

Eurasian Watermilfoil Management Lake Leelanau 2025 Field Report



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"We need acts of restoration, not only for polluted waters and degraded lands, but also for our relationship to the world"

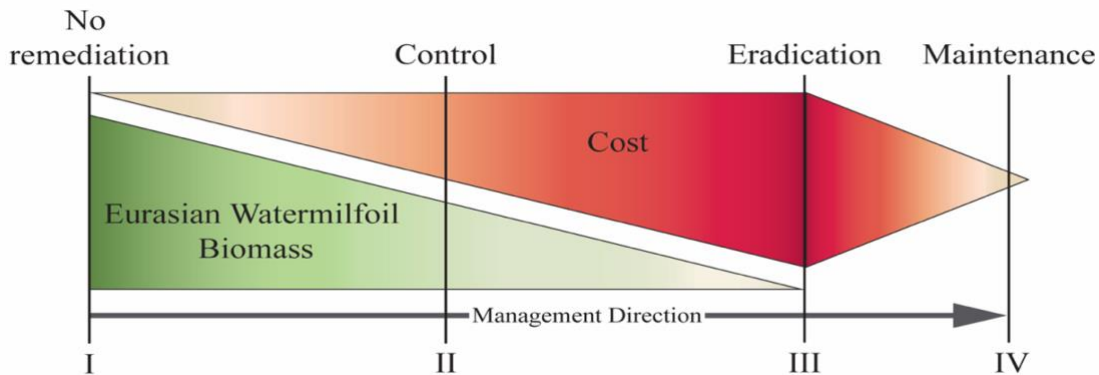
from *Braiding Sweetgrass* (pg. 189)
Robin Wall Kimmerer

Executive Summary

This report presents progress and advances in Eurasian watermilfoil (*Myriophyllum spicatum* - EWM) management on Lake Leelanau (Leelanau County, Michigan) made in 2025, with the ultimate goal of reclaiming ecological balance in the lake through EWM control and prevention while embracing the spirit of Robin Wall Kimmerer aptly defined above. Building upon our strategic shift away from *control* and towards local *eradication* initiated in 2023, the 2025 field season demonstrated continued refinement of methodology with targeted deployment of biodegradable benthic barriers to eradicate whole lake regions.

The 2025 field season marked a strategic focus on maintenance and surveillance of previously treated sites while addressing newly discovered infestations. Total burlap barrier deployment in 2025 was approximately 2.32 acres (101,099 sq ft), representing a 19% decrease from 2024 levels. This reduction reflects our transition from large-scale initial coverage toward more targeted maintenance and micro-barrier applications, again consistent with our shift from Stage II (control) to Stage III (eradication) and Stage IV (maintenance) management strategies as shown in Figure 1 below.

Figure 1: Predicted Cost v. Management



Significant effort was concentrated at the Mebert region with 1.35 acres (58,860 sq ft) of barriers deployed, which accounted for over half (58.2%) of the burlap deployed in 2025. All the remaining 300+ deployments added up to less than an acre, including the Gordon's Point region, Kelenski Point region, Grant's/Farber region, and Cedar River region.

The 2025 season saw continued refinement in micro-barrier applications, with 354 micro-barriers (<25 sq ft) deployed compared to 61 meso-barriers (25-2,000 sq ft) and 22 large barriers (2,000 sq ft). This distribution reflects our evolving approach of addressing smaller satellite colonies and maintaining previously treated areas with precision applications rather than broad coverage.

Several whole-lake surveys were conducted by boat with a “crow’s nest” to track EWM distribution and assess management effectiveness across both North and South Lake Leelanau. The field team logged 507 diver hours across 14 active management regions surveying for EWM and deploying burlap barriers. Notable observations include continued success of the eradication strategy at multiple sites, evidence of natural, native plant recolonization on older as well as newer barriers, and refined understanding of optimal barrier deployment timing and techniques. Nearly all EWM discovered in South Lake Leelanau in 2025 was covered with burlap barriers.

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Brief Historical Context

Eurasian watermilfoil was first discovered in South Lake Leelanau (SLL) during the fall of 2018 by Brian Price, then contracted lake biologist for the Lake Leelanau Lake Association (LLLA). Management efforts began as an initiative by the Grand Traverse Band of Ottawa and Chippewa Indians (GTB) in 2020 in close collaboration with the LLLA. Initial field work took a multi-faceted approach, including synthetic lake bottom blankets, biodegradable benthic barriers, diver-assisted suction harvest (DASH), and hand-pulling by SCUBA divers.

Through systematic field observations from 2020-2022, the team refined its methodology and discontinued less-effective techniques (i.e., hand-pulling, DASH, and synthetic benthic barriers). Beginning in 2023, management focused exclusively on biodegradable burlap barriers after determining they were the only non-chemical method that could permanently kill EWM on Lake Leelanau. Observational data confirmed previously published scientific literature documenting that barriers left in place for eight weeks or more effectively eradicated EWM plants, with no regrowth observed through deployed barriers in subsequent years.

The strategic shift from control (Stage II) to local eradication (Stage III) as shown in Figure 1 began in 2023, with the recognition that permanent eradication at individual sites would ultimately prove more cost-effective than ongoing annual control measures. The 2025 season continued this trajectory, with many sites now transitioning into Stage IV (maintenance), requiring only surveillance and/or minor intervention to address new fragment establishment found along a few barrier edges.

For a comprehensive understanding of work conducted from 2020-2024, please read annual field reports archived on the LLLA website (<https://lakeleelanau.org/aquatic-invasive-species/>).

EWM Management Progress and Advancements in 2025

North Lake Leelanau, Community-based Monitoring, EWM Early Detection Pilot Program

An original goal of the GTB/LLLA collaboration to combat EWM, which began in 2020, was to *"prevent introduction and spread of EWM to North Lake Leelanau"*. One major component required to achieve this goal was vigilant surveying of North Lake Leelanau (NLL) so that an "early detection, rapid response" protocol could be implemented. Whole-lake NLL surveys (littoral zone) were conducted from a boat with a raised platform ("crow's nest") on June 4 and August 4, 2025. In addition, we successfully launched the EWM Surveillance Community-based Monitoring program in 2025, a new pilot program developed to engage NLL riparians to routinely survey their own shoreline in search of EWM fragments that may have washed up on shore. Auto-fragmentation (asexual reproduction), the most common method used by EWM to

propagate and spread, produces fragments that initially float and travel by wind and currents to outlying areas. It is at this stage they can be most easily detected, often washed up on a windward shoreline. In fact, that is how EWM was first discovered on Lake Leelanau in 2018.

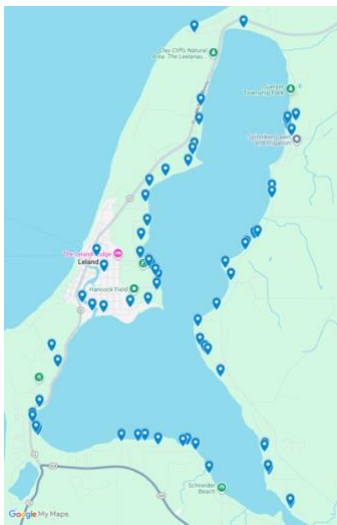
A total of 75 NLL riparians volunteered to survey their shoreline at least twice a week during the months of June, July, and August while they were residing on the lake. A season-end survey was sent out twice via email in September asking volunteers to tally their monthly results and evaluate the program. Of the 75 volunteers who participated during the 3-month pilot, 29 people responded to the survey. Those respondents recorded 832 looks for EWM along their shoreline. If we assume the non-respondents surveyed at a similar rate, we can estimate there were 2,234 looks at the shoreline of NLL during the summer months in 2025. A total of 14 phone texts were sent to Ron Reimink, contracted LLLA Lake Biologist, over the summer with pictures of suspect plant fragments. Fortunately, none of the plants were EWM.

Participants were asked *"How could we improve this program for next year?"* Responses were very positive, such as: "Pretty easy as is", "It seems to work well", "It is well organized, easy and important", "We were happy to help!", "Nothing. The bad guy's id sheet helped", and "Super easy once I was signed up! And Ron's fast responses were helpful".

Participants were also prompted to respond to *"We are hoping to expand this project next year to have more participants- please suggest ways we can do this, if you have them".* Representative responses include: "Include SLL with more involvement from riparians", "Maybe a quick handout we could give to our neighbors to suggest they do it", "Give it prominence in the newsletter in the spring", "Clarify and stress how easy it is to monitor", and "Maybe just put a 1-page guide in everyone's mailbox around the lake".

Participants were distributed fairly evenly around the lake (Figure 2), adding confidence that EWM has not become established in NLL.

Figure 2: Volunteer Spatial Distribution NLL



Field Team and Infrastructure Developments

The 2025 field season built upon infrastructure established in previous years. The field team continued to utilize the 21' Tracker workboat, 20' pontoon dive boat, 20' pontoon burlap supply boat, enhanced GPS equipment with Real-time Kinematic (RTK) capabilities, and expanded SCUBA equipment inventory.

The dive team maintained a strong crew composition with experienced divers and field technicians coordinating daily operations including barrier deployment, dive safety, GPS recordings, sandbag management, and site documentation. The established collaboration with the GTB continued to provide essential leadership, logistical support, and field expertise.

Infrastructure improvements focused on operational efficiency, including refined barrier assembly procedures, optimized boat deployment techniques, and enhanced data recording protocols using ArcGIS FieldMaps for accurate site documentation.

Methodology Refinements

The 2025 season continued the exclusive use of biodegradable benthic barriers for EWM management, with no hand-pulling or other methods employed. Key methodological refinements included:

Barrier Sizing and Application Strategy: The field team deployed barriers in three general size categories based on site conditions and EWM density. Large barriers (20x100'+ lengths) addressed extensive infestations, meso-barriers (medium-sized deployments, 25-2,000 sq ft) covered moderate patches, and micro-barriers (<25 sq ft, usually 4x4', 5x5', or large sandbags 18"x24") targeted individual plants or small clusters. The 2025 barrier distribution (354 micro-, 61 meso-, 22 large) reflects the evolution toward maintenance-phase management at many sites.

Strategic Deployment Timing: Building on observations from 2023 and 2024, barriers were deployed strategically throughout the season based on site priorities, weather conditions, and crew availability. Earlier season deployment at select sites allowed for assessment of same-year native plant regrowth potential (Figure 3). Several observations have been recorded of large-leaf pondweed (*Potamogeton amplifolius*) growing up through new burlap as early as two weeks after deployment.

Figure 3: Same-Year Native Plant Germination



Precision Coverage: Continued emphasis on complete EWM coverage at deployment sites ensured movement toward true local *eradication* rather than temporary control. All barrier perimeters were carefully inspected and verified by SCUBA divers to confirm no EWM strands remained uncovered.

Enhanced Site Documentation: RTK GPS technology provided sub-meter accuracy for barrier placement coordinates, marking new infestations, enabling precise record-keeping for future maintenance needs, and ongoing effectiveness monitoring.

Sandbag Deployment: The field team continued using pea stone-filled burlap bags in three sizes (10x14", 12x20", 18x24") for barrier securement. Total sandbags deployed showed a 23.4% decrease from 2024, reflecting the shift toward smaller, more targeted barrier applications requiring less ballast. Thank you to many volunteers who met upon request to fill sand bags so that our dive team could spend more time working in the water (Figure 4).

Figure 4: Some LLA Pea Gravel Filling Volunteers



Benthic Barrier Deployment

Overall Deployment Summary (Appendix A)

The 2025 field season resulted in deployment of approximately 2.32 acres (101,099 sq ft) of burlap barriers across South Lake Leelanau. This represented a strategic reduction of 0.54 acres (23,754 sq ft) or a 19% reduction compared to 2024 levels, reflecting the transition from initial large-scale coverage toward targeted maintenance and eradication completion at specific sites.

Barrier Type Breakdown (Appendix B)

- 22 Large barriers: 63,400 sq ft (62.7% of total)
- 61 Meso barriers: 26,370 sq ft (26.1% of total)
- 354 Micro barriers: 11,329 sq ft (11.2% of total)

Regional Deployment Details

The effectiveness of our EWM mitigation efforts warranted a practical strategy change from numbered individual "maintenance sites" to larger "maintenance regions". South Lake Leelanau was artificially, yet strategically, divided into 14 regions (Figure 5). Our field strategy was to survey and cover all EWM within a region before shifting to another, thus declaring a region momentarily "EWM-free" for 2025.

Every previously known EWM infestation site, identified either by Brian Price from 2019-21, aerial drone surveys from 2022 and 2023, or our 2023-24 boat surveys, was thoroughly examined in 2025 by our SCUBA divers. Any EWM discovered was completely covered with burlap of appropriate sizes.

Figure 5: Artificial SLL Regions



Top Five Sites by Acres of EWM Controlled:

1. **Mebert Site** – 1.35 acres (58,860 sq ft) representing 58.2% of total 2025 deployment
 - Diver hours: 146.2
 - Status: Major colony requiring extensive new coverage; primary focus of 2025 efforts
2. **Gordon's Point** – 0.27 acres (11,685 sq ft)
 - Diver hours: 81.4
 - Status: Maintenance and perimeter extension of previous deployments
3. **Kelenski Point** – 0.22 acres (9,556 sq ft)
 - Diver hours: 28.8
 - Status: New significant infestation requiring initial coverage
4. **Grant's/Farber** – 0.18 acres (7,997 sq ft)
 - Diver hours: 83.4
 - Status: Substantial reduction from 2024 (1.03 acres or 44,975 sq ft) indicating transition to maintenance phase
5. **Cedar River** – 0.13 acres (5,531 sq ft)
 - Diver hours: 24.3
 - Status: Ongoing management of infestation at river mouth

Other Active Sites:

- **Willow Point** – 0.06 acres (2,645 sq ft) with 35.9 diver hours
- **Otto Road** – 0.04 acres (1,937 sq ft) with 45.1 diver hours, major reduction from 2024's 1.06 acres (46,358 sq ft)
- **Sunset Shores** – 0.03 acres (1,420 sq ft) with 20.9 diver hours
- **Tiki Bar** – 0.02 acres (1,073 sq ft) with 3.0 diver hours
- **Narrows** – 0.01 acres (377 sq ft) with 15.3 diver hours
- **Dar's Landing** - 18 sq ft with 8.4 diver hours - significant reduction indicating near-completion of eradication

Surveillance-Only Sites (Appendix C)

Three sites (Billman's Beach, Bingham, Narrows, and Fountain Point) received diver surveillance hours but no barrier deployment, indicating successful maintenance of previously treated areas or absence of EWM requiring coverage.

Management Stage Progression (Appendix C)

Several sites demonstrated clear progression through the management stages defined in the Predicted Cost vs. Management framework (Figure 1).

Sites Transitioning to Stage IV (Maintenance) (Appendix C)

- Otto Road: 96% reduction in barrier needs (46,358 sq ft in 2024 to 1,937 sq ft in 2025)
- Grant's/Farber: 82% reduction (44,975 sq ft in 2024 to 7,997 sq ft in 2025)
- Dar's Landing: 97% reduction (576 sq ft in 2024 to 18 sq ft in 2025)

These dramatic reductions indicate successful control at these sites, with remaining barrier deployments addressing only minor new fragment establishment found along the perimeter of barriers, or in the case of Otto Road, maintenance due to a suspected anchor strike on the barrier. Future management within these regions should require only annual surveillance and limited micro-barrier applications.

Sites Requiring Expanded Coverage

The Mebert region required substantial new coverage in 2025, increasing from 3,120 sq ft in 2024 to 58,860 sq ft in 2025. This 1,786% increase reflects either previously undetected EWM or significant expansion of the infestation in the Mebert Shoal region. Most EWM covered prior to 2025 in this region had focused on the Mebert Creek site. The Mebert region became the primary focus of 2025 field operations, accounting for nearly 60% of total barrier deployment and 29% of total diver hours.

Kelenski Point similarly showed major expansion, increasing from 16 sq ft in 2024 to 9,556 sq ft in 2025, representing a new significant infestation requiring comprehensive initial coverage.

It should be noted that nearly all EWM observed lake wide was covered by the end of the 2025 field season, save for a scattering of strands left in the Mebert region due to time constraints at the end of the season.

Littoral Zone Context

Based on the 2022 independent aquatic plant study by ZeroGravity Aerial LLC and Freshwater Solutions LLC, South Lake Leelanau contains 2,214 acres of littoral zone (0-20 ft depth). The 2025 barrier deployment of 2.32 acres represents approximately 0.1% of the entire littoral zone and roughly 1.5% of the estimated 159.5 acres of aquatic vascular plant coverage in SLL. This minimal footprint demonstrates the targeted, surgical nature of the current management approach, focusing on complete eradication at specific sites rather than broad-scale coverage.

Notable Observations

Strategic Success at Previously Treated Sites

The dramatic reductions in barrier requirements at Otto Road, The Narrows, Grant's/Farber, and Dar's Landing validate the local eradication strategy adopted in 2023. These sites demonstrated that comprehensive barrier coverage with attention to complete perimeter

treatment results in long-term EWM reduction requiring only minimal maintenance in subsequent years.

This observation strengthens confidence in the Stage III (eradication) to Stage IV (maintenance) progression model (Figure 1), suggesting that initial investments in thorough coverage will yield significant cost savings and reduced labor requirements in future seasons.

Mebert Site Expansion

The substantial increase in EWM prevalence in the Mebert region represents the most significant challenge we experienced during the 2025 season. The explosion from 3,120 sq ft to 58,860 sq ft required reallocation of substantial field resources and raised questions about detection methodology, growth patterns, and fragment dispersal mechanisms.

Several possible explanations warrant consideration. First, a 2024 single line transect survey may have underestimated the true extent of EWM at this location, particularly if smaller plants or deeper growth were present but not visible due to late season algal blooms, especially at this deeper and more offshore site. Second, environmental conditions in 2024-2025 may have favored exceptional growth at this site. Third, fragment deposition from upstream sites or boat traffic may have contributed to rapid expansion, as this area is nestled between two of the largest infestations on SLL.

The Mebert observation underscores the importance of comprehensive surveys and the value of maintaining robust field capacity to respond to unexpected infestations at this time. It also highlights the ongoing need for public education regarding boat hygiene and fragment prevention.

Micro-Barrier Effectiveness

The 2025 season saw extensive deployment of micro-barriers (354 individual applications), reflecting the maturation of this technique for addressing small colonies and individual plants. Micro-barriers offer several advantages over hand-pulling or other methods:

- Permanent eradication of targeted plants, including root mass
- Limited fragment generation
- Precise application with minimal impact on surrounding native plants
- Simple deployment by SCUBA divers without as much boat support
- Cost-effective use of materials

The high number of micro-barrier deployments across multiple sites in multiple regions demonstrates the importance of thorough site surveillance and immediate treatment of new fragment establishment before colonies can expand.

Native Plant Observations

Continued observation of native plant growth on previously deployed barriers suggests successful natural ecosystem recovery following EWM removal (Figure 6). Species including *Potamogeton* sp. (pondweeds), *Vallisneria americana* (wild celery), *Myriophyllum* sp. (native milfoil) and various native macroalgae were observed colonizing 2023 and 2024 barriers at multiple locations, in addition to 2025 barriers within only a few weeks of barrier deployment.

Figure 6: Lush Native Plant Restoration Over Previous Barrier



This native revegetation provides important ecosystem benefits including habitat structure for fish and invertebrates, competition against future EWM establishment, and restoration of natural aquatic plant communities. The observation supports the hypothesis that permanent EWM removal creates opportunities for native species recovery rather than leaving barren substrate.

Equipment and Methodology Evolution

Several operational improvements enhanced field efficiency in 2025. Refined micro-barrier assembly techniques reduced preparation time, improved GPS documentation enabled better site tracking, and optimized dive team coordination increased daily productivity. The established infrastructure (boats, storage, staging areas), along with a willing volunteer army to fill sandbags and perform other chores, allowed the team to focus on field operations rather than logistical challenges.

The learning curve effects from six years of continuous operations (2020-2025) have significantly improved the team's ability to assess sites, deploy barriers effectively, and

document results. This accumulated expertise represents a valuable institutional asset for long-term EWM management with ever-decreasing project costs.

Ongoing Research

Research on the biological and geochemical impacts of biodegradable benthic barriers on the lake ecosystem, initiated in 2022 under the direction of Dr. Mark Luttenton at Grand Valley State University, continued through 2024 with final data collection completed. Graduate student Anna Briem, with the assistance of our dive team and GTB personnel in 2024, conducted comprehensive sampling of plant communities, macroinvertebrate assemblages, fish populations, and water chemistry parameters to quantify the effects of barrier deployment on the lake ecosystem. Targeted data evaluation and manuscript writing continued in 2025 with expected scientific publications due this winter.

Research Summary

The research program evaluated multiple aspects of barrier impacts:

EWM Control Efficacy: Documentation of EWM removal effectiveness and timeline of plant mortality under barriers of various deployment durations.

Native Plant Recovery: Assessment of native aquatic plant species composition and abundance on treated sites, including identification of recolonizing species and comparison with reference sites.

Macroinvertebrate Communities: Sampling of benthic macroinvertebrates above and below barriers to determine whether barrier presence affects invertebrate diversity, abundance, or community composition.

Fish Communities: Survey of fish species utilization of treated areas compared to untreated reference sites to assess whether barriers affect fish habitat quality or species preferences.

Water Chemistry: Analysis of water samples from above and below barriers for soluble reactive phosphorus (SRP), nitrate/nitrite, and ammonia to determine whether decomposition of plant material under barriers affects nutrient dynamics.

Preliminary Findings

Based on three years of data collection (2022-2024), preliminary observations include:

- Barriers effectively removed EWM with little or no regrowth through barriers observed
- Native plant species began colonizing treated sites, with species such as *Vallisneria americana* and *Potamogeton amplifolius* establishing through barriers

- Initial nutrient spikes (ammonia and nitrate/nitrite) were observed shortly after barrier deployment, followed by gradual decrease with no sustained elevation of SRP
- Fish surveys indicated there was no major change in fish communities associated with barrier deployment

As noted, these are preliminary summaries and final results could change. Full statistical analysis and publication of results are expected following completion of data processing in winter of 2025-26. This research will hopefully provide important scientific validation of burlap barriers as an effective EWM management tool with minimal negative ecosystem impacts.

The collaboration between GVSU, GTB, and LLLA demonstrates the value of integrating rigorous scientific research with adaptive management practices, ensuring that field operations are informed by evidence-based understanding of barrier effects.

Acknowledgements

So many individuals and organizations are required to make progress on an initiative of such magnitude as this. Along with those mentioned below, there exists a whole community of people who support this work, both financially and with their gift of time. To all, we are forever grateful.

Friends of Lake Leelanau Foundation for continued funding.

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Grand Traverse Band of Ottawa and Chippewa Indians for direction and assistance with critical field work activities. None of this would be possible without the partnership and collaboration between the LLLA, GTB, and its Natural Resources Department and Tribal Leadership. Special thanks to **Josh Jackiewicz** and **Nathaniel Campbell**, both 5th year field technicians with GTB, for their consistent technical assistance to this project.

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Lonnie Rademacher, LLLA volunteer, for his countless volunteer hours and full engagement in our work. Without Lonnie's work and commitment, we could not have accomplished what we did in 2025. His attention to detail, willingness to volunteer his time to seek out and organize other volunteers, and unwavering encouragement of our work was invaluable.

Carol Rademacher, LLLA volunteer, for organizing, recruiting, and managing data for our CBM EWM Monitoring pilot program.

Thad Popa, LLLA volunteer who continued to maintain our SCUBA tank compressors and troubleshoot issues during the field season.

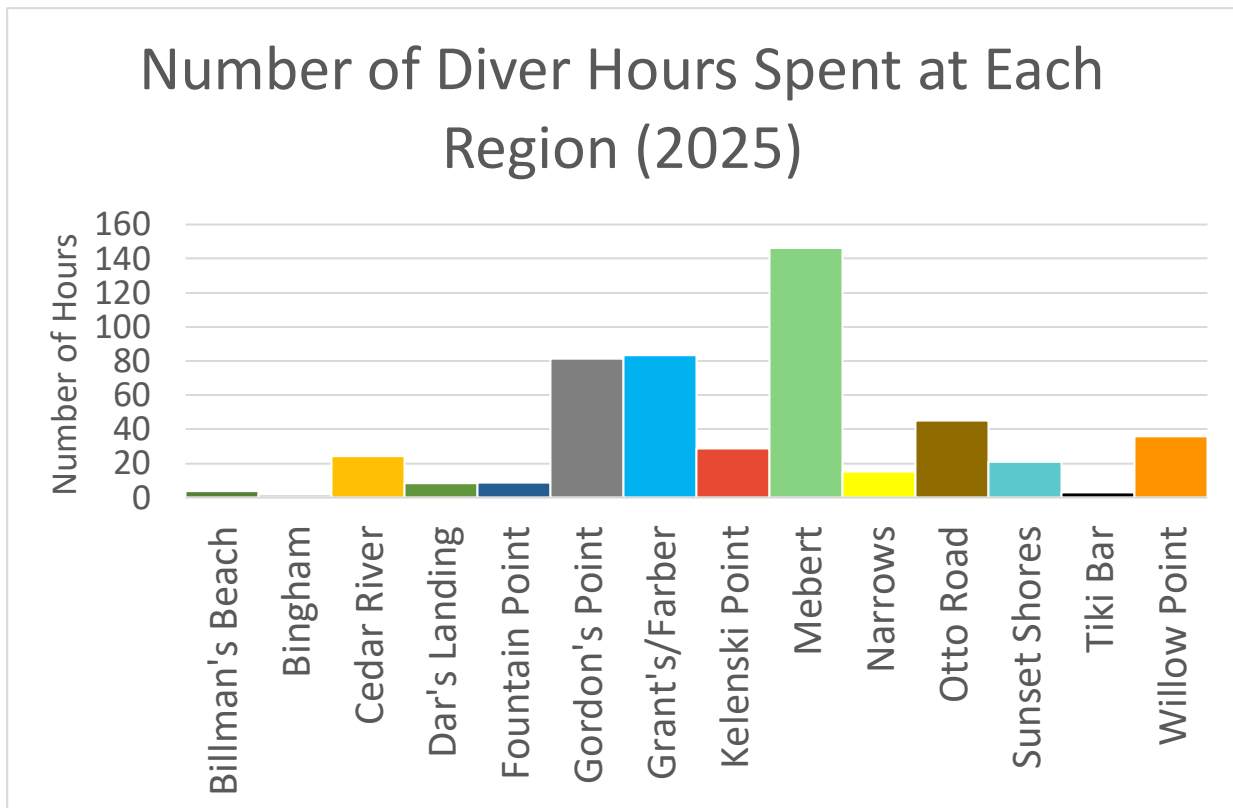
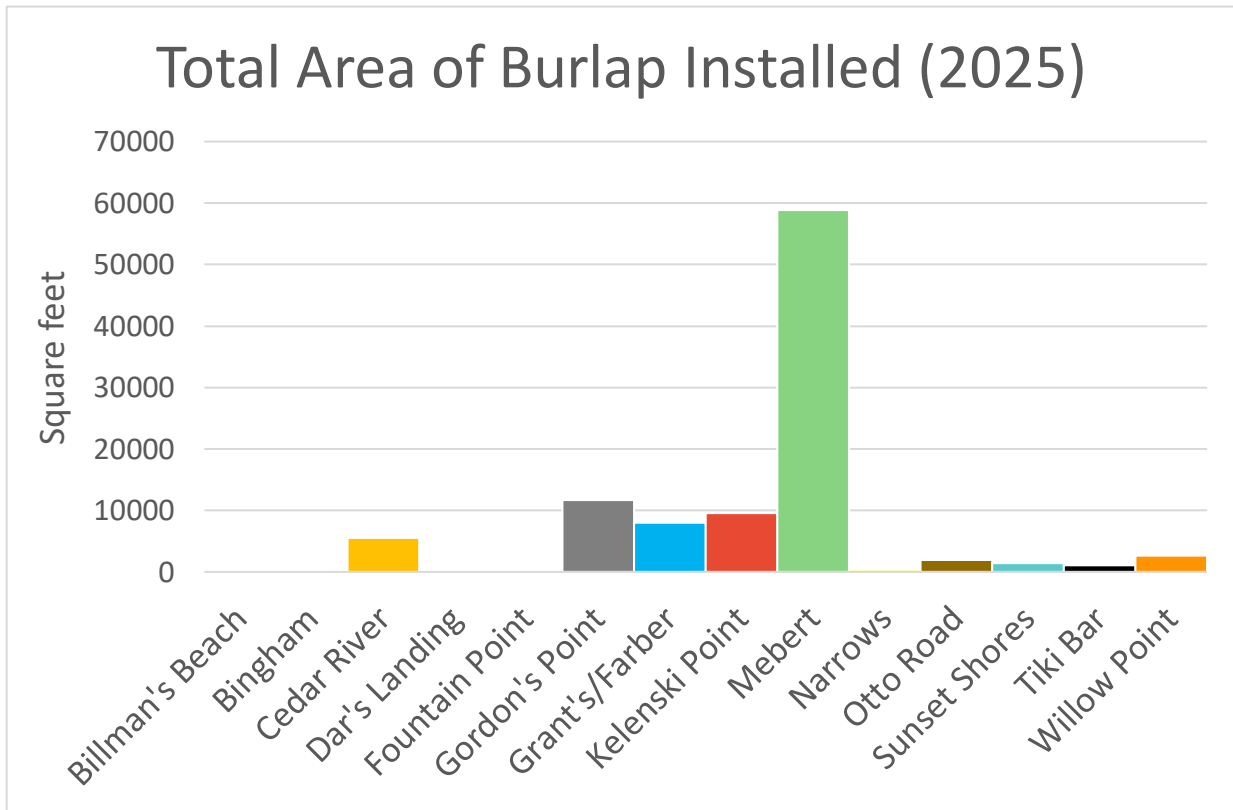
Kelsey Froelich (Freshwater Solutions, LLC) for volunteering to fill in numerous times and for helping develop the NLL CBM pilot program.

The 2025 Field Work Team for their hard work, dedication, and commitment throughout the field season. The team consisted of **Chris Froelich** (3rd year field technician), **Elizabeth Haber** (1st year field technician and data manager), **Austin O'Connor** (4th year diver), **Catherine Dunn** (4th year diver), **Em Masterson** (3rd year diver), **Marin Young** (1st year diver), and **Mara Pellerito** (2nd year diver). This entire team was punctual, positive, and a delight to work with due to their work ethic and willingness to "go the extra mile" so that we would have a better chance for success. A special thanks to **Elizabeth Haber** for her meticulous management of data throughout the field season. Without such a talented and committed team our chance for progress and advancement would have been greatly diminished.

Appendices

Appendix A: Regional Data Summary Table and Graphs

Region Name	Diver Hours (2025)	Burlap Area 2024 (sq ft)	Burlap Area 2025 (sq ft)	Change (sq ft)
Billman's Beach	3.75	0	0	0
Bingham	2.00	0	0	0
Cedar River	24.27	2,252	5,531	+3,279
Dar's Landing	8.42	576	18	-558
Fountain Point	8.76	0	0	0
Gordon's Point	81.37	12,880	11,685	-1,195
Grant's/Farber	83.42	44,975	7,997	-36,978
Kelenski Point	28.75	16	9,556	+9,540
Mebert	146.23	3,120	58,860	+55,740
Narrows	15.26	304	377	+73
Otto Road	45.12	46,358	1,937	-44,421
Sunset Shores	20.93	0	1,420	+1,420
Tiki Bar	3.00	1,160	1,073	-87
Willow Point	35.88	13,212	2,645	-10,567
TOTAL	507.16	124,853	101,099	-23,754
		2.87 acres	2.32 acres	-0.55 acres



Appendix B: Barrier Type Distribution 2025

Barrier Category	Count	Total Area (sq ft)	Percentage of Total
Micro barriers	354	11,329	11.2%
Meso barriers	61	26,370	26.1%
Large barriers	22	63,400	62.7%
TOTAL	437	101,099	100%

Appendix C: Management Stage Assessment by Site

Site	2024 Status	2025 Status	Stage Progression
Mebert	Stage II	Stage III	Eradication
Kelenski Point	-	Stage III	New - Maintenance
Cedar River	Stage III	Stage III	Eradication
Sunset Shores	-	Stage III	New - Maintenance
Willow Point	Stage III	Stage III/IV	Transitioning
Gordon's Point	Stage III	Stage III/IV	Transitioning
Tiki Bar	Stage III/IV	Stage IV	Maintenance
Narrows	Stage IV	Stage IV	Maintenance
Otto Road	Stage III	Stage IV	Maintenance
Grant's/Farber	Stage III	Stage IV	Maintenance
Dar's Landing	Stage III	Stage IV	Maintenance

Stage Definitions:

- Stage I (No remediation): EWM located but not addressed
- Stage II (Control): Managing growth but not achieving eradication
- Stage III (Eradication): Comprehensive coverage to eliminate all EWM from site
- Stage IV (Maintenance): Surveillance and minor interventions only; eradication achieved