Gregg Lake Action Plan

1. Water Quality Goal

Since 2004, Gregg Lake has been included on the 303(d) New Hampshire List of Impaired Waters as impaired for supporting Aquatic Life Integrity due to elevated phosphorus and chlorophyll-*a* and low dissolved oxygen levels. At our July 12, 2019, Water Quality Advisory Committee Meeting, the Gregg Lake Watershed Management Plan Committee (GLWMPC) set a goal of removing Gregg Lake from the impaired list by improving the water quality to meet a seasonal average chlorophyll-*a* concentration of 3.0 µg/L or less and reduce the extent and duration of low oxygen in bottom waters (*FBE, Water Quality Goal Memorandum, 2019*). This goal represents a 23% reduction in the current chlorophyll-*a* concentration.

2. Pollutant Load Reductions Needed

Since chlorophyll-*a* is the response indicator for the plant nutrient phosphorus, in order to reduce chlorophyll-*a* levels, in-lake phosphorus levels must be reduced. Although Gregg Lake does not show a strong direct correlation between in-lake total phosphorus and chlorophyll-*a* levels, the straight-forward approach is to set a goal of cutting back lake phosphorus loading by 23% to achieve a 23% reduction in chlorophyll-*a*.

Based on current zoning standards, our consultants, FB Environmental Associates, completed a build-out analysis to forecast the effects of future development in the watershed on the water quality in Gregg Lake (*FBE, Gregg Lake Watershed Build-out Analysis, 2019*). FBE used the build-out analysis, along with data on watershed land cover, terrain, soils, precipitation, septic systems and water quality, to model past, current and future phosphorus loading from different sources (*FBE, Gregg Lake Watershed Lake Loading Response Model, 2019*). Thus, we can take anticipated future development into account as we make a long-term plan to preserve and improve Gregg Lake's water quality.

A watershed management plan (WMP) is intended to be a ten-year plan to restore and preserve water quality. To effect a 23% reduction in phosphorus loading over ten years, with concomitant reductions in sediment and nitrogen loading, FBE calculated that we would need to reduce phosphorus (TP) loading by a total of 44 lb/yr, combined with an offset of 15 lb/yr through conservation easements and adoption of regulations to encourage low-impact development. Calculations were performed with 2028 as the endpoint for the WMP, and interim goals were set for 2020 and 2023 (Fig. 2.1).

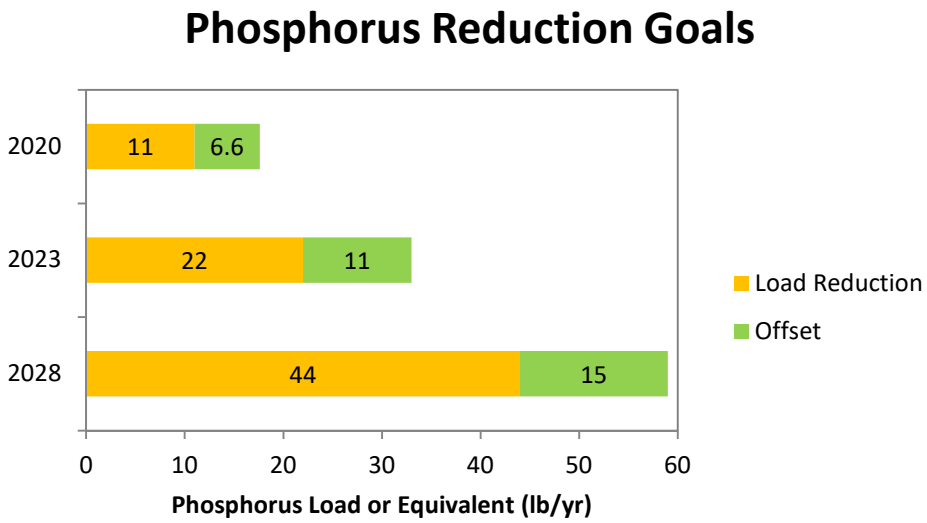

Figure 2.1. *Cumulative phosphorus load reduction goals over the course of the ten-year WMP, with interim goals in 2020 and 2023. Goals were set to reduce amounts of total phosphorus entering Gregg Lake (Load Reduction) and to offset phosphorus loading through conservation easements and zoning and ordinance changes to encourage low-impact development (Offset).*

3. Identification of Watershed Pollutant Sources

In 2018, the GLWMPC and FBE identified 31 areas in the Gregg Lake watershed that were likely sources of in-lake phosphorus, sediment and nitrogen through stormwater runoff and erosion (*FBE, Gregg Lake BMP Matrix 01102019, 2019*). Each site was documented with photographs. FBE evaluated these erosion "hotspots" to quantify the amounts of pollutants coming from each source (Table 3.1), and assumed the existence of other sites not visible from public roads.

Table 3.1. *Estimated pollution loading in Gregg Lake from 31 erosion hotspots identified in Summer–Fall 2018, along with estimated remediation costs. Data were sorted by phosphorus load, with loads over 1.5 lb/yr considered "high impact" (red shading) and loads between 0.1 and 1.5 lb/yr considered "medium impact" (orange shading). Sites were identified by the GLWMPC and FBE, and pollutant loading and remediation costs were calculated by FBE (FBE, Gregg Lake BMP Matrix 01102019, 2019). Site ID numbers correlate with locations indicated in Figures 3.2 & 3.3. Abbreviations: TSS, total suspended solids; TP, Total Phosphorus; TN, Total Nitrogen; BC, Brimstone Corner; GL, Gregg Lake; WBP, White Birch Point; HH, Holt Hill; HB, Hattie Brown*

SITE ID	TSS (lb/yr)	TP (lb/yr)	TN (lb/yr)	Est. Low Cost	Est. High Cost	Avg. Est. Cost	Cost Per lb TP	Site Description
01	1175	2.5	7.9	$15,000	$25,000	$20,000	$7,969	BC Rd near Craig Rd
14	5000	2.1	4.3	$50,000	$75,000	$62,500	$29,412	GL Rd undercut
04	4000	1.7	3.4	$50,000	$75,000	$62,500	$36,765	Causeway shoulder
07	3960	1.7	3.4	$10,000	$20,000	$15,000	$8,913	Private Beach
12	741	1.6	7.7	$10,000	$30,000	$20,000	$12,282	Private Beach
19	74	1.3	5.5	$75,000	$100,000	$87,500	$68,996	Antrim Public beach
11	630	1.2	3.6	$30,000	$50,000	$40,000	$33,145	WBP Rd
09	564	1.1	2.5	$30,000	$40,000	$35,000	$31,483	HH Rd runoff at private beach
23	2571	1.1	2.2	$15,000	$30,000	$22,500	$20,590	Private beach
30	785	1.0	2.1	$15,000	$30,000	$22,500	$23,461	BC Rd 4
18	465	0.8	5.6	$20,000	$30,000	$25,000	$31,181	Private beach
13	379	0.8	4.4	$15,000	$25,000	$20,000	$25,947	Timber cut
08	1571	0.7	1.3	$10,000	$20,000	$15,000	$22,460	Private beach
10	291	0.7	2.2	$10,000	$30,000	$20,000	$30,414	GL Rd-GL Dr drainage
28	529	0.6	1.5	$10,000	$20,000	$15,000	$23,280	BC Rd 1
27	526	0.6	1.4	$10,000	$20,000	$15,000	$23,372	BC Rd 2
29	524	0.6	1.4	$10,000	$20,000	$15,000	$23,435	BC Rd 3
03	1500	0.6	1.3	$20,000	$30,000	$25,000	$39,216	GL Rd bridge erosion
05	133	0.5	1.8	$30,000	$50,000	$40,000	$76,248	Boat launch
24	210	0.5	2.0	$15,000	$25,000	$20,000	$41,488	GL Dr landscaping
21	938	0.4	0.8	$10,000	$20,000	$15,000	$37,647	Upper S HH Rd
31	313	0.4	0.8	$10,000	$20,000	$15,000	$39,019	BC Rd 5
02	132	0.3	0.6	$15,000	$30,000	$22,500	$86,237	BC Rd, GL Rd, Craig Rd pulloff
16	18	0.2	0.1	$10,000	$20,000	$15,000	$66,115	GL Rd culverts
17	500	0.2	0.4	$5,000	$10,000	$7,500	$35,294	Private shoreline cut
22	100	0.2	0.6	$5,000	$10,000	$7,500	$39,367	S HH Rd shoulder
25	92	0.2	0.4	$5,000	$10,000	$7,500	$41,322	Craig Rd & HB Rd
06	62	0.1	0.3	$10,000	$20,000	$15,000	$121,833	Craig Rd bridge
20	220	0.1	0.2	$10,000	$20,000	$15,000	$160,428	Private beach
15	200	0.1	0.2	$10,000	$20,000	$15,000	$176,471	Private beach
Total	**28,204**	**24**	**70**	**$540,000**	**$925,000**	**$732,500**		

In their calculation of the feasibility of reaching the water quality goal, FBE made the assumption that additional phosphorus load reductions would be obtained from erosion hotspots in locations they could not see from public roads or Town property. To get a realistic estimate of the maximum likely attainable phosphorus load reduction, GLWMPC followed up with an additional complete shoreline survey in 2019 (Figs. 3.1 & 3.2). This survey added 32 erosion sites to the 31 sites originally identified.

Two additional sites comparable to "high impact" sites identified earlier were found. Since these were sites where loads of sand had been dumped on private beaches, these sites were assigned the same phosphorus loading values as the previously-identified beach where sand had been dumped. It should be noted that FBE recommended using an average phosphorus loading value of 4.4 lb/yr for severe sites not visible for evaluation from public roads. However, since our top-ranking erosion sites fell in the range of 1.5–2.5 lb/yr for medium-high priority sites (with no sites rated as severe), phosphorus loading values for comparable sites were used.

Figure 3.1. *Erosion "hotspots" identified in the Gregg Lake watershed in the vicinity of the northern part of the lake. Locations classified as "high impact" (red dots) were estimated to cause phosphorus loading in the range of 1.5–2.5 lb/yr, whereas "medium impact" sites (orange dots) were estimated to supply 0.1–1.5 lb/yr. Sites 1–31 were evaluated by FBE for pollutant loads; sites 32–63 were rated by comparison with FBE's assignments.*

Figure 3.2. *Erosion "hotspots" identified in the Gregg Lake watershed in the vicinity of the southern part of the lake. Locations classified as "high impact" (red dots) were estimated to cause phosphorus loading in the range of 1.5–2.5 lb/yr, whereas "medium impact" sites (orange dots) were estimated to supply 0.1–1.5 lb/yr. Sites 1–31 were evaluated by FBE for pollutant loads; sites 32–63 were rated by comparison with FBE's assignments.*

Many additional moderate erosion sites were found. These were assigned the average moderate phosphorus load of 0.44 lb/yr suggested by FBE for the purposes of calculating phosphorus loading reductions. In total, 63 sites were identified as "high impact" or "medium impact" phosphorus loading sources, and all sites were documented with photographs.

4. Assessment of Bundled Projects

For each of the original 31 erosion hotspots, FBE provided impact ratings and specific recommendations for remediation *(FBE, Gregg Lake BMP Matrix 01102019, 2019)*. Impact ratings were based on proximity to Gregg Lake with High (1) and Medium (2) having a direct effect; Low (3) affecting wetlands or tributaries to Gregg Lake; and Low (4) having an indirect effect. The erosion sites needing remediation were bundled into discrete projects—Brimstone Corner Road (Table 4.1), Gregg Lake Road (Table 4.2), Public Beach & Boat Launch (Table 4.3), White Birch Point Road (Table 4.4), Holt Hill Road (Table 4.5), Craig Road (Table 4.6) and Private Land (Table 4.7)—for the purposes of long-term planning.

Phosphorus load reductions for the bundled projects were estimated, along with sediment load reductions and average estimated costs (Table 4.8, Fig. 4.1). The total phosphorus load reductions added up to approximately 24 lb/yr, well below the target of a 44-lb/yr phosphorus load reduction by 2028.

Since these reductions only took into account the first 31 identified erosion sites, it was important to consider the possible phosphorus load reductions to be obtained from the 32 sites identified in the second shoreline erosion survey. Two additional sites were identified as "high impact" and assigned phosphorus loads of 1.7 lb/yr. The remaining 30 sites were assigned a mean "moderate" value of 0.44 lb/yr, for a total phosphorus load of 16.6 lb/yr. Combining the estimated phosphorus load from the second shoreline survey with the total phosphorus loads estimated from the first 31 sites, gives a total phosphorus load of 40.5 lb/yr from shoreline erosion and stormwater runoff.

Further reductions in phosphorus levels can be obtained by reducing loading due to internal sources, waterfowl and septic systems (estimated to account for 20, 6.6 and 13 lb/yr of phosphorus, respectively.) Internal loading comes from bottom sediments stirred up by motorboat traffic and exposed to anoxic (extremely low-oxygen) conditions. Thus, it will be important to minimize the effects of motorboat traffic, make the lakeshore as uninviting as possible to waterfowl and encourage replacement of failing septic systems, as well as proper maintenance of systems that meet code.

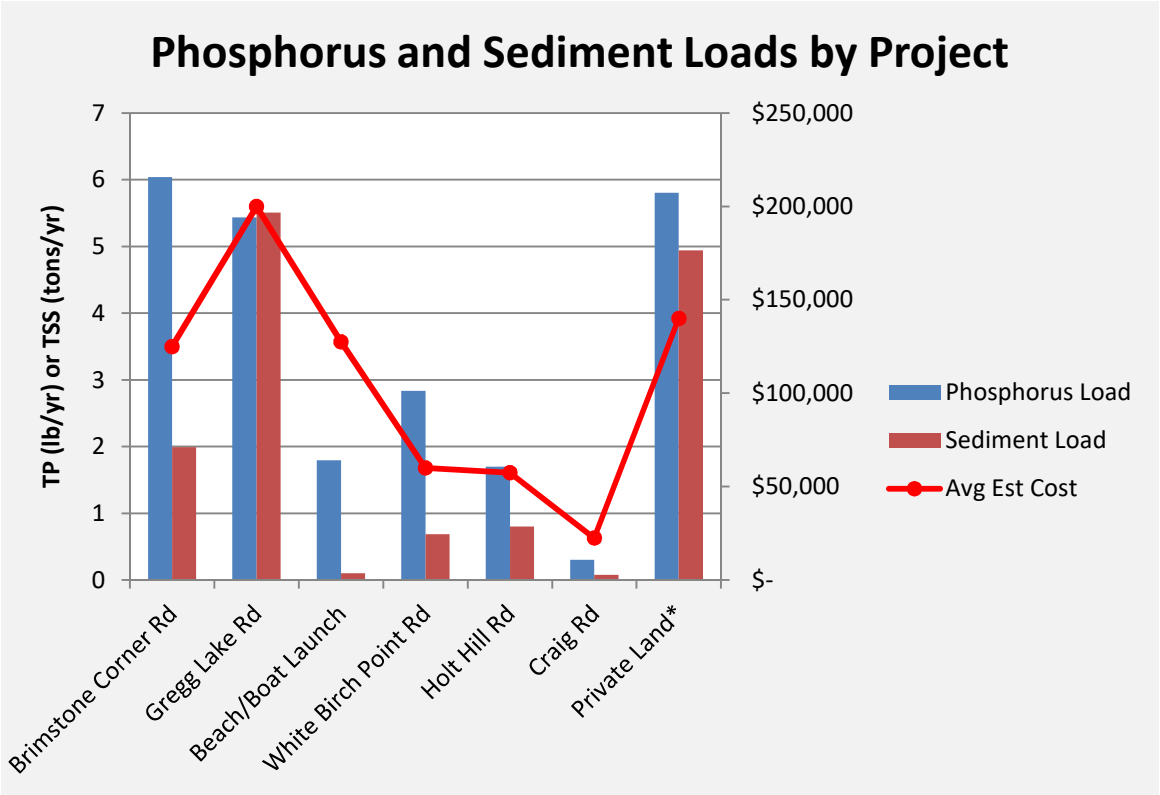

Figure 4.1. *Phosphorus and sediment loads and average estimated costs for Gregg Lake erosion sites bundled into project areas. TP, total phosphorus; TSS, total suspended sediments.*

Table 4.1. *Descriptions of major Brimstone Corner Road erosion sites with recommendations for remediation, responsible parties and estimated time frame for completion. Conceptual engineering plans were drawn up for sites highlighted in grey (Horsley-Witten Group, 10% Conceptual BMPs, 2019).*

	Site ID	Owner	Impact	Description Of Problem	Recommendations	Responsible	Time Frame	Comments
Brimstone Corner Road	01	Town	1	Road surface, shoulder, and ditch erosion from steep dirt road (Brimstone Corner Rd) carries sediment directly into lake via turnout. Unstable and undersized culvert - both inflow and outflow of culvert have a collapsing ditch. Significant erosion and deposition of unconsolidated sand and stone. Signs of beaver-chewed trees.	Grading and stabilization of road surface. Install vegetation and/or riprap with check dams in ditches. Install turnouts to wooded areas to decrease the velocity of flow along dirt road. Enlarge and lengthen culvert with riprap and plunge pool or settling basins. Add to buffer where ditch meets the lake.	Antrim HWY	Fall 2019	Plan to rebuild northern ~1000 ft of steeply sloping road bed and ditches as completed at north end of Reed Carr Rd in 2017, including enlarging plunge pool and replacing culverts.
	02	Town	2	Large dirt pull-off area at the intersection of Brimstone Corner Rd, Gregg Lake Rd, and Craig Rd has loose gravel, evidence of sheet/rill erosion to the wetland from the pull-off and along Gregg Lake Rd (north side).	Decrease the size of the pull-off area and add to the vegetated buffer along the pull-off area and Gregg Lake Rd (north side). Stabilize the road shoulder and divert runoff to buffer.	Antrim HWY	Spring 2020	Include with rebuild of north end of Brimstone Corner Rd. Old pavement under gravel surface interfering with drainage to be removed. Regulate parking in area.
	30	Town	4	85 Brimstone Corner Rd, road surface and ditch erosion, significant gully formation.	Reshape and re-crown road, stabilize road shoulder and ditches. Armor ditches with vegetation or riprap. Install check dams and turnouts.	Antrim HWY	2020-2021	Remaining ~4000 ft of road to be rebuilt to improve drainage.
	28	Town	4	55/58 Brimstone Corner Rd, road shoulder and ditch erosion.	Stabilize road shoulder and ditches. Armor ditches with vegetation or riprap. Install check dams and turnouts.			
	27	Town	4	Brimstone Corner Rd, road shoulder and ditch erosion.	Stabilize road shoulder and ditches. Armor ditches with vegetation or riprap. Install check dams and turnouts.			
	29	Town	4	North of 60 Brimstone Corner Rd, road shoulder and ditch erosion undercutting road.	Stabilize road shoulder and ditches. Armor ditches with vegetation or riprap. Install check dams and turnouts.			
	31	Town	4	93 Brimstone Corner Rd, unstable culvert and ditch filling in with sediment.	Stabilize road shoulder and ditches. Armor ditches with vegetation or riprap. Install check dams and turnouts. Enlarge culvert.			

Table 4.2. *Descriptions of major Gregg Lake Road erosion sites with recommendations for remediation, responsible parties and estimated time frame for completion. Conceptual engineering plans were drawn up for sites highlighted in grey (Horsley-Witten Group, 10% Conceptual BMPs, 2019).*

	Site ID	Owner	Impact	Description Of Problem	Recommendations	Responsible	Time Frame	Comments
Gregg Lake Road	14	Town/Private	2	High lake levels causing undercut and eroding bank between Gregg Lake Rd and the lake for approx. 2,000 linear ft, minimal buffer.	Regrade and stabilize/build-up road shoulder. Add to vegetated buffer.	TOA	2019-2023	Suggested Gabion baskets not a realistic solution. Investigate lowering lake level to prevent eroding, undercutting and establishing new shoreline. Post and enforce boating laws and investigate lowering horsepower limit and increasing no-wake zone to reduce wake effects and stirring up bottom sediment.
	04	Town	2	Minimal road shoulder and buffer between Gregg Lake Rd (causeway) and surface water; sediment, sand, oil carried into lake on both sides.	Add to the vegetated buffer along both sides of the Gregg Lake Rd causeway. Stabilize the road shoulder and divert runoff to buffer.			
	03	Town	2	Gregg Lake Rd bridge at inlet stream with beaver dam under bridge; sediment washing from road on both sides, beaver dam reduces flow, but is periodically breached, minimal road shoulder with runoff erosion around bridge culvert inlet and outlet.	Add to the vegetated buffer along both sides of the Gregg Lake Rd bridge. Stabilize the road shoulder and divert runoff to buffer.	Antrim HWY	2019-2025	Beaver dam removed Fall 2018. If dams are rebuilt, beaver boxes to be constructed with Harris Center advice to keep water levels from rising too high.
	16	Town	2	Culvert at 180 Gregg Lake Rd (several other similar culverts along road), sediment-filled culverts with scouring at downflow end into lake.	Armor ditches with vegetation and check dams, enlarge culverts, install settling basins.	Antrim HWY	2019-2028	Maintain catch basins and culverts.
	15	Town	2	Winter oil slick on lake water near 189 Gregg Lake Rd noted by Town.	Regrade and stabilize/build-up road shoulder. Add to vegetated buffer.	TOA	2020	Investigate source of oil slick.
	10	Town/Private	2	2 Gregg Lake Dr, runoff from hilly road carries sediment down driveway and into the lake.	Armor road shoulder with vegetation and/or riprap, add infiltration field.	Antrim HWY	2021	Armor road shoulder, add infiltration field. Lower priority at this time—material entering lake near dam outlet unlikely to backflow into lake proper.

Table 4.3. *Descriptions of major Antrim Public Beach and Boat Launch erosion sites with recommendations for remediation, responsible parties and estimated time frame for completion. Conceptual engineering plans were drawn up for sites highlighted in grey (Horsley-Witten Group, 10% Conceptual BMPs, 2019).*

	Site ID	Owner	Impact	Description Of Problem	Recommendations	Responsible	Time Frame	Comments
Public Beach & Boat Launch	19	Town	1	Public beach and parking lot off Gregg Lake Rd, lack of buffer, vegetation sparse, evidence of gully and rill erosion of beach sand to lake, shoreline retreat and collapse, exposed tree roots near picnic areas.	Stabilize and armor shoreline with shrubby plants and create a "no-mow" zone. Encourage recreational water access to be from the public beach area only. Divert beach runoff to infiltration field.	TOA	2020-2021	Use TransAlta payment earmarked for beach improvement ($40,000) and s319 Watershed Assistance grant funds, plus funds in Parks & Rec CRF. Also replace original (1960s) septic holding tank. TP estimate does not include material possibly leaching from tank.
	05	Town	1	Boat launch to Gregg Lake off Gregg Lake Rd has lack of vegetated buffer and gully and rill formations from access area and launch, sand deposited directly to lake (no stable launch point).	Regrade access area with stable material. Create stable boat ramp/launch point with permeable pavers or similar. Add a vegetated buffer. Consider creating an interactive/educational pollinator garden.			

Table 4.4. *Descriptions of major White Birch Point Road erosion sites with recommendations for remediation, responsible parties and estimated time frame for completion. Conceptual engineering plans were drawn up for sites highlighted in grey (Horsley-Witten Group, 10% Conceptual BMPs, 2019).*

	Site ID	Owner	Impact	Description Of Problem	Recommendations	Responsible	Time Frame	Comments
White Birch Point Road	12	Town/Private	1	Private beach off White Birch Point Rd, runoff carrying sediment down steep path to private beach with evidence of gully formation.	Minimize area of private sandy beach with a stable vegetated bank, divert road runoff from beach to vegetated area, obtain permit for new material additions.	Antrim HWY	2022-2025	Reconstruct White Birch Point Rd to manage runoff. Analysis of major issues completed—major reconstruction required. Material entering lake close to dam outlet lower priority at this time—little backflow from channel into lake proper.
	11	Town	2	White Birch Point Rd to dam outlet; multiple points of sediment erosion from hilly road surface and shoulders down to lake outlet.	Regrade unpaved road surface, armor road shoulder with crushed stone or rip rap. Install check dams and turnouts. Add to vegetated buffer.			

Table 4.5. *Descriptions of major Holt Hill Road erosion sites with recommendations for remediation, responsible parties and estimated time frame for completion. Conceptual engineering plans were drawn up for sites highlighted in grey (Horsley-Witten Group, 10% Conceptual BMPs, 2019).*

	Site ID	Owner	Impact	Description Of Problem	Recommendations	Responsible	Time Frame	Comments
Holt Hill Road	09	Town/Private	1	Runoff from S Holt Hill Rd carries sediment into lake; runoff from Holt Hill Rd turns northwest, crosses Gregg Lake Rd, and erodes private sandy beach into lake.	Minimize area of private sandy beach with a stable vegetated bank, obtain permit for new material additions, divert S Holt Hill Rd runoff to infiltration field.	Antrim HWY	2020-2028	Maintain existing infiltration basin built in 2017. Study and remedy remaining flow issues. Suggested infiltration basin substantially on private property.
	21	Town	4	S Holt Hill Rd, road surface and ditch erosion to turnout.	Clean out and armor ditches with vegetation or riprap with check dams.	Antrim HWY	2020-2028	Clean out ditches; add check dams.
	22	Town	4	S Holt Hill Rd, steep road shoulder unstable.	Stabilize road shoulder.	Antrim HWY	2020-2028	Shoulder stabilized 2017-2018. Maintain.

Table 4.6. *Descriptions of major Craig Road erosion sites with recommendations for remediation, responsible parties and estimated time frame for completion.*

	Site ID	Owner	Impact	Description Of Problem	Recommendations	Responsible	Time Frame	Comments
Craig Road	06	Town	3	Small wooden bridge on Craig Rd over inlet stream to Gregg Lake, road surface and shoulder erosion at both ends of the bridge, undercutting of road evident from a hole in the road shoulder, lack of buffer.	Armor road shoulder with vegetation and/or riprap, add to vegetated buffer, replace bridge.	Antrim HWY	2019	Craig Rd bridge replaced Spring 2019. Eroding surface and shoulders rebuilt. Beaver dam under bridge removed. Beaver box to be built with Harris Center guidance if dam is rebuilt.
	25	Town/Private	3	Craig Rd intersection with Hattie Brown Rd, muddy pooled area at intersection adjacent to wetland. Likely high sediment runoff during high flow conditions. Road surface erosion.	Regrade road surface and shoulder. Plant vegetation in pooled area to divert traffic away.	Antrim HWY	2021	Regrade road surface and shoulder to prevent sediment runoff.

Table 4.7. *Descriptions of major Private Property erosion sites identified in initial shoreline erosion survey, with recommendations for remediation, responsible parties and estimated time frame for completion. In the follow-up shoreline survey, 32 additional sites were identified, but not assigned sediment or phosphorus load values or given specific recommendations for remediation.*

	Site ID	Owner	Impact	Description Of Problem	Recommendations	Responsible	Time Frame	Comments
Private Land	07	Private	1	181 Gregg Lake Rd; private beach, 2 truck-loads of sand dumped at lake edge to form artificial beach, evidence of erosion.	Minimize area of private sandy beach with a stable vegetated bank, divert road runoff from beach to vegetated area, obtain permit for new material additions.	TOA, GLA, WBPA, Private Landowners	2020-2028	Extensive outreach and education—Soak Up the Rain, LakeSmart, Landscaping at the Water's Edge. Reporting major infractions. Town ordinances.
	23	Private	2	104 Gregg Lake Rd, private sandy beach, no buffer (no photos).	Minimize area of private sandy beach with a stable vegetated bank, divert road runoff from beach to vegetated area, obtain permit for new material additions.			
	18	Private	2	4 Brimstone Corner Rd, beach sand erosion into lake.	Decrease the size of the beach area. Improve vegetated buffer. Stabilize, minimize, and meander access paths.			
	08	Private	2	171 Gregg Lake Rd; private beach, minimal buffer, evidence of sediment runoff to lake.	Minimize area of private sandy beach with a stable vegetated bank, divert road runoff from beach to vegetated area, obtain permit for new material additions.			
	24	Private	2	Gregg Lake Dr, minimal buffer along lake side houses.	Encourage "no-mow" practices along the shoreline of private properties. Create a vegetated buffer.			
	17	Private	2	140 Brimstone Corner Rd, eroding access path to lake with gully formation.	Regrade and armor path surface with crushed stone. Improve vegetated buffer.			
	20	Private	2	197 Gregg Lake Rd, private beach access to lake, road shoulder erosion, steps down to water convey runoff from road, creating gully formation on beach.	Minimize area of private sandy beach with a stable vegetated bank, divert road runoff from beach to vegetated area, obtain permit for new material additions.			
	13	Private	3	Timber harvest off Gregg Lake Rd across from public beach, timber harvest on steep hillside adjacent to wetland.	Replant vegetation. Install vegetated swale to catch and infiltrate runoff coming off the hill.			

Table 4.8. *Summary of phosphorus and sediment loads and average estimated costs for remediation.*

Project	Phosphorus Load (lb/yr)	Sediment Load (tons/yr)	Avg Est Cost
Brimstone Corner Rd	6.0	2.0	$ 125,000
Gregg Lake Rd	5.4	5.5	$ 200,000
Beach/Boat Launch	1.8	0.1	$ 127,500
White Birch Point Rd	2.8	0.7	$ 60,000
Holt Hill Rd	1.7	0.8	$ 57,500
Craig Rd	0.3	0.1	$ 22,500
Private Land*	5.8	4.9	$ 140,000
Total	**23.9**	**14.1**	**$ 732,500**
***Includes only sites 1-31			

These calculations show us that it will be necessary to reduce phosphorus loading at every possible site in order to achieve the goal of reversing Gregg Lake's impaired status. Each of the infrastructure projects will be addressed. Many can be adequately performed by the Antrim Highway Department. Outreach and educational programs will be run to encourage private landowners to address their erosion sites. Zoning and other town ordinances will be investigated to encourage responsible watershed practices, and lake management practices will be addressed.

5. Watershed Infrastructure Projects

The Brimstone Corner Road, White Birch Point Road, Holt Hill Road and Craig Road projects are all within the capabilities of the Antrim Highway Department. They have experience with reshaping and recrowning gravel roads, building turnouts and check dams, stabilizing shoulders and ditches and building catch basins. They are also certified in replacing culverts.

Brimstone Corner Road (6 lb/yr phosphorus load)

The main challenge to completing the Brimstone Corner Road project is scheduling Antrim Highway Department time. The Highway Department began work on the project in Fall 2019 (Fig. 5.1), and will continue in 2020.

Figure 5.1. *Erosion Site 01 at the intersection of Brimstone Corner Road, Craig Road and Gregg Lake Road, where stormwater runoff carries sediment down a steep section of Brimstone Corner Road and deposits it directly into Gregg Lake. Photos taken at the outlet of the culvert under Harbor Road looking towards Gregg Lake before (left) and after (right) installation of uphill turnouts and diversion dams, lining ditches, crowning, stabilizing road shoulders and installing a catch basin.*

White Birch Point Road (2.8 lb/yr phosphorus load)

The Antrim Highway Department has assessed conditions on White Birch Point Road. Longstanding drainage issues mean that replacing deeply-buried culverts and rebuilding the road and ditches to improve drainage and direct runoff to catch basins will require major construction efforts.

Obstacles to the White Birch Point Road project are locations for catch basins. Town-owned land in the vicinity of the dam may be able to be used for a catch basin for stormwater runoff from the lower section of White Birch Point Road. In addition to concerns about phosphorus loading in the outlet channel, sediment deposits particularly in the dam area should be minimized to prevent stress on the dam valves or the dam itself. To the greatest extent possible, runoff from the steep hillside should be directed to catch basins before emptying into the channel.

To limit stormwater runoff from the upper section of WBP Road from draining down the access road to the WBP beach and an adjacent driveway, it may be necessary to seek an easement from the White Birch Point Association, which owns

the property at the turnaround above the beach access road (Fig. 5.2). Limiting runoff entering the steep access road would allow the White Birch Point Association to install stormwater BMPs to protect the road and the private beach from erosion. Similarly, preventing road drainage from entering the adjacent driveway would allow the homeowner to take appropriate actions.

In Summer 2020, the White Birch Point Association will be approached regarding an easement for a catch basin. The Antrim Highway Department will schedule work to begin in 2022.

Figure 5.2. *Erosion Site 12, where stormwater runoff from the upper section of White Birch Point Road flows across the turnout (left) and enters the steep access road to the White Birch Point private beach (right) or an adjacent private driveway.*

Holt Hill Road (1.7 lb/yr phosphorus load)

Drainage from South Holt Hill Road has long flowed down the hill, across Gregg Lake Road and across private beaches into Gregg Lake. Recent road work has directed much of the flow into a catch basin, from which it enters a culvert and flows under Gregg Lake Road and into the lake (Fig. 5.3). Ditches in the area have taken only a few years to fill with sediment, and will be cleaned out and maintained.

In addition to stabilizing the road shoulder and armoring ditches, the recommendation from our consulting engineers (HWG) is to install a water bar to divert remaining water flow from South Holt Hill Road into an infiltration basin on the east side of the road. There may be adequate space to install a catch basin within the road right-of-way. If not, an easement from the land owner may have to be sought. Runoff will be monitored to see how much private beach erosion continues to take place. Further work on Holt Hill Road will be scheduled to begin in 2025.

Figure 5.3. *Erosion Site 09, where stormwater flows down Holt Hill Road, crosses Gregg Lake Road and washes across private beaches to enter Gregg Lake. A recently-constructed catch basin directs some of the flow under the road (left). Suggested area for installing a catch basin for remaining flow directed across Holt Hill Road, with storm drain in place (right). Ditch maintenance will be increased as needed to retain sediment.*

Craig Road (0.3 lb/yr phosphorus load)

At the time of the initial survey in July, 2018, severe erosion was evident around the Craig Road Bridge (Fig. 5.4). Water levels were also high due to beaver dams under both the Craig Road bridge and the Gregg Lake Road bridge. A sinkhole had opened up near the north side of the bridge in 2018. The Craig Road bridge was replaced in Spring 2019. An additional erosion site was identified at the intersection of Hattie Brown Road and Craig Road.

Figure 5.4. *Left: Erosion Site 06 viewed from the south, showing severe erosion of Craig Road causeway and bridge shoulders, high water level on west (left) side of bridge due to beaver dam underneath and location of filled sinkhole, which had opened up in 2018 (arrow). Right: Site 06 viewed from the north, after bridge replacement. Sinkhole location still visible (arrow).*

It is likely that high water levels have caused stress on both sides of the Craig Road causeway, as evidenced by sinkholes and shoulder erosion. The beaver dam under the Craig Road bridge was removed for construction of the new bridge, but the beavers had begun to rebuild by mid-summer (Fig. 5.5). Given the sinkhole formation and shoulder and bank erosion, beaver control devices should be installed under the Craig Road bridge to minimize the rise of water levels.

Figure 5.5. *Beaver dam under new Craig Road bridge (left), with downstream water level lowered by approximately 16 inches after removal of flash boards at Gregg Lake dam. Bank erosion and probable sinkhole drainage site (arrow) at high water level made visible by low water level.*

Gregg Lake Road Undercut (2.1 lb/yr phosphorus load)

Since the Gregg Lake dam was rebuilt in 1982, the lake level has been kept consistently higher than it ever was in the past. Erosion in many areas shows that a new shoreline is being established. This erosion is severe for a stretch of about 2,000 feet along Gregg Lake Road, where in several spots the bank undercut at the summer water level reaches close to, if not under, the road pavement (Fig. 5.6). The land on the lake side of the road from near the dam to the public beach is privately owned.

Figure 5.6. *Undercut of bank close to Gregg Lake Road at summer water level. Photo taken with water at winter level, with both flash boards removed and water just flowing over dam.*

Gregg Lake Road Causeway (Causeway, 1.7 lb/yr phosphorus load; bridge, 0.6 lb/yr)

The causeway stretch of Gregg Lake Road crosses what used to be a mowed wet meadow (Fig. 5.7). It appears that the causeway was first constructed around 1835, when the Gregg Lake dam was located at the mouth of the current outlet channel and lake water levels were several feet lower. Records of repairs and improvements are scant, and the composition of the causeway foundation is not known.

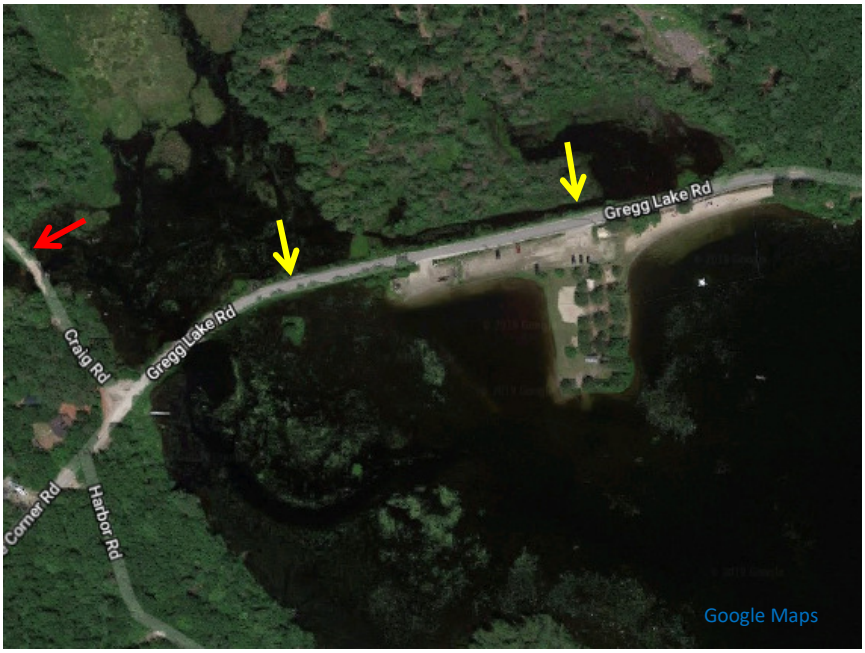

Figure 5.7. *Overhead view of the causeway stretch of Gregg Lake Road, including the Town Beach and Boat Launch area. Arrows show locations of sinkholes that opened up along Gregg Lake Road (yellow) and Craig Road (red) in 2018.*

High water levels due to beaver dams, combined with the higher water levels maintained since the Gregg Lake dam was rebuilt in 1982, have led to unprecedented strain on both sides of the causeway. The lower sections of the steep banks on the south side of the causeway are eroding due to wave and water action (Fig. 5.8).

Figure 5.8. *Loss of vegetation and erosion at steep causeway bank, visible at winter water level.*

In addition, the shoulders require reinforcement and revegetation along much of the 1,300-foot causeway (Fig. 5.9). Private property borders the eastern 900 feet of the causeway on the north side; the rest of the property bordering the causeway is Town-owned.

Figure 5.9. *Erosion Sites 03 and 04, showing bare shoulders and erosion of steep banks leading directly into Gregg Lake.*

Beaver dams constructed under the Gregg Lake Road bridge have regularly filled the space under the bridge (Fig. 5.10). In 2018, the water was measured to be more than two feet higher on the northern (upstream) side than the summer lake level on the southern (downstream) side, and reached several inches over the bottom of the bridge.

Figure 5.10. *The Gregg Lake Road bridge with the water on the north side of the beaver dam nearly touching the bottom of the bridge in Summer 2018, and in Fall 2018, following removal of the beaver dam.*

In 2018, two sinkholes opened up on the north side of the causeway (locations shown in Fig. 9). One was likely at least partly responsible for a town truck falling into the water—the causeway shoulder collapsed when the truck tires left the pavement as two town trucks tried to pass each other. The second sinkhole was observed approximately a month after the truck incident (Fig. 5.11).

Figure 5.11. *Sinkhole approximately 3 feet in diameter and 3 feet deep, with water visible at the bottom, found on Gregg Lake Road causeway Fall 2018.*

Our engineering consultants, Horsley-Witten Group (HWG) suggested stabilizing the banks along Gregg Lake Road with a wall of Gabion baskets (wire cages filled with rocks). This approach would be very difficult to achieve, considering that the land on the lake side of Gregg Lake Road is privately owned except along the causeway.

Town Beach and Boat Launch (Beach, 1.3 lb/yr phosphorus load; boat launch, 0.5 lb/yr)

The Antrim Town Beach and boat launch areas (Fig. 5.12) are heavily used. Banks are eroding, vegetation has been worn away and stormwater drains across the sand into the lake in several areas (Fig. 5.13). The boat launch has receded as sand has been carried into the lake (Fig. 5.14). Engineering suggestions are to stabilize the boat ramp with permeable pavers, revegetate the area, set aside no-mow areas and install swales and rain gardens to capture runoff. In addition, it is likely that the septic holding tanks are the original tanks installed in the 1960s. The tanks should be inspected and decisions made regarding the need for replacement with a similar setup or an alternative, such as a composting toilet or portable toilets.

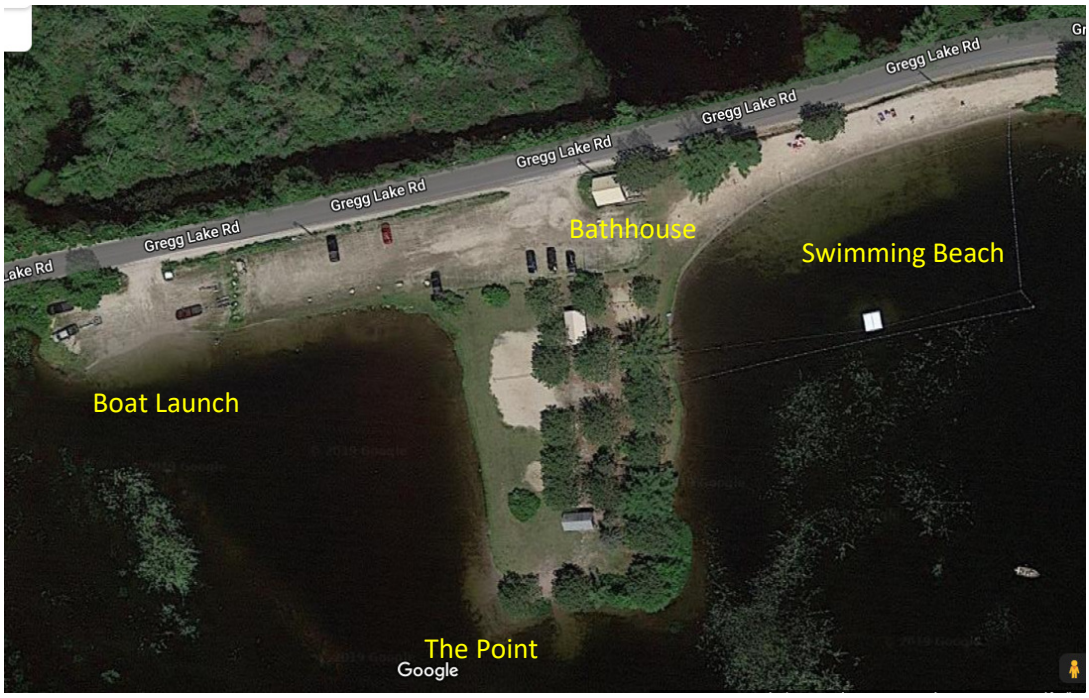

Figure 5.12. *Antrim Town Beach and Boat Launch area.*

Figure 5.13. *Drainage from Gregg Lake Road and the beach parking lot across the beach into Gregg Lake.*

Figure 5.14. *Stormwater flow down the public boat ramp into Gregg Lake.*

Much of the remediation work to be done at the Beach and Boat Launch areas can be performed by volunteers and/or town employees. Funding will be needed for plants for revegetation efforts, signage and materials.

The estimated cost range for rebuilding the boat launch is $30,000–$50,000, if entirely outsourced. Costs can be greatly reduced if labor can be provided by the Antrim Highway Department or volunteers. The estimated cost for beach remediation is $75,000–$100,000 if outsourced, not including bathhouse or septic holding tank upgrades. Native landscaping and stormwater management can be used as an example for area private landowners.

6. Private Landowner Engagement

Lake phosphorus loading needs to be reduced by 44 lb/yr to achieve the goal of lowering chlorophyll-*a* levels to below 3.0 µg/L and removing Gregg Lake from the impaired listing. Phosphorus loading from sites that are primarily under Town control totals at most 18.1 lb/yr (Table 6.1). The private sites identified in the initial shoreline survey were estimated to contribute another 5.8 lb/yr of phosphorus loading, and additional private sites identified in the second shoreline survey were estimated to contribute another 16.6 lb/yr for a total possible from private erosion control of 22.4 lb/yr, and a total from Town and private erosion sites of 40.5 lb/yr. More phosphorus loading reductions should be obtained through septic system upgrades. Thus, it is critical to engage private landowners in phosphorus loading reduction efforts to the greatest possible extent to reach our phosphorus loading reduction goals.

Table 6.1. *Estimated phosphorus load reductions from Town and private sites.*

Source	Estimated Phosphorus Load (lb/yr)		Running Total (lb/yr)
Sites primarily under Town control	18.1		18.1
Private sites identified in initial survey	5.8	22.4	23.9
Private sites identified in second survey	16.6		40.5
Load reduction goal by 2028			**44.0**

Shoreline Protection

Although shoreline surveys did not identify many severe erosion sites, there were several sites where practices do not adhere to shoreline protection guidelines, especially in the areas of dumping sand to create beaches and clearing vegetation from areas close to the shoreline. One site visible from Gregg Lake Road, where sand was dumped on the steep bank leading down to the shoreline, was rated by FBE as contributing 1.7 lb/yr of phosphorus and nearly 2 tons/yr of sediment loading (Fig. 6.1). Two analogous additional sites were found during the Fall 2019 shoreline survey, for a total phosphorus load of approximately 5.1 lb/yr—a substantial fraction of Gregg Lake's phosphorus load that could be reduced through landowner education.

Figure 6.1. *Severe erosion sites where sand has been dumped recently to create beaches on Gregg Lake.*

There have also been several recent instances in which vegetation has been cleared to the shoreline (Fig. 6.2). Education to reach shoreline landowners about the effects of these practices on lake phosphorus and suspended sediments due to erosion and stormwater runoff should help to reduce the frequency of such practices.

Figure 6.2. *Examples of recent clearing, exposing shoreline to erosion at Gregg Lake.*

Lawn

There are not too many properties around the perimeter of Gregg Lake with extensive areas of lawn, and few of these are treated with fertilizers or pesticides. However, shoreline property owners, including the Town of Antrim, will be encouraged to decrease expanses of lawn to make the lake less attractive to geese and limit erosion (Fig. 6.3). Lawn areas at the Town Beach are worn bare and eroding.

Figure 6.3. *Lawn areas at Gregg Lake.*

Stormwater and Sediment Management

Many sites of erosion due to stormwater runoff are found around the lake shoreline (Fig. 6.4). A combined effort with the Town installing BMPs to reduce runoff from roads and private landowners managing land runoff and drainage from impervious surfaces will be required to achieve the necessary reductions in phosphorus and sediment.

Figure 6.4. *Erosion Site 11, where runoff from Holt Hill Road flows across a private beach, carrying phosphorus and sediment into Gregg Lake.*

Septic System Upgrades

Based on septic survey results collected in 2018, the septic systems from residences within 250 feet of Gregg Lake are estimated to contribute 6% of the total lake phosphorus load. Although many septic systems are up to code and regularly maintained, there are some whose locations and/or conditions are completely unknown. Although septic education was included in the survey, further education regarding the importance of replacing failed systems and regularly maintaining functioning ones will be emphasized. In 2019, one leaky cesspool was replaced with a compliant septic system and plans were approved to replace another septic system whose location has not been found in several attempts in recent years. Upgrades such as these will reduce lake phosphorus loading, and will be encouraged to continue.

Outreach and Education

An intensive shoreline homeowner education effort will begin in Spring 2020, with Soak Up the Rain programs, introduction to the concepts of the LakeSmart program and information from the NH Homeowner's Guide to Landscaping at the Water's Edge.

7. Regulatory Changes

In order to meet the goal of offsetting a total phosphorus load of 15 lb/yr by 2028, we will need to address zoning in the lakefront residential and the rural conservation districts, as well as considering ordinances that support adoption of lake-mindful shoreline protection practices. In addition, permanent conservation easements on undeveloped tracts of land will be critical to offsetting phosphorus loading.

Zoning

Antrim currently requires a 100-foot setback from the shoreline for new construction, which is more stringent than the state requirement of 50 feet. The minimum lot size for single-family homes in the lakefront residential district is 90,000 sq. ft. (about 2 acres), whereas the minimum lot size in the rural conservation district is 130,000 sq. ft. (about 3 acres). Antrim also has steep slope zoning intended to reduce damage to streams and lakes from erosion, stormwater run-off, and effluent from septic systems and preserve vegetative cover.

A map of existing land use (Fig. 7.1A) shows that approximately 36% of the watershed land area is buildable. Conserved lands currently make up a large part of the southwestern quadrant of the watershed, while most of the existing 126 buildings are located in the vicinity of Gregg Lake. Full build-out analysis under current zoning shows that another 275 buildings could be built in the watershed (Fig. 7.1B), with a large impact on the water quality of Gregg Lake.

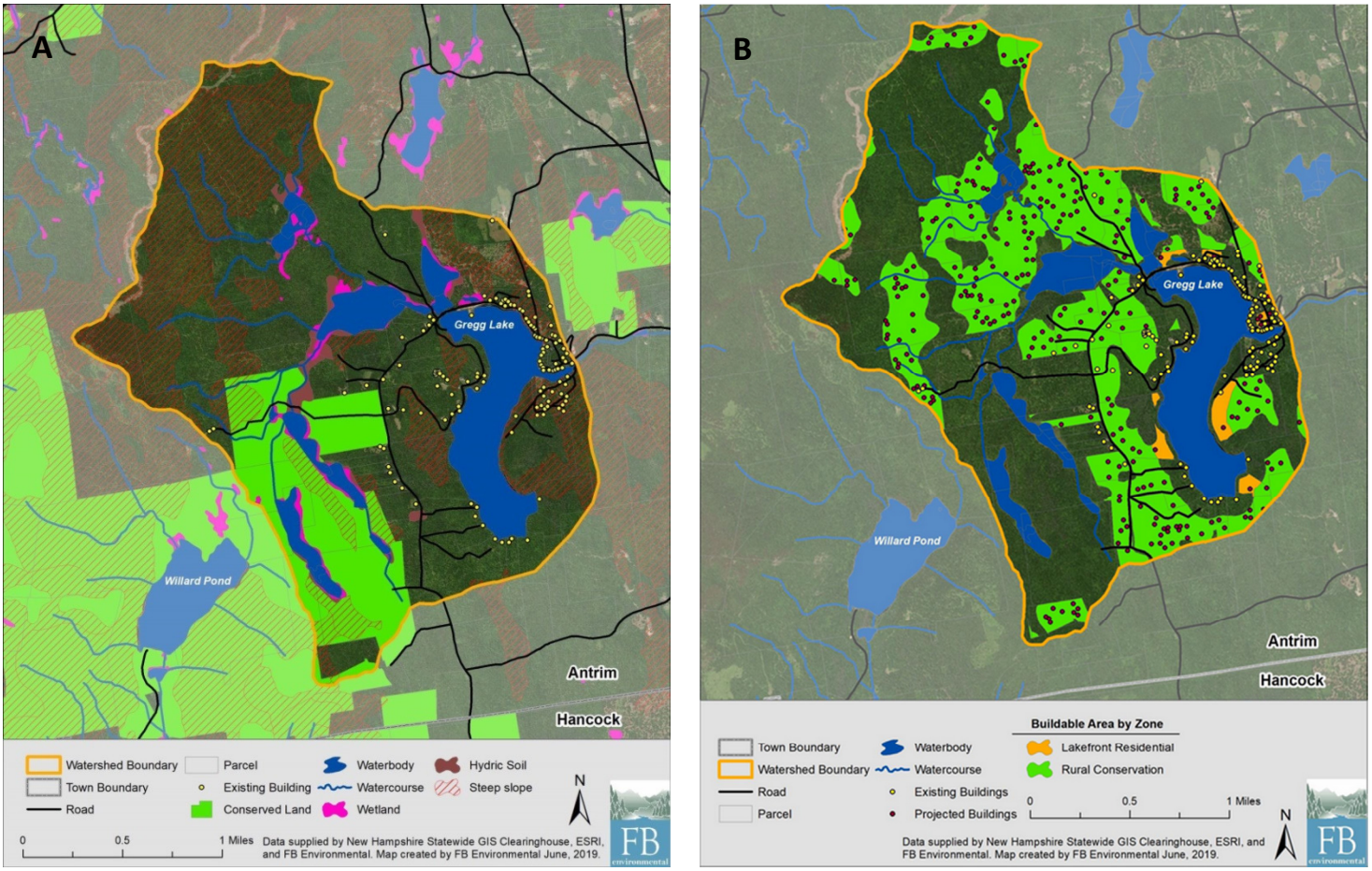

Figure 7.1. *A) Existing Gregg Lake watershed land use, with conservation land shaded bright green, steep slope areas indicated by red slashes and buildings shown as yellow dots. B) Watershed at full build-out under current zoning, with buildable areas in the rural conservation district shaded in bright green and buildable areas in the lakefront residential district shaded orange. Projected new buildings are shown as red dots. Maps prepared by FBE (Build-Out Analysis, 2019).*

Ordinances

While a large effort will be made to inform and educate lake residents and users about practices that protect lake water quality for the long term, town ordinances prohibiting harmful practices will also be investigated. These will include defining penalties for practices such as dumping sand at beaches and clearing vegetation from shoreline property that contribute large amounts of phosphorus and sediment load to the lake. Area contractors will also be educated regarding fill practices and will be held responsible for harmful actions.

Conservation easements

Permanent conservation easements are an effective method of preserving the large tracts of undeveloped land in the Gregg Lake watershed. About 400 acres along the western edge of the watershed was due to go under conservation easement when the Trans Alta wind farm became operational on December 18, 2019. Although much of this area is subject to steep slope zoning and would not be developed, the conservation easement should prevent approximately ten buildings from being built in the watershed for a phosphorus load offset of 6.4 lb/yr.

A second conservation easement was completed in 2019 on an undeveloped 57-acre lakefront property with approximately 2500 feet of shoreline (Fig. 7.2). The easement on this property will offset an estimated phosphorus load of 5.2 lb/yr by preventing construction of one house in the lakefront residential district and seven houses in the rural conservation district.

Figure 7.2. *Currently undeveloped 57-acre lakefront property with approximately 2500 feet of shoreline put under a conservation easement in 2019.*

Watershed landowners will be encouraged to consider putting other properties under conservation easements.

8. Lake Management

We face a stiff challenge to reduce and offset phosphorus loading to the extent needed to meet the goal of reducing chlorophyll-*a* levels by 23% in Gregg Lake over the next ten years. Calculations show that nearly all identified erosion sites on both public and private properties will need effective remediation if the goal is to be met. Since it is unlikely that we will achieve that level of engagement, we propose several lake management approaches that should reduce shoreline erosion and deposition of phosphorus and sediment into the lake water.

Lower Lake Level

When the Gregg Lake dam was replaced in 1982 (Fig. 8.1), the water level was raised substantially above historical levels. The new dam was built to be used with three 8" flashboards in place in the summer months, but the third flashboard was quickly removed due to complaints that the water level was too high.

Figure 8.1. *Gregg Lake dam, rebuilt in 1982, with no flashboards in place.*

Since then, the dam has been operated with two 8" flashboards, and the lake has been establishing a new shoreline, with severe erosion along steep banks and recession of the shoreline in shallower areas (Fig. 8.2). Erosion along the steep banks of a 2,000-foot stretch of Gregg Lake Road is reaching a critical point, where the bank has been undercut in some places as much as three feet deep, reaching close to or under the road pavement (see Fig. 5.6). Wave and boat wake action at summer water level exacerbates the undercutting.

As a first step towards managing the erosion along Gregg Lake Road and the causeway, we propose lowering the summer lake level by 12", by replacing the two 8" flashboards currently in use with a single 4" flashboard. Lowering the lake by this amount will pull the water back from the steep banks in most locations, with wave energy dissipated against rocky or sandy bottom rather than continuing to cut away higher on the banks. This will limit the shoreline erosion evident all around the lake and give private landowners along Gregg Lake Road a start at managing shoreline erosion on their properties. We have been advised by NHDES that since the Town owns the dam, the Select Board would have to approve a change in the summer water level. Leaving a 4" flashboard in place allows release of water, if needed, since we are not currently able to operate gates at the dam.

Figure 8.2. *Shoreline erosion on Gregg Lake, visible at winter water level.*

Another advantage to lowering the lake water level is that the groundwater level may be lowered, and thus move farther away from septic systems, especially old systems that were installed when the water level was much lower.

It is anticipated that lowering the lake level, even by as little as 12”, will be a contentious issue. The concept was brought before the Select Board at a public hearing on February 24, 2020, but discussion was continued and it may take some time for a decision to be made.

Post & Enforce Current Boating Laws

Along with lowering the summer lake level, it will be essential to try to control shoreline erosion by clearly posting and enforcing current boating laws. Gregg Lake has a 150-horsepower motorboat limit and is subject to the New Hampshire default of a no-wake zone within 150 feet of the shoreline, docks, swimmers and non-motorized boats. Personalized watercraft, such as Jet-skis, must move at headway speed only anywhere north of the Narrows.

Motorboats stir up the water to a surprising depth (Fig. 8.3A; NHDES Fact Sheet WD-WMB-25). Extrapolating from Figure 25A, a 150-hp motorboat operating at full speed will disturb the water to a depth of approximately 20 feet, and thus will stir up phosphorus and sediments from the lake bottom over about 75% of Gregg Lake’s surface (Fig. 8.3B). Increasingly powerful motorboats stirring up bottom sediments may be contributing to the increase in lake turbidity seen over the past twenty years.

Motorboat wake is also an important factor in shoreline erosion and phosphorus and suspended sediments in the water. Because of Gregg Lake's long, narrow shape, it is particularly susceptible to wake damage, since most wake does not travel far before reaching shore. As reported in a Chesapeake Bay study on boat wake impacts, even small recreational boats operating within 500 feet of the shoreline are capable of producing wakes that can cause shoreline erosion and increased turbidity (STAC Review Report, 2016). Gregg Lake has a no-wake zone extending out 150 feet from the shoreline, the default for NH lakes, but it is difficult to estimate a distance of 150 feet, and many boats cruise much closer to the shoreline. In addition, much of the wake generated strikes the shoreline on both sides with little loss of energy after traveling across the narrow lake.

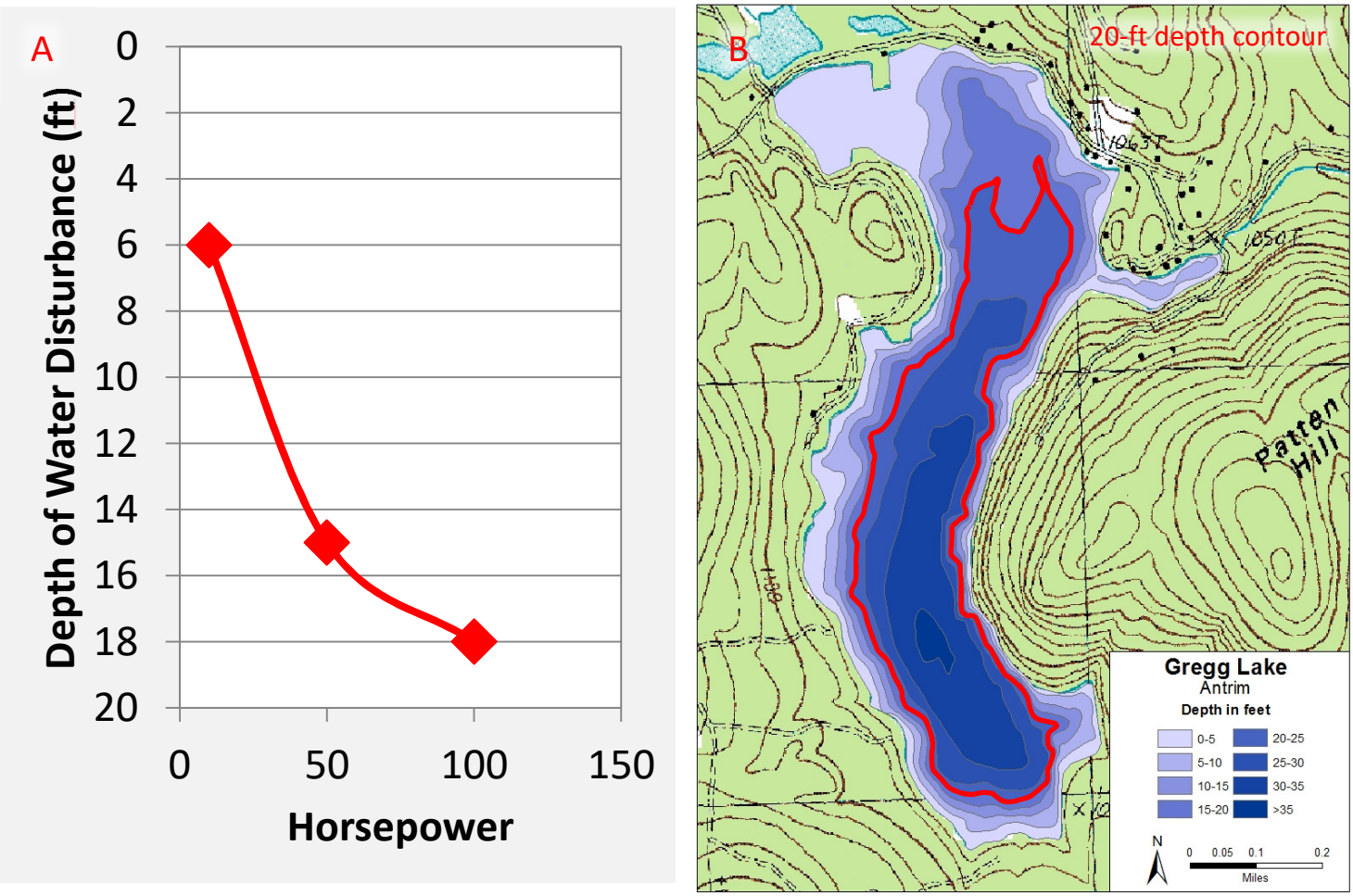

Figure 8.3. *A) Relationship between motorboat horsepower and depth of lake water disturbance when operated at full speed. B) Gregg Lake bathymetry with 20-foot depth contour highlighted. The area outside of this contour, where the lake depth is less than 20 feet, represents approximately 75% of the lake surface area.*

Our efforts for the next few years will focus on clearly posting, educating and enforcing the current boating regulations on Gregg Lake, along with lowering the lake water level by one foot. If, after a few years of lake water quality monitoring, these measures are not considered adequate for reaching phosphorus loading reduction goals, we will move to petition the state to reduce the horsepower limit and work towards introducing a bill to the NH State Legislature to increase the no-wake zone to 500 feet (Fig. 8.4).

It is our hope that educating boaters about the importance of both reducing wake and staying well away from the shoreline while traveling at high speeds will encourage better adherence to current regulations and not require imposition of stricter limits.

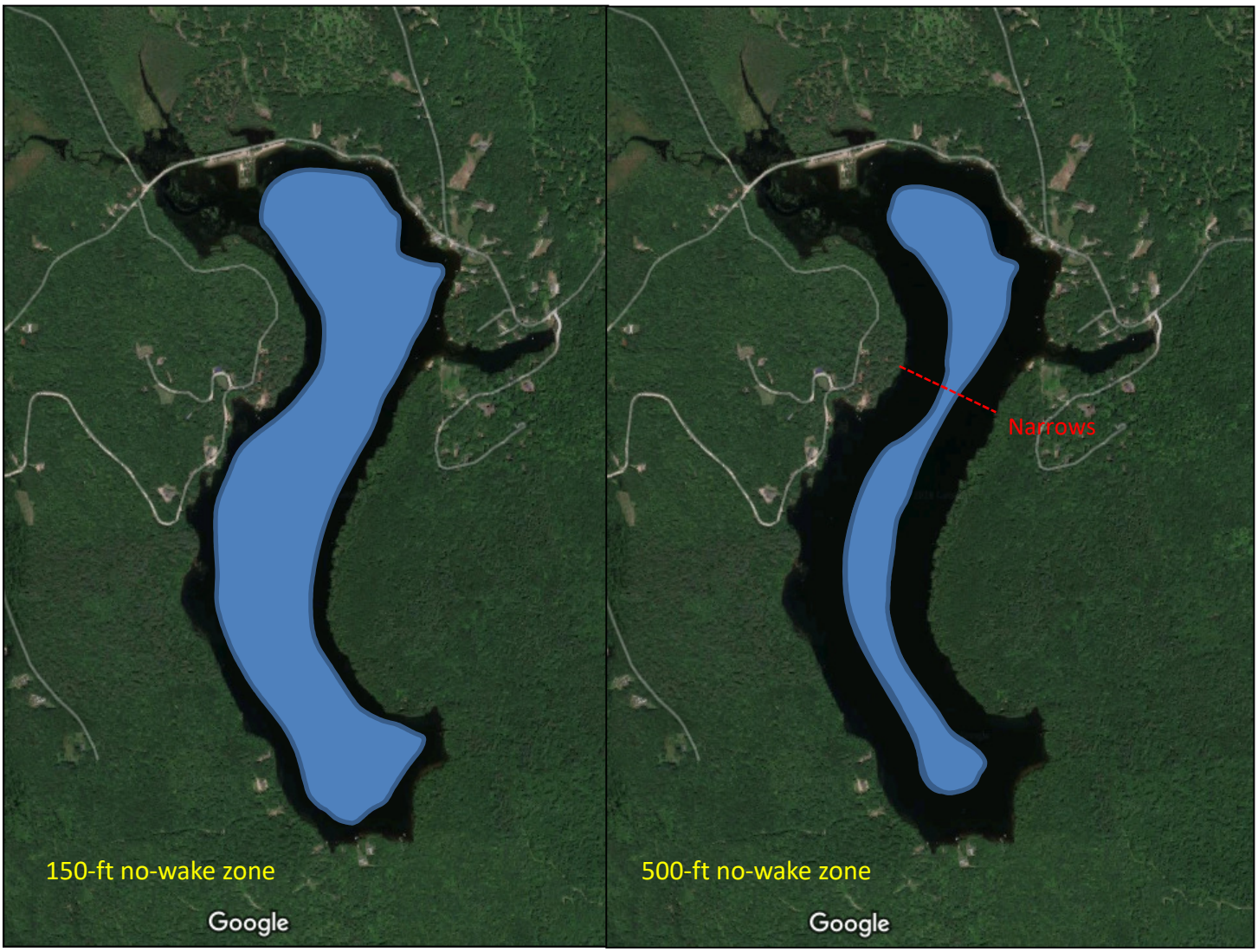

Figure 8.4. *Allowable full-speed travel areas in Gregg Lake with A) a 150-foot no-wake zone or B) a 500-foot no-wake zone. Much of the north end above the Narrows is less than 20 feet deep.*

9. Implementation Schedule

Implementation of the Gregg Lake Watershed Management Plan will be carried out in phases, along with continued monitoring, with interim goals set for 2020 (Table 9.1) and 2023 (Table 9.2), and a final evaluation in 2028 (Table 9.3).

Table 9.1. *Action goals for 2020, with responsible parties and expected total phosphorus (TP) loading reductions and offsets.*

Action - 2020 Goals	Responsible	TP Load Reduction (lb/yr)
Brimstone Corner Rd	TOA/HWY	6.0
Craig Rd/Bridge	TOA/HWY	0.3
Lower Lake Level*	TOA/HWY	2.0
Publicize and enforce current boating laws*	WMPC	1.5
Stormwater BMPs/Landscaping (4)	Private	1.7
Septic upgrades (2)	Private	1.0
Conservation easement (prevent 18 houses)	Private	11.6
Beaver barriers (Craig Rd/Gregg Lake Rd bridges)*	TOA	0.4
Apply for grant funding	WMPC	
Total for 2020 (Reduction + Offset)		**12.5 + 12.0**
2020 Target (Reduction + Offset)		**11 + 6.6**

*Funding needed for:

- Markers to clearly delineate boat channel from outlet to main body of lake
  - 10 floats @ $5 = $50
  - 10 x 5 ft rope = 50 ft, $20
  - 10 concrete blocks =$20

- Signs indicating current boating laws
  - Printing = $300
  - Post, fasteners = $50

- Marker indicating 150-foot distance
  - 1 float, 5 ft rope, 1 concrete block = $9

- Materials and labor for beaver barrier installations
  - $2,000-$5,000, depending on how much we do ourselves

- Total, $2,500 – $5,500.

Table 9.2. *Action goals for 2023, with responsible parties and expected total phosphorus (TP) loading reductions and offsets.*

Action - 2023 Goals	Responsible	TP Load Reduction (lb/yr)
Gregg Lake Rd/Causeway/bridge*	TOA/WMPC/Grant	2.3
Beach/Boat Launch*	TOA/WMPC/Grant	1.8
White Birch Point Rd	TOA/HWY	2.8
Stormwater BMPs/Landscaping (5)*	Private	2.2
Septic upgrades (2)	Private	1.0
Culvert/Catch basin maintenance	TOA/HWY	1.5
Zoning/Ordinances	TOA/WMPC	2.5
Conservation easement (4 houses)	Private	2.5
Total for 2022–2023 (Reduction + Offset)		**11.6 + 5.0**
Cumulative Total (Reduction + Offset)		**24.1 + 17.0**
2023 Target (Reduction + Offset)		**22 + 11**

*Funding will be needed for BMP installations to stabilize and revegetate the banks along Gregg Lake Road, both sides of the Causeway and the Gregg Lake Road bridge, as well as for stabilizing the Boat Launch, Point and Public Beach areas, also along Gregg Lake Road. Funding will also be sought for education and assistance with BMPs on private properties. We anticipate applying for grant funding to help with these projects.

Table 9.3. *Action goals for 2028, with responsible parties and expected total phosphorus (TP) loading reductions and offsets.*

Action - 2028 Goals	Responsible	TP Load Reduction (lb/yr)
Holt Hill Rd	TOA/HWY	1.7
Stormwater BMPs/Landscaping (20)	Private	8.8
Septic upgrades/maintenance (10)	Private	5.0
Culvert/Catch basin upgrades/maintenance	TOA/HWY	1.5
Reduce HP limit	TOA/WMPC	2.0
Increase no-wake zone	TOA/WMPC	1.0
Conservation easement (2 houses)	Private	1.3
Zoning/Ordinances	TOA/WMPC	2.5
Total for 2024–2028 (Reduction + Offset)		**20.0 + 3.8**
Cumulative Total (Reduction + Offset)		**44.1 + 20.8**
2028 Target (Reduction + Offset)		**44 + 15**

Using realistic assessments of phosphorus loading to Gregg Lake due to stormwater runoff and septic systems, it is evident that it will be a challenge to meet the goals set at our Water Quality Advisory Meeting, but it should not be impossible. It is critical for the Town of Antrim to address every identified erosion site under its jurisdiction and to engage as many private property owners and boaters as possible in the effort to protect and improve Gregg Lake's water quality. We will continue closely monitoring water quality through VLAP testing to determine whether we are making the necessary progress towards the set goals.