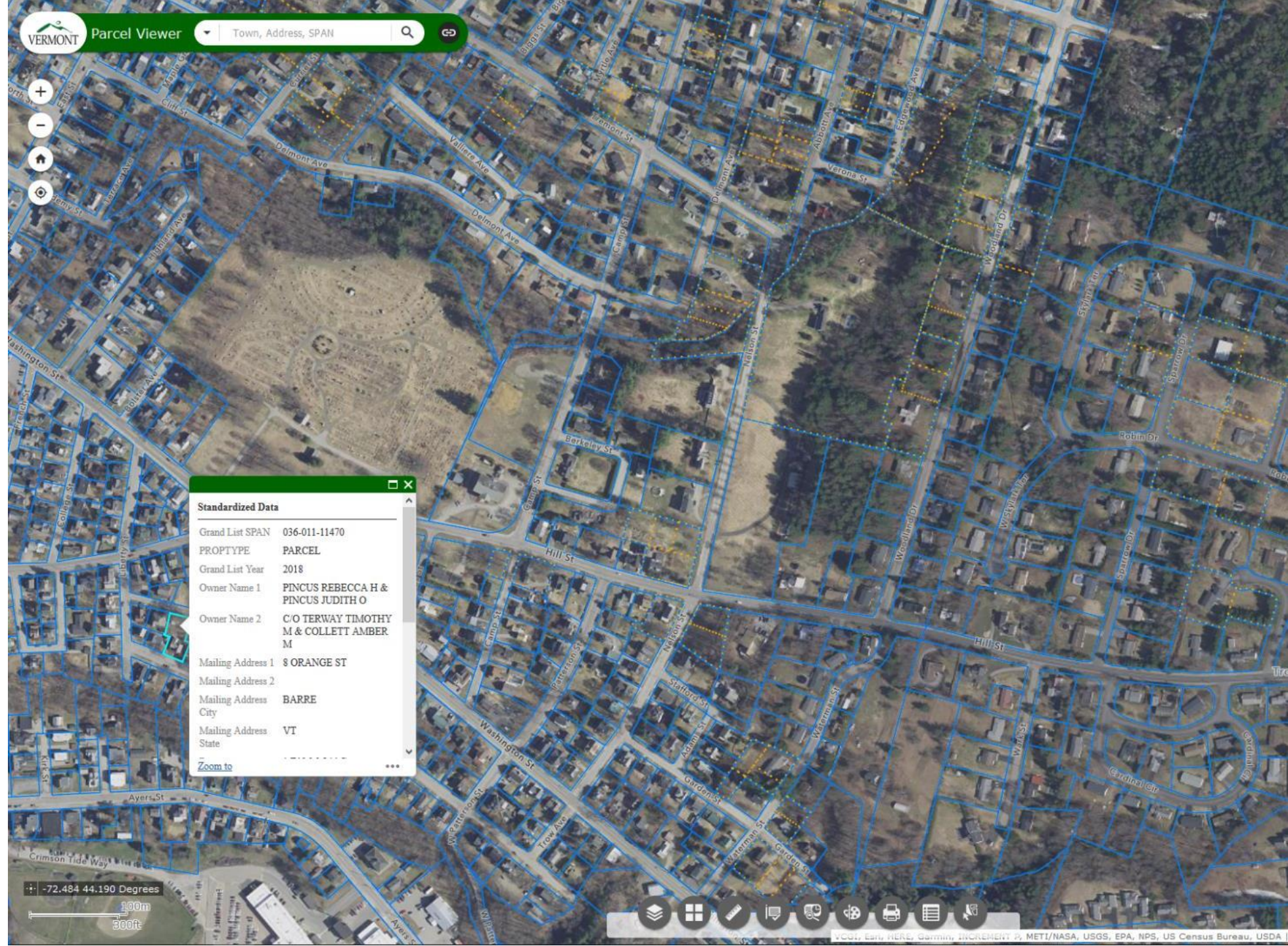
[Land Survey Library](#)

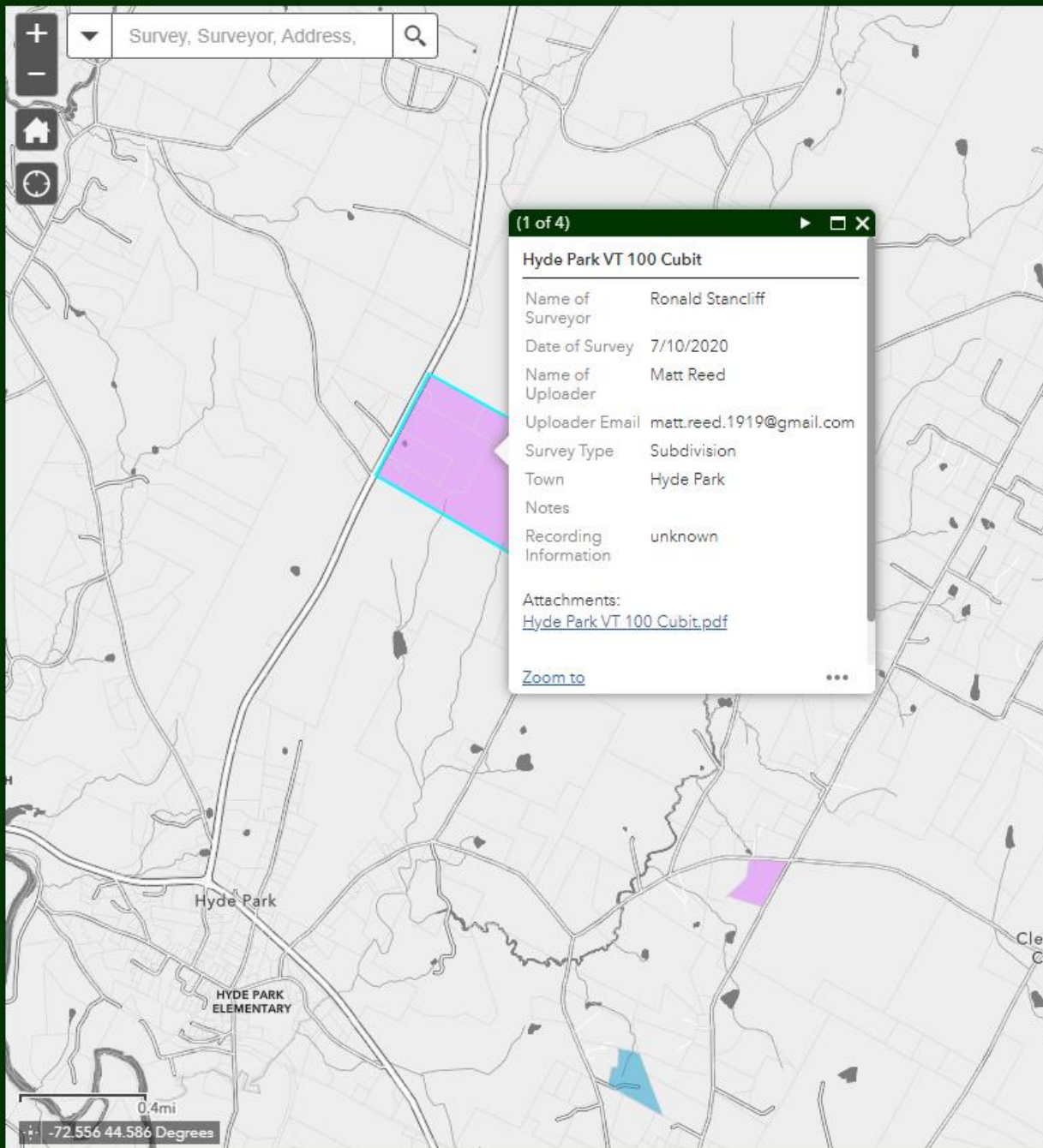
[Parcel Data Viewer](#)

VT Parcel Program Received 2020 National Geospatial Excellence Award



Vermont Parcel Viewer



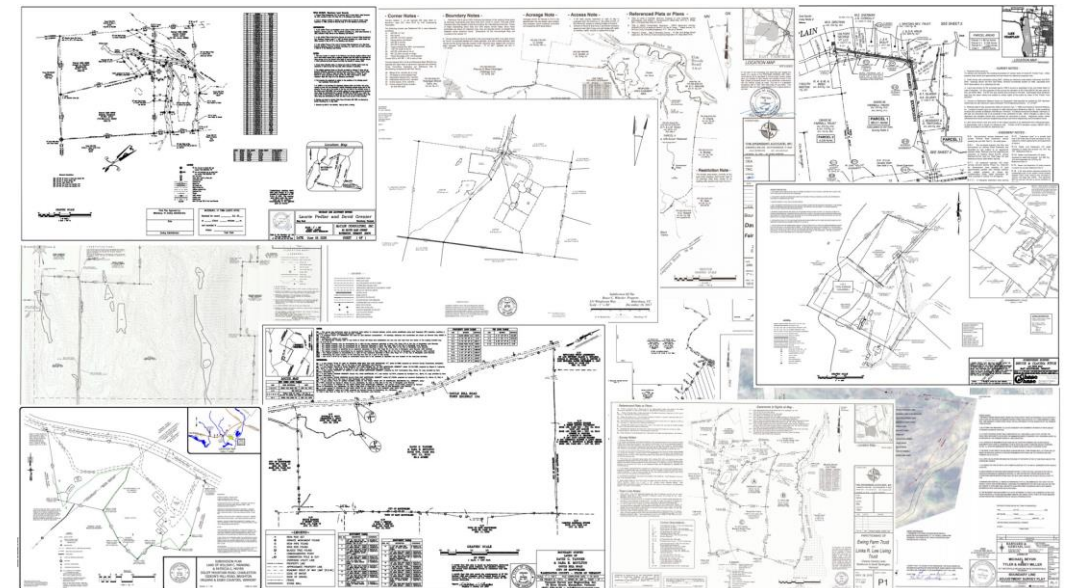


(1 of 4) Hyde Park VT 100 Cubit	
Name of Surveyor	Ronald Stancliff
Date of Survey	7/10/2020
Name of Uploader	Matt Reed
Uploader Email	matt.reed.1919@gmail.com
Survey Type	Subdivision
Town	Hyde Park
Notes	
Recording Information	unknown
Attachments: Hyde Park VT 100 Cubit.pdf	
Zoom to	

Land Survey Library

The digital Library went live on January 1, 2020 and has received 600+ submissions from surveyors, with almost half of submissions being for subdivisions and a quarter of for boundary line adjustments. Users can browse the library by map or specific survey information. An index shape with a particular color depicts the type of survey available for location.

<https://landsurvey.vermont.gov/>



Vermont Parcel Values

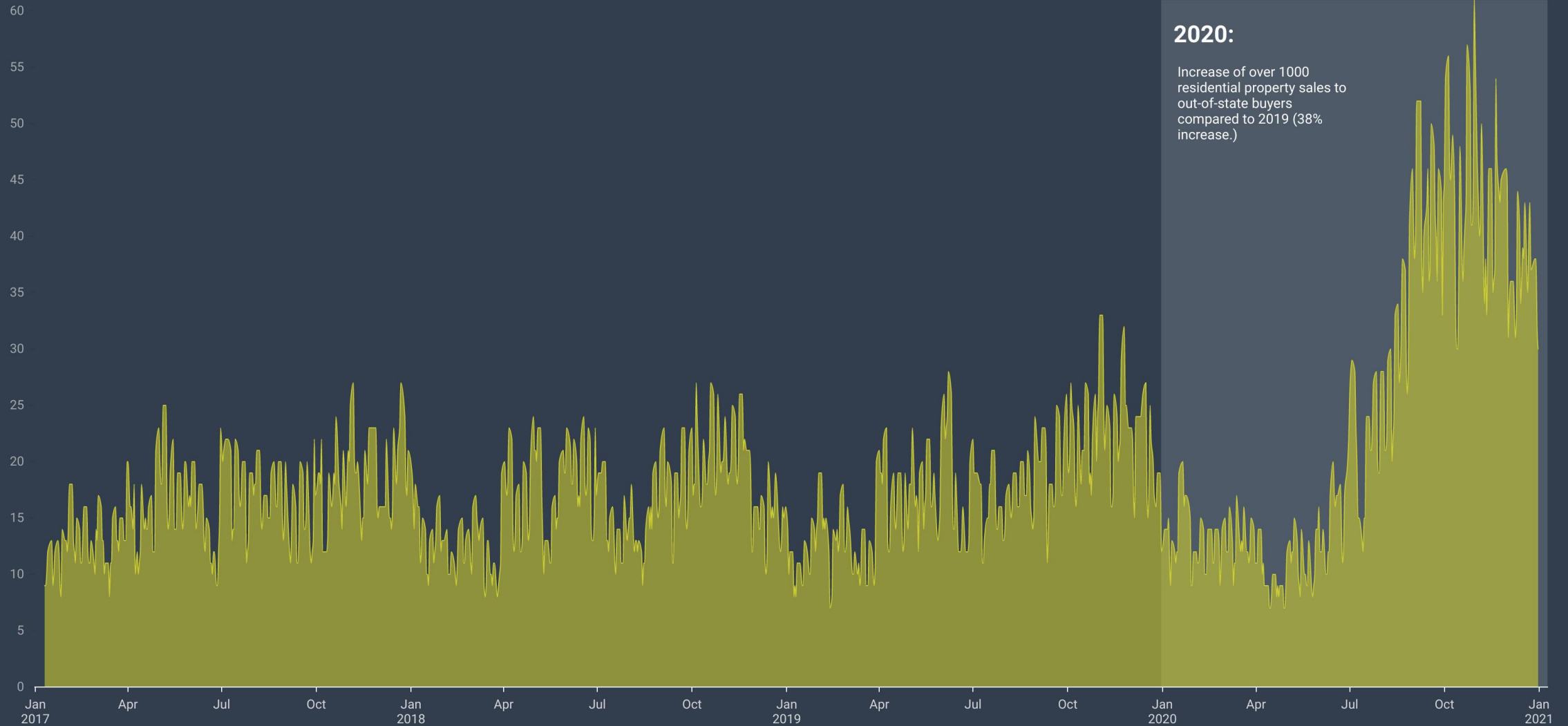
This map compares the use category and listed value of parcels in Vermont. Heights of the parcels are scaled on property values in dollars per acre, adjusted to the [common level of appraisal](#). Parcels are colored by their grand list use category and can be seen by clicking on a parcel. Current data is based on the 2018 grand list. For more information about the Vermont Parcel project please visit the [Program Page](#). This visualization is for comparative, informational purposes only.



[Explore Property Valuation in 3D](#)

VT Residential Property Sales to Out-of-State Buyers

7-Day Average of Daily Transactions from 2017-2021



2020:

Increase of over 1000 residential property sales to out-of-state buyers compared to 2019 (38% increase.)

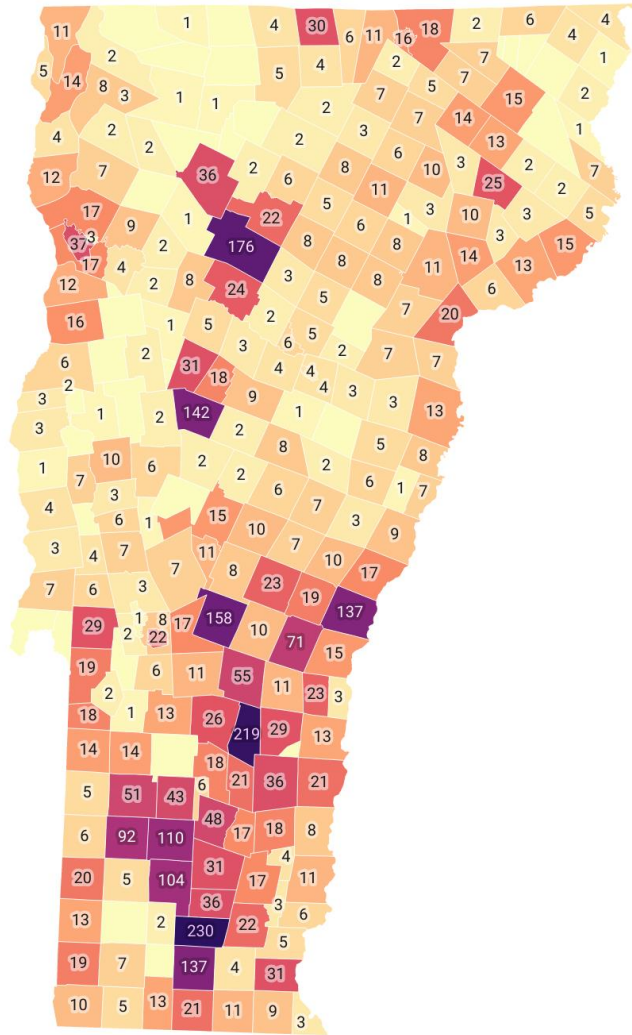
Transactions included are those over \$20,000 with buyer self reporting use as 'primary' or 'secondary' residence and buyer mailing address outside of Vermont in the property transfer tax return.

Chart: VCGI • Source: VT Dept of Taxes • Created with Datawrapper

[Explore interactive property transfer data](#)

Residential Property Sold to Out-of-State Buyers in 2020

of transactions where buyer listed out of state mailing address



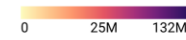
Transactions included are those over \$20,000 with buyer self reporting use as 'primary' or 'secondary' residence and buyer mailing address outside of Vermont in the property transfer tax return

Map: VCGI • Source: VT Tax Dept • Created with Datawrapper

VT Residential Property Sales to Out-of-State Buyers

Search in table

Page 1 of 11



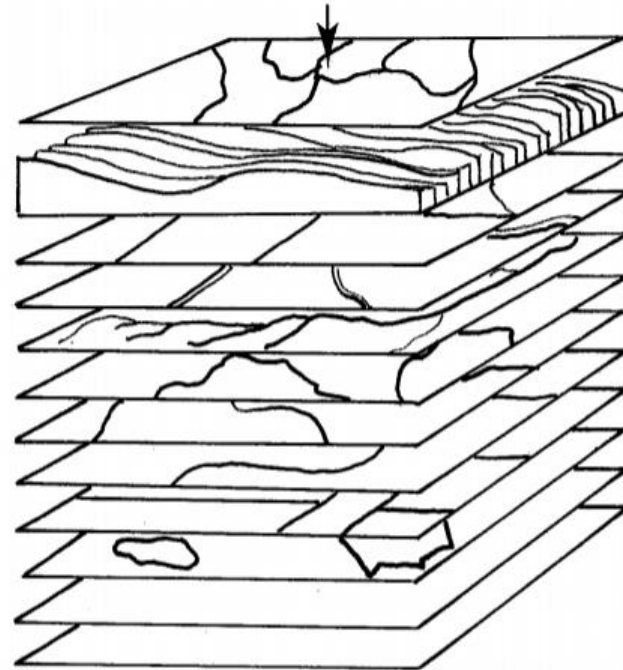
Town	Sales	2017	2018	2019	2020
1 Stowe	156 176	84.7M	104.2M	66.8M	132.1M
2 Ludlow	142 219	44.7M	65.4M	75M	97.9M
3 Dover	126 230	38M	37M	32.6M	72.7M
4 Stratton	63 104	31.4M	29.9M	31.5M	65.4M
5 Wilmington	96 137	37.6M	19.4M	21.3M	53.8M
6 Woodstock	48 71	37.9M	21.8M	28.7M	53M
7 Warren	104 142	23.2M	25M	29M	49.3M
8 Winhall	48 110	20.1M	23.8M	24.8M	49.2M
9 Manchester	39 92	16.1M	22.9M	25.3M	46M
10 Killington	140 158	27.5M	31.8M	43.5M	43.9M
11 Hartford	85 137	20.1M	27.7M	29.5M	41.8M
12 Dorset	20 51	9.2M	11.8M	15.7M	37M
13 Plymouth	25 55	5.7M	11M	11M	20.4M
14 Burlington	32 37	12.4M	10.4M	6.7M	17.6M
15 Pomfret	5 19	2.1M	7M	1.6M	17.4M
16 Barnard	9 23	6.2M	8.4M	5.6M	16.8M
17 Peru	18 43	4.4M	7.6M	9M	15.5M
18 Londonderry	43 48	12.1M	13.2M	10.3M	15M
19 West Windsor	8 23	4M	1.4M	2.3M	13.7M
20 Charlotte	7 16	5.3M	6.4M	2.3M	13M
21 Chester	21 36	6M	2.4M	6.2M	12.4M
22 Jamaica	36 31	7.7M	6.3M	8.4M	12.2M
23 Fayston	24 31	5.7M	7M	11.1M	12.1M
24 Norwich	10 17	5.5M	5.9M	5.3M	11.2M
25 Weston	11 18	3.6M	4.9M	4.8M	11.1M

Transactions included are those over \$20,000 with buyer self reporting use as 'primary' or 'secondary' residence and buyer mailing address outside of Vermont in the property transfer tax return.

Table: VCGI • Source: VT Dept. of Taxes • Created with Datawrapper

[Explore interactive property transfer data](#)

A GEOGRAPHIC INFORMATION SYSTEM for VERMONT



SOILS

TOPOGRAPHY

slope, aspect, elevation

POLITICAL BOUNDARIES

TRANSPORTATION

STREAM COURSES, WATERSHEDS

LAND COVER/USE

GROUND WATER

GEOLOGY

SOCIO-ECONOMIC FACTORS

HISTORICAL/ARCHAEOLOGY

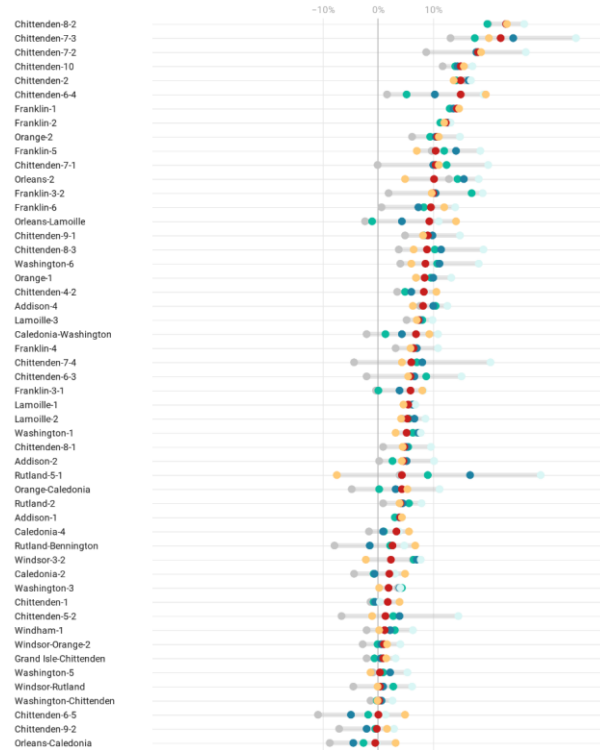
FUTURE EXPANSION

FUTURE EXPANSION

Estimated % Deviation from Ideal Population for House Districts

Table shows % for various population estimates. ACS high and 'low' estimates calculated using margin of error at 90% confidence level.

● ACS 2019 5YR Low ● ACS 2018 5YR ● ACS 2019 5YR ● ACS 2019 5YR High ● Composite ● ESRI 2020

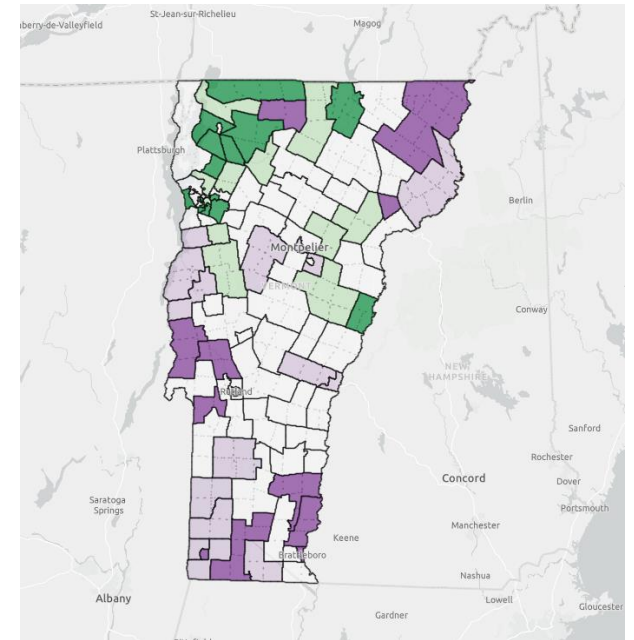


Search in table

Page 1 of 6

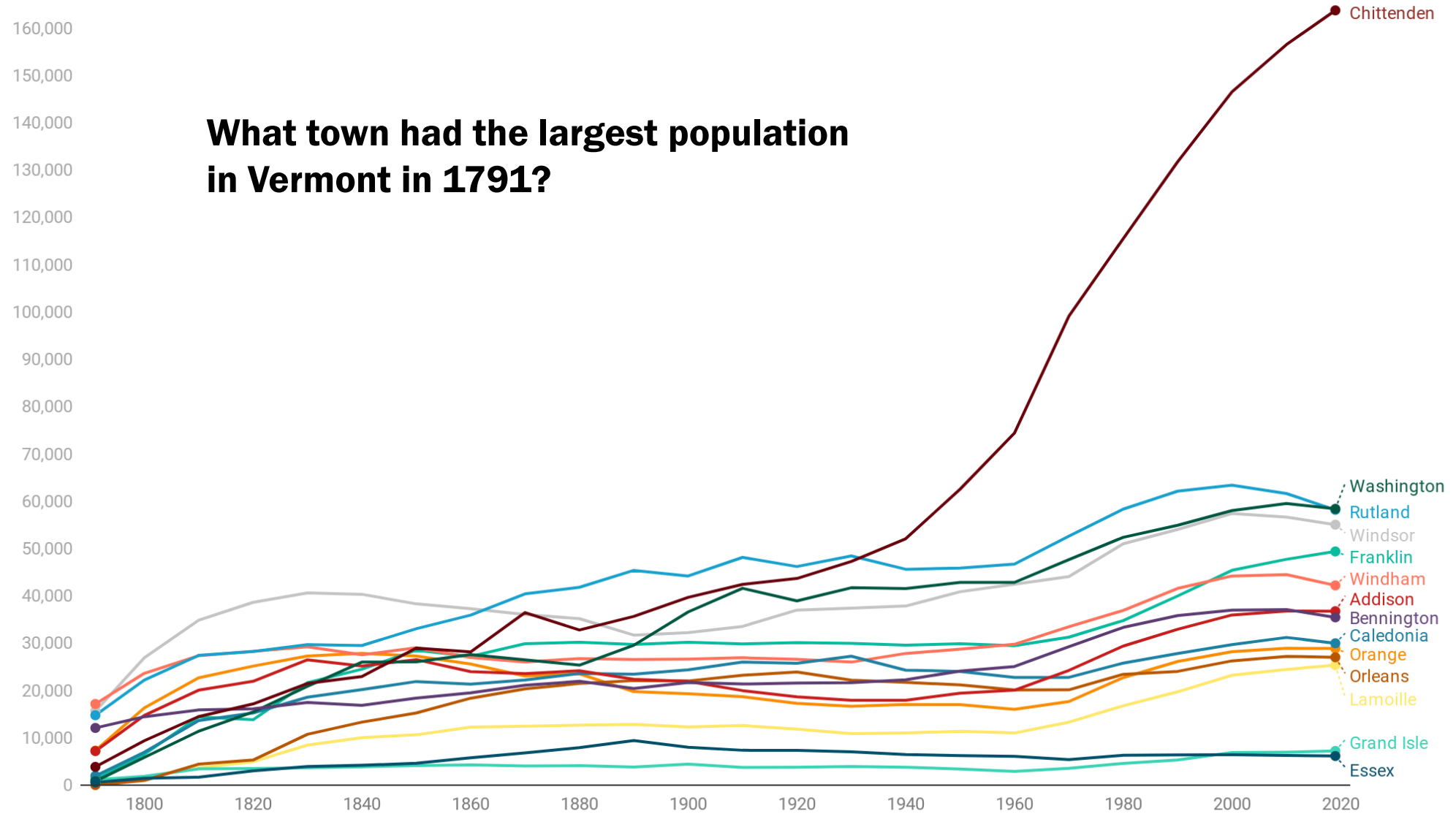
NAME	A	MEMBERS	AREA	2010 - 2019	DEVIATION (POP)	%
Addison Rutland	1	155.0	3,990	3,722	-510	-12.1%
Addison-1	2	39.1	8,496	8,812	348	4.1%
Addison-2	1	188.8	4,496	4,430	-198	-4.7%
Addison-3	2	143.4	7,897	7,911	53	0.7%
Addison-4	2	168.6	8,922	9,159	695	8.2%
Addison-5	1	105.2	3,778	3,842	390	9.2%
Bennington-1	1	94.2	3,951	3,880	-352	-8.3%
Bennington-2-1	2	33.8	7,997	7,826	-638	-7.5%
Bennington-2-2	2	8.7	7,767	7,349	-1,116	-13.2%
Bennington-3	1	126.9	3,840	3,838	-94	-0.9%
Bennington-4	2	132.8	7,827	7,856	698	7.2%
Bennington-Rutland	1	179.4	4,130	3,937	-295	-7.0%
Caledonia-1	1	119.8	4,162	4,165	67	0.6%
Caledonia-2	1	90.3	4,161	4,322	90	2.1%
Caledonia-3	2	36.7	7,603	7,490	-974	-11.5%
Caledonia-4	2	112.0	8,763	8,750	-286	-3.4%
Caledonia-Washington	1	147.0	4,361	4,525	293	6.9%
Chittenden-1	1	32.7	4,081	4,306	74	1.7%
Chittenden-10	2	30.9	9,039	9,734	1,270	15.0%
Chittenden-2	2	30.5	8,698	9,734	1,270	15.0%

Created with Datawrapper



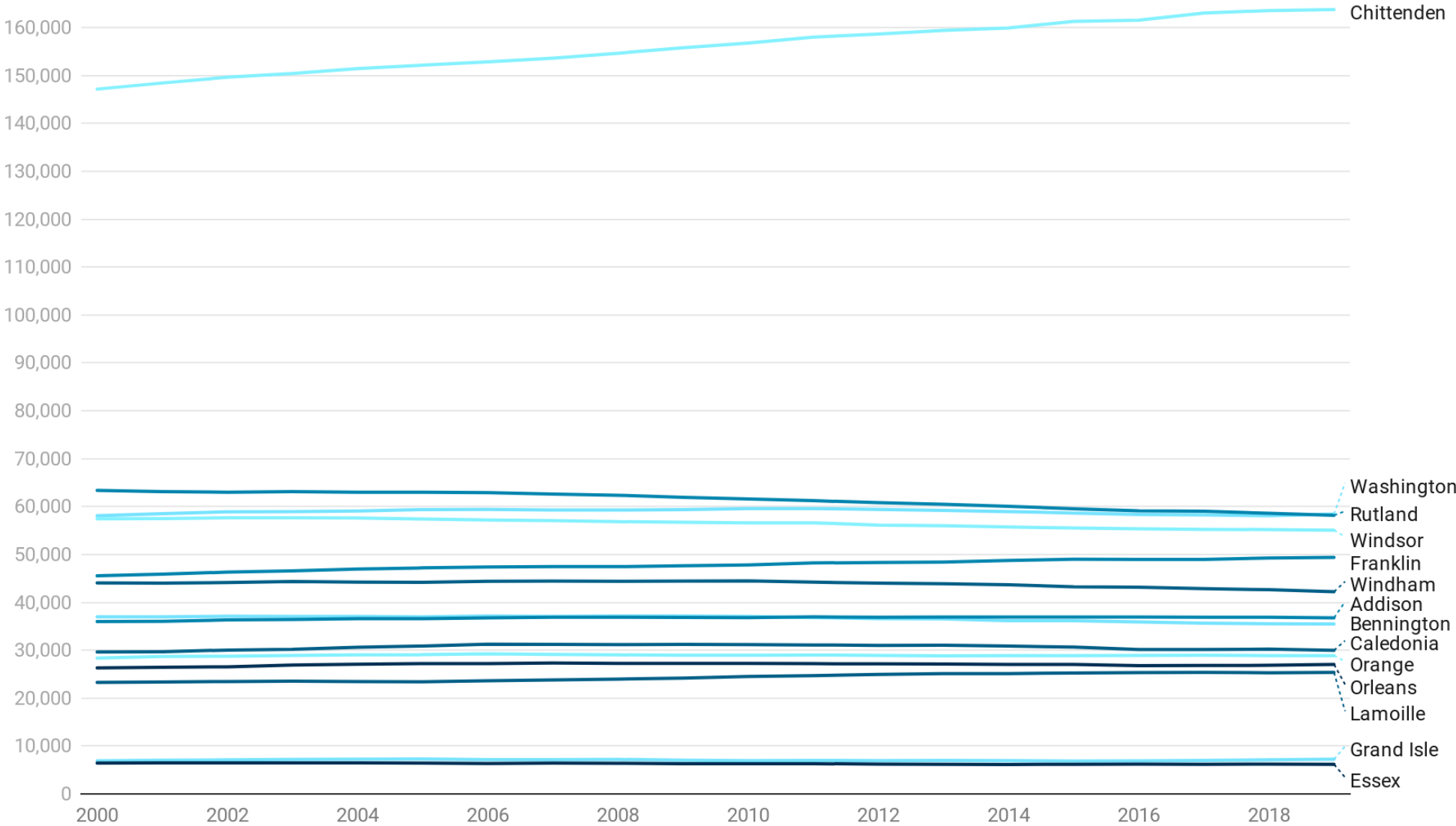
VT County Population: 1791-2019

What town had the largest population in Vermont in 1791?



VT County Population Estimates

2000-2019

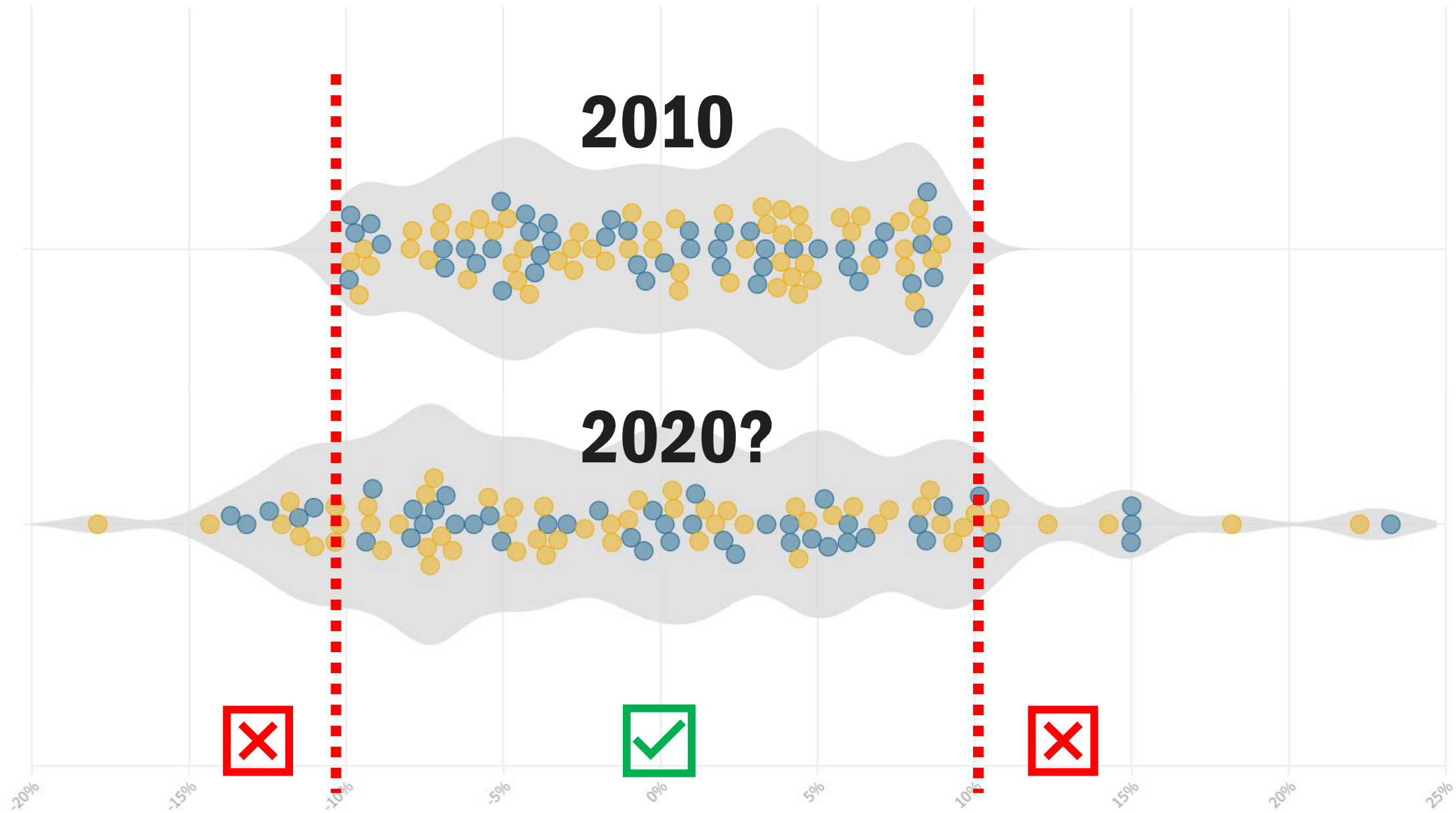




4,162

estimated 'Ideal' population per member

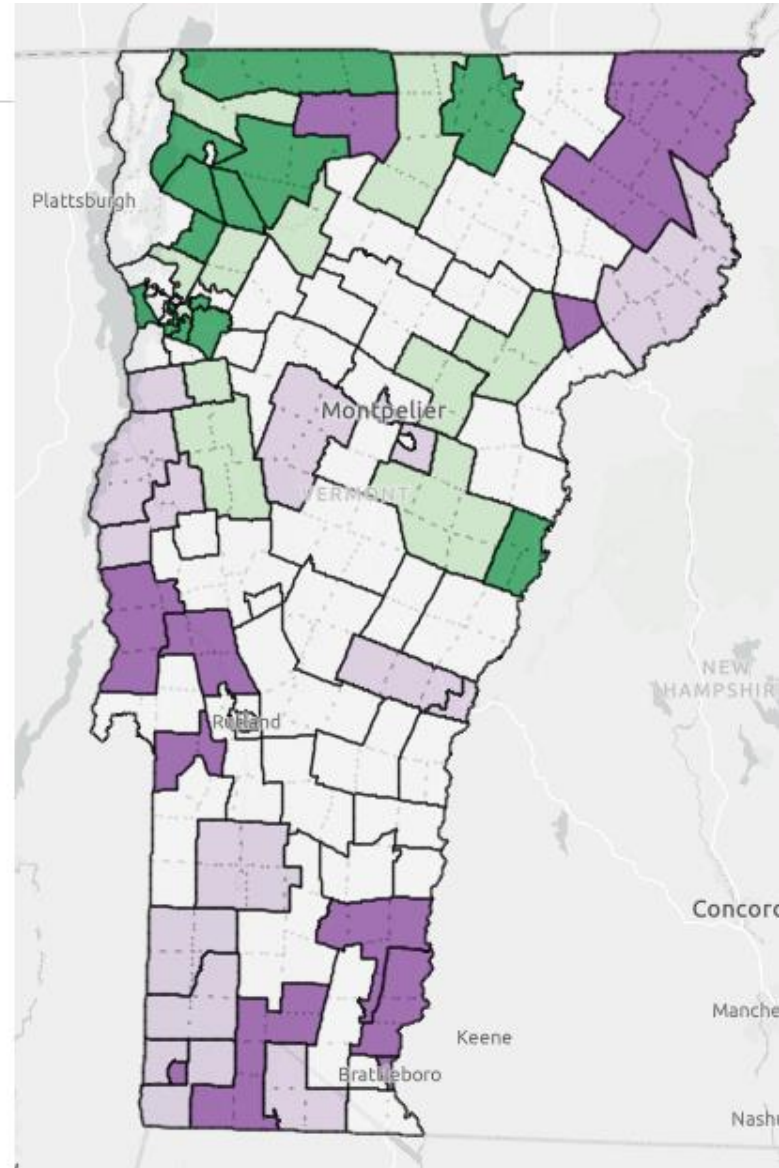
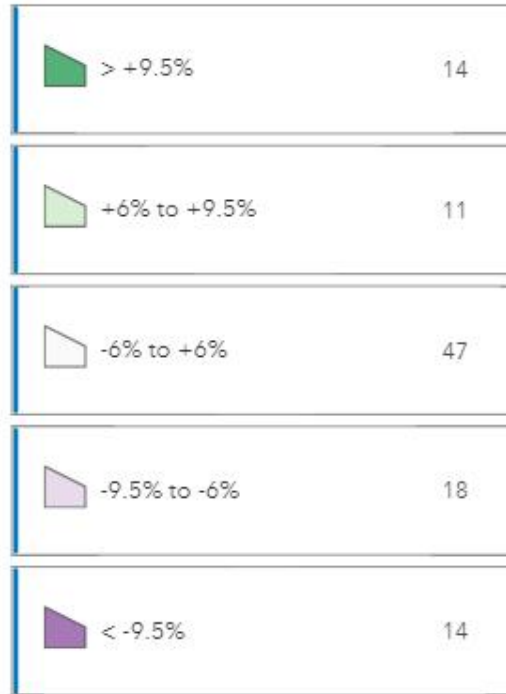
Members ● 2 ● 1



House Districts

Total Feature Count: 104

% DEVIATION FROM IDEAL



[Link to interactive map.](#)

**SOME OF THE ESTIMATES
WILL BE OFF**

lab.mapvt.com

Total Cases

1,987

15 New

Currently Hospitalized

0

Hospitalized Under Investigation

3

Total People Recovered

1,718

Deaths

58

People Tested

181,677

Travelers Monitored

542

Contacts Monitored

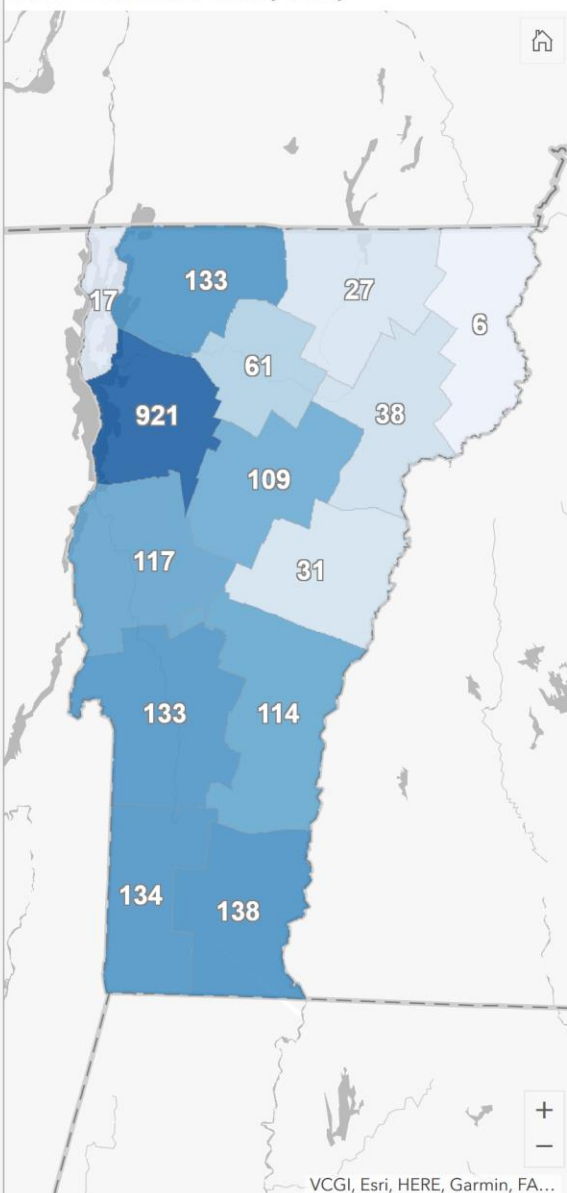
82

People Completed Monitoring

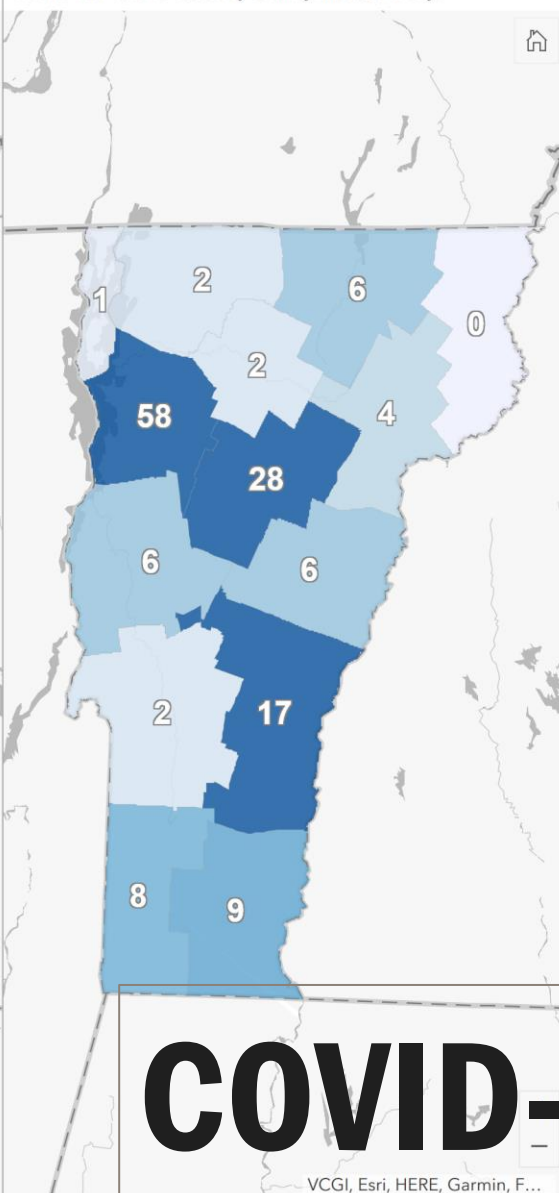
9,868

Last Updated: 10/22/2020, 10:40:23 AM

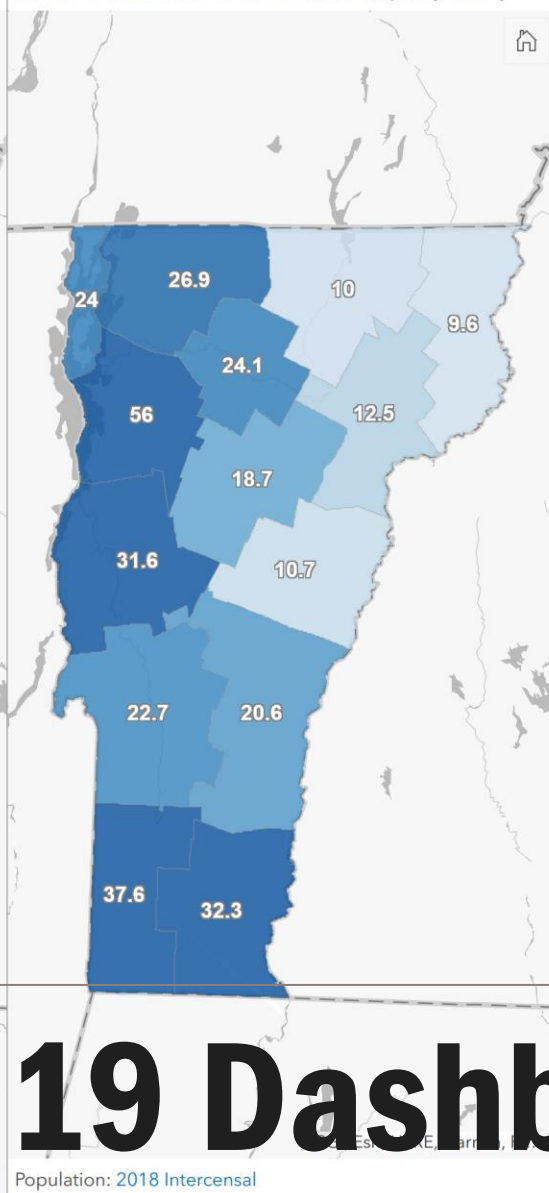
COVID-19 Cumulative Cases by County



COVID-19 Positive Cases by County in Last 14 Days



COVID-19 Cumulative Cases Per 10,000 People by County



Chittenden County

Total Cases: 921
New Cases: 8
Total Deaths: 39

Windham County

Total Cases: 138
New Cases: 1
Total Deaths: 3

Bennington County

Total Cases: 134
New Cases: 0
Total Deaths: 1

Franklin County

Total Cases: 133
New Cases: 1
Total Deaths: 7

Rutland County

Total Cases: 133
New Cases: 0
Total Deaths: 1

Addison County

Total Cases: 117
New Cases: 1
Total Deaths: 2

Windsor County

Total Cases: 114
New Cases: 1
Total Deaths: 2

Washington County

Total Cases: 109
New Cases: 2
Total Deaths: 2

Lamoille County

Total Cases: 61
New Cases: 0
Total Deaths: 1

Caledonia County

Total Cases: 38
New Cases: 0
Total Deaths: 0

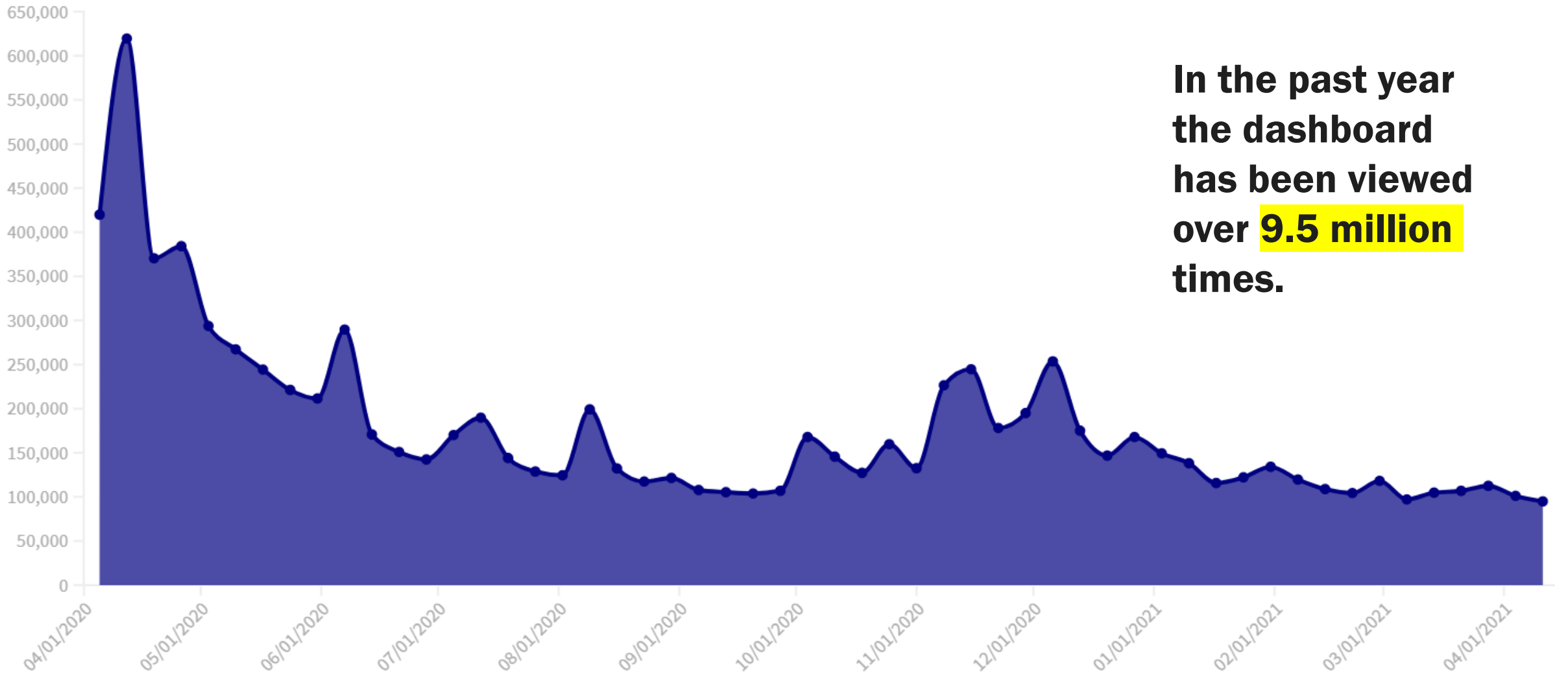
Orange County

Total Cases: 31
New Cases: 0
Total Deaths: 0

Click a County to highlight it on the map.

COVID-19 Dashboard

COVID-19 Dashboard Weekly Views



In the past year
the dashboard
has been viewed
over **9.5 million**
times.

Vermont Vaccination Data

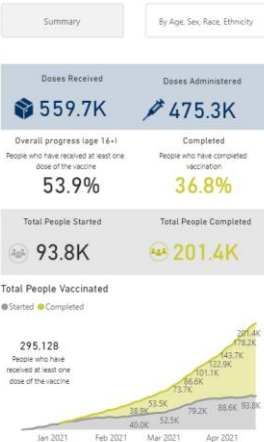
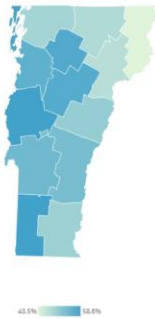
Vaccination by County

The percent of the county population that has received at least one dose of the vaccine

Show Race Detail

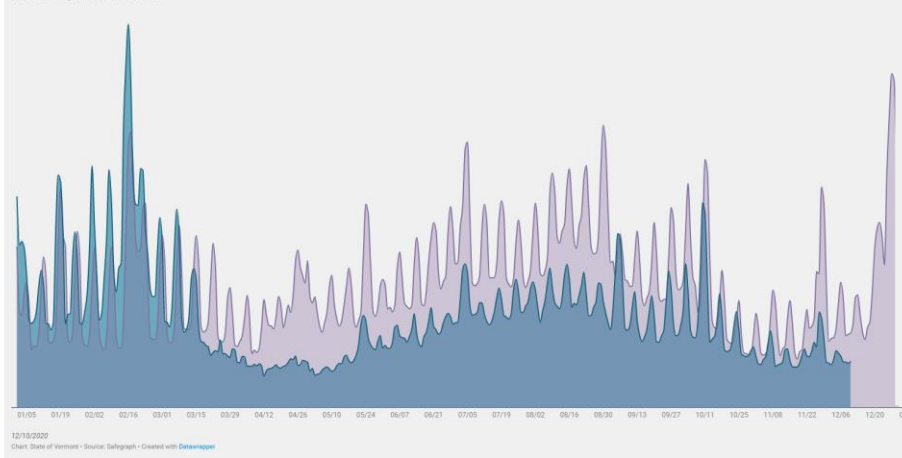
County Overall progress

County	Overall progress
Addison	58.6%
Bennington	58.6%
Caledonia	47.3%
Chittenden	55.8%
Essex	43.5%
Franklin	49.2%
Grand Isle	58.3%
Lamoille	37.1%
Orange	50.6%
Orleans	48.2%
Rutland	54.3%
Washington	56.8%
Windham	49.8%
Windsor	53.4%
Vermont	53.9%

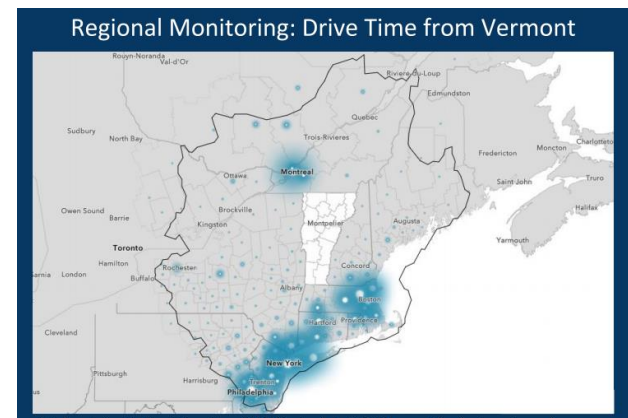
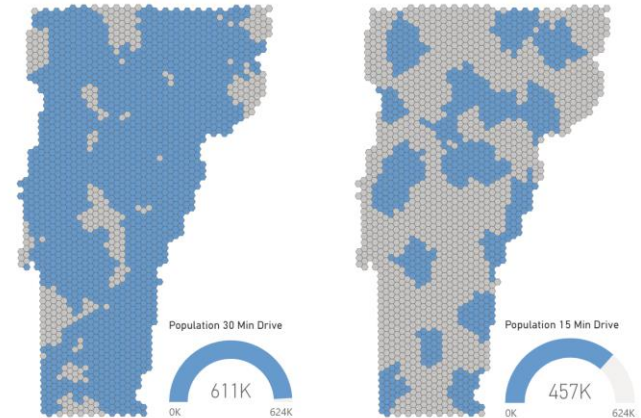
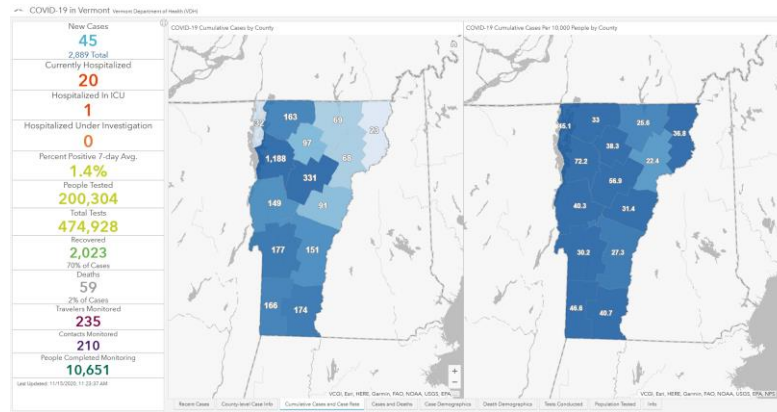
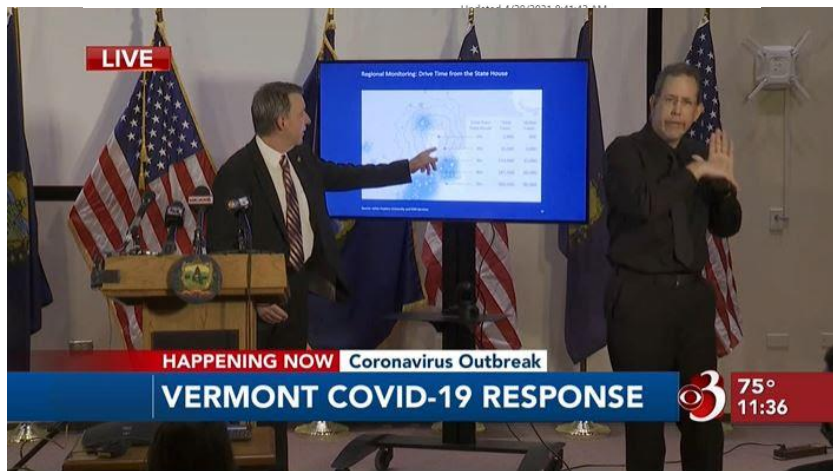


Out-of-State Visitors to Vermont 2019 vs 2020

Estimate of daily visitors from out of state



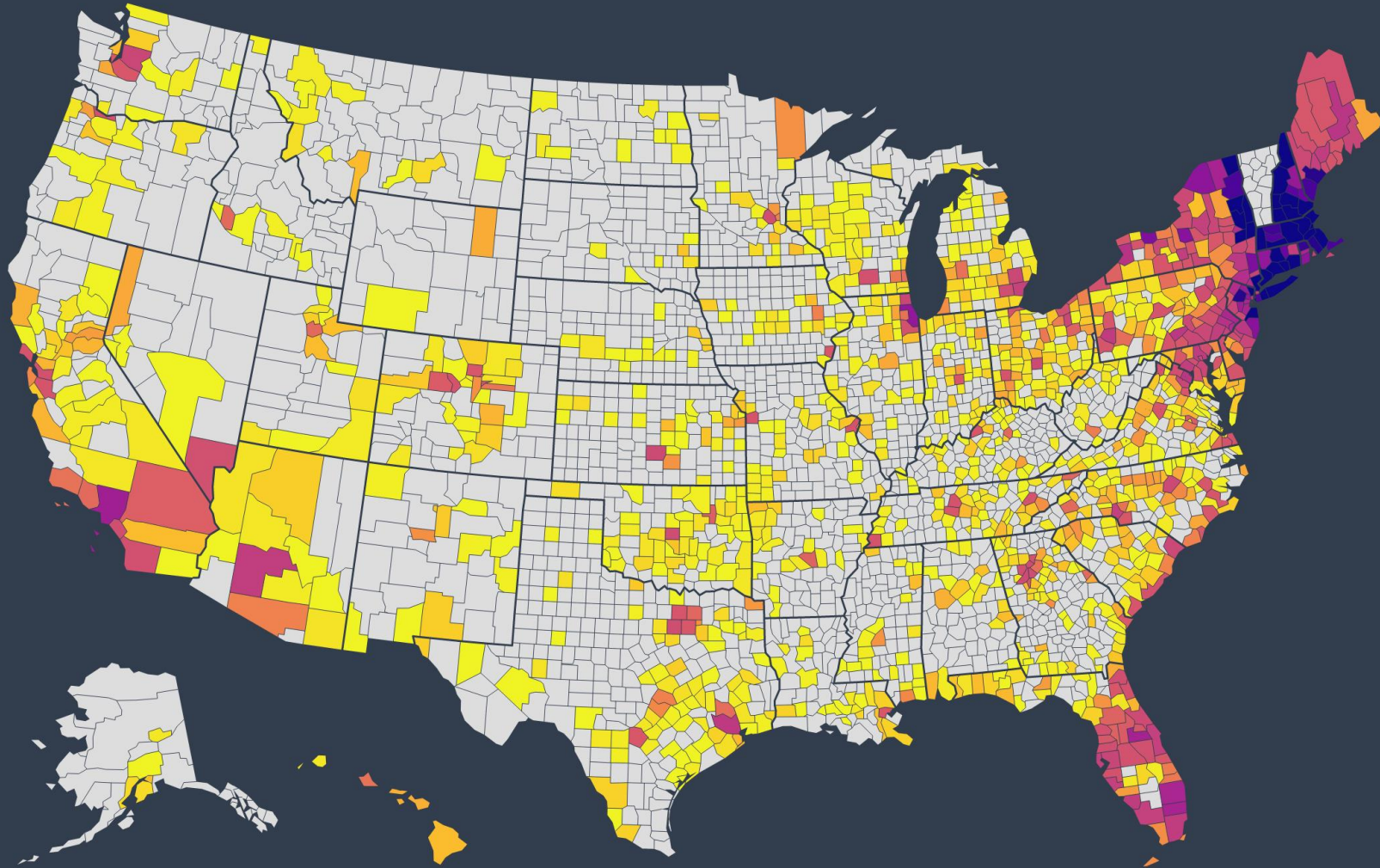
COVID-19 Response Examples



Thanksgiving Weekend 2019

Travel to/from Vermont

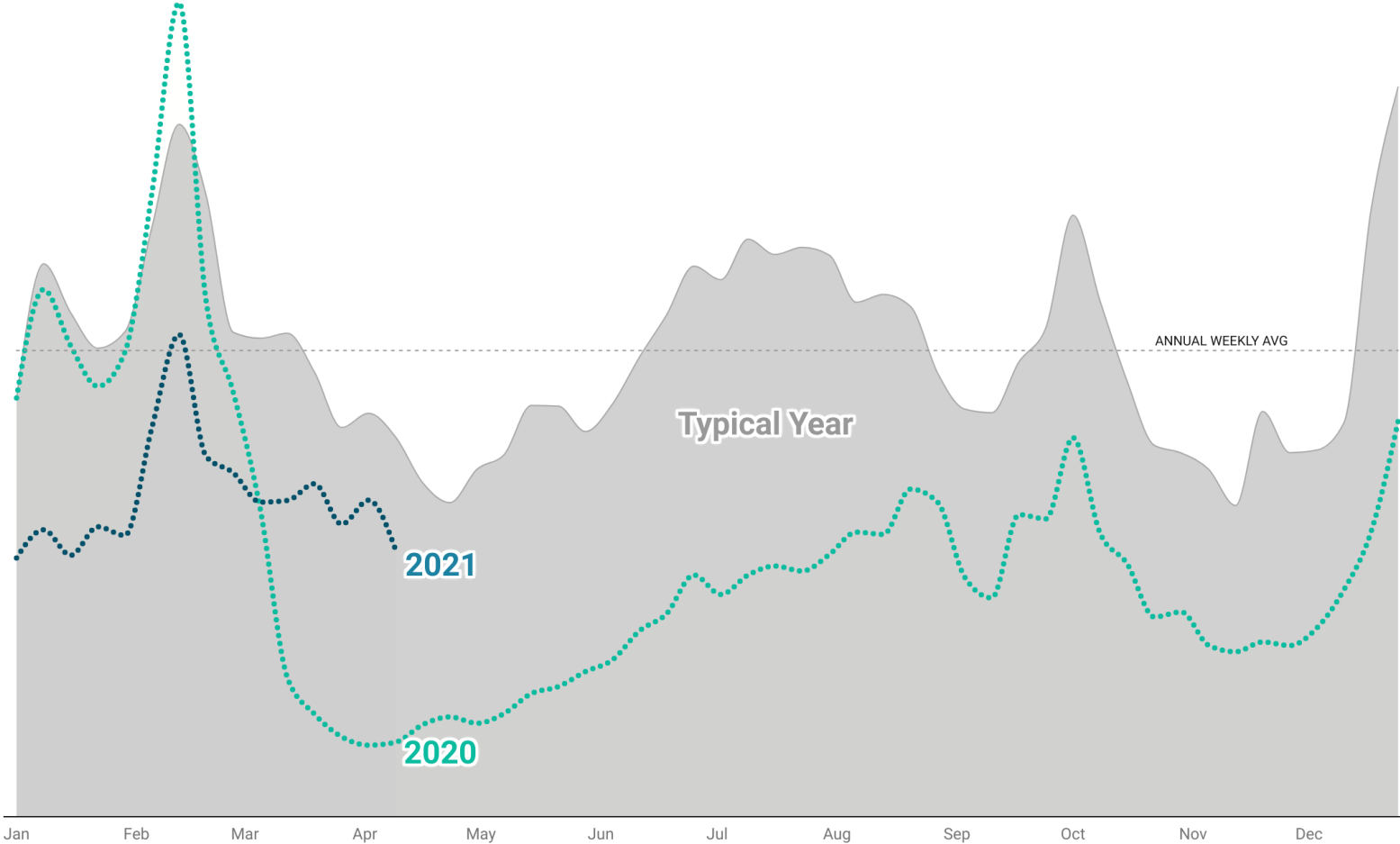
Travelers by County



Mobility Data from Safegraph

VT Hotel Visitors in 2020 & 2021 Compared to a Typical Year

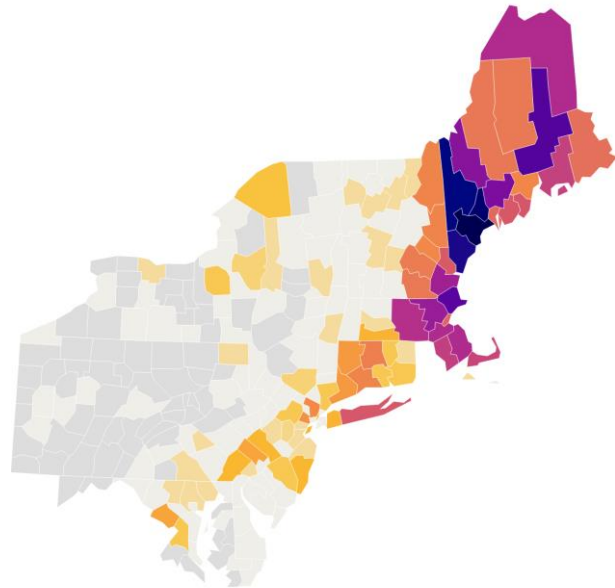
Through week ending April 10th, 2021.



'Typical Year' calculated using 2018 & 2019 average.
Chart: VCGI • Source: Safegraph • Created with Datawrapper

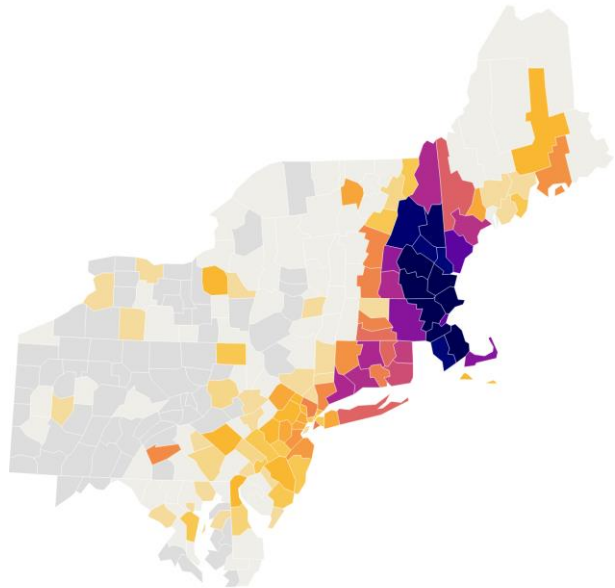
Maine Ski Resort Visitors

December 2020 & January 2021



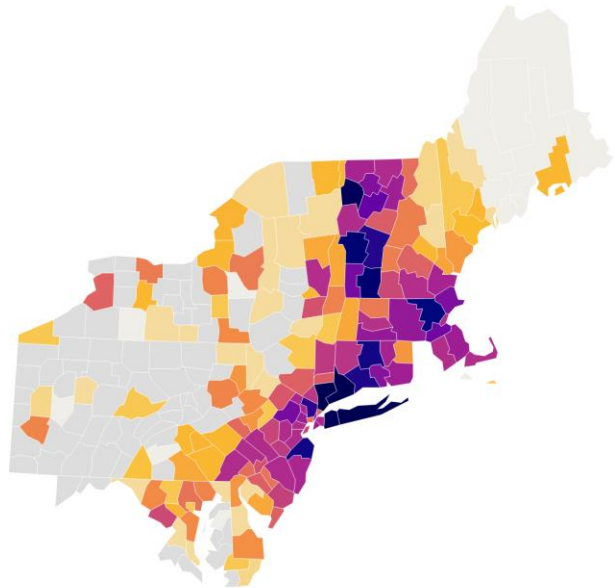
New Hampshire Ski Resort Visitors

December 2020 & January 2021



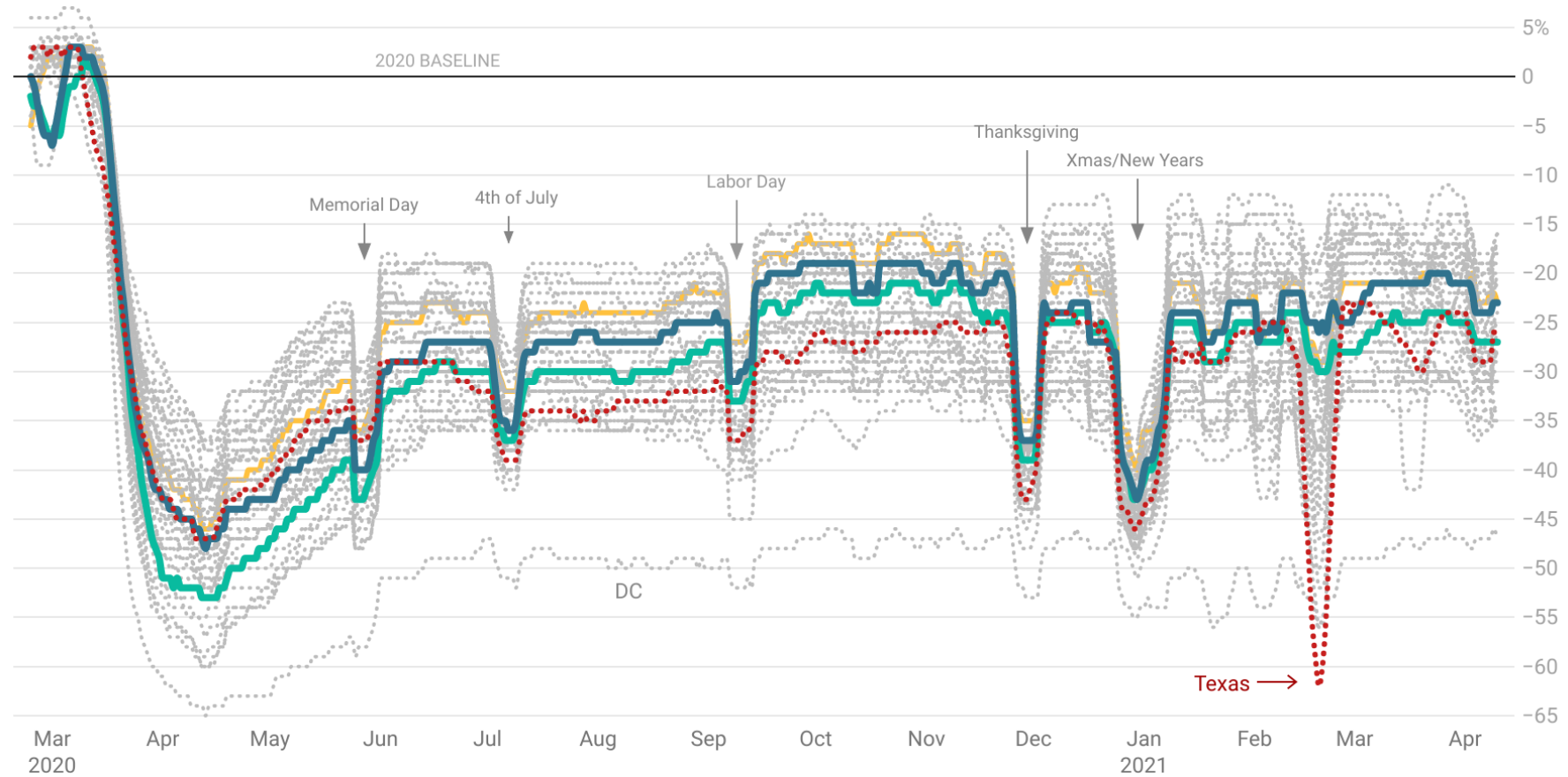
Vermont Ski Resort Visitors

December 2020 & January 2021



Workplace

Vermont New Hampshire Maine Other States



Lines represent 7 day average. Baseline set Jan 3 – Feb 6, 2020.

Source: Google • Created with Datawrapper

Learn More

- [2020 GIS Year in Review](#)
- [Interactive Map Viewer](#)
- [Tax Parcel Data Viewer](#)
- [Census: High Cost of a Low Count](#)
- [Historic Imagery](#)
- vcgi.vermont.gov

john.e.adams@vermont.gov

