

Benthic mat pilot project for Forge Pond -- Westford sites			
Site address	14 Pleasant Street	28 Green Needles Road	2 Fellows Lane
Participants	Jeffrey and Alison Sacknowitz	Michael Broderick and Lincoln Alexander	Mark and Aimee Fellows
Installation			
Date of installation	5/28/2022	6/6/2022	7/9/2022
Benthic mat material	LakeBottomBlanket (plastic-like material)	Polyethelene mat from LakeBottomBlanket.com	Polyethelene mat from LakeBottomBlanket.com
Benthic mat size	10x40	400 sq ft	400 sq ft
Benthic mat length (parallel to shore)	10	10 ft	10 ft
Benthic mat length (perpendicular to shore)	40	40 ft	40 ft
Sketch provided?	Yes	Yes	Yes
Anchor mechanism	rebar (10 ft by 1/2", every 5 ft)	Mat weighted with rebar inserted into channels in the mat. Nine 9-ft, 3/8-inch rebar pieces, one every 5 ft.	Mat weighted with rebar inserted into channels in the mat. Nine 9-ft, 3/8-inch rebar pieces, one every 5 ft.
Lake bottom	rock/sand/muck	Gentle grade/slope; mostly sandy/silty/gravel bottom; no obstructions	Sandy/Silty and gradual grade
Water depth -- shallowest	18"	6 ft	5 ft
Water depth -- deepest	65"	8 ft	7 ft
Plants present at time of installation	none - early spring	Coontail, bladderwort, eurasian milfoil	Bladderwort, Eurasian milfoil, and Coontail
Density of plant growth (light, moderate, dense)	none - early spring	Moderate	Moderate to dense

Installation procedures used	blanket alongside dock, so dock (and then boat for placement)	<p>We used my 10x10 plastic floating swim platform to do it. Stacked the matt w/ rebar pre-installed (and marker buoys attached on the edge of the platform and pushed/swam it out to the deepest part (end of weeds). There were moderately heavy weeds extending all the way to the surface. With me in the water behind the raft and Lincoln on top feeding it off, I pushed the raft slowly toward shore while feeding in the tarp dropping one piece of rebar at a time. It sank slowly (even with the heavy rebar). The raft really worked well with rounded edges etc for pushing the matt off slowly.</p> <p>After fully dropped, I adjusted the length of the rope on the marker buoy to the right depth (with just a little slack for waves). I then used fins and mask to dive down adjust the mat a little after it had settled to the bottom. It seemed easy to grab a piece of rebar and move it to extend things more as needed. The bottom was smooth so no risk of snagging the tarp on things while moving it around. The water was pretty stirred up at the end so hard to really see well how it looked immediately. Will go back in later to check it out better.</p> <p>Using a rangefinder from shore after, the two buoys are at about 87ft and 123ft from shore. So the 40ft length seems to be pretty well extended under water.</p>	<p>We used our paddle board. My son was on the board with the mat and we started installing it roughly 40' from shore. I was in the water and we started placing the mat down on the lake bottom. We placed it one rebar at a time until we placed all 40'. My son then adjusted the buoys to the right height.</p>
------------------------------	---------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

	Any problems with installation?	No	Could have moved the raft quicker to better extend the mat as it sank vs adjusting on the bottom afterward	No. It was pretty smooth installation.
	DEP file number sign posted? "Mass DEP 334-1794"	Yes	Yes	Yes
	1-month update after installation			
	Date of report	6/28/2022	7/17/2022	
	Any change in the condition of the mat	None		
	Any issues in maintaining position of the mats or hold-down equipment	None		
	Plants growing adjacent to the mats. Any change from prior to installing mats?	much denser plant growth in general area, including all around mats		
	Plants growing on the mats	None		
	Any other notable conditions related to the mats (e.g., siltation on the mats)	some silt/dirt		
	Any other comments or thoughts on the mat experience?		Moved the mat on this date. Previous covered area had most/all weeds gone (just a sandy/silty bottom.) No dead/decaying plants left. All gone!	
	2-month update after installation			
	Date of report	7/9/2022		
	Any change in the condition of the mat	mat moved to next location (exactly adjacent to East side of where blanket previously was)		

	Any issues in maintaining position of the mats or hold-down equipment	None		
	Plants growing adjacent to the mats. Any change from prior to installing mats?	entire area much denser except where mat was in initial (1st) location -- only slight signs of plants there (<4")		
	Plants growing on the mats	None		
	Any other notable conditions related to the mats (e.g., siltation on the mats)	slight silt/dirt on mats, a few rocks		
	Any other comments or thoughts on the mat experience?			
3-month update after installation				
	Date of report	8/10/2022		
	Any change in the condition of the mat	Mat moved again (to third location, exactly adjacent to East side of where Mat previously was)		
	Any issues in maintaining position of the mats or hold-down equipment	None		
	Plants growing adjacent to the mats. Any change from prior to installing mats?	very heavy weed growth in general area, including adjacent to mat (except for area adjacent to West side of mat -- the strip where the mat initially was --this strip still had only slight signs of plant growth -- <4")		
	Plants growing on the mats	None		
	Any other notable conditions related to the mats (e.g., siltation on the mats)	silt/dirt. A few rocks		

	Any other comments or thoughts on the mat experience?			
4-month update after installation				
Date of report	9/10/2022			
Any change in the condition of the mat	No			
Any issues in maintaining position of the mats or hold-down equipment	No			
Plants growing adjacent to the mats. Any change from prior to installing mats?	untreated area (to East of mat) plants/weeds denser. Area to the west of the mat (areas covered in 1stand 2nd location of the mat) slight plant/weed growth (location 2 with just a few plants/weeds, about 1-2" tall; location 1 with more numerous plants/weeds mainly 3-5" tall)			
Plants growing on the mats	none noticeable			
Any other notable conditions related to the mats (e.g., siltation on the mats)	some silt/muck			
Any other comments or thoughts on the mat experience?	this is a lot of work			
2nd installation of mat (moving the mat)				
Date of installation	7/9/2022	7/17/2022		
Benthic mat material	LakeBottom Blanket (plastic/material) and rebar	Polyethelene mat from LakeBottomBlanket.com		
Benthic mat size	10x40	400 sq ft		
Benthic mat length (parallel to shore)	10	10 ft		

Benthic mat length (perpendicular to shore)	40	40 ft	
Sketch provided?	No		
Anchor mechanism	rebar (10 ft by 1/2", every 5 ft)	Mat weighted with rebar inserted into channels in the mat. Nine 9-ft, 3/8-inch rebar pieces, one every 5 ft.	
Lake bottom	rock/sand and weeds	Sandy, shallow slope, some rocks on bottom	
Water depth -- shallowest	18"	4 ft	
Water depth -- deepest	60"	5 ft	
Plants present at time of installation	yes - heavy density	Celery Grass, Milfoil, Coontail	
Density of plant growth (light, moderate, dense)	Dense	Moderate to dense	
Installation procedures used	flotation device	<p>After just over 6 wks in one location (since 6/6), moved the mat parallel with old location (moved it east) to a new location. Left some overlap with original area. Water level was down ~11in from original install on 6/6 so could now stand with head above water at shallow end of mat. Stood on bottom and picked up one rebar at a time, starting at shallow end. until had 6 (of 9) rebar in arms. (Too heavy/bulky to pick up all 9 rebar at once.) Walked east/sideways ~6-8ft with rebar in hand somewhat dragging the last couple sections. Lowered one rebar at a time while walking backward extending it (popped up for a breath several times). Then dragged the last 3 sections (deep end) over. For final adjustment, went under water (with mask) and starting at center, pulled one bar at a time to fully extend the mat. Finally,</p>	

			shortened ropes going to orange markers (since water was 11in lower).	
	Any problems with installation?	None	<p>The day before, a fisherman had snagged the marker buoy/rope with outboard prop (not running) while fishing using a trolling motor. He had pulled and flipped over half the mat before discovering he was snagged. Good prompt to proceed with moving it to a new location!</p> <p>There was a small amount of silt collected on the top of the mat. Moving stirred all the silt and clouded the water. So came back later to examine the original area. Previous covered area had most/all weeds gone (just a sandy/silty bottom.) No dead/decaying plants left. All gone!</p> <p>Marker buoy does not sit fully upright if slack in line (slack needed for waves). Ideally should suspend a smaller counterweight to keep the buoy more upright.</p>	
	Any other comments or thoughts on the mat experience?			
1-month report after moving mat				
Date of report	8/10/2022	8/20/2022		
Any change in the condition of the mat	slight signs of plants (very small size -- eg <4")	No change in condition of the mat. A light layer of silt across it all.		
Any issues in maintaining position of the mats or hold-down equipment	very heavy weed growth in general area, including adjacent to mat (except for area adjacent to West side of mat -- the strip where the mat initially was in 1st location --this strip still had only slight plant growth --<4")	No		

Plants growing in the previous mat location. Any change from prior to mat installation?	rock/sand. No plants noticeable where mat was in 2nd location (from which Mat was moved today, to 3rd location)	Seems mostly clear but visibility too poor at the moment to see for sure.	
Plants growing adjacent to the new mat location. Changes from prior to mat installation.	None	No change detected	
Plants growing on the mats	None	None	
Any other notable conditions related to the mats (e.g., siltation on the mats)		None	
Any other comments or thoughts on the mat experience?		Need ability to cover more area. Want to move mat again but already cleared 600 sq ft	
3rd installation of mat (moving the mat)			
Date of installation	8/10/2022		
Benthic mat material	LakeBottomBlanket- plastic material		
Benthic mat size	10x40		
Benthic mat length (parallel to shore)	10		
Benthic mat length (perpendicular to shore)	40		
Sketch provided?	No		
Anchor mechanism	rebar (10 ft by 1/2", every 5 ft)		
Lake bottom	rock/sand and very dense plants		
Water depth -- shallowest	18"		
Water depth -- deepest	60"		
Plants present at time of installation	Yes		

	Density of plant growth (light, moderate, dense)	Dense (except for 20x40 strip to the west side, where the mat was in the 1st and 2nd locations -- no plants in 2nd location, and only tiny (<4") occasional plant growth in 1st location)		
	Installation procedures used	flotation device		
	Any problems with installation?	None		
Removing the mat				
	Date of mat removal	9/10/2022	9/25/2022	9/15/2022
	Any change in the condition of the mat	mat covered in silt/muck, disgusting smell when removed from lake	A light layer of silt across it all. White side is stained.	Mat was coated in slime and muck.
	Any issues in maintaining position of the mats or hold-down equipment	No	No	
	Plants growing adjacent to the mats	untreated area (to East of mat) plants/weeds denser. Area to the west of the mat (areas covered in 1stand 2nd location of the mat) slight plant/weed growth (location 2 with just a few plants/weeds, about 1-2" tall; location 1 with more numerous plants/weeds mainly 3-5" tall)	Water clarity very poor. Hard to see much. There was some plant growth in the old mat location.	Same weeds present around the edge of the mat.
	Plants growing on the mats	none noticeable	None	None
	Any other notable conditions related to the mats (e.g., siltation on the mats, mat degradation, etc)	silt and muck, terrible smell	A light layer of silt across it all. White side is stained.	Mat was in good shape. One fishing hook found attached to the mat.
	Any issues with removal	This is hard work. Getting mat out of the lake, and removing the rebar (to enable transporting of the mat to a flat surface) and then cleaning the mats is a pretty big effort. Not necessarily sure	Removal was not difficult. Water only 3-5 ft deep at this point due to drought. Dragged deep end of mat over the shallow end and up to dock on shore. Pulled up one piece of rebar	With help from my family we pulled the mat up on the dock. One section at a time. We checked the mat as it was removed for any items/animals that might have been attached.

		this is worth the effort, given the limited area covered by the mat (10x40)	at a time onto the dock. Lifted entire mat and 9 pieces of rebar (all intact)	
Condition of the lake bottom under the mat, after the mat has been removed. (bottom material, any plants, plant debris)			water clarity remained very poor all fall. Could not analyze conditions.	Slit and sand with some rocks.
Plants adjacent to the mat. Any change from prior to installing the mat.	Dense plant growth in adjacent areas that haven't been covered by the mats.		There were tall weeds growing right next to the mat that grew all summer and reached the surface.	Thick weeds around the mat. Same weeds are before installation.
Any other comments or thoughts on the mat experience?	Effective, but on a limited area. And a lot of work (installing, moving, removing, cleaning, storing) - - mulling whether it is worth the effort!		Definitely need ability to cover/clear more area. (more than 600sqft). Would have started earlier and moved the mat 3-4 times (once/month) if coverage limits allowed. E.g., 2000 sq ft limit -- which is <10% of my waterfront area up to 7ft deep (~140x150) -- would be better. Mat was stained silty brown which could not be easily removed. Laid mat out on lawn and cleaned silt off best as possible with hose and push broom. Let air dry then rolled up and stood upright against wall in garage. So could not thoroughly clean the mat well (which may lead to earlier degradation of the material?)	Wish it could cover more area. Also wish I had the chance to move it at least once this summer. Was planning on moving the mat, but time escaped me.
1-month report after mat removal				
Date of report		mid-October	10/28/2022	
Plants growing adjacent to the mat location. Any change from prior to mat installation?		water clarity remained very poor all fall. Could not analyze conditions.	No change	

Condition of the lake bottom at the mat location (bottom material, plant debris)			As far as I can tell there is no change.
Plants growing at the mat location		yes some plants present.	
Density of plant growth at mat location (light, moderate, dense)		water clarity too poor to tell	
Any other comments or thoughts on the mat experience?		need to try shorter durations and move mat more to see how long weeds stay away	
Burlap mats only			
Did you at any time over the summer see any evidence of the burlap mat disintegrating and having burlap pieces floating away?	N/A	N/A	N/A
Non-burlap mats only			
Was all non-natural material used for the benthic mat installation removed by Oct 15, 2022?	Yes	Yes	Yes
Would you put a benthic mat in again, another time?			
	Yes. The effectiveness did not seem to be as high as I had hoped, but without any better options it seems like it's worth doing.	Yes, not much work. will continue to use and see how long it lasts	Yes. Will plan on moving the mat at least once next year.







