Lake Watershed Action Plans

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What is an LWAP?

- Lake Watershed Action Plans are assessment and planning tools
- Goal: Identify the greatest threats to the health of the lake coming from the shore
- Essentially answering two questions
  - What are the sources of nutrient pollution into the lake?
  - What can we do about them?
- The end product of this assessment is a plan that identifies problem areas, identifies possible fixes, and prioritizes them using a series of factors
- Results in a series of potentially implementable projects that increase the health of the lake

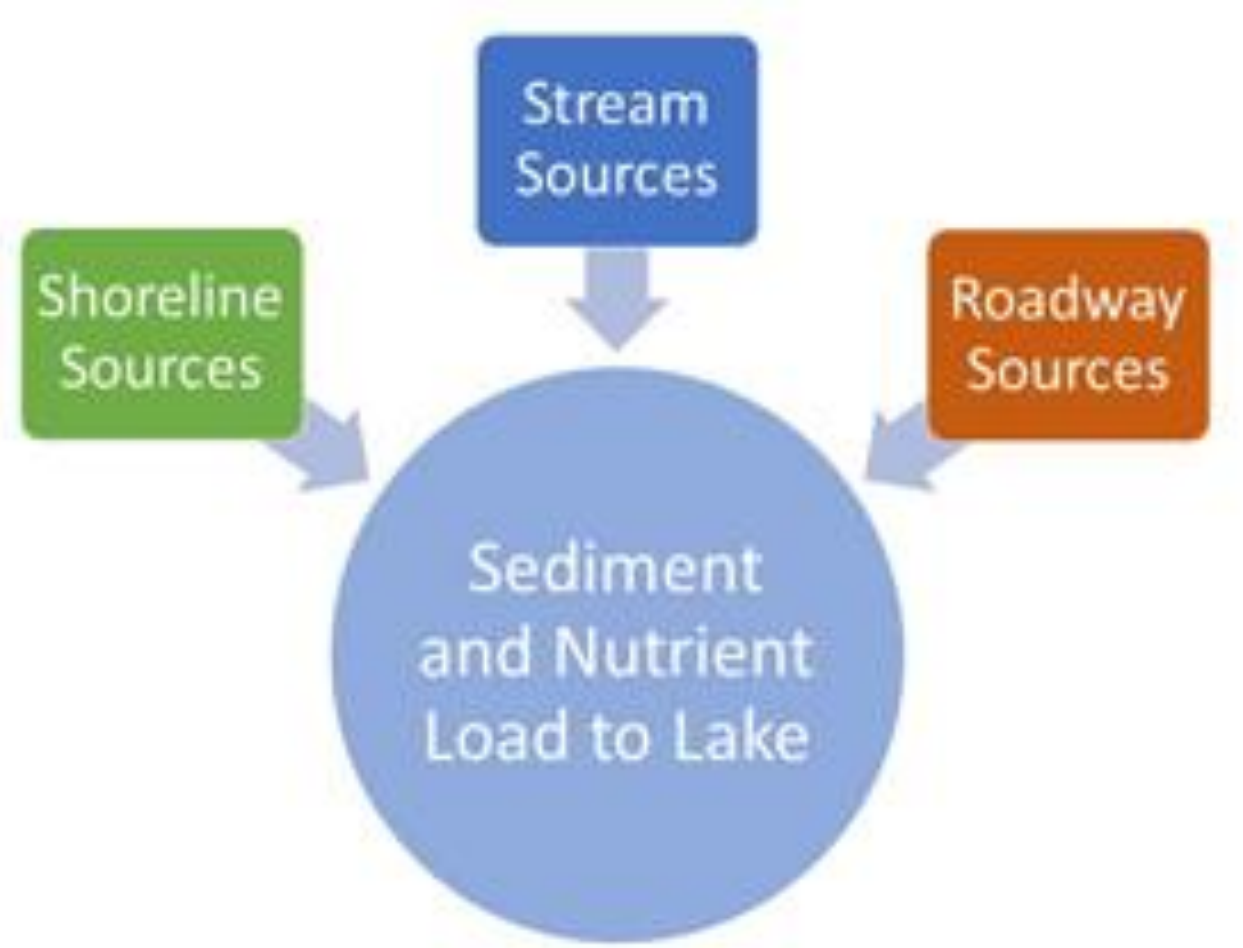
Why are we doing this?

- We know Vermont's lake shores are highly developed
- We know Vermont lake shores have poor development
  - Vermont lakes have been measured to be below the national average for the health of our shoreland by the EPA
- We know that development correlates strongly with pollution
- We know when a lake's natural vegetation is removed for development that wildlife habitat degrades, shores erode, and nutrient loading into lakes increases

A Whole Watershed Approach

- Looking at not just the water quality or just the shoreline but at the whole watershed
- This a holistic approach to water quality management
- And allows us to look for sources of nutrients beyond the lake itself

A Watershed is…
All the land area that drains to a common body of water, like streams and runoff from all the land uses in the area draining to Coles Pond, pictured below, in Jamaica, VT.



Three Key Areas of Assessment

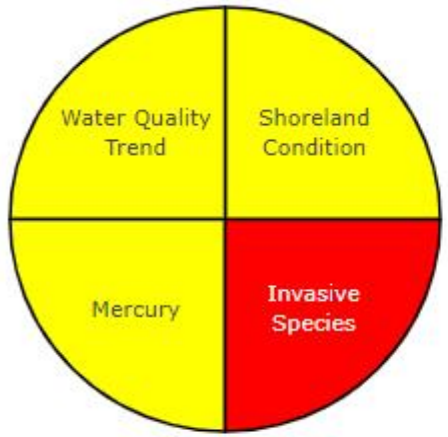
- **Shoreland**
  - Areas of erosion usually due to shoreland development practices that are close to the lake edge and remove vegetation
- **Roads**
  - Stormwater runoff from roadways can add pollution and sediment into the lake
  - Many roads were built right along lake shores and can be prone to undercutting and erosion
- **Streams**
  - Erosion further inland from the lake due to forestry, agricultural practices or other factors can cause sediments to enter the streams and flow into the lake

https://dec.vermont.gov/watershed/lakes-ponds/lakeshores-lake-wise/LWAP

How Are Locations Determined

- Significantly increasing phosphorus trend
- Disturbed watershed (we look at lake shore, hydrologically connected roads, and streams in our assessment)
- Active and engaged lake association or other user group
- All three funding sources that aren't self funded have geographical restrictions
  - LCBP only in LCB
  - CWSP only in their region
  - DEC Lakes and Ponds outside of Champlain and Memph

Scores | Water Quality Data | Lake Information



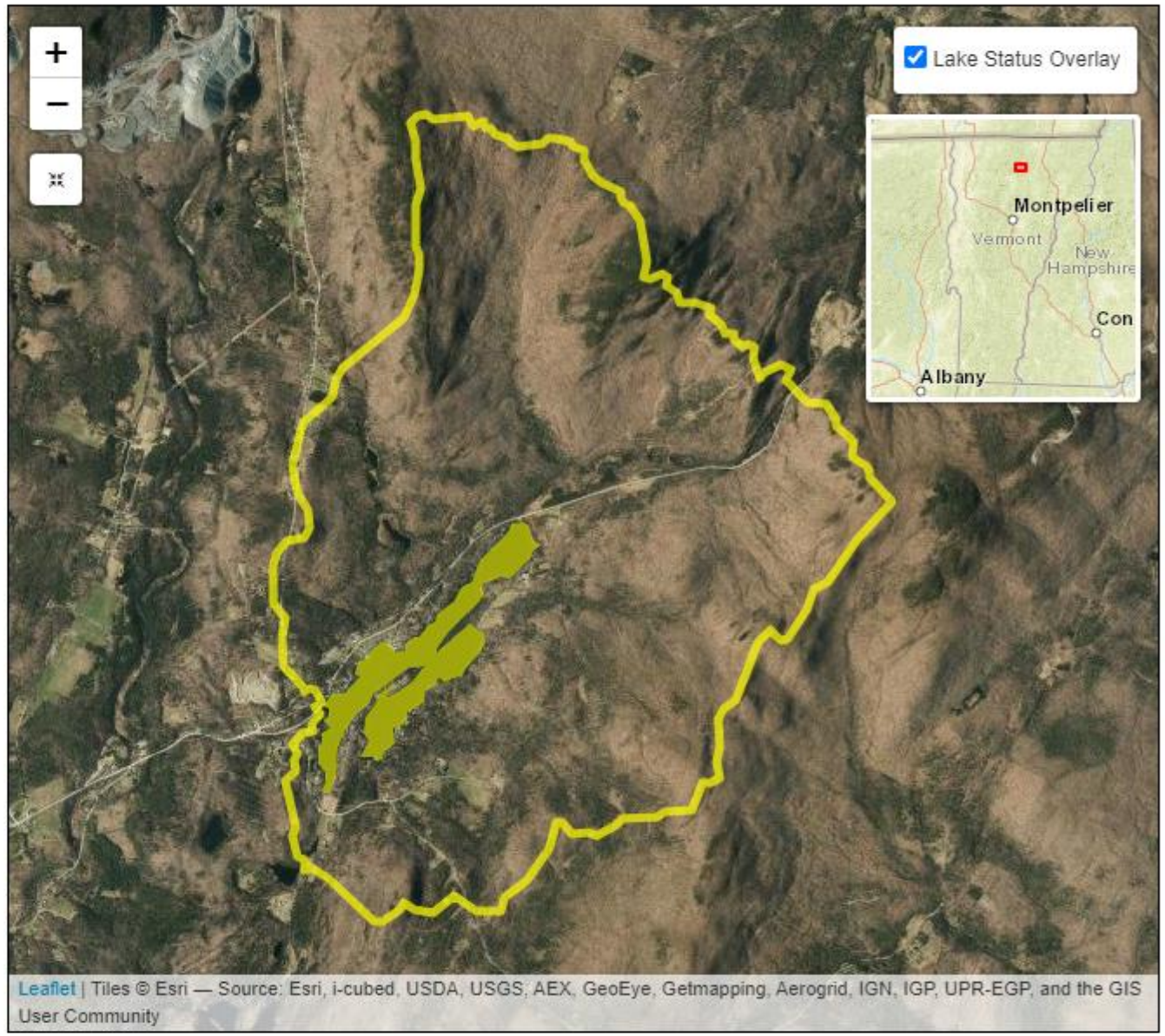
Watershed:	Moderately Disturbed
WQ Standards:	Stressed

WQ Standards Details

Stressed – Nutrients
Stressed – Organic Enrichment - DO
Stressed – Phosphorus

Color Scoring System

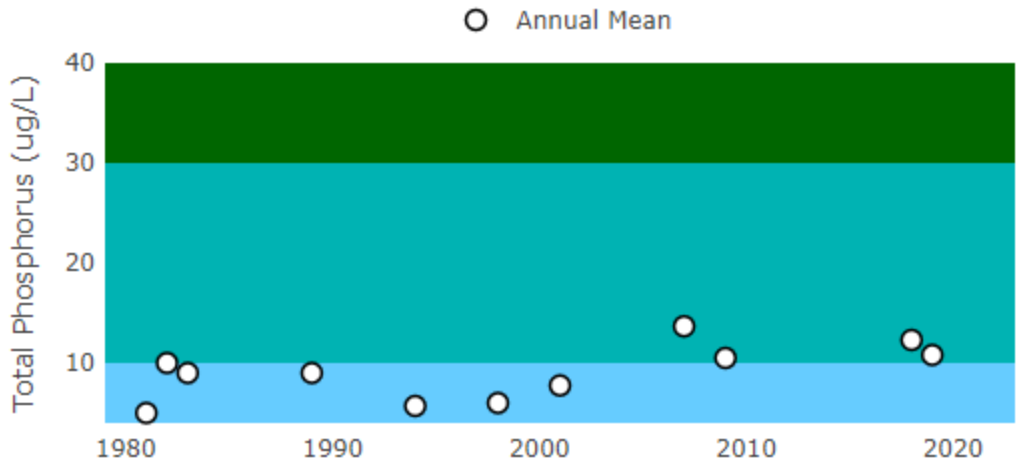
- Good Conditions
- Fair Conditions
- Poor Conditions
- Insufficient Data



[Learn How Lakes Are Scored]

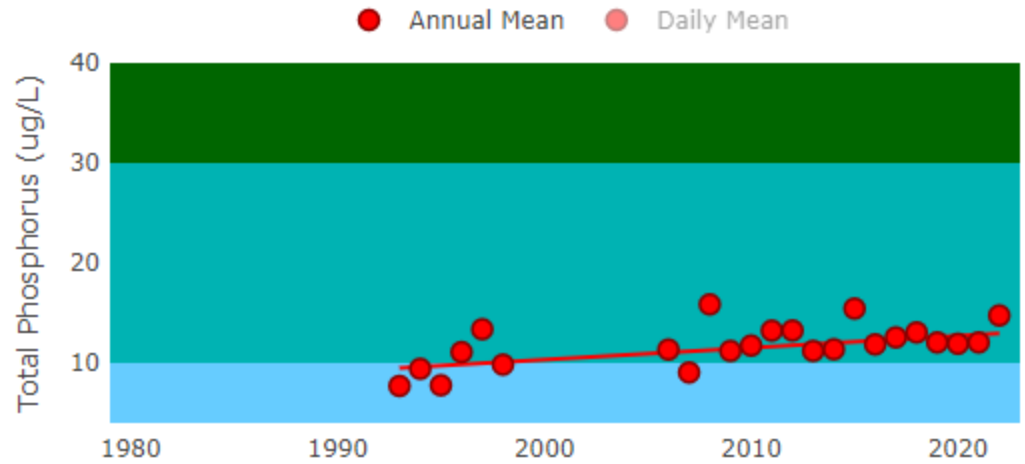
Spring Phosphorus

Trend: Stable (p-value = 0.0609)



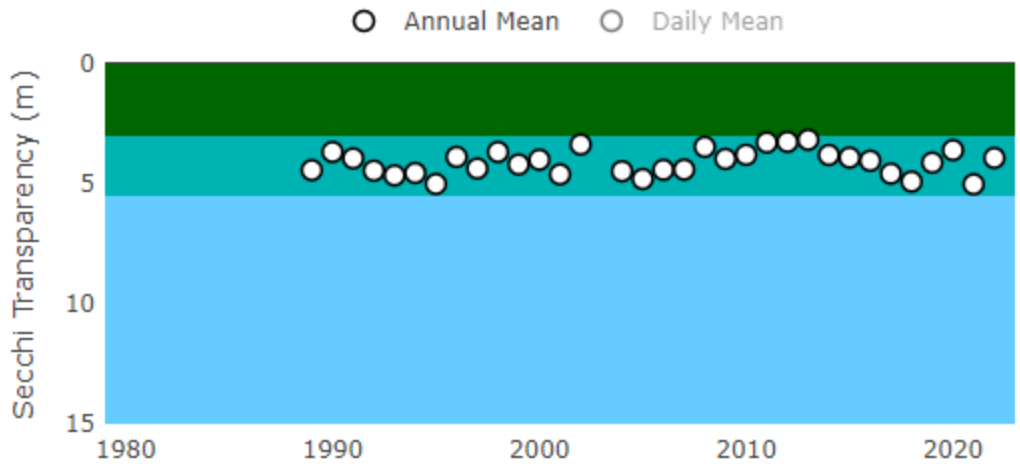
Summer Phosphorus

Trend: Highly Significantly Increasing (p-value = 0.0052)



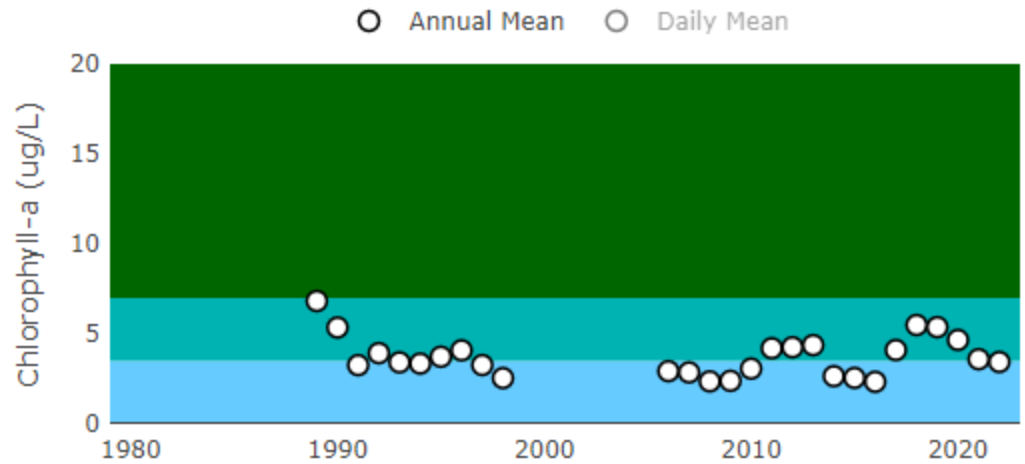
Summer Secchi

Trend: Stable (p-value = 0.2462)



Summer Chlorophyll-a

Trend: Stable (p-value = 0.9604)



Where have LWAPs been completed?

- Lake Eden (2019)
- Lake Elmore (2020)
- Lake Dunmore (2021)
- Maidstone Lake (2023)
- Lake Fairlee (2023)

Where are LWAPs Happening Now?

<u>Will Be Complete 2024</u>

- Caspian Lake
- Lake Willoughby
- Shadow Lake (Glover)
- Lake Morey
- Woodford Pond
- Halls Lake
- Echo/Seymour
- Lake Iroquois
- Lake St. Catherine
- Fairfield Pond
- Keeler Bay

<u>Beginning in 2024</u>

- Lake Bomoseen
- Little/Great Averill
- Miles Pond

Who Funds All This?

Four Sources of Funding have been used

- DEC Enhancement Money
  - Eden, Elmore, Maidstone, Fairlee, Willoughby, Morey, Shadow, Halls, Woodford, Echo/Seymour, Little/Great Averill, Miles Pond
- Lake Champlain Basin Fund
  - Fairfield Pond, Keeler Bay, Caspian, Iroquois, St. Catherine
- Self Funded
  - Lake Dunmore
- Clean Water Service Provider
  - Lake Bomoseen

Outcomes

- Prioritized list of projects that would address inputs of nutrients
- Projects are prioritized using a custom prioritization matrix
- A handful are selected to move to 30% design by the stakeholders

Prioritization

- Phosphorus Reduction
- Sediment retention
- Landowner Support
- Cost/Feasibility
- Co-Benefits
  - Chronic Problem Area
  - Reduce Flood Risk
  - Highly Visible/Educational
  - Enhance Habitat/Natural Communities

	ID Code	PROJECT NAME	P Removal (4pts)	Sediment Retention (4pts)	Drainage Area (1pts)	Impervious or Ag (3pts)	Connectivity to Surface Waters (3pts)	WQ BENEFITS (15pts)	Landowner Support (2pts)	Cost / Feasibility (6pts)	O&M / Project Longevity (2pts)	Co-Benefits (7pts)	TOTAL SCORE (32pts)	Description of Co-Benefits	Notes/ Comments	Cost Range	P Reduction lbs/yr (STP or P Calculator)	Sediment Load	Linear Feet	Drainage Area (acres)	Impervious / Ag / Developed Area (acres)	Proposed Treatment Area (sq ft) e.g. buffer, STP, wetland	treatment acres	CWIP COST	NOTES		
2	Ag_01	Disconnect drainage ditches and improve water storage in fields on former Lacross Farm	4	4	1	1	3	13	2	2	1	3	21	Proposed BMPs would address a chronic problem area, reduce peak flow, and promote agricultural land use compatibility	OCNRCD has relationship with landowner; interested in pursuing water quality projects.	$50-100k	21		2500	670	50.7 (18.7%)	175000	4.02	$ 53,981.86	compared to calcalation for grassed swales using Ag BMP SOP or riparian buffer using P calculator	Ag BMP SOP	0.: lo
3	Ag_02	Agricultural runoff from dairy barns, silage bunker, and manure pits near Wheeler Mountain rd	4	4	1	1	3	13	2	2	1	3	21	BMPs for this barnyard area would address a chronic problem area, improve BMP performance, and reduce peak flows in Roaring Brook.	Landowner is already engaged with OCNRCD on buffer restoration projects. Willing to consider other BMPs	$50-100k	15		500	4.5	2.3	20000	0.46	$ 96,333.20			
4	Ag_03	Farmyard and heavy use area best management practices on farm at end of Perkins Ln	3	3	1	2	3	12	0	3	1	2	18	BMPs for this barnyard area would improve BMP performance and reduce peak flows on this brook.	MWA & OCNRCD spoke with landowner; they are not currently interested in any proposed projects	$25-50k	5		1500	10	2.9	75000	1.72	$ 47,797.80			
5	Dam_01	Derelict dam removal on unnamed brook north of Hinton Hill Rd	3	4	1	0	3	11	0	1	1	2	15	Removal would address chronic problem area and reduce seasonal flooding issues/mitigate potential flood risks.	No contact made with the landowners. May not improve AOP due to downstream impoundment	>$100k	2.4		250	670	50.7 (18.7%)	10000	0.23	$ 150,000.00	0.25 acres restored. from low to moderate floodplain connectivity.		
6	Flpn_01	Stream & buffer restoration along five unnamed tributaries draining farm at end of Perkins Ln	4	4	1	1	2	12	0	4	1	3	20	Chronic problem area, reduces seasonal flood, and preserves ag land use	MWA & OCNRCD spoke with landowner; they are interested in grant programs and incentives to address	$10-25k	6.12		3000	90	33.5 (37.3%)	150000	3.44	$ 24,841.60	stacked BMPs. 2.8 acres buffer enhancement/restoration & 0.2 acres perennial gully/ stream crossing stabilization		
7	Flpn_02	Farm pond removal, stream and floodplain restoration on unnamed brook near Lacross Farm	4	2	1	1	3	11	1	1	1	4	18	area with regard to nutrient pollution and stream alteration. Restoration would mitigate seasonal flooding in gully, improve existing barnyard	Will require feasbility analysis to determine potential for full restoration.	>$100k	4		1600	61.8	30 (48.9%)	80000	1.84	$ 113,298.44	stacked BMPs. 1.1 acre dam removal/floodplain restoration. 0.5 acre buffer plantings. 0.35 acre gully stabilization		
8	Flpn_03	Stabilize mass wastings on unnamed tributary to Lake Willoughby north of Hinton Hill Rd	4	4	1	0	3	12	0	4	1	2	19	Stabilization would address chronic problem area and would reduce sediment loading attributed with peak flows.	Strategic woody additions will need permit approval, fish biologist support, and a risk assessment to determine potential	$10-20k	26		100	742	48.5 (6.5%)	3000	0.40	$ 16,000.00	Calcaulated using gully stabilization and SWA metrics		
9	LS_01	North Beach shoreland restoration	2	1	1	3	3	10	0	3	1	4	18	The site is subject to seasonal flooding, has high visibility and therefore educaitonal opportunities, and enhances lakeshore natural communities.	Will need extensive public comment period. WQ benefits are not enormous, but worth the public visibility	$25-50k	1.9		1200	4.5	3.75 (85%)	24000	0.55	$ 27,548.21			
															Perform lakewise assessment to												

- Eden Recreation Area owned by the town
- Two areas for improvement
  - Stream running through the park needs a buffer
  - Lakeshore lacks buffer
- Plant buffer along east side of stream, create infiltration steps for access
- Grass lined swales or infiltration basins

Project: SW-8	Problem Area Summary
Lake Segment	Lamoille River
Location	Eden Recreation Area
Land Ownership	Town of Eden
BMP Type	Surface Infiltration
Drainage Area/Impervious	0.4 / 0.15 acres
% Impervious	38
Estimated Project Cost	$ 10,700
P Efficiency ($/lb removed)	$ 22,061
Project Priority	Moderate

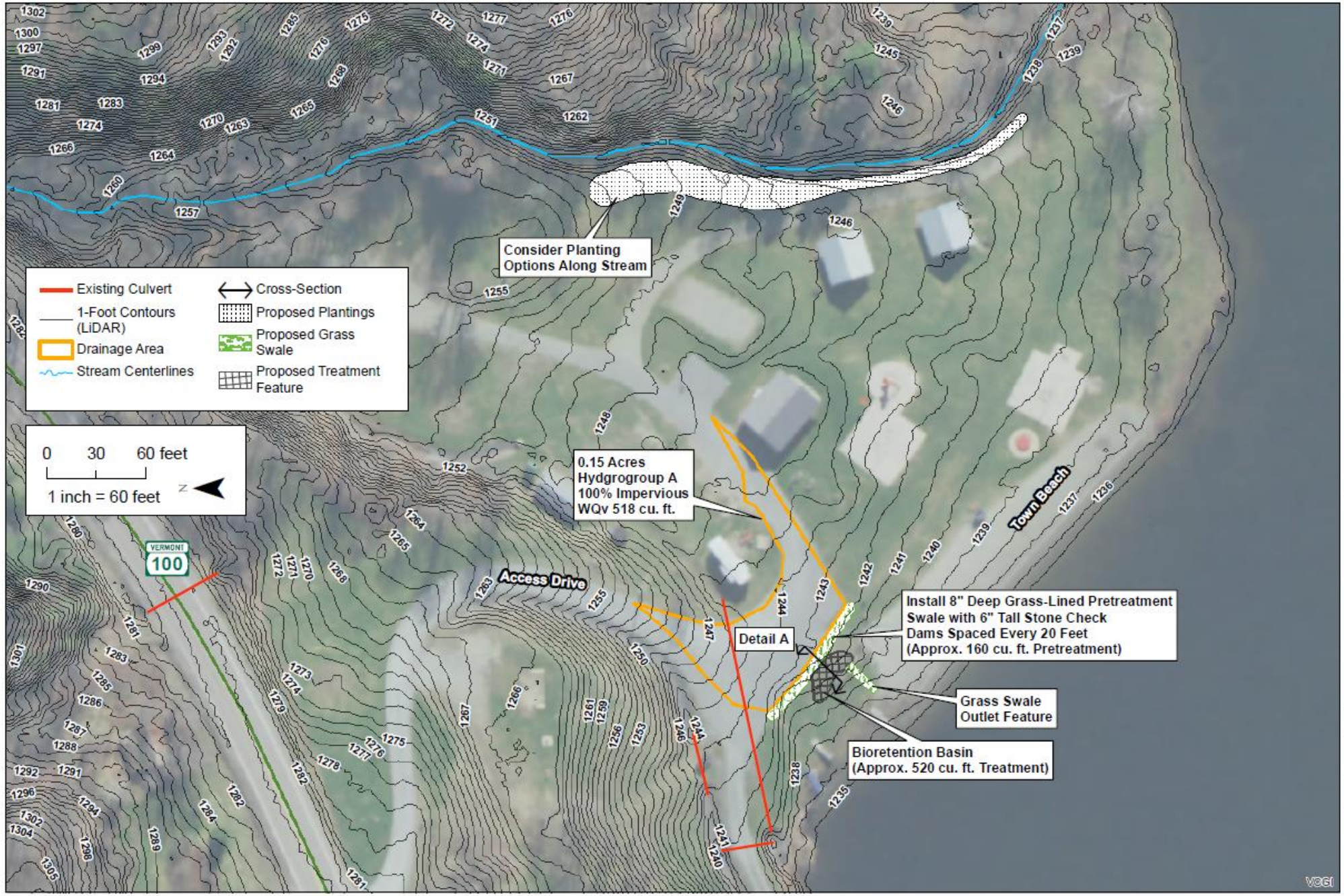
Site Description: The stream passing through the park is straightened and lined with rip-rap for approximately 400 feet, with no buffer on the west side adjacent to the gravel picnic area access. The lakeshore is also lacking a native buffer, with mowed lawn extending from the east side of the swimming area to the tributary outlet. Gravel roads and parking areas could be mitigated with enhanced infiltration on the property. See concept design in Appendix E for updated scope and cost opinion.

Photo 1: Tributary is straightened, armored, and lacks an adequate buffer.

Photo 2: Mowed lawn along the lakeshore with potential space for an infiltration feature.

BMP Description: Plant a buffer along the east side of the stream. Install infiltration steps to provide an access to the stream. Consider moving the picnic area road to the west side of the pavilions. The tributary channel could be naturalized with a flood bench, natural substrate, and wood habitat features. Implement "no mow" areas along the hill on the east side of the property, around trees, and near lakeshore if possible. Install grass-lined swales or infiltration basins to enhance infiltration on the property.

BMP Volume (cf)	P Load (lbs)	P Reduction (lbs)	Sed Reduction	%WQv/CPv	Gully/Erosion	Maintenance
600	0.51*	0.49	Low	High	None	Mod



Fitzgerald Environmental Associates, LLC.
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www.fitzgeraldenvironmental.com

Notes
- Imagery is from 2018.
- Contours generated from 2014 0.7-meter LiDAR digital elevation model.

Lake Eden Watershed Action Plan
30% Conceptual Design
Eden Recreation Area
Eden, VT

EHB	EPF
Map By	Checked By

1" = 60'
Scale

December 18, 2019
Date

SW-8
SHEET 1
SHEET NO.


PARKING

Who Performs the Work

- Projects are put out to bid depending on the funding source
- Contracts or grants are awarded to:
  - Natural Resource Conservation Districts
  - Environmental Contracting Firms
  - Other watershed groups

  - Technical guidance and oversight is provided by DEC

Questions?

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