Candlewood Lake Authority 2022 & 2023 Lake Steward Program Final Report



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Results Summary

Launch	Pontoon	Bowrider	Fishing Boat	Wakeboard Boat	Misc.	PWC	Kayak	Total Vessels Inspected
Lattins Cove	20	216	16	25	2	120	1	400
Squantz Cove	0	0	0	0	0	0	0	0
Brookfield	3	15	2	1	0	5	0	26
Danbury	9	66	2	0	0	27	0	104
New Fairfield	0	0	0	0	0	0	0	0
New Milford	2	14	0	1	0	0	0	17
Sherman	0	11	1	0	0	2	0	14
Total Vessels	34	322	21	27	2	154	1	<u>561</u>

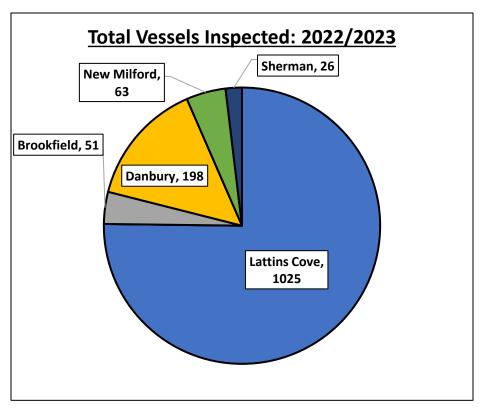
Table 1: Total Vessels Inspected by Launch & Type of Vessel in 2022

Launch	Pontoon	Bowrider	Fishing Boat	Wakeboard Boat	Sail	PWC	Kayak	Total Vessels Inspected
Lattins Cove	31	367	34	7	1	181	4	625
Squantz Cove	0	0	0	0	0	0	0	0
Brookfield	2	20	0	0	0	3	0	25
Danbury	7	65	3	0	0	19	0	94
New Fairfield	0	0	0	0	0	0	0	0
New Milford	2	33	0	1	0	10	0	46
Sherman	0	9	0	0	0	3	0	12
Total Vessels	42	494	37	8	1	216	4	802

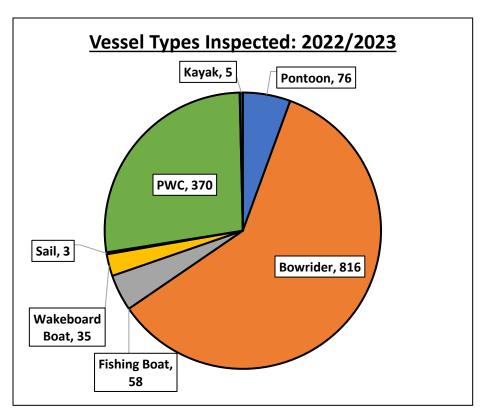
Table 2: Total Vessels Inspected by Launch & Type of Vessel in 2023

Between 2022 and 2023, a total of <u>1363</u> boats were inspected by Lake Stewards before entering Candlewood Lake. The majority of these inspections (1025) were conducted at the public Lattin's Cove boat launch and were of bowrider type boats (816). The decision was made in 2022 to not man the launch at Squantz Cove because of sufficient inspection coverage by the DEEP Boating Education Assistants (BEAs), and the launch at New Fairfield due to extremely low usage by daily boaters.

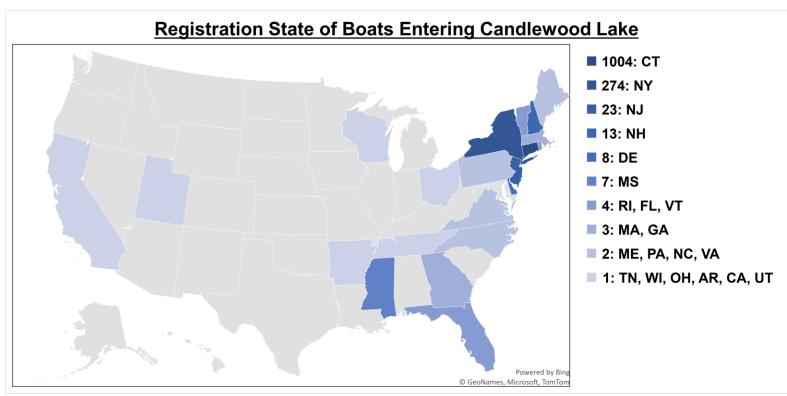
A total of **35 invasive species were stopped** at the ramps, **including 5 instances of new invasive species** (Water Chestnut, Hydrilla, and Zebra Mussels).



Graph 1: Total Vessels Inspected by Launch



Graph 2: Total Vessels Inspected by Type



Map 1: Registration State of Boats Entering Candlewood Lake in 2022 and 2023

	Lattins Cove	Squantz Cove	Brookfield	Danbury	New Fairfield	New Milford	Sherman	Total
СТ	686	0	51	187	0	61	19	1004
NY	262	0	0	7	0	0	5	274
NJ	22	0	0	1	0	0	0	23
NH	12	0	0	0	0	0	1	13
DE	7	0	0	1	0	0	0	8
MS	6	0	0	1	0	0	0	7
RI	2	0	0	2	0	0	0	4
FL	2	0	0	0	0	1	1	4
VT	4	0	0	0	0	0	0	4
MA	2	0	0	1	0	0	0	3
GA	3	0	0	0	0	0	0	3
ME	2	0	0	0	0	0	0	2
PA	2	0	0	0	0	0	0	2
NC	1	0	0	1	0	0	0	2
VA	1	0	0	0	0	1	0	2
TN	1	0	0	0	0	0	0	1
WI	1	0	0	0	0	0	0	1
OH	1	0	0	0	0	0	0	1
AR	1	0	0	0	0	0	0	1
CA	1	0	0	0	0	0	0	1

Table 3: Registration State of Boats Entering Candlewood Lake by Launch of Inspection in 2022 and 2023

Previously Visited Lake	Boats
Candlewood	
LI Sound	1008
	38 32
Hudson River	
Lake George	29
Lillinonah	28
Other	23
None	23
Zoar	22
CT River	15
Mahopac	13
Bantam	11
Peach Lake	8
Hopatcong	5
Greenwood Lake	4
Highland Lake	4
Housatonic	4
Oskawana	3
Roanoke	3
Winnipesaukee	3 3 2 2 2
Beaver Lake	2
Congamond Lakes	2
Crystal Lake	2
Ontario	2
Sebago	2
Smith Mountain Lake	2
(Beseck)	1
(Branford)	1
(Cedar Lake)	1
(Champlain)	1
(Channel Islands)	1
(Coventry)	1
(Davis Mill Pond)	1
(Farmington River)	1
(Fulton Chain Lakes)	1
(Gulf of Mexico)	1
(Island lake)	1
(Lake Arrowhead)	1
(Montauk)	1
	1
(Otis Reservoir)	1
(Otsego)	1
(Quassapaug)	
(Reacher Bay)	1
(Silver Lake)	1
(Squantz Pond)	1
(Van Sciver)	1
(Wallenpaupack)	1
(Wanaksink)	1
(White Lake)	1

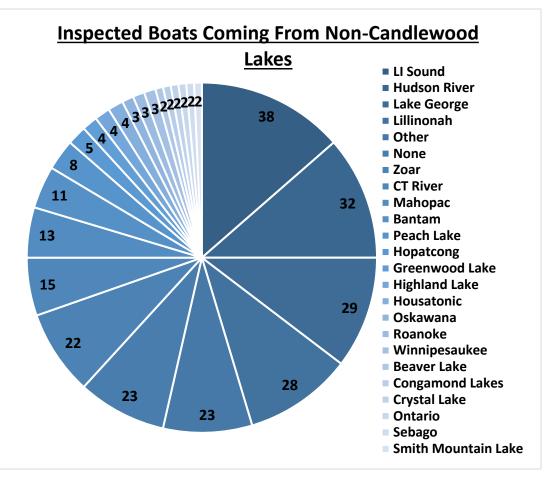
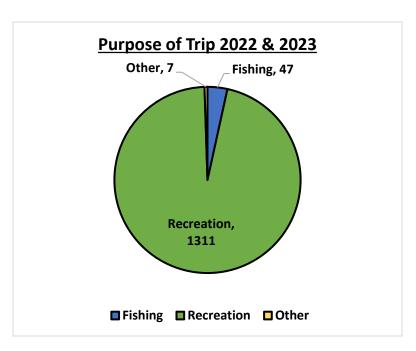


Table 4 & Graph 3: Previous Lake or Waterbody Visited before Candlewood. Note that waterbodies in "()" are part of the "other" category. Boats re-entering Candlewood were by far the most common (77%) and were not included in the graph for ease of visualization.



Graph 4: Self-Reported Purpose of Trip from Boaters During Inspection in 2022 and 2023.

	Yes	No	% Yes
2022	487	70	87.43
2023	707	97	87.94

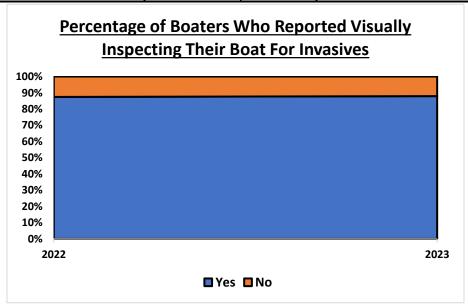


Table 5 & Graph 5: Percentage of Boaters who self-identified as having inspected their boat for invasives before leaving that day. This question was added in 2022.

	Yes	No	% Yes
2021	552	76	87.90
2022	457	97	82.49
2023	695	109	86.44

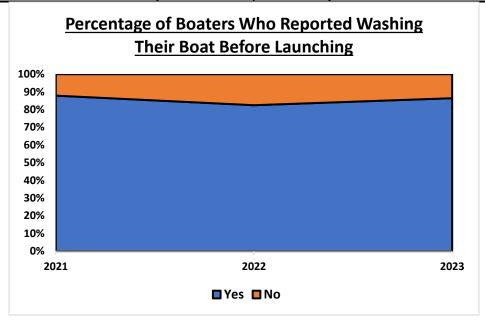


Table 6 & Graph 6: Percentage of Boaters who self-identified as having washed their boat before leaving that day.

	Yes	No	% Yes
2021	351	307	53.34
2022	291	268	52.06
2023	580	224	72.14

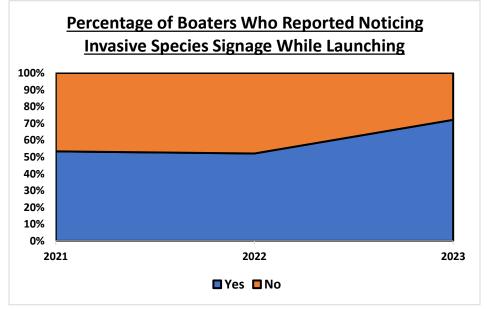
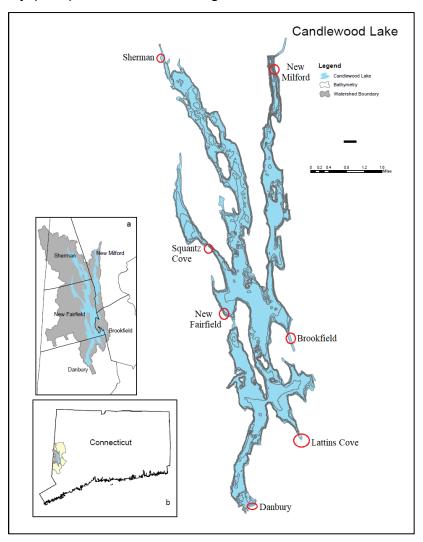


Table 7 & Graph 7: Percentage of Boaters who self-identified as having noticed Invasive Species Signage when Launching their Boats Previously.

Program Introduction

The Candlewood Lake Authority (CLA) "Lake Steward Program" started in 2021

with a mission to help prevent the introduction of aquatic invasive species to Candlewood Lake, as well as educate recreational boaters on invasive species prevention. To accomplish these goals, the CLA stations "Stewards" at the 7 public launches around Candlewood Lake on peak boating days during the summer to offer free voluntary boat and trailer inspections to boaters. Those 7 launches include 5 municipally managed launches that are reserved for



Map 2: Candlewood Lake with 7 Public Boat Launches Highlighted.

residents of that town, as well as two public launches managed by the State of Connecticut Department of Energy and Environmental Protection (DEEP).

Historically, it has been relatively easy to launch on Candlewood Lake without a boat inspection for invasive species. The two main existing means of protection before the Lake Steward Program were educational signage at the ramps, and DEEP Boating Education Assistants (BEAs) who were tasked with conducting inspections at the two

state ramps, along with a host of other responsibilities. However, the signage can be difficult to notice along with all the other signage at the ramps, and when the BEAs get so busy with traffic control and other responsibilities they wouldn't have time to inspect every boat. CLA Stewards were meant to assist the BEAs by taking care of the inspection and invasive species education responsibilities on the busiest days, as well as add that layer of protection to the 5 municipal launches which generally just had signage. CLA Stewards would work in teams of 2, where one team member would conduct the inspection of the boat and trailer, while the other member would speak with

the boater, educate them on what the program was, and collect anonymized data to help inform stakeholders about recreational patterns on the lake. Inspections and data collection were completely voluntary, and thus, not every boat entering the lake accepted



Photo 1: Two Lake Stewards Waiting for Boaters at Lattins Cove

an inspection, but the majority of boaters agreed to an inspection and data collection. Inspections involved a quick search of the hull, prop, and trailer, followed by asking the boater to empty their bilge, ballast, and live-well (if present). Stewards would feel the boat hull with their hands to search for small juvenile zebra mussels and other mollusk species.

Stewards were stationed at launches from roughly 8am-4pm, and would cover two different launches on Saturdays, Sundays, and holidays (Memorial Day, July 4th, and Labor Day). That would mean on any given day, two of the seven total launches would be covered. As the program has progressed and we began to get an understanding of which ramps had the most activity, our efforts became more focused on the busiest ramps, while still visiting most ramps semi-regularly to ensure our data was representative of the whole lake. Boater responses to the program were overwhelmingly positive, with most boaters not only agreeing to the inspections, but expressing their excitement about the program and their happiness to see steps being taken to protect Candlewood Lake. Stewards were trained both by CLA staff and volunteers, as well as attending a DEEP online training required for the BEAs.

Funding for this program was provided by the CT DEEP's grant funding opportunity for the control of aquatic invasive species (AIS) and blue-green algae, funded through the boat registration stamp program in the state of CT.

Total Inspection Results

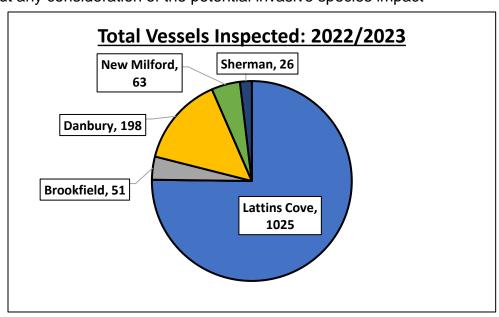
Launch	Pontoon	Bowrider	Fishing Boat	Wakeboard Boat	Sail	PWC	Kayak	Total Vessels Inspected
Lattins Cove	51	583	50	32	3	301	5	1025
Squantz Cove	0	0	0	0	0	0	0	0
Brookfield	5	35	2	1	0	8	0	51
Danbury	16	131	5	0	0	46	0	198
New Fairfield	0	0	0	0	0	0	0	0
New Milford	4	47	0	2	0	10	0	63
Sherman	0	20	1	0	0	5	0	26
Total Vessels	76	816	58	35	3	370	5	<u>1363</u>

Table 8: Total Vessels Inspected by Launch & Type of Vessel for both 2022 & 2023

The 2022 steward season stretched from June 18th, 2022 to September 4th, while the 2023 season stretched from June 10th, 2023 to September 3th. In that time, stewards inspected 1363 boats and stopped **35 boats with invasive species from entering.** That is 1363 boats and boaters that would likely have otherwise launched into Candlewood Lake without any consideration of the potential invasive species impact

they would have had, including 35 with known invasives — including 5 instances of new invasives (Water Chestnut, Hydrilla, and Zebra Mussels). In any of

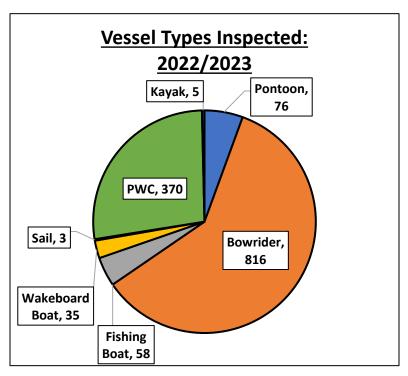
these cases, all visible



Graph 1: Total Vessels Inspected by Launch

plant/mussel material was removed, and the boater was educated on future invasive species prevention. Most commonly found was Eurasian Watermilfoil, an invasive plant that has already established a self-sustaining population in Candlewood Lake. The stewards would take photos of any species not obviously milfoil for identification.

As shown in Graph 1, the lion's share of inspections were conducted at Lattins Cove, one of the DEEP managed launches, and the busiest on Candlewood Lake. Danbury's municipal launch was second in inspections. We cannot say for certain whether Danbury or Squantz Cove is the more often utilized ramp, as Squantz Cove was generally covered sufficiently by the BEAs stationed there; allowing our stewards to focus on other ramps, but Squantz Cove was likely more often used due to its easy parking access and openness to the public. The other 4 municipal town ramps were not used at the same rate and had a higher use at the beginning of the boating season



Graph 2: Total Vessels Inspected by Type

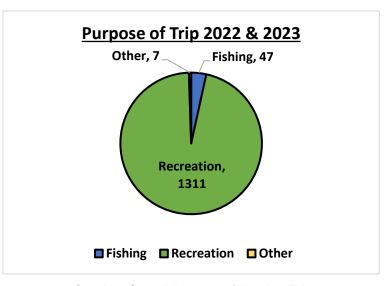
compared to the end.

As for the share of boat
types launching in Candlewood
Lake, shown in Graph 2,
Bowriders were far and away
the most common boat type,
followed far behind by
Personal Watercraft (PWCs, or
Jetskis), then pontoons and
fishing boats. While the count
of wakeboard boats was only

35, we still believe there was significant overlap between that and the bowrider category as some of the stewards weren't familiar enough with boat types to make the distinction. We will continue to work on ensuring that both wakeboard boats and fishing boats are properly categorized. V-hull boats also present a unique problem for invasive species inspection, requiring inspectors to look even further beneath the hull to ensure there are no species stuck between the trailer and boat. This is something our stewards were trained in and equipped with grabbers to help get plants out of difficult to reach places.

When asked the purpose of their boating trip for the day, most boaters were

general with their answer, saying things like "just for fun", "recreation", or "spend time with family." Generally, most boaters visit Candlewood Lake to spend the day on the water and enjoy multiple different activities in one day, including: swimming,



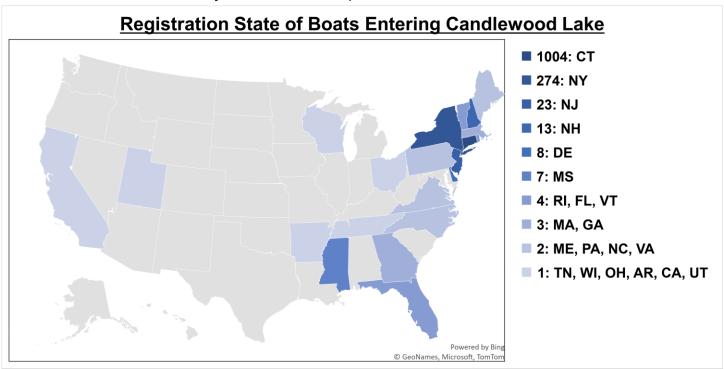
Graph 4: Stated Purpose of Boating Trip

tubing, sunbathing, eating & drinking, and just driving the boat. There were a number of boaters who were visiting for the expressed purpose of fishing, but many of those boaters might also come to Candlewood Lake during tournaments, which our stewards were not stationed at (but DEEP employees are). Moving forward, we will more specifically include "Wakeboarding" and "Visiting Islands" in this question to understand usage patterns more specifically.

Previous Location of Boaters Results

One of our priorities in data collection was to determine where boaters were coming from when visiting Candlewood to help assess the level of risk associated with transient boat traffic. If, for instance, very few boaters were coming from other areas with invasive species that hadn't yet been introduced to Candlewood, then the level of risk of introduction would be lower than we thought. Or, if most boaters were coming from a few waterbodies with known invasive infestations, we could focus our inspection and education efforts on those species specifically.

First, in an effort to get an idea of where the boaters visiting Candlewood are from (and where their boat spends most of its time), we asked each boater which state the vessel was registered in. That information is contained in Map 1, as well as Table 2 in the "Results Summary" section of this report. In 2022 and 2023, it remained true that



Map 1: Registration State of Boats Entering Candlewood Lake in 2022 and 2023

the vast majority (74%) of boaters visiting Candlewood had registered their boats in Connecticut. That percentage has remained consistent through all 3 years of the program. New York State, due to its proximity to the lake (including the very high

Previously Visited Lake	Boats
Candlewood	1008
LI Sound	38
Hudson River	32
Lake George	29
Lillinonah	28
Other	23
None	23
Zoar	22
CT River	15
Mahopac	13
Bantam	11
Peach Lake	8
Hopatcong	5
Greenwood Lake	4
Highland Lake	4
Housatonic	4
Oskawana	3
Roanoke	3
Winnipesaukee	3
Beaver Lake	2
Congamond Lakes	2
Crystal Lake	2
Ontario	2
Sebago	2
Smith Mountain Lake	2
(Beseck)	1
(Branford)	1
(Cedar Lake)	1
(Champlain)	1
(Channel Islands)	1
(Coventry)	1
(Davis Mill Pond)	1
(Farmington River)	1
(Fulton Chain Lakes)	1
(Gulf of Mexico)	1
(Island lake)	1
(Lake Arrowhead)	1
(Montauk)	1
(Otis Reservoir)	1
(Otsego)	1
(Quassapaug)	1
(Reacher Bay)	1
(Silver Lake)	1
(Squantz Pond)	1
(Van Sciver)	1
(Wallenpaupack)	1
(Wanaksink)	1
(White Lake)	1
(write Lake)	1

population of southeastern New York) was second with 20% of the boaters. Every other state was relatively rare, comprising 6% of the total between all 19 of them. These results aren't unexpected. Due to the public nature of the lake being open for visitors, and its closeness to the NY border, it makes sense that NY would be second most common registration state – and this percentage has also remained consistent all three years of the steward program.

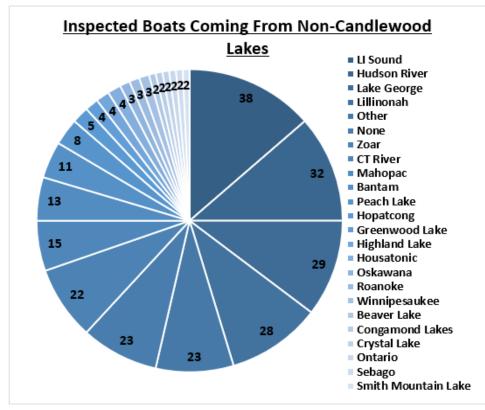


Table 4 & Graph 3: Previous Lake or Waterbody Visited before Candlewood. Note that waterbodies in "()" are part of the "other" category. Boats re-entering Candlewood were by far the most common (77%) and were not included in the graph for ease of visualization.

It is worth noting that these are not necessarily new unique boaters every inspection, as boaters will often return to Candlewood many times through the course of the season.

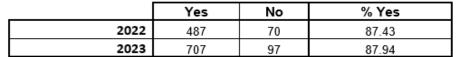
To try to understand the number of returning boaters, they were asked if they've undergone a steward inspection before, which is discussed later in this report.

Boaters were also asked what was the most recent lake or waterbody they visited before Candlewood to get an idea of the invasive species threat presented by the transient boating community. Again, the vast majority of boaters (77%) had previously been on Candlewood before their visit, presenting no invasive species threat to Candlewood's ecosystem. Second to that is the Long Island Sound, which presents a relatively low invasive species risk due to it being a saltwater environment. Of particular concern are boaters coming from: Lake Lillinonah, Lake Zoar, the CT River, the Housatonic River, and single boats coming from smaller unknown waterbodies contained in the "other" category. These boaters present a very real risk of spreading invasive species of concern to Candlewood, including Hydrilla and Water Chestnut in particular. This "high risk" category respresents 7% of all boaters inspected by our stewards. This percentage would have been even higher before the program began, but since the introduction of zebra mussels in the Candlewood Ecosystem, the primary concern now are those plant species, as well as Quagga Mussels.

Best Practice Implementation Results

Our final priority in data collection was trying to assess what impact, if any, educational efforts have had on the Candlewood Boating Community. Namely, how often are people taking the steps to wash, drain, and dry their boats before launching, and what impact is the signage at the ramps having on that messaging? Finally, now that the steward program has been running for a couple of years, we're hoping to see some positive improvement in these numbers as more boaters return having gone through an inspection.

First, stewards asked whether boaters had conducted a visual inspection of their boats before leaving that day. This question was not asked in 2021 but was added in 2022 to understand who is taking basic invasive species precautions. Most boaters responded that yes, they had inspected their boat before launching.



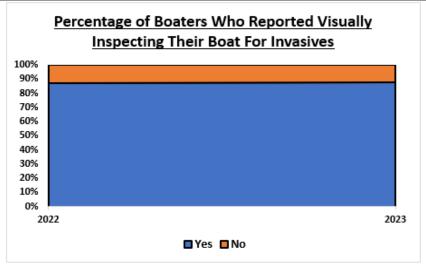


Table 5 & Graph 5: Percentage of Boaters who self-identified as having inspected their boat for invasives before leaving that day. This question was added in 2022.

The boaters were then asked whether they had actively washed and dried their boat before leaving that day. The expectation was that this number would be higher than just those who inspected, as it indicates a more comprehensive invasive species prevention strategy. This question has been asked all three years.

	Yes	No	% Yes
2021	552	76	87.90
2022	457	97	82.49
2023	695	109	86.44

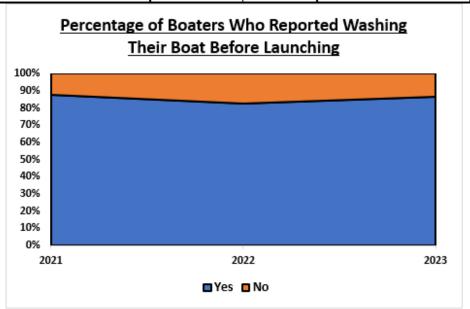


Table 6 & Graph 6: Percentage of Boaters who self-identified as having washed their boat before leaving that day.

While it was true that the numbers of boaters reporting that they had washed their boat was lower than those who just inspected their boat, the amounts are much closer than we expected. Unfortunately, this might indicate some significant social desirability bias in the data, as boaters are self-reporting behavior they expect to be "correct" rather than answering truthfully. While the inspections were voluntary, and it was clear our stewards did not have any enforcement capabilities, it is almost certain that the share of boaters who did not inspect or wash and dry their boat is larger than the amount reflected in the graphs. In fact, there were multiple boaters with invasive

species found during an inspection who self-reported having inspectedWith all that said, we can still be encouraged by the fact that, 87% of boaters reported that they inspected, washed, and dried their boat – meaning that at the very least they also understand that this is the best practice for protecting any lakes they visit.

Our stewards also asked boaters if they had noticed the invasive species signage at the boat launches before.

	Yes	No	% Yes
2021	351	307	53.34
2022	291	268	52.06
2023	580	224	72.14

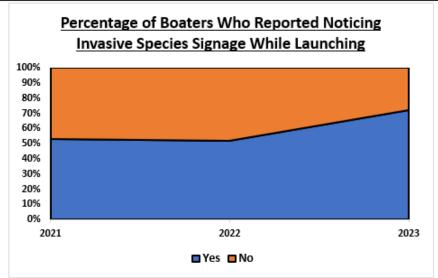


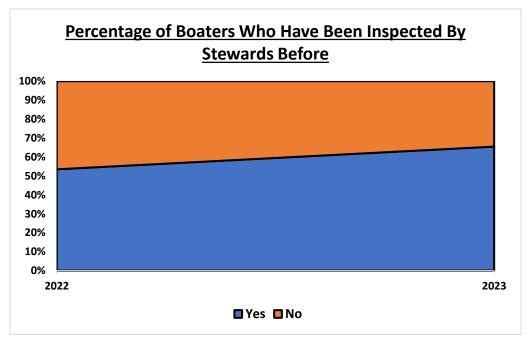
Table 7 & Graph 7: Percentage of Boaters who self-identified as having noticed Invasive Species Signage when Launching their Boats Previously.

Of all the best practices results, these are probably the most interesting. While our initial results were discouraging, indicating that in year one 47% of boaters reported never having even noticed educational signage before, the change over the past year is significant. This could mean either that boaters are noticing signage because they are more aware of the issue, or they are noticing signage that is part of the stewards' stations, which is hopefully reaching them more effectively. This is a pretty clear indication that actual people at the ramps educating boaters about invasive species not

only directly informs them of the issue but might clue them in enough to notice signage moving forward both on Candlewood Lake and other lakes. Ideally this would have longer term educational impacts past just the times when stewards are present, but hopefully extending to times when launches are not manned. Of course, the only change was seen during the 2023 season, so we'd like to see this trend continue through subsequent years to confirm our suspicions.

Finally, stewards asked whether boaters had been through a steward inspection before.

	Yes	No	% Yes
2022	299	260	53.49
2023	525	277	65.46



Graph 8: Percentage of boaters who reported having undergone a steward inspection before from 2022-2023.

This question was added in 2022 to try to understand how many boaters were new and how many were returning after a previous inspection. More than half of all the boaters both years were returning, and this percentage increased the following year. We will track this moving forward to see if the increase continues.

Conclusions

We are extremely pleased with the continued results and progress of the CLA Lake Steward Program. Our program succeeded in three key areas: **inspecting 2067 boats that would have otherwise not been inspected**, reaching over 1000 boaters with critical invasive species prevention messaging, and collecting new and informative data that informed this report and will continue to inform our management moving forward.

It is clear that the majority of boaters visiting Candlewood Lake enter through the two state launches, particularly Lattins Cove, and to a lesser extent, the Danbury municipal launch. Squantz Cove launch is generally more manageable for the DEEP BEAs than Lattins due to its traffic patterns and somewhat less convenient location. We will continue to focus on the other launches until such time that support is once again needed at Squantz Cove. The majority of boaters are also returning to Candlewood from a past visit to Candlewood, and are registered in the state of Connecticut, with a healthy number having registered their vessel in New York. These percentages have remained very stable over three years, indicating consistency in the share of boaters from Connecticut vs. New York vs. other states. There were boaters visiting from waterbodies with invasive species of concern for Candlewood Lake: particularly Hydrilla and Water Chestnut. Both of these species were stopped and removed by stewards in 2023. The focus will continue to be on ensuring that more transient recreational boaters are given the invasive species information necessary to know not to transfer any species between lakes.

The amount of boaters self-reporting that they washed and dried teir boats prior to launching in Candlewood is encouraging for past invasive species messaging, but might be indicitive of response bias in the data. While signage at the launches historically did not have the impact we would like, hopefully that signage paired with education from the stewards will sufficiently remind boaters of invasive species best practices moving forward. We will continue to monitor how this percentage changes over time to see if perhaps the steward program is helping to make signage more effective by direct education hopefully lasting – and reports of boaters being inspected by stewards multiple times (over 50%) will hopefully help that message remain clear year-over-year.

For future years' lake stewards, we'd like to ensure that boats are being properly categorized, especially wakeboard boats and fishing boats. We'd also like to add times of inspections and be more specific for the "purpose of trip" to help us understand usage patterns on the lake better. We are extremely encouraged by the positive feedback received from the community regarding our stewards and this new program and feel as if this is another way for the CLA, municipalities, and DEEP to reach the boating community directly and make a positive impact. Not only does the direct education of boaters make a difference, but the active stopping of 5 new invasive species is exceptional.

We look very forward to the future of the program, and want to thank the CT DEEP again, who's funding made this program possible. Together we hope to continue having a positive impact on the lake's ecosystem and continue to preserve Candlewood Lake for generations.

Acknowledgements

The below people and organizations made the Lake Steward Program Possible:

Our Lake Steward Managers: Dylan Cortese, Liam Ford, Jack Deakin

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All municipal First Selectmen and Mayors who supported the program.

The entire Candlewood Lake Boating Community for welcoming our stewards and enjoying the program!

Thank You!

Appendix A:

All Raw Data Available from the Candlewood Lake Authority upon request

to science@candlewoodlakeauthority.org