Lake Carmi Watershed Stream Assessments

Summer 2009

Prepared by

Carmi Consulting

For

Franklin Watershed Committee

Table of Contents

Map

Intro

Stream Assessments

Bridge and Culverts

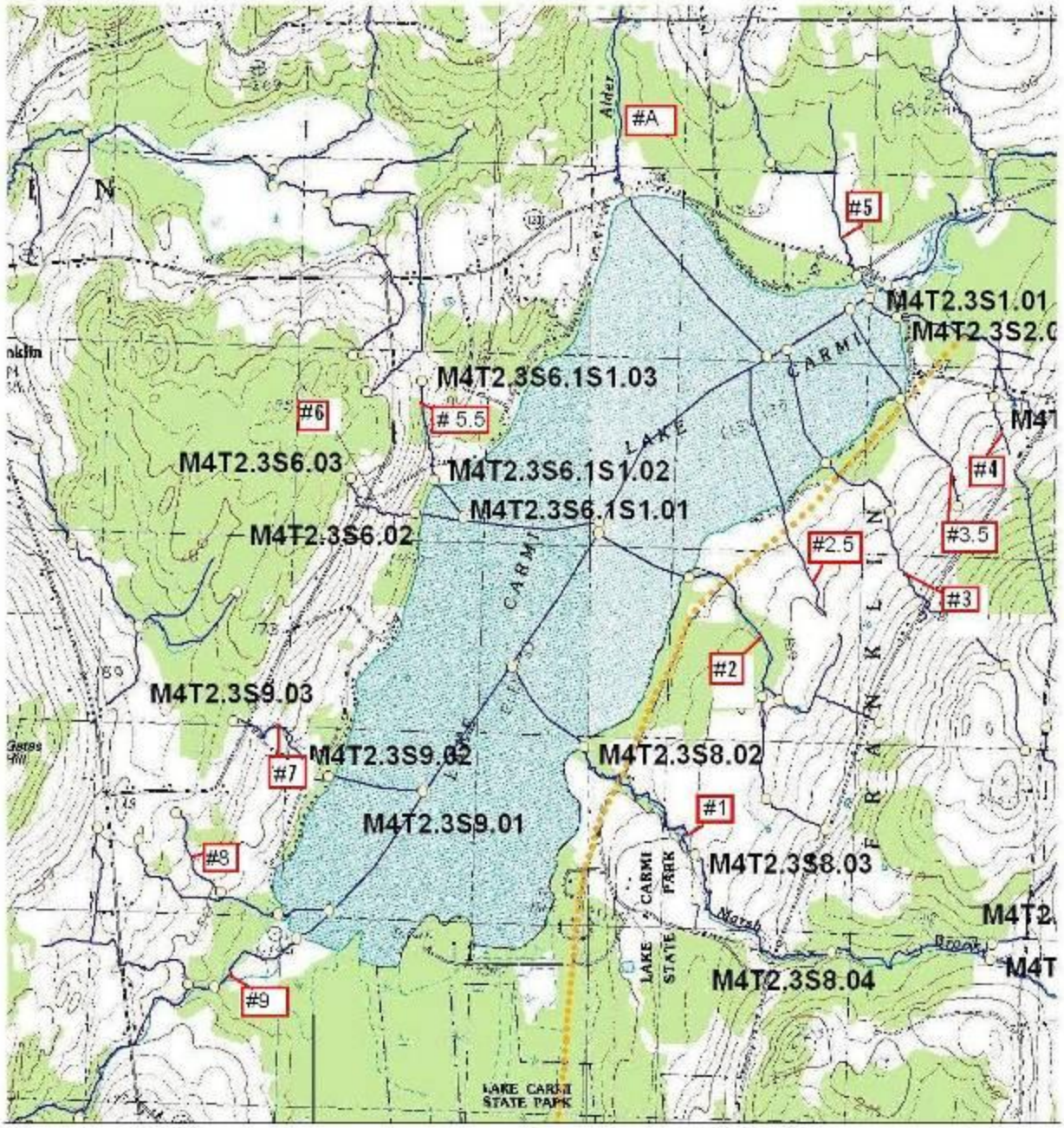
Common Problems

High Priority Structures

Medium Priority Structures

Low Priority Structures

*Cover shot of bridge over Marsh Brook constructed by the Cold Hollow Career Center



#1=Marsh Brook #2=No Name #2.5=No Name #3= No Name #3.5= No Name #4= Dewing Brook? #5= Dickie Brook #A= Alder Run #5.5= Gator Brook? #6 Aldiho Brook? #7= Westcott Brook #8= No Name #9= No Name

Pike River Watershed
Franklin County, VT

Intro

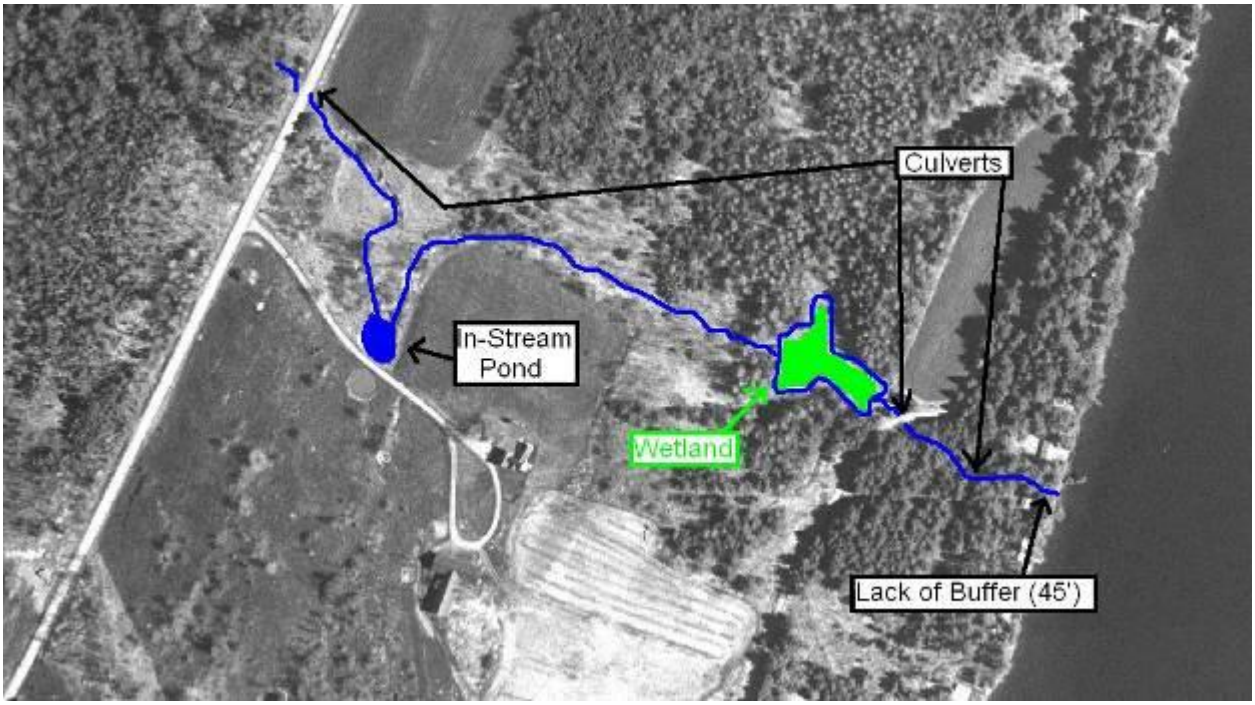
In the Fall of 2008, Lake Carmi received funding via a EPA 319 grant to reduce phosphorus in accordance with the Lake Carmi TMDL (total maximum daily load) report published in the summer of 2008. A portion of these funds were used to gather the information for this report.

According to estimates from the Lake Carmi TMDL, 1,421 kg/yr of the total 1,535 kg/yr of phosphorus that enters Lake Carmi each year does so via its tributaries. Stream Assessments are an excellent way to assess this calculation and to develop projects that will help reduce this figure in the future. The target phosphorus load for Lake Carmi each year is around 1,027 kg/yr.

Due to the relatively small size of Lake Carmi's watershed and tributaries, carrying out full geomorphic assessments in the watershed can be both expensive and time consuming. Therefore, stream walks were identified in the TMDL as an avenue for identifying new potential projects for the watershed.

Letters were sent out to landowners informing them the assessment team would be on their property in May 2009 and many landowners did not want to participate in the process. During this round of funding one stream was assessed in its entirety along with 47 crossing structures. Bridge and culvert assessments are a great way to look at the entire watershed and coincide with the states phase one geomorphic assessment protocols.

Stream Assessment



Trib 7

Trib 7 begins just upstream of the Riley Road. It eventually meanders its way down to an in-stream pond. After leaving the pond the trib meanders its way further down to an in-stream wetland complex. Downstream of the wetland complex, the trib goes under Westcott Shore Road (see b and c assessments) and winds its way another 300' or so before entering another culvert. The trib then runs between two camps and into the lake.

On the south side of the trib, before it enters the lake there is a 45' section of no buffer. This is the only such occurrence on the whole trib.

The main problem areas for this trib are where the trib and roads intersect. Poorly placed and installed culverts plague this brook and it is par for the rest of the watershed.

Bridge and Culvert Assessments

Walking on the dirt roads that surround the lake one may not see an immediate problem with the culverts. If you took a tour with someone pointing out everything that could be fixed or a potential problem you most definitely would be surprised. First of all 75% of the culverts assessed had a scour pool on the outlet end. 75% of the scour pools are a result of the culvert at a lower grade than the grade of the slope it is draining. A lower grade means the water leaving the culvert is dropping/freefalling out of the culvert. Scour pools vary in size and depth, but all of the soil that was in the pool is now in the lake. Also at first glance someone would think what a nice little habitat for minnows, frogs and other small amphibians. In reality a culvert that creates a scour pool because it is a lower grade then natural is the last place these animals can go, they can no longer travel upstream. If these culverts were at grade they would continue upstream, making the overall habitat of the lake more natural. Therefore fixing the culverts so they are at grade not only would reduce the sediment by slowing the flow of water and reducing scour pools but it would allow a more natural habitat for lake wildlife.

Of the 46 bridges and culverts assessed, there were 43 culverts and only 3 bridges. Culverts, also known as the "watershed killer" and their chronic installation mistakes can cause a wide range of problems. Stream channels can easily be de-stabilized for great distances when the stream channel gradient is disrupted. When culverts are installed at angles not equal to the stream's equilibrium slope, they will create depositional and erosional reaches both up-stream and downstream of the culverts.

If culverts are not properly installed, the result will be headward erosion or degrading of the stream upstream and an aggraded steeper slope downstream. Erosion can be seen in the form of pools below almost every single culvert assessed in the Lake Carmi watershed. Channel bed erosion also was common where discharges are increased relative to the increased relation to the sediment transport.

Upstream impacts of culverts can be seen during and after storms. In a high flow event culverts will act as a dam and water will back up behind it. If the culvert does not have a header (like 90% of the culverts in the watershed), severe erosion can and does occur. This is very noticeable while driving around the watershed and examining the many culverts.

Common Problems Associated with Culverts

Culverts too low or too high

- -Sediment fills entrance to culvert
- -Plunge pool forms downstream of culvert which can erode up hill and undercut culvert and road
- -Down stream erosion caused by faster velocities and grade changes

Unmaintained Culverts (lacking header and footer)

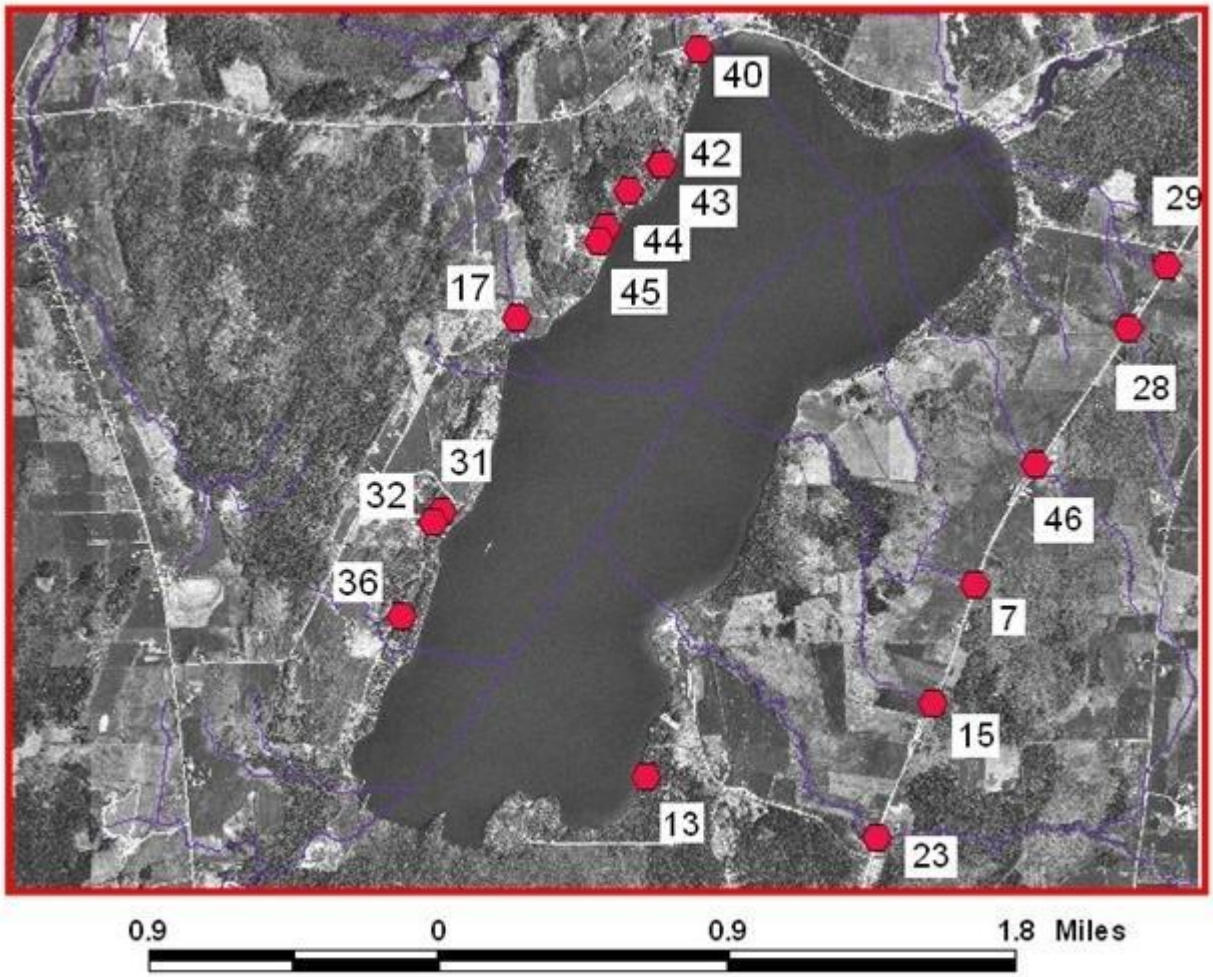
- -Storm flows back up and cause erosion

Stream Meander Change/ Wrong Alignment

- -Stream erodes culvert
- -Erosive action displaces culvert

For the purpose of this report, culverts have been categorized as high, medium and low priority. This will aid in the maintenance and replacement prioritization.

High Priority Crossing Structures



All data in Feet unless noted

Name	Trib	Size	Length	Type	Perched	Header	Footer	Pool Downstream
7	2	2	75	Steel	2	X		X
13	unnamed	1.5	20	Steel	0.5			X
15	2	Culvert	75	Steel	2			X
17	5.5	3	50	Steel	2			X
23	1	Culvert	75	Steel	2			X
28	4	Culvert	75	Steel	2			X
29	4	Culvert	75	Steel	2			X
29	4	2.5	75	Steel	3			X
31	unnamed	1.5	20	Concrete	0.2			X
36	7	2	26	Concrete	1			X
40	unnamed	1	20	Plastic	0.4			X
41	unnamed	2	35	Plastic	0		X	
42	unnamed	1.5	99	Plastic	1	X		X
44	unnamed	1	17	Steel	1			X
44	unnamed	1.8	2	plastic	1			X
45	unnamed	1.2	24	plastic	1.2			
46	3	2	75	Steel	2	X		X

Westcott Shore Road Structures

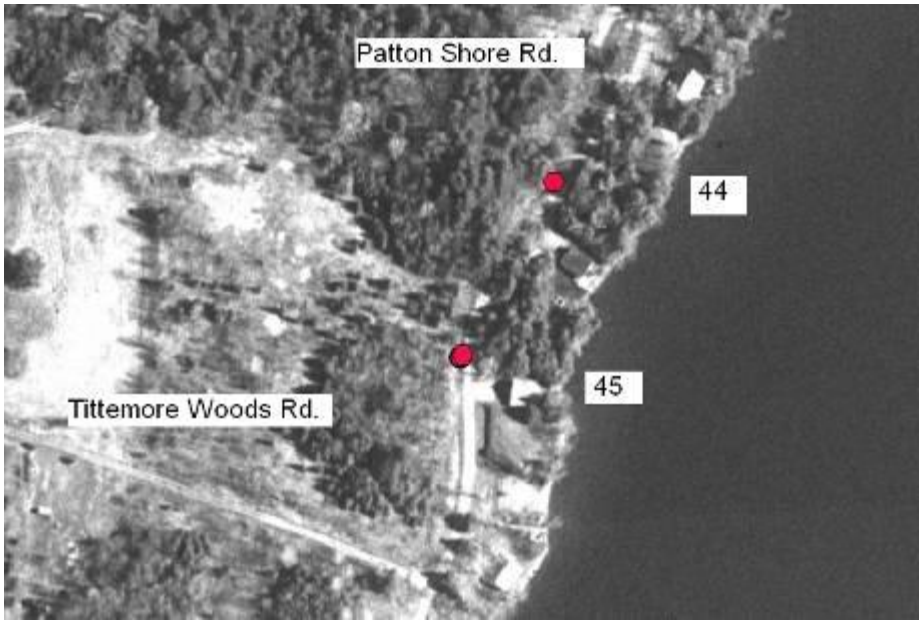
Structure #36 is located on trib #7 on Westcott Shore Road. There is a sizeable scour pool below and erosion happening both upstream and downstream of the culvert. This site would be an excellent candidate for a bridge or headers and footers, or a culvert extension.

Structures 31 and 32 are also located on Westcott Shore Road and drain a 200’ drainage ditch. Hydric soils are located upstream of this ditch and water will often gather, due to the impervious road downstream. As shown in the picture, much road sediment is lost into this ditch each year. Possible remediation techniques include stone lining, tiling, headers, footers, and culvert extensions.

Sandy Bay Road Structures

Structure 17 runs under the Black Woods Road by Sandy Bay. This culvert is perched and has a sizeable scour pool below. If this culvert were replaced by a bridge this trib would run uninterrupted all the way to the lake. * Much road dirt runs down this road and enters the channel at this spot.

Patton Shore Road Structures



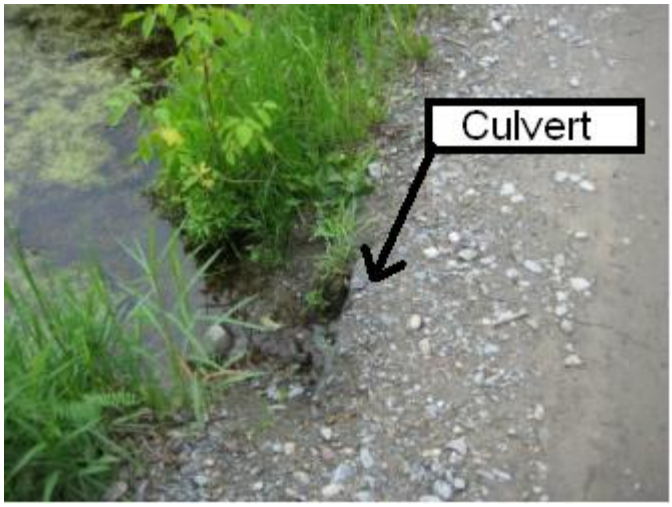
Structure 44 on Patton Shore Road has great potential for a bridge. If a bridge was installed, this trib would also run uninterrupted from its headwaters all the way to the lake. This spot would benefit greatly from a bridge, header, footer or a culvert extension. Attention is needed as soon as possible.

Structure 45 on Patton Shore Road was recently worked on and the downstream channel was ditched from the road to the lake. Upstream there is a 150’ ditch that runs along the road. Culvert needs header and footer. The ditch also needs vegetation and or stone lining.

In between structures 41 and 42 there is a deep pool. Structure 41 runs under Patton Shore Road while 42 runs under a parking lot/ shed. For some reason there is a ten foot gap between the two culverts causing unnecessary erosion. Possible fixes include filling the pool with stone and extending the upstream culvert to flow directly into the lower one.

Structure 43 on Patton Shore Road would benefit greatly from the installation of a header and footer. Much road sediment is lost at this location.

Structure 40 is located at the beginning of Patton Shore Road. Upstream of the culvert and bordering the road there is a wetland complex. Further planning is needed at this site. It is a similar site to structure31. If nothing else the culvert should be extended further into the wetland, to not pick up so much sediment. Not much information was found regarding dirt roads and adjacent wetlands.



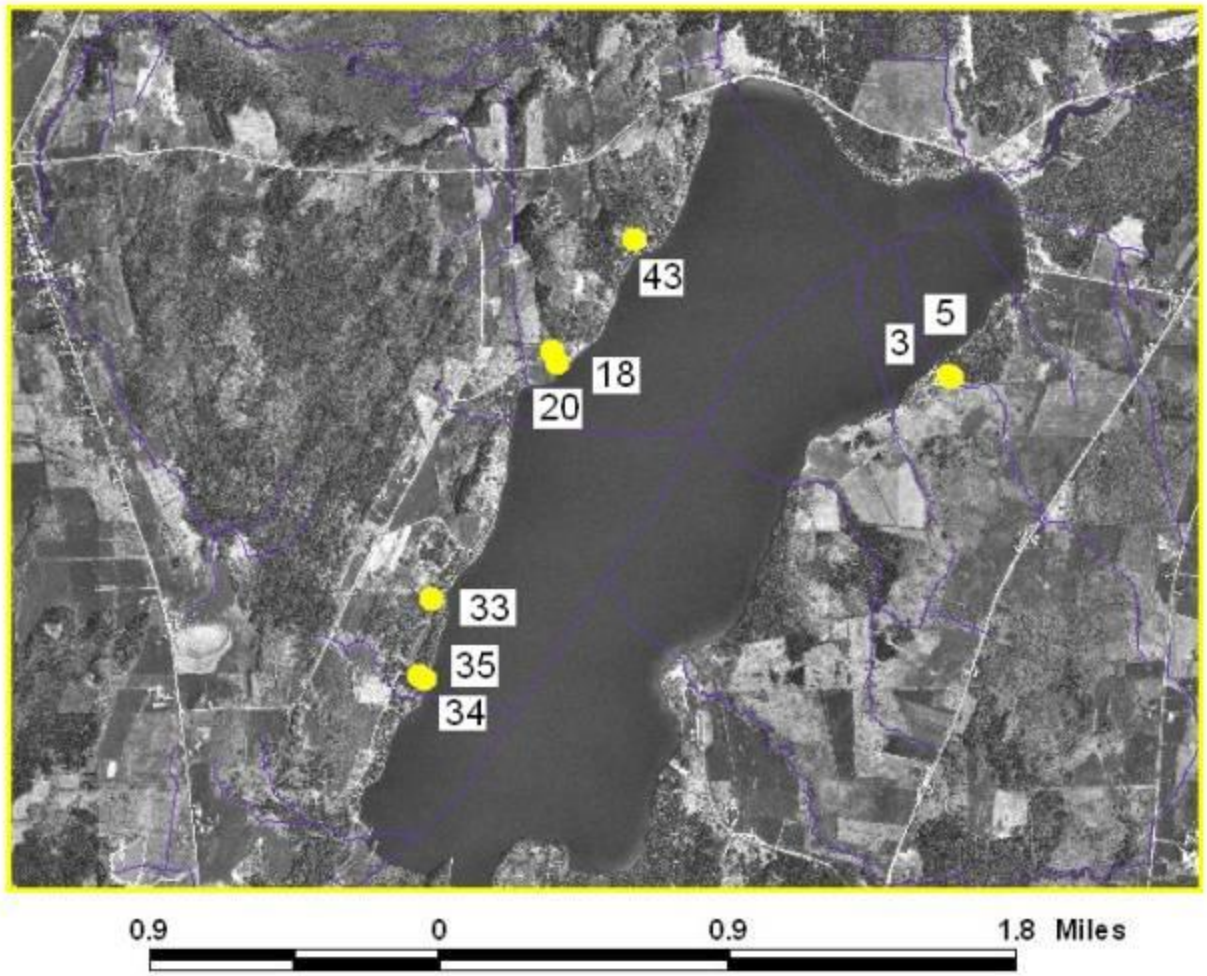
State Park Road Structures

Structures 29, 28, 46, 7, 15 and 23 are all plagued by a very similar fate. When the State Park Road was constructed lengthy culverts were installed underneath the road bed. Today at the output of these culverts very large scour pools can be observed. They are all perched between two to four feet. The largest pool is on the Marsh Brook.

State Park Structures

Structure 13 is located in the State Park. This poorly placed culvert is adding loads of unnecessary sediment into the brook. This culvert is locate only a few hundred feet from the lake and is in dire need of some sort of fix. If a small foot bridge can not installed, some other sort of remediation is necessary.

Medium Priority Crossing Structures

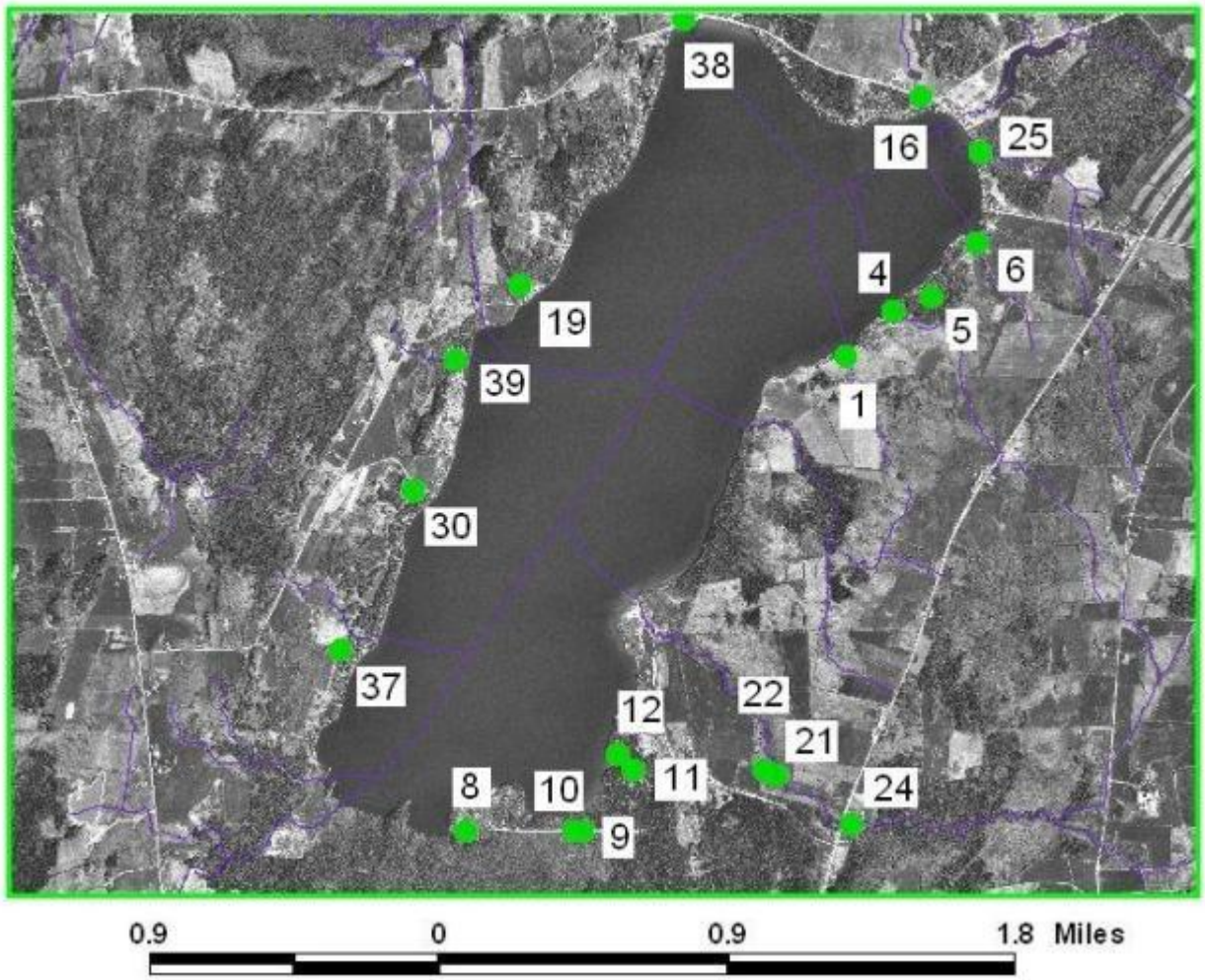


Name	Trib	Size	Length (feet)	Type	Perched Output	Header	Footer	Pool
20	5.5	1.5'	20	Steel	0.5'			X
33	unnamed	2'	21	Steel	0.2'			X
34	7	2'	10	Steel	1'		X	X
35	7	2'	10	Steel	.5'			X

20

33

Low Priority Crossing Structures



Name	Trib	Size	Length (feet)	Type	Perched Output	Header	Footer	Pool
1	2	2.5	16	Concrete	0.5'	X	X	X
2	2.5	2'	20	Steel	0.2'	X	X	X
8	unnamed							
9	unnamed							
10	unnamed							
11	unnamed							
12	unnamed	3'	40	Steel	0.1'			X
16	5	4'x 8'	40	Box Culvert		X	X	X
19	unnamed			Steel				
21	1	Culvert		Steel				
22	1	Bridge						X
24	1	Bridge						
28	Alder	two 4'		Steel				
30	unnamed	1'	24	Steel	.5'			
32	unnamed	1'	19	Steel	0			
37	unnamed	1'	20	Steel	0.8'			
26	4	Box Culvert		Concrete				X
27	4	Culvert						X
25	4	Bridge		Concrete				
4	3		125	Steel				
14	unnamed							
6	3	2'	50	Concrete				X
39	6	2.5'	50	Steel	0.2'			X