

Loon Nesting Rafts

Maine Partners Working With Local Volunteers
to Improve Loon Nesting Success Using
Artificial Nesting Platforms

MAINE 
AUDUBON



Maine Loon Restoration Project

Photo: Michelle Duffy



This project is funded by the U.S. Fish and Wildlife Service on behalf of the Bouchard Barge 120 Buzzards Bay Oil Spill Trustees

For more information, visit our project websites or email one of the project partners:

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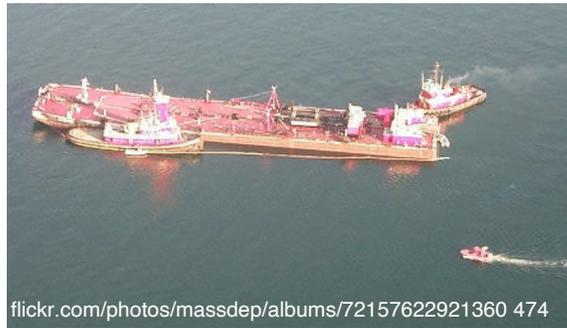
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https://mainelakes.org/news_article/lea-is-part-of-a-larger-loon-project/

Maine Loon Restoration Project

What happened?

In 2003, 98,000 gallons of oil spilled in Buzzards Bay, off the coast of Massachusetts and Rhode Island, from a tank barge called Bouchard B-120 (pictured above). Over 500 Common Loons died, including some that breed on Maine lakes.



flickr.com/photos/massdep/albums/72157622921360474

Loon Restoration

A settlement from this spill, announced by the U.S. Fish and Wildlife Service in 2021, has led to funding for loon recovery on their breeding grounds. The Maine Loon Restoration Project received a portion of the funds to increase loon breeding success and reduce loon deaths in Maine.



flickr.com/photos/massdep/sets/72157622921360474 /

A view of an oiled cove in Buzzard's Bay after the spill

What are we doing?

This is a 5-year collaboration between Maine Audubon, Maine Lakes, Lakes Environmental Association, and the Penobscot Indian Nation. The project partners will work with volunteers across the state to place artificial nests where appropriate, conduct seasonal monitoring, expand the Fish Lead Free Program, and create a Loon Rangers program aimed at increasing nest protection measures and outreach to lake users.

Loon Rafts

This guide focuses on one part of the overall restoration project—the placement of artificial loon nesting platforms or “rafts”.



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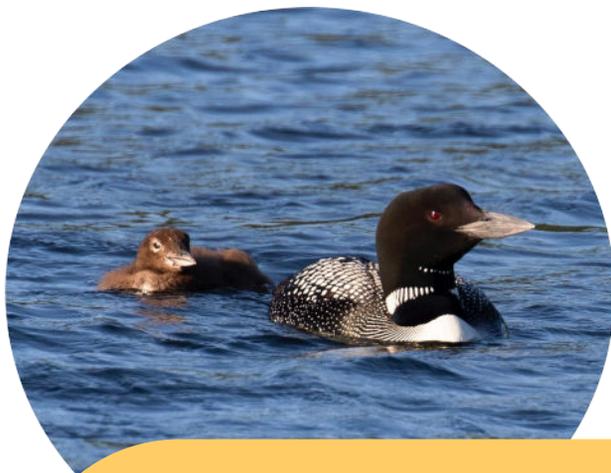
Oil covers the shoreline at Barneys Joy beach in Dartmouth after the 2003 Bouchard oil spill.

Where are we working?

We will be working with lake associations and other local volunteers to place rafts on lakes and ponds with low nesting success in 11 counties: York, Cumberland, Oxford, Androscoggin, Sagadahoc, Kennebec, Lincoln, Knox, Waldo, Hancock, and Penobscot.

Goal of Loon Rafts

Increase the number of loon chicks hatched through placement and monitoring of 99 loon nesting rafts through 2026.



Should I put out a nesting raft? Do nesting rafts work?

Why not put out a raft? Because rafts come with risks.

- Rafts may lure loons away from more sheltered and hidden marsh or shoreline nesting locations.
- Rafts can attract the attention of a nearby loon pair, resulting in territorial disputes that keep the pair from tending and guarding their nest.
- Rafts can make loon nests more visible to avian predators, like gulls and eagles.
- Improper placement can put nesting rafts in the path of boat wakes or waves, which can flood the nest.
- Rafts can break loose and go ashore, or float into other loon territories. Or the nest can flood if the raft is damaged.
- Other animals may nest on or damage the raft.
- Ill-designed or improperly built or placed rafts can lead to chick injuries or egg losses.

A Good Rule of Thumb:
if a pair successfully raises a chick at least once every three years, they probably don't need our help!

YES- in the right situations! But in the *wrong* circumstances, without proper maintenance and monitoring or with poor placement, rafts can actually hurt the loons' chances of producing chicks.

Remember: Loons have options

- They can start over again if their first nesting attempt fails.
- A nest that fails one year may be successful the next or they may find a new nest site.
- Some newly formed pairs might need a few seasons to learn the ropes and be successful.
- Some pairs don't nest or nest successfully every year. That's ok!

Sometimes it's better to just wait!

When is a raft appropriate?

A raft may be a good idea on your lake if these 3 situations apply:

1 Continual nest failure:

The loon pair has failed to hatch chicks every year for at least three years, or three of the last five years.

Continual Nest Failure

Clues that the pair may be nesting but not producing chicks: Nest building, courtship, an adult on the nest, but no chicks ever seen; nest predation; broken or floating eggs; the pair abandons the nest.

2 Failure due to problems that a raft CAN address:

Fluctuating water levels, predation from land animals, lack of good nesting habitat, and some types of disturbance.

Lack of Nesting Habitat

Lakeshore development can reduce prime nesting habitat, forcing loons to nest in poorer sites or not at all. A raft may be useful if prime habitat is lost within a loon pair's territory.

Fluctuating Water Levels

As lake levels rise and fall, nests can be flooded or stranded. Rafts float, so they help with fluctuating water levels or if waves & wakes flood the nest. Rafts make the most sense on lakes with dams where suitable nesting sites are flooded or stranded.

Predation from Land Animals

A raft can move the nest offshore, protecting it from mainland predators like raccoons or even dogs

Disturbance

If a loon is regularly disturbed, it may abandon its nest. If the nest is near a boat landing or other high use area, a raft can be placed offshore where activities may be less intrusive.

3 Local commitment to monitoring and maintenance:

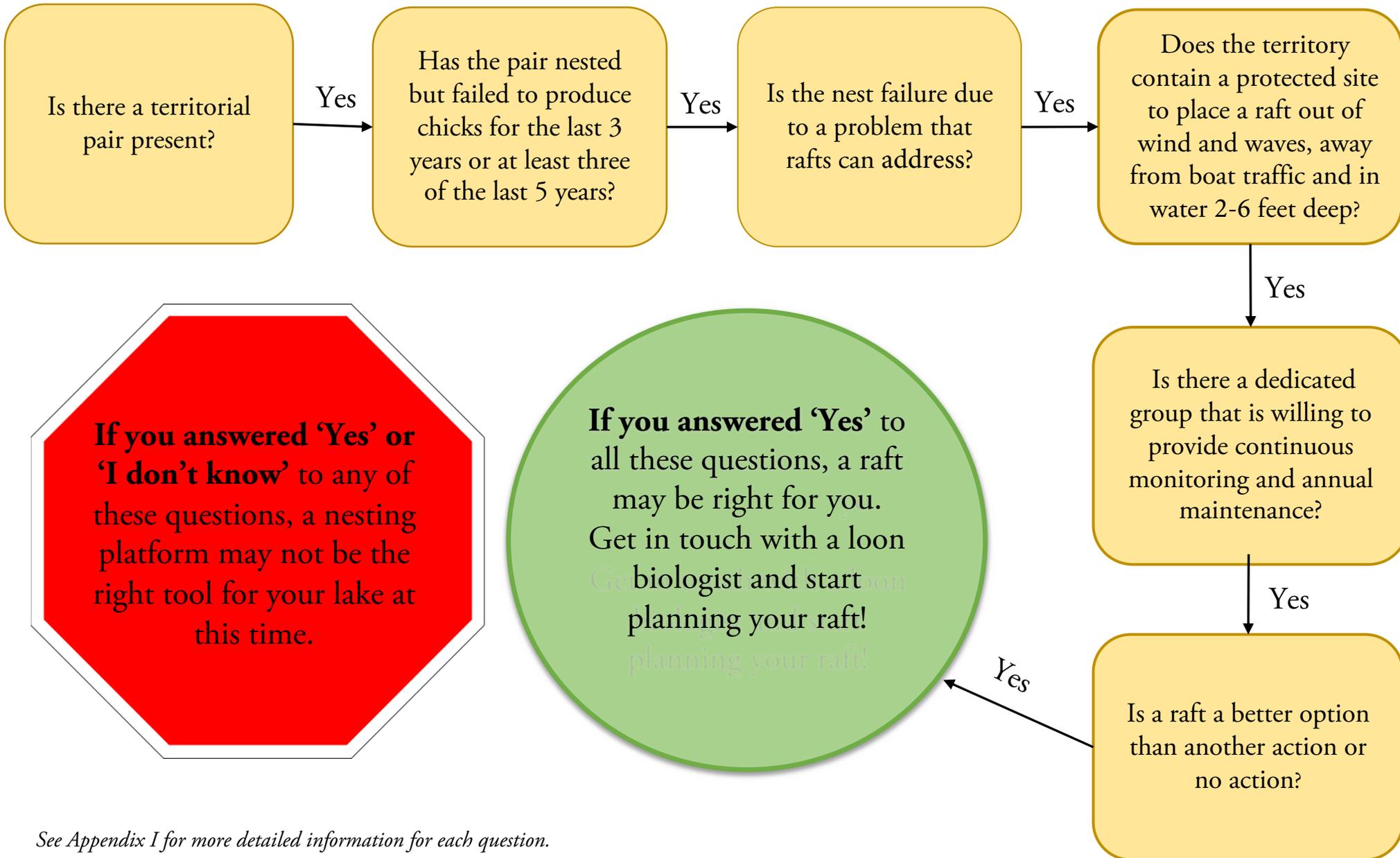
Rafts are a serious investment of time and take active management.

Local Commitment

The community should be ready to commit, including learning how to build the raft, placing it as soon as the ice melts, taking it out at the end of the season, and monitoring for problems and chicks.

Is a raft right for your lake?

Tip: If you don't have enough information to answer one of the questions below, watch the loons for a few years or participate in our monitoring program to find out more about how successful the loons on your lake are at nesting before considering a raft.



See Appendix I for more detailed information for each question.

Summary:

With the right team of people and the right circumstances, a loon nesting raft can be a great tool to increase loon nesting success, especially when changes in water level, mainland predators, or habitat losses result in repeated nest failures (the loss of eggs or newly hatched chicks still in the nest) for more than three breeding seasons. Loon rafts do come with risks, so consulting a professional loon biologist is a good idea – for you and for the loons.



So, you're ready for a raft. What's next?

Aug-Fall

Join one of our webinars to learn more about the project and what's involved. Contact one of the project partners to help you determine a good site for raft placement.

Winter

Plan to build your raft in fall or winter (or even the summer before), so you're ready to put it in the water soon after ice out.

Mar-Apr

Loons start defending their territories and looking for nest sites as soon as they return in early spring. The sooner the raft is out, the greater the chance that it will be used by loons. If geese nest on your lake, wait to put out the raft until they have chosen nest sites or put rocks or other obstructions on the raft temporarily to prevent the geese from settling in.

Apr-July

Monitor the loon pair and the raft once a week or at least once every two weeks to track the loons' use of the raft. Also check if the raft is securely attached, the loons have cover, and there are no other problems.

Aug-Fall

Continue to monitor until the chicks leave the lake in late fall/early winter, or at least until the chicks are 6 weeks old. Turn in monitoring reports. Retrieve the raft from the lake to store for the winter. With landowner permission, log rafts can be hauled ashore and leaned against a tree or placed on top of anchor blocks above the highest water line.

Next Year

Don't give up if the loons don't immediately take to the raft. Keep putting the raft out in the spring (and removing in the fall). If after 3 years it is not used, something is not right with the location or the raft, or they are simply not interested. Sometimes small changes like removing or putting on an avian guard, or moving to another location make it more suitable.

What does a properly constructed and placed raft look like?

Hint: you want it to mimic a natural nest

Raft characteristics

- Mimics a natural island or marsh hummock
- Rises and falls with changing water fluctuations
- Shade cover, vegetation to act as a visual barrier, a well-draining nest bowl, and easy access on and off
- A nest that floats 1” to 3” above water



Nesting raft built by W. Hughson, Photo: J. Seaton



This natural nest is what we're trying to replicate—visual barrier of shrubs, easy on and off, well-drained nest bowl.

Raft location

- A protected site out of prevailing winds and protected from waves and boat wakes
- 10-50' offshore where land predators may have a harder time accessing it
- Not so far offshore that it's in the way of boat traffic or fishing areas.
- Away from land-based recreation and development
- In a spot that doesn't attract attention from lake users
- Outside heavy boat traffic or recreational use area
- Well within the pair's territory so unlikely to attract other loons.

See Appendix II for detailed raft placement information

Types of Artificial Rafts

There are many kinds of artificial rafts that people have used for nesting loons. In this program we focus on two that have different advantages (and disadvantages). Site specific modifications may be warranted for both types.

Cedar Log Raft



Modular Raft



Cedar Log Rafts

Advantages:

Tried and true design. Has worked successfully to hatch chicks for over 50 years. Logs are durable, will work for a long time, can be built from local materials, and have a biodegradable base that won't introduce materials into the lake environment or end up in a landfill.

Disadvantages:

Heavier than modular rafts. The weight can be reduced significantly by letting the raft dry out close to the shoreline before propping it against a tree or on cinder blocks for the winter. Can saturate or waterlog over time, so may need added floatation.



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Wildlife Sanctuary



©Tracy Hart

Cedar log raft with
trapwire avian guard

Project participant
Alfred Lund towing
loon raft with cedar
boughs for aerial guard

Traditional cedar log design. This raft also includes optional features: a wave guard, an aerial guard with tree boughs for shade, and cedar decking to form the nesting platform.



©Somes-Meynell Wildlife Sanctuary

Cedar Log Raft Construction



Attach 4 logs together to form the base



8' long timberlock screws

1

Construct Base:

We will supply prepared raft supplies. But if you are creating your own cedar log raft, cut two 5-inch width cedar logs to 4 foot lengths. Notch the ends of the logs with a Sawzall, cutting off approximately half of the diameter of the log on both ends. Cut to the point that you have a notch that is 5" long. Now cut two additional logs to 3 1/2 foot lengths (no notches).

Align your two notched logs perpendicular to the other two logs to form 4' x 4' frame. Connect the four logs together using two 8" long timberlock screws on each corner.

Note: You can add a fifth log across the center for extra buoyancy and rigidity.



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Red arrow shows where the end of one log fits into the notched log to form a 90 degree corner

Cedar Log Raft Construction

2

Attach Floatation:

Use the 3-foot long twist ties you will be provided to attach a rigid oyster floats to each log on the inside of the log frame. Make sure the float isn't higher than the top of the logs where the decking will be placed.



Rigid oyster floats

3

Build Nesting Platform:

Line up 4-foot long cedar decking planks on top of the log frame running in the same direction as the notched logs. Make sure the decking extends to the outside edges of the log frame to fully cover the platform area. Consider leaving small gaps (less than 1/4" wide) for drainage. Use two to three 3" decking screws to secure the end of each piece of decking to the log frame.



Cedar log frame with attached cedar decking to form the nesting platform

Cedar Log Raft Construction

4

Attach Anchor Lines:

Screw in an eye bolt at opposite corners of the raft. Then once you are lakeside, attach 8-20' of galvanized coated cable, rope, or sinking line to the eyebolt using a clamp.

Note: Make sure to use enough cable so the line will not be taught even when the water is at the highest level.



5

Wrap several feet of chain around a cinder block and then use a chain link to attach the loose end of the anchor line to the chain. This step attaches the raft to a cinder block anchor. Alternatively, you can thread a marine grade rope through a several foot length of garden hose and wrap the hose around the cinder block to protect the line from abrasion.



Note: As a part of our raft kit, you will be provided with all of these materials except for the cinder blocks. For a full list of materials and tools needed, please see Appendix III.

Modular Raft Design

This raft, known as the Robinson Raft, is a new design by a Portland-based family.
For more information visit www.robinsonraft.org.

Advantages:

Lightweight and designed to assemble and disassemble easily, making it easier to transport over land and water, and to haul out at the end of the season. Uses recyclable materials whenever possible.

Disadvantages:

All man-made materials. This is a new design that has received limited use and testing so far, but with positive initial results.

Eco-sensitive: Recyclable materials

Durability: All rugged industrial materials.

Easy to assemble: 15 minutes, lakeside (no power tools).

Compact travel: Multiple bases can be stacked in a pick-up truck.

Detachable planted ballast boxes: Can be planted ahead, and attached to platform in water.



Modular Rafts

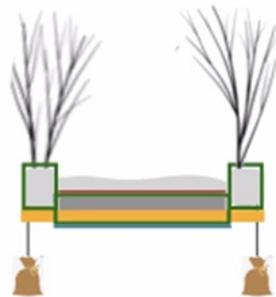


Photos and graphic from <https://www.robinsonraft.org>

Modular Raft Design

We are offering two Modular Designs:

Open Top



Open Top Raft
Planting Boxes,
No Avian Guard

**Basic with
Avian Guard**



Basic Raft with
Avian Guard



©VT Center for Ecostudies

Photos and graphic from <https://www.robinsonraft.org>

Modular Raft Assembly

Watch an assembly video of a basic base at www.robinsonraft.org/assembly.

See Appendix IV for a materials list and full, detailed instructions on assembly.



Trap wire comes pre-bent



Lay down cross beams



Add floatation—rigid floats here.
235 lbs. floatation



Flexible floats here. 248 lbs. floatation.
Cross beams longer for rafts
with planting boxes.
Planting boxes rest on extended beams.



Assembled base—
can attach avian guard



Finished raft without avian guard or
planting boxes. Note: oyster mesh on
edges to cover trap wire

Planting Boxes



Deploying a finished modular raft



Planting boxes are a trapwire frame lined with landscape felt. Attach boxes to sides of the base with stainless steel hog rings. Float the raft before attaching planting boxes, and remove them prior to haul out at the end of the season. Transport without the planting boxes attached.



Saplings provide a natural avian guard. Some roots benefit from direct access to the water.

Photos and graphic from <https://www.robinsonraft.org>

So, which raft should I choose?



	Advantages	Disadvantages
Cedar Log	<ul style="list-style-type: none"> • Tried and true design. We know they work! • Logs are durable. Will last for a long time • Can be built from local materials on hand • Has a biodegradable base 	<ul style="list-style-type: none"> • Heavier, but thorough drying along the shoreline and prior to transport can greatly reduce weight • Can saturate over time. May need to add floatation • May use manmade materials for deck, floatation, or avian guard (not all recyclable or biodegradable)
Modular	<ul style="list-style-type: none"> • Light weight • Assembles and disassembles easily lakeside, making it simpler to transport, put in and take out of the lake • Industrial grade marine materials, most curbside recyclable • Positive results from initial testing • Detachable plant boxes can be planted ahead of time 	<ul style="list-style-type: none"> • Mostly man-made, non-biodegradable materials • A new design that has received less use and testing so we don't fully know how well they work in different conditions

Nesting Material/The Nest Bowl

The Base

Forest moss or native sod (available from Maine Audubon and nurseries) can be used to create the base of the nest bowl and cover the decking material. Native sod is a layer of native groundcover plants planted together to form a layer very much like grass sod for lawns. Bunchberry sod is one type of native sod that works well for loon rafts.

To create the base make a thin 1-inch layer across the raft platform. Make the layer a bit thicker around the very edges (2-3" thick). The idea is to create a well-draining, 1-3" mat, and then you'll be adding to this mat with a layer of soil, mud, moss, etc. to create the nest bowl.



The Nest Bowl

Put a loose layer of live grasses, military rush, more mosses, or sedges mixed with lake bottom or lakeside "muck," on top of the initial base layer to form the nest bowl.

Pack it all down with your hand to form a shallow nest bowl. Fill any divots or holes where an egg could become lodged with additional material. In the end, the dish-shaped nest bowl should be about 18" in diameter and 4" high. Adding some excess loose material outside the nest bowl will allow loons to add to the nest as the nest material compacts.

If you collect materials locally, make sure to avoid plants that are dead and lying on the ground, because decaying material can carry fungal spores that can cause a deadly fungal respiratory disease in loons.

Tip: Well-formed nest bowls can often be removed intact from rafts at the end of the season and reused the following season. Vegetation in planting boxes on modular rafts can also be stored and reused next year, replacing only dead vegetation.

For the base and nest bowl you'll need enough material to fill approximately a two-bushel basket. Reserve some sod or moss to cover and embed the roots of shrubs and small conifers that will be attached later. Do not overload the platform, as it needs to hold the weight of one or two loons, as well as the vegetation.

Raft Add-ons (for either kind of raft)

Floatation

- Hard, closed-cell foam is often used for raft floatation, but breaks down over time or can be chewed by animals if not properly protected. Some are now exploring alternatives like rigid or flexible oyster floats (shown below). Empty plastic bottles have also been used as floatation.
- Attach the floatation underneath the decking material, or sandwich it between the two trap wire layers in modular rafts.



Visual barrier/shading

- Plant shrubs, ferns, grass, sedges, perennials or small conifers on opposite sides of the raft for shading and cover.
- Leave a place open for loons to climb on and off the nest on one or two sides of the raft.
- Do not overload the platform. It needs to hold the weight of two loons, plus the vegetation.



- Always use plants native to Maine! See Appendix V for a list of suggestions.

Avian guard

If bird predators pose a threat, an avian guard can be installed to help offer some protection—but note that rafts can make nests more visible so they should be considered carefully if avian predators are an issue.



- A guard can be made out of trap wire, arched tree boughs, conifer saplings, or marsh bushes placed or planted on the raft platform. The highest point should be about 26" high off the raft platform.
- The guard should offer shade, camouflage, and protection from predators flying overhead, but still allow the loons to easily enter and exit the raft.
- Fasten the arch to the deck or a wave guard using galvanized mending plates.

Decking materials/ramps

- A platform is needed to hold the nesting material. Some cover a base of vinyl-coated, large-mesh lobster trap wire with soil and vegetation. But be aware that holes and mesh openings larger than ½" can snag a chick's foot. Many use materials, such as:
 - Cedar decking
 - HDPE black oyster bag mesh (*in photo below*)
 - Black landscape cloth
 - ½" plastic snow-fencing (*Note: will break down in lake environment*)
- You can also build a ramp with wood and non-slip material or cover the edges on the open side(s) of the raft with ½" or smaller gauge mesh to create a smooth entry and exit.



Wave guard

- If your raft cannot be placed in an area that is protected from boat wakes or the prevailing wind and wave direction, consider a wave guard such as a 1-6" high cedar spray rail around 3 sides, or a plexiglass sheet placed on the windward side to deflect waves.



See Appendices III and IV for full materials list and dimensions for cedar log rafts

Summary of Key Design Considerations for Loon Nest Rafts

- **Prevent trapping loon adults or chicks in mesh or crevices.**
- **Make sure loons will be able to climb up onto platform and provide traction for getting on and off.**
- **Provide overhead cover (i.e. plants) for shade and to protect from avian predation.**
- **Install wave guards to buffer wave action caused by wind or boat wakes.**
- **Accommodate water level fluctuations with an adequate anchoring system and enough slack in the lines that the lines aren't taut at even the lowest lake levels.**
- **Anticipate maintenance needs, such as reattachment of parts, removal from water for winter, removal of nest bowl and overhead cover for winter, replacement of vegetation.**

Adapted from Montana Common Loon Working Group



Photo: Tracy Hart; Raft by Alfred Lund

Appendix I

Is a Raft Right for Your Lake?

Is there a territorial pair present?

A territorial pair consists of two adult loons that are observed together and interacting over a multi-week period and defend an area from other loons. The two loons demonstrate courtship behavior including synchronized movement (swimming, diving, and foraging together), exchanging wails or hoots, mutual bill dipping or circling each other. You may observe them testing out shoreline nest sites. Territorial pairs can also engage in territorial confrontations, including sudden simultaneous dives, chases, the “penguin dance”, or other aggressive behavior. To be considered a territorial pair, a loon pair must establish and defend a territory for at least 4 weeks.

Has the pair nested but failed to produce chicks for the last 3 years or at least three of the last 5 years?

Most successful rafts are placed where a resident pair has repeatedly nested and failed. What evidence do you have that the pair is nesting but failing? (e.g., nest building or an adult seen on nest, but no chicks ever seen; known nest predation; or broken or floating eggs found.

Is the nest failure due to a problem rafts can address?

Rafts can only address certain problems that cause nests to fail, namely: fluctuating or altered water levels, predation from land animals, loss of nesting habitat, or human disturbance onshore. A raft won't help if a nest fails for other reasons, like avian predation, lead poisoning, disease, or disturbance from boats.

Does this pair's territory contain a protected site for a raft out of the wind, away from boat traffic and in water 2-6' deep at its lowest point?

A raft has to be placed in sheltered spot well within the pair's territory to attract a pair, without attracting additional pairs and inviting territorial disputes. You'll need a rough understanding of the boundaries of the pair's territory before placing a raft and their breeding history.

Is there a dedicated group that is willing to provide continuous monitoring and annual maintenance?

Rafts require monitoring and maintenance. They need to be taken out every fall and returned in the spring as soon after ice out as possible. Rafts may have to be moved if water levels drop. They need to be monitored to make sure they are in good condition and are supporting nesting. Without ongoing commitment, your raft could be worse than no raft at all.

Is a raft a better option than another action?

Are there other actions that could accomplish the same ends without the same risks, such as signage or outreach to reduce disturbance, measures to reduce wake and boat speeds, or better trash management to discourage scavengers?

If you answered 'no' or 'I don't know' to any of these questions, a nesting platform is probably not the right tool for your lake at this time.

Appendix II

Raft Placement

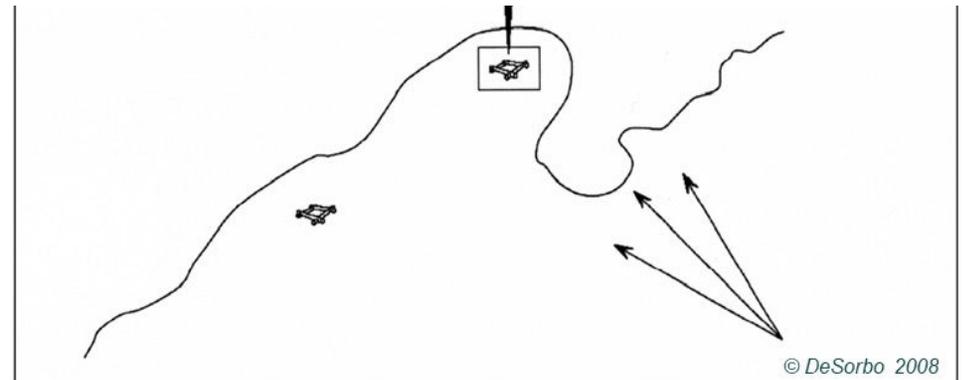
LOCATION:

The diagram to the right shows proper siting of a raft:

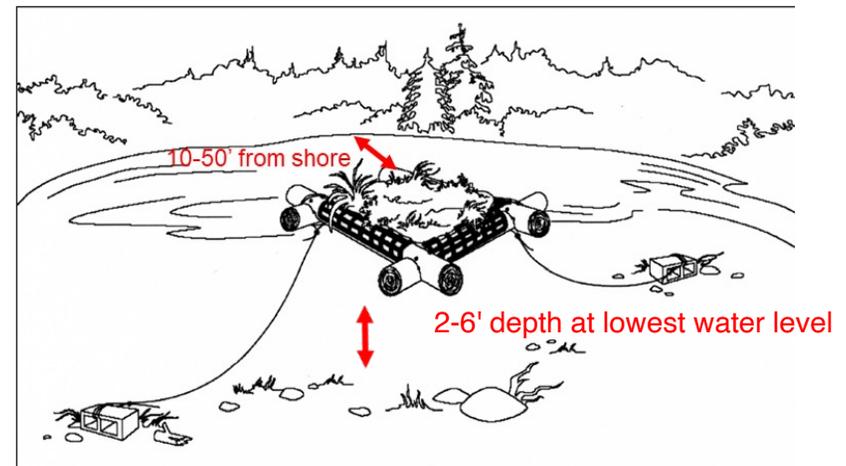
- in a sheltered, quiet cove or bay, protected from prevailing winds, waves and boat wakes;
- 10-50' offshore
- where the nest is unlikely to be disturbed, away from recreational areas and motorboat or paddling thruways, travel lanes, and high traffic areas;
- in deep enough water that the raft will not be stranded if water levels drop (2-6' deep or at least 2-3 feet deeper than the greatest expected water-level drawdown). You want it to be deep enough that if water levels go down, loons can swim under it. Know the bottom.

It is Important to Consider

- **Human use patterns**—place in areas where the nest is unlikely to be disturbed from watercraft or from human activity on the shore.
- **Locations of other loons on the lake.** Place your raft away from the boundaries of another pair's territory. Causing conflict by placing a raft between two territories, or on the edge of a pair's territory, can do more harm than good.
- **Pair History:** Rafts used most frequently by loons are often near the pair's former nest sites.



Aerial View of proper and improper placement: The raft in the cove is out of prevailing winds (shown by arrows) and is a proper distance offshore. The second raft placement is a poor choice because of wind exposure



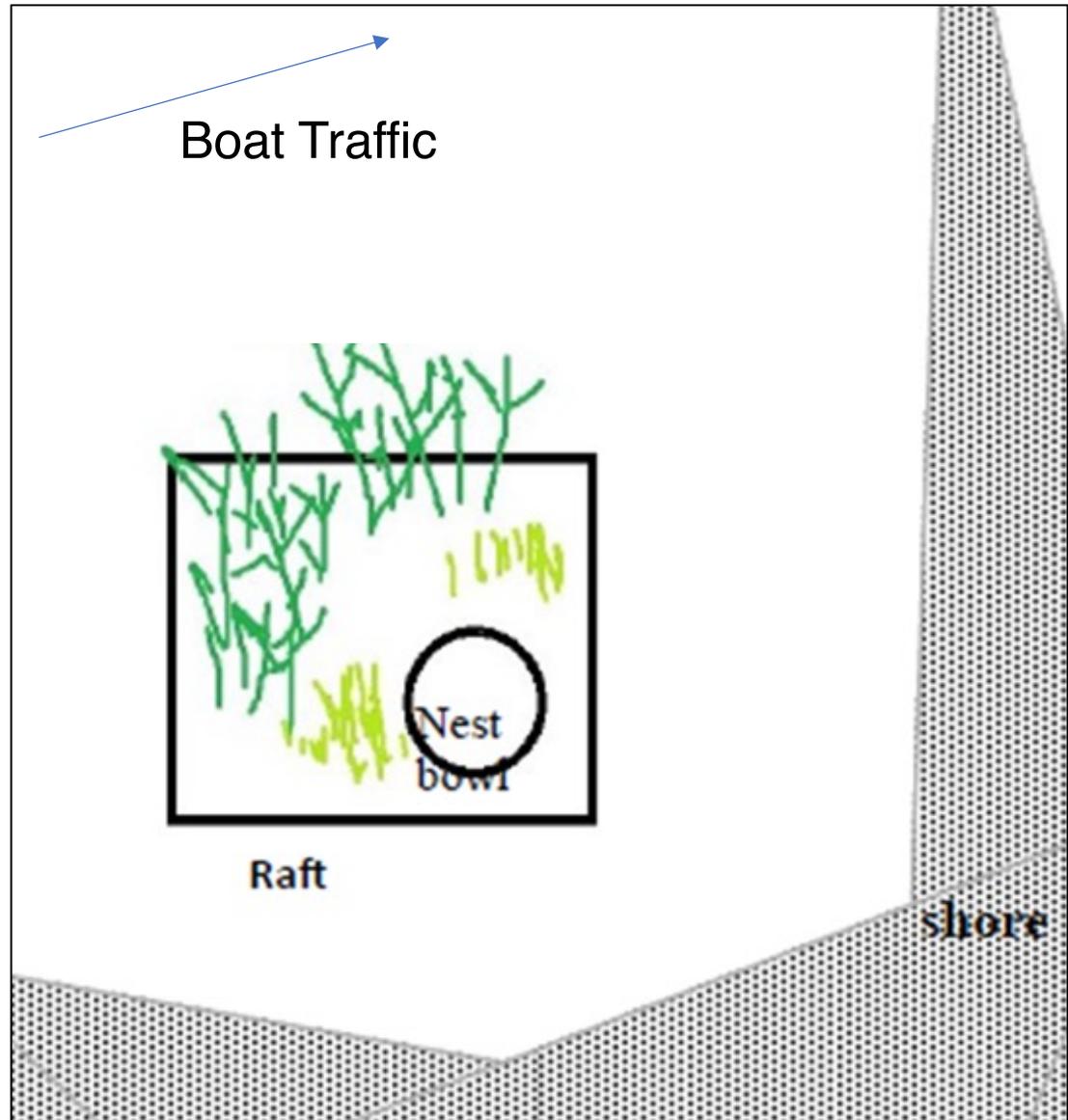
Anchoring: Securely anchor the raft to the lake bottom with several cinder blocks. Position one anchor into the prevailing wind and the other on the opposite side. The lines should not be taught. Leave several feet of slack to prevent the raft from sinking or flooding if water levels fluctuate. Watch throughout the summer to make sure the raft stays in place.

We can help you conduct a survey of your lake and gather information to decide where to put your raft. For more detailed information about raft placement, read [Chris DeSorbo's 2008 article in the Northeastern Naturalist](#) or Vermont Center for [Ecostudies Loon Raft Nest Guidelines](#).

Appendix II

Raft Placement cont.

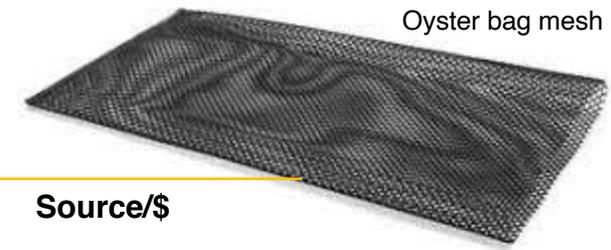
Always place your raft between shore and any boat traffic. Orient the raft so the nest bowl faces the shore, with the biggest opening facing shore. From the water, the nest should be blocked from view by vegetation. 10-50' offshore and in 4-6' of water or where the depth is at least 2' above the lowest level the lake will reach.



Graphics from VCE Loon Raft Nest Guidelines

Appendix III

Cedar Log Raft Materials



Oyster bag mesh

Qty.	Item	Dimensions	Details	Notes	Source/\$
4-5	Cedar logs (untreated, bark removed)	4' long; 7-10" diameter	Notched 5" from end with an ax or chainsaw Use logs up to 7' long if you expect a lot of wave action.	For freshly cut and wet logs, use 4-6 rigid oyster floats for floatation (from Portland Trap Company)	Frost Cedar Products, Emden. ~\$8.50/log
8	Lock tight decking screws	8" long, 1/4" hex head	Alloy steel	2 screws per corner	Hardware store
1	Decking material	4' x 4' sheet (or coverage area)	1" thick cedar decking, 4' or 8' long, varying widths of 4", 5", and 6"		Tweedie Lumber, Thorndike. \$50/raft
2	Cinder blocks	Standard size		Or other anchoring material (e.g., sand-filled milk jugs)	Volunteers provide
4	Cable Clamps/U-clamps	6.4 mm		For clamping anchor line to cinder blocks & the raft	Hardware
4	Anchor Lines	8-20' ea. (more in deeper water)	3/16" wire cable, 6.4 mm plastic-coated wire cable or marine grade rope	To attach raft to cinder block anchor	Hardware or marine store
2	Chain	2' length		To attach cable wire to cinder block anchor	Hardware
Man y	Fasteners	3" 2"	<ul style="list-style-type: none"> Coated wood screws Galvanized roofing nails 	Use screws to attach decking to outer cedar logs, if center log used use nails to attach decking there.	Hardware



Lobster trap wire (and view of anchor cable attachments) (VCE)

Tools Needed:

Chainsaw, skill saw, bucksaw and/or axe for notching logs; Hammer; Wire cutters; Adjustable wrench; Power drill and bits; Ratchet wrench

Appendix IV

Materials and assembly instructions for basic modular raft *(credit: Robinsonraft.org)*

Materials:

Bottom: 40.5" x 48" sheet of trap wire bent to 31.5" x 48" with the long sides extending upwards 4.5"

Top: 31.2" x 57" sheet of trap wire top bent to 31.5" x 48" with the short sides extending downward by 4.5"

Avian guard: 1 trap wire @ 48" x 78"

Spacers: 4 eco composite @ 3/8" x 1" x 48"

Stiffening Beams: 5 eco composite @ 1-1/2" x 1" x 32"

Flotation: 23 oyster floats, 2" x 4" x 32"

Hardware: 1/2" Stainless Steel hog rings (about 50)

Not included in kit:

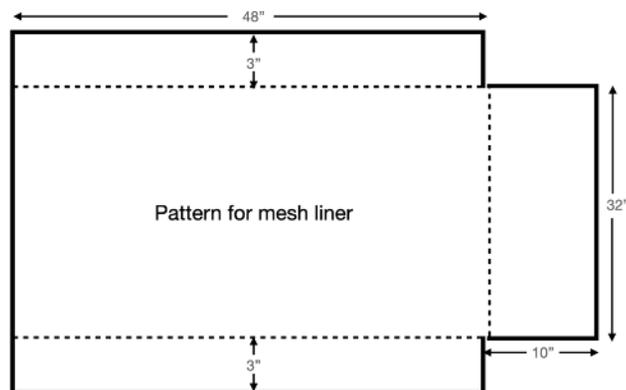
Plastic mesh 38" x 48" of mesh covering which can be made from oyster bags, or hardware store 1/2" plastic fencing grid..

Camouflage shade cloth approximately 30 x 48", available online in many styles and colors.

Tools: Hog ring pliers



1. Watch the video <https://www.robinsonraft.org/assembly> for a quick overview of the process.
2. Prior to assembly, use hog rings to attach the 48" x 4.5" piece of trap wire to the base so that it mirrors the opposite side. It should be attached alongside the base such that it adds 1/4" of interior width, which is required for the foam beams to sit flat.
3. Working on a flat surface, lay out the bottom tray, and add 4 spacers as shown in the picture above. Cover with a layer of 12 beams. As you add the second layer, interspace the stiffeners as follows: stiffener, 2 foam, stiffener, 3 foam, stiffener, 3 foam, stiffener, 3 foam, stiffener.
4. Slide the trap wire top in place and secure with stainless steel hog rings approximately every 6" along all seams. This completes the base structure.
5. If you are using an avian guard, attach the guard to one side of the base placing rings long both the top and bottom edges of the base. Then brace the platform against a building, log or sturdy vertical surface while (a second person is helpful) bending the guard over the top and hog ring into place. This can be done with stainless steel hog rings, or if it is going to be removed seasonally, steel hog rings, as they are easier to cut with pliers.
6. In order to keep chicks from getting caught in the avian guard, cover the base with a layer of plastic mesh as pictured above or attach a rail along the edges where the avian guard meets the base. The mesh will have 3" upturned edges along the avian guard and a flap that folds over the front and is zip-tied to the bottom of the raft creating a smooth entry surface. If using oyster bags for this purpose, the sleeves will need to be sliced open and cut and patched to fit. The material will remain a bit wavy until soil and plants are added over the top.
7. If you are using planting boxes, you will receive longer stiffeners for the base and also pre-bent trapwire that you can place on the protruding stiffeners and attach with hog rings. You can line the planting boxes if you wish before adding soil and vegetation to create a visual barrier and shading.



Appendix V

Suggested native plants for visual barriers and shading

- Leather Leaf (*Chamaedaphne calyculata*)--propagates well, tolerates wet
- Sheep Laurel (*Kalmia angustifolia*) – tolerates wide range of conditions
- Labrador Tea could (*Rhododendron groenlandicum*)
- ~2-3' high Northern White Cedar (*Thuja occidentalis*)
- Native Sod
- *Sphagnum* spp. (peatmosses)—tolerates wet, too wet for nest bowl but good to anchor nest materials. But may be hard to transport and transplant.
- Soft forest mosses and clubmosses--*Diplazium complanatum*, Ground cedar, and *Lycopodium clavatum*, Common clubmoss
- *Calamagrostis* spp. (grasses, e.g. bluejoint grass (*Calamagrostis canadensis*)--great plant, successfully propagated
- Other grasses: Canada wild-rye, Redtop, Tufted hair grass (*Deschampsia caespitosa*), Nodding wild rye, June grass (*Koeleria Macrantha*), Sweet Grass (*Hierochloa odorata*)—but these cannot tolerate very wet.
- Carex spp. (sedges), e.g., Fringed sedge – *Carex crinita*, Pennsylvania sedge (*Carex pensylvanica*), Common Wood Sedge (*Carex blanda*), Lake Sedge (*Carex lacustris*), Fox Sedge (*Carex vulpinoidea*)
- Bulrushes: Softstem Bulrush (*Schoenoplectus tabernaemontani*), Hardstem Bulrush (*Scirpus acutus*), River Bulrush (*Scirpus fluviatilis*), Green Bulrush (*Scirpus atrovirens*)
- Other shrubs: White Meadowsweet (*Spiraea alba*), Pussy Willow, Speckled Alder
- Blue flag iris, Ostrich fern
- Path rush – *Juncus tenuis* (pretty much indestructible plant)
- Military Rush (*Juncus militaris*)
- Cottongrass (*Eriophorum angustifolium*)
- Cranberry (*Vaccinium macrocarpon*)
- Wild Mint – (*Mentha Canadensis*)
- Dwarf huckleberry – *Gaylussacia bigelovina*
- Bluets – *Houstonia caerulea*
- Steeplebush - *Spiraea tomentosa*
- Canada wildflower – *Anemone Canadensis*
- Golden alexanders – *Zizia aurea*
- White turtlehead – *Chelone glabra*
- Sweet pepperbrush – *Clethra alnifolia*
- Sweetgale - *Myrica gale*
- Common winterberry – *Ilex verticillata*

Caution!

Do not use hay or dead grasses, rushes, and sedges, especially those laying on the ground or the base of these plants closest to the ground. Dead and decaying materials can harbor fungal spores that cause a deadly respiratory disease in loons.

Appendix VI

Sources:

Text Adapted from these sources:

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