

Geomorphology & Engineering survey

Site assessment and VT tools



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Assessment and Design Overview

Independent Variables

(Assessment)

- Physical Site Constraints
- Valley Slope
- Valley Confinement
- Discharge
- Stream Power ($\Omega = \gamma QS$)
- Existing Floodplain Dimensions
- Floodplain Connectivity
 - Entrenchment
 - Incision
- Channel Evolution
- Sediment and Large Wood

Increasing complexity and variables that may drop out of basic assessment during quick emergency repairs.

Dependent Variables

(Design)

- Floodplain Elevation, Width, Length, and Slope
- Floodplain Connectivity
- Channel Pattern, Sinuosity, and Dynamics
- Excavation or Fill Volume
- Fill Disposal Areas
- Stabilization Measures
- Vegetative cover
- Floodplain features (oxbows, wetlands, etc.)

Additional Assessment and Water Quality Overview
At your site
&
Upstream & Downstream of your Site

- Dam Hazard Class
- Stream Geomorphic & Habitat Condition
- Stream Type
- River Corridor and Floodplain Areas
- Incision Ratio
- Sediment Transport & Storage potential
- Water Quality Monitoring Data – bugs, fish, & Chemistry
- Impaired Listings
- Wetlands
- Soil Types
- Other Barriers

Assessment – Site Constraints

1. Identify surrounding infrastructure
 1. Utility & Water lines
 2. Houses, retaining walls
 3. Roads, railroads
 4. Stormwater
2. Permission from one or more landowners.
3. Cultural resources in floodplain areas.
4. Hazardous waste materials
5. Soil Disposal Areas

ANR Atlas

The screenshot displays the Vermont Natural Resources Atlas web application. At the top, the logo for the Vermont Agency of Natural Resources is visible, along with the title "Natural Resources Atlas". Below the header, there is a search bar and a "Layers" panel on the left side. The "Layers" panel contains a list of map layers, each with a checkbox and a plus sign to expand it. The layers listed are: Atlas Layers (checked), Watershed Management (checked), Waste Management (checked), VP Atlas - Vernal Pools (checked), Stormwater (checked), Rivers (checked), Geology (checked), Emerald Ash Borer (EAB) Areas (unchecked), Forests Parks and Recreation (checked), Fish and Wildlife (checked), Drinking Water and Groundwater Protection (checked), VT Culverts (unchecked), Buildings (unchecked), Parcels (checked), ANR Basemap Data (checked), ACT250 Permits (unchecked), and Bridge & Culvert Inventory (unchecked). The main map area shows a satellite view of Vermont with a dark brown grid overlay representing the atlas data. Major roads like Interstates 89, 91, and 93 are visible. A "Quick Tools..." button is located in the top right of the map area. At the bottom, there is a scale bar (0 to 40 km) and a "1:500" scale indicator.

VERMONT Natural Resources Atlas
Vermont Agency of Natural Resources

Layers

Atlas Layers

- Atlas Layers
- Watershed Management
- Waste Management
- VP Atlas - Vernal Pools
- Stormwater
- Rivers
- Geology
- Emerald Ash Borer (EAB) Areas
- Forests Parks and Recreation
- Fish and Wildlife
- Drinking Water and Groundwater Protection
- VT Culverts
- Buildings
- Parcels
- ANR Basemap Data
 - ACT250 Permits
- Bridge & Culvert Inventory

ESRI Wor... 0 20 40km 1:500

Phase 1 & Phase 2 SGA Data

SGAT_ID
177_T7S1.01-

GlobalID
{B4A328AA-139F-4412-A482-E82664F51223}

Shape
N/A

ProjectName
Brewster River

URLPage1
<https://anrweb.vt.gov/DEC/SGA/renderReport.aspx?repName=Phase2SegmentSummary&pid=177&rid=47&sid=0>

URLPage2
<https://anrweb.vt.gov/DEC/SGA/renderReport.aspx?repName=Phase2SegmentLegacySummary&pid=177&rid=47&sid=0>

Rivers Program

Filter Layers... Filter

- Stormwater
- Rivers Management
- SGAT FIT Layers
- SGAT Assessment Layers
- Rivers
- Dams
- Hazard Class
- Historical Dam Location
- Stream Alterations Open

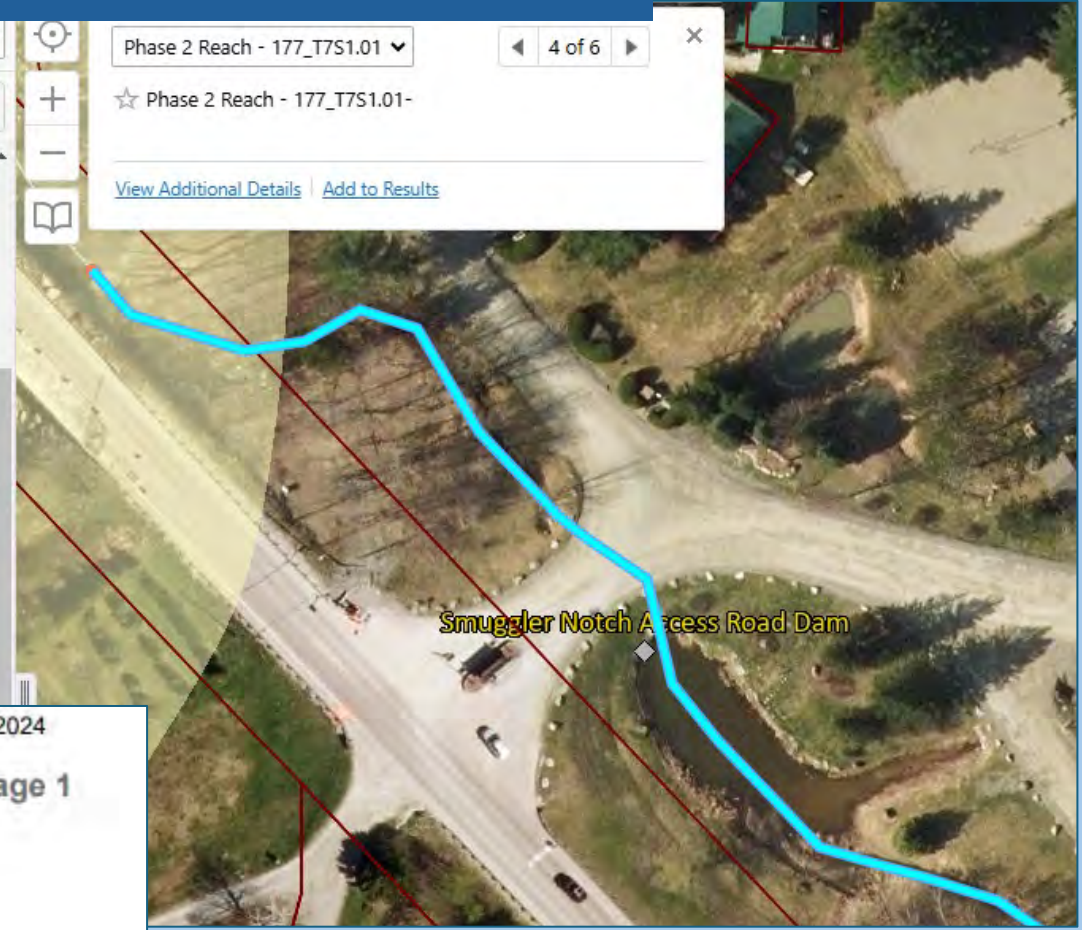
EPMS

Phase 2 Reach - 177_T7S1.01

4 of 6

☆ Phase 2 Reach - 177_T7S1.01-

[View Additional Details](#) | [Add to Results](#)



December, 02 2024

Phase 2 Segment Summary Report Brewster River

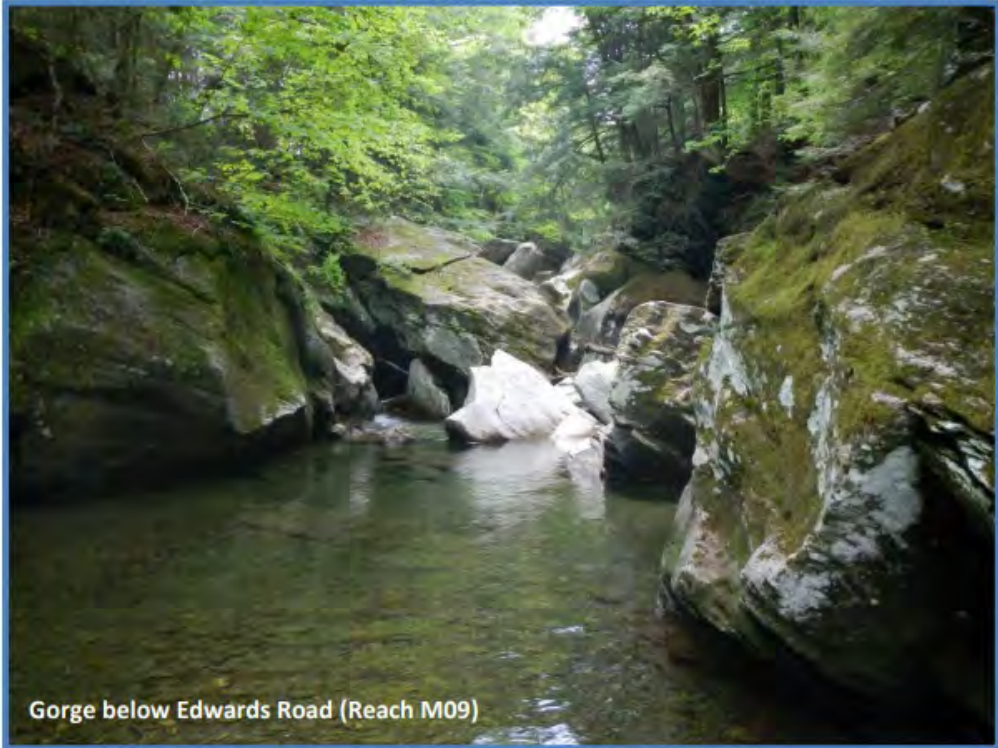
Page 1

Stream:	First tributary to T7	SGAT Version:	4.56
Reach:	T7S1.01-0	Organization:	Fitzgerald Environmental
Segment Length(ft):	1,385	Observers:	JHB, MPL
Rain:	Yes	Completion Date:	6/10/2014
Segment Version:	Base	Quality Control Status - Consultant:	Provisional
		Quality Control Status - Staff:	Provisional

- Step 0 - Location: **Begins at T7.01, just downstream of the Rt 108 crossing; crosses the entrance road into Smuggler's Notch Village, follows Gateway Rd then ends 250 feet downstream of parking lot.**
- Step 5 - Notes: **Man-made trout pond in the middle of the reach impounds approximately 150ft of channel and was not segmented out. Cross-section was collected in upper portion of reach but is representative of the lower reach.**
- Step 7 - Narrative: **This heavily modified reach is departed to F-type and has very little opportunity to widen or adjust planform due to extensive encroachment and armoring. The majority of the reach is plane-bed likely due to bed scour and a combination of sedimentation and possible ditch maintenance dredging along the gravel parking area. Minimal erosion was indexed but the left bank was heavily scoured through most of the reach, right bank was near continuous rip-rap.**

**Brewster River
River Corridor Plan**

July 31, 2015



Gorge below Edwards Road (Reach M09)

Prepared by:

Fitzgerald Environmental Associates, LLC.
18 Severance Green, Suite 203
Colchester, VT 05446



**Fitzgerald Environmental
Associates, LLC.**

Applied Watershed Science & Ecology

Prepared under contract to:

Lamoille County Planning Commission
PO Box 1637



SGA Final Reports

<https://anrweb.vt.gov/DEC/SGA/finalReports.aspx>

The screenshot shows the Stream Geomorphic Assessment (SGA) web application. The header includes the Vermont logo, the title "Stream Geomorphic Assessment", and the "Agency of Natural Resources" and "VT DEC Vermont.gov" information. A navigation menu contains links for "home", "projects", "datasets", "staff", and "LogOut". A sidebar on the left lists menu items: "Home", "Instructions", "Protocol", "Personnel", "SGA Map Site", and "Final Reports" (which is highlighted). The main content area shows a breadcrumb trail "Home > Final Reports" and a login form with fields for "User Name:" and "Password:" and a "Log In" button. Below the login form is the title "Stream Geomorphic Assessment - Final Reports" and a table of reports.

Basin Name	Year	River	Project	Report	Consultant/Author
Black, Barton, Clyde	12/29/2014	test	Aaron testing new FIT	test	Addison County River Watch Collaborative
Black, Barton, Clyde	12/19/2008	Barton River and Johns River	Barton River	River Corridor Plan for Barton and Johns River	North Woods Stewardship Center
Black, Barton, Clyde	3/01/2011	Black River	Black River	Black Corridor Plan FINALREPORT_March2011	North Woods Stewardship Center
Black, Barton, Clyde	4/01/2008	Clyde River	Clyde	Restoring Water Quality in the Lake Memphremagog Basin: Clyde River Phase I and II Stream Geomorphic Assessments	North Woods Stewardship Center
Deerfield	1/04/2006	Deerfield River	Deerfield - North	North Branch of Deerfield River Phase	Bear Creek

Stormwater & Sediment Inputs



Impaired Listing

The screenshot displays a GIS interface with a map of a residential area. A yellow line on the map represents an impaired river/stream, labeled "Trib #10 to Brewster". A popup window titled "Impaired River/Stream (303d List)" provides details about this water body. The popup text states: "This surface water, described as 'Trib #10 to Brewster River (1 Mile)' has the problem of 'Impacts from landfill leachate; bio community improving; monitoring to continue' and the pollutant(s), 'IRON', have caused it to not meet the [Vermont Water Quality Standards](#). The surface water is impaired where a total maximum daily load (TMDL) is required. The complete list of 2020 impaired (303d) waters is [here](#)." Below the text are two links: "View Additional Details" and "Add to Results".

Atlas Layers

Filter Layers...

- Watershed Management
- Water Quality Monitoring
 - Wetland Projects
 - Lakes and Ponds Permits
 - 303(d) List of Impaired Streams and Rivers
 - 303(d) List of Impaired Lakes and Ponds
 - Watersheds for 303(d) List
 - Priority Waters List (Streams and Rivers)
 - Priority Waters List (Lakes and Ponds)
- Outstanding Resource Waters

Impaired River/Stream (303d List)

This surface water, described as "Trib #10 to Brewster River (1 Mile)" has the problem of "Impacts from landfill leachate; bio community improving; monitoring to continue" and the pollutant(s), "IRON", have caused it to not meet the [Vermont Water Quality Standards](#). The surface water is impaired where a total maximum daily load (TMDL) is required. The complete list of 2020 impaired (303d) waters is [here](#).

[View Additional Details](#) | [Add to Results](#)

Map labels: Smuggler Notch Access Road Dam, Morses Mill, Trib #10 to Brewster

Monitoring Site Summary Data



Monitoring Site Summary - River/Stream

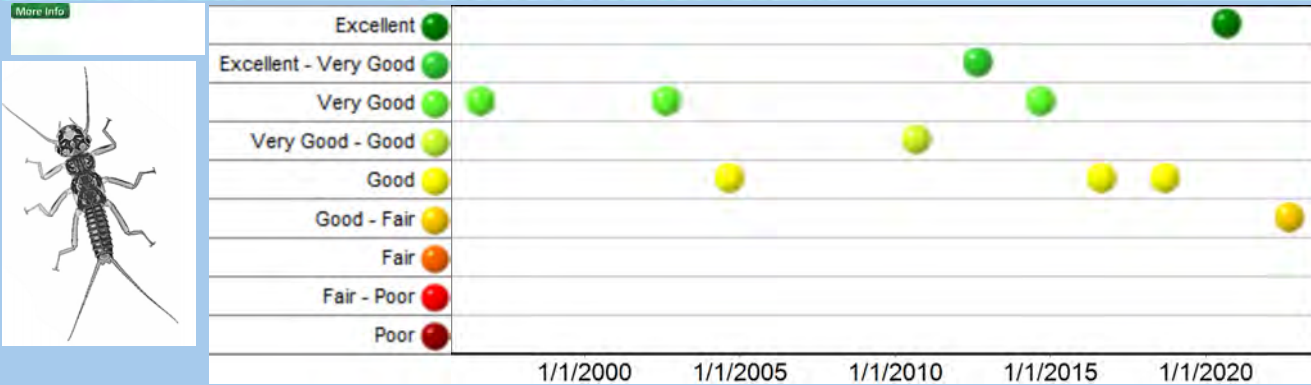
Brewster River

River Mile: 5.0

Located below Route 108 and Unnamed Brook at Smugglers Notch Ski area about 50m.
Cambridge, VT (44.58943, -72.79083)

Macroinvertebrate Assessment

Macroinvertebrate population Assessments are a measure of the biological integrity of the macroinvertebrate community and an indicator of the health of the aquatic biota. (For More Details)



Water Quality Measurements

Chemical and physical parameters provide a "snapshot" of current conditions and are used to detect changes in water quality and to make determinations about a waterbody and its watershed. (For More Details)

Characteristic	Description	Trend	Max	Mean	Min
Chloride (mg/L)	At elevated values mostly from deicing		13.4	13.4	13.4
Conductivity (umho/cm)			177.0	115.4	84.4

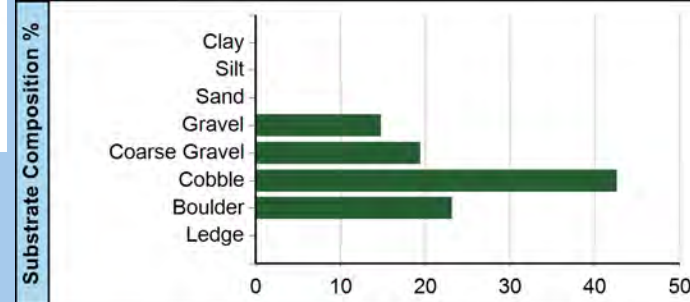


pH	Acidity		7.1	7.0	7.0
Phosphorus (ug/L)	Nutrient that may fuel algae blooms		5.0	5.0	5.0
Turbidity (NTU)	Measure of suspended sediment		0.5	0.4	0.5

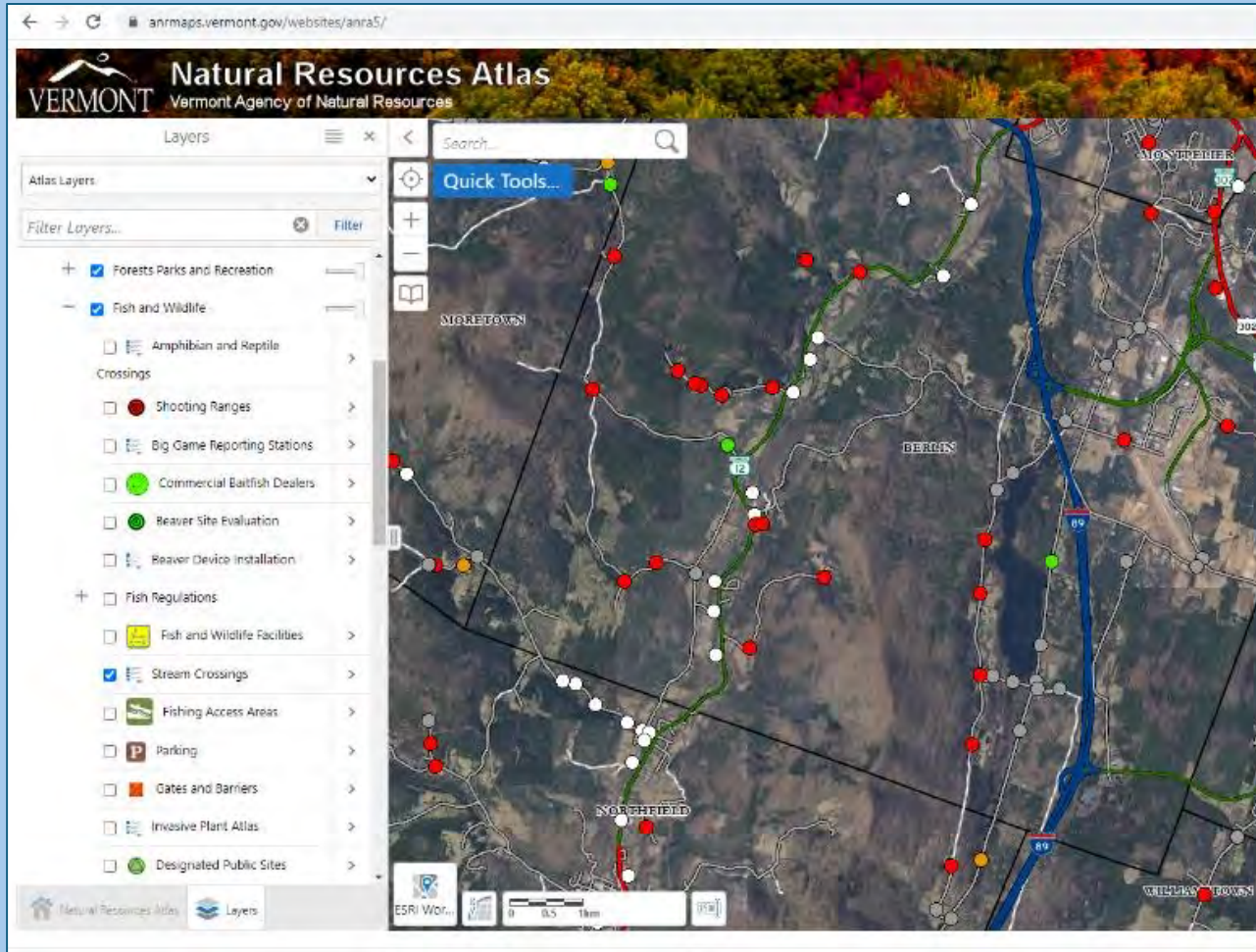
Habitat Observations

Observations on the physical condition of the waterbody can be useful in determining the habitat type present and if watershed stressors have degraded its ability to support a healthy community of aquatic biota. (For More Details)

Observation Date: 9/25/2022
Habitat Type: Riffle
Embeddedness Estimated %: 25
Canopy %: 80



ANR Bridge & Culvert Assessments



SGAID: 401213000512131

Assessment: 7/26/2006

Town: Northfield

Stream: Pond Brook

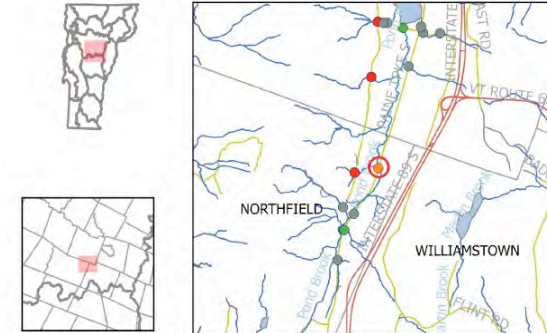
Latitude: 44.15657

Longitude: -72.59448

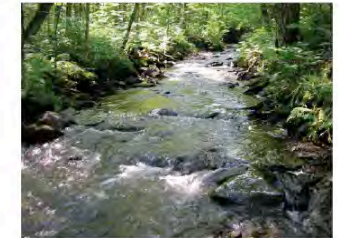
Location: Elevation - 1050' Last structure on Pond Brook before flowing into Berlin Pond

Road: BERLIN POND RD,

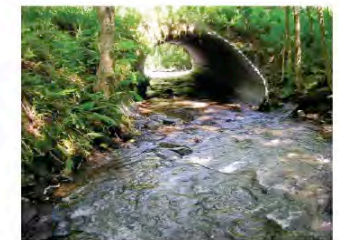
Surface: Gravel



Upstream



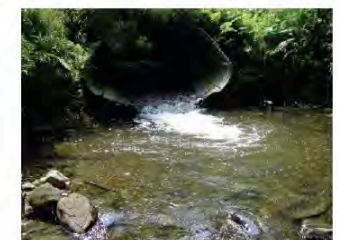
Inlet



Downstream



Outlet



Structure

Structure (overflow): Culvert (No)
 Material: Steel Corrugated
 Width: 11.3 ft
 Height: 7.5 ft
 Length: 57 ft
 Footers:

Stream

Structure skewed: Yes
 Floodplain filled: Entirely
 Avulsion (distance): Follow Road (500)
 U/S bed (bedrock): Cobble (No)
 Struct. bed (bedrock): Gravel ()
 D/S bed (bedrock): Gravel (No)

Aquatic Organism Passage

Coarse screen: Orange
 Outlet (drop): Free Fall (0.6 ft)
 Backwater length: ft
 Depth at outlet: 0.3 ft
 Number of culverts: 1
 Retrofit potential: HHM
 Pool present: Yes
 Pool depth (at outlet): ft
 Pool depth (max): ft
 Substrate throughout: No
 Inlet obstructions: None
 High Flow Stage: No

Geomorphic Compatibility

Coarse Screen (25 max): 19
 BFW: 14.2 ft (measured)
 % BFW: 79.3%
 U/S deposits (>50% BFH): None (No)
 D/S scour: Culvert
 D/S bank > U/S Bank: No
 Approach angle: Mild Bend
 Structure slope: Same
 Break in slope: No
 U/S erosion: None
 D/S erosion: Low
 U/S armoring: None
 D/S armoring: None
 Steep riffle: No

Stream Network

U/S Total: 8.9 mi
 U/S Net: 1.4 mi
 U/S, D/S Barriers: 1, 4
 U/S Mainstem: 0.7 mi
 Net: 1.4 mi

Comment: Squished culvert shapped like an arch culvert but all steel

USGS Historic Topo Maps

<https://livingatlas.arcgis.com/topomapexplorer/#maps=&loc=-72.79,44.59&LoD=13.62>

The screenshot displays the USGS Historical Topo Map Explorer web application. The interface includes a header with the USGS and Esri logos, a search bar, and a list of available map versions. The selected map is the 1927 revision of the 1927 edition, with a scale of 1:62,500. The map shows the Gallup River and Branch, with contour lines indicating elevation. Key features include a circled '108' and a red crosshair marking 'Morses Mill BM 1111'. The map is overlaid on a grid with letters 'N', 'S', 'M', and 'O'.

HISTORICAL TOPO MAP EXPLORER | USGS | esri

27 Topo Maps | Pinned Topo Map

YEARS: 1879 - 2006 | SCALES: 1:10k - 1:250k

- 1925 | 1925 rev | Mount Mansfield | 1:48,000 | Mount Mansfield, VT
- 1927 | 1927 rev | Mount Mansfield | 1:62,500 | Mount Mansfield, VT
- 1927 | 1927 rev | Mount Mansfield | 1:62,500 | Mount Mansfield, VT
- 1927 | 1931 rev | Mount Mansfield | 1:62,500 | Mount Mansfield, VT
- 1927 | 1940 rev | Mount Mansfield | 1:62,500 | Mount Mansfield, VT
- 1927 | 1945 rev | Mount Mansfield | 1:62,500 | Mount Mansfield, VT
- 1944 | 1944 rev | Mount Mansfield | 1:62,500 | Mount Mansfield, VT

Map features: Gallup River, Gallup Branch, Morses Mill BM 1111, Contour lines (1000, 1200, 1400, 1600, 1800, 2000, 2200, 2400), Grid letters (N, S, M, O), Circled '108', Scale bar.

- Data and Programs
- Resources
- Maps
- Partners
- About VCGI

1962 Aerial Imagery Now Available Statewide (non-georeferenced)

[Data Release](#)
November 4, 2019





Historic & Recent Imagery

<https://vcgi.vermont.gov/data-release/1962-aerial-imagery-now-available-statewide-non-georeferenced>

<https://hub.arcgis.com/documents/VCGI::vt-data-historic-dcc-1942-black-white-imagery-120000/about>

ArcGIS Hub Learn More Gallery Templates

DATA



Imagery

VCGI

VT Data - Historic DCC - 1942 Black & White Imagery (1:20,000)

Opendata VCGI
VT Center for Geographic Information

[View Document](#)

Summary

This resource is largely incomplete, but the tile index created from photographic indexes provides some information concerning hardcopy resources that may be obtainable from VSARA or the UVM Map Library. Images may or may not be georeferenced or available digitally; consult tiled download tool for information concerning availability and georeferenced status.

[\(Link to Metadata\)](#) DCC_1942 consists of scanned black-and-white aerial images from 1942 collected by the U.S. Soil Conservation Service.

Details

- Web Link**
Document Link
- Irregular**
Date Updated: August 22, 2024
- October 31, 2017**
Published Date
- 251 B**


VT LIDAR & 1 ft contours

<https://maps.vcgi.vermont.gov/lidarfinder/>

Vermont ANR - Natural Resources

Vermont Lidar Finder

→ ↻ 🔍 <https://maps.vcgi.vermont.gov/lidarfinder/>



Lidar Finder

Click on the map to find available lidar collections and derivatives available for download.

Quality Level 1 (2023)

The 2023 statewide lidar collection is still going through the quality control process. Preliminary data are available across the state in 3 blocks as cloud optimized geotiffs (COG). [Learn more about using COGs.](#)


[Access preliminary 2023 data.](#) Please note that preliminary data may contain errors.

Quality Level 2 (2013-2017)

[Statewide composite web services derived from QL2 \(2013-2017\) data are available.](#)

Contours (1-Foot)

1-foot contours derived from QL2 data are available to [download by tile](#) and [by municipality](#).



FFI Tool

FFI Functioning Floodplain Initiative

HOME EXPLORE DATA PROJECT PLANNING WATERSHED REPORTING USER MANUAL

Reconnecting Vermont's Rivers

The Vermont Functioning Floodplains Initiative is an effort by Vermont DEC and partners to identify and prioritize natural infrastructure projects through scoring, tracking, and mapping of floodplain and wetland functions as well as quantification of their social values. The goal is to achieve the highest possible water quality, ecological integrity, and flood resilience by targeting restoration and reconnection where it is most beneficial.

[EXPLORE MAP DATA](#) [BEGIN NEW PROJECT PLANNING](#)

FEATURE DATA [ADD TO PROJECT SCREENING](#)

Stream Connectivity
FFI ID: 177_17.01-
SGAT ID: 177_17.01-

Connectivity Details

Priority Projects

- Remove Medium Breached Dam
- Replace Bridge (Wbkt>100%)

LAYERS

FIND A PLACE

Cambridge, VT, USA