

FINAL REPORT

Oyster Nirvana – Wooden Oyster Crates

Project Goals

It has been a long time dream of mine to grow oysters in cedar crates, and reduce our dependency on plastics and farm gear derived from the fossil fuel industry. I've mulled this idea over in my head for 20 years but never had the funds or time to prototype cedar cages or build them myself. The grant process has enabled that exploration, and it is truly a dream come true.

The timing of this grant seems especially important to note. After recently witnessing a few Maine oyster farms adopt the new "Flip Farm" technology from New Zealand, it seems likely that a significant number of farms will be switching to a flip farm setup before too long. The appeal has to do with the ease of handling large quantities of oyster bags with extreme efficiency, as it alleviates the need to manually lean over a boat and flip bags. Flipping oyster bags regularly increases the quality of the oyster; it improves shell shape, and also dries out the side of the bag that is out of water, which prevents bio-fouling. My thought is that if farms do make the decision to switch to a flip farm setup, it would be the perfect opportunity to offer a cedar crate setup as an alternative to plastic gear. The timing of this new technology and this grant is a huge opportunity to move towards a plastic free aquaculture world; we'll be providing a viable substitute that is a renewable, recyclable, locally-sourced, plastic-free, long lasting and aesthetically pleasing.

Process

The first prototype design was one for a nesting, stacking oyster crate, but after two trial prototypes, we realized that it was not successful. The idea behind the stacking crate was to save space on the boat while working through the gear, but the space saving design required complex fabrication, and resulted in a crate that was prone to breakage. Additionally, the space that this design saved was negligible.

We knew we needed to find a cedar box maker that could handle a larger order and who could help us with our third prototype, and we found Steve at Creative Wood Solutions out of Gray, Maine. We happened to find him on google, after extensive searching for local custom wooden box makers. We felt like when struck gold when we finally found him, as he was excited by our project and was eager to help us with our improved design.

Our third prototype, developed with Steve, resulted in a simplified, square, durable cedar crate, which attachment points on either end through solid wood. Our third prototype with him included a shorter, wider, and taller crate from our first and second prototype (24" wide, 16" deep, 6" tall). It features two solid cedar end caps, and cedar slats that span the tops and sides of the box. The spacing between the slats of 10 mm allows for 12mm oyster seed to sit in the box, while also allowing adequate water flow through the crate. The top of the box swivels open for easy access to the oysters. Even though there is technically fewer openings than a plastic mesh bag, the volumetric ratio of the crate is such that there is adequate water flow through the crate.



Steve from Creative Wood Products dropping the nicely palatized oyster crates off at the fish pier in Rockland, Maine.



The first 100 crates loaded up on a boat in Rockland Harbor, on their way to Pulpit Harbor on North Haven.



Had to borrow my friend's boat to get the crates to the island (my propellor was damaged the day before!)

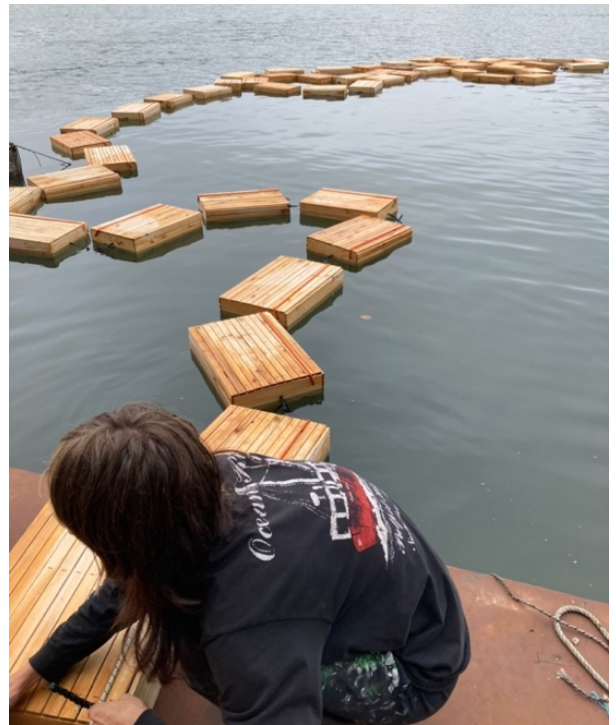
Once the cedar crates arrived on the farm, my oyster crew began the process of rigging them up! We drilled holes through the end caps for a simple connection system on either end (a proven technique borrowed the lobster industry). The attachment points are durable, they swivel easily for when the crates are flipped, and the materials used are easily procured and inexpensive. We also added a bungy over the top lid of the crate, which is a durable yet easy access way to keep the lids closed.



Our team rigging up the boxes at our oyster farm on North Haven.



Pictured here is the attachment mechanism that holds the crates together; a short piece of line with a rubber ring knotted at the end. The other side of the box has a loop that slides over the rubber ring. The orange bungee keeps the lid on the top of the box closed.



We grade the seed from the upweller through 10mm mesh; graded seed is then put into the crates and floated in the Salt Pond at the farm to grow for the rest of the summer / fall season.



Above: the oyster team happily filling the crates with 10mm+ seed. They all agree, working with the cedar crates is much more enjoyable than working with the plastic mesh bags that is commonplace on oyster farms.

Right: The first 100 cedar crates, strung together in the salt pond. In comparison, you can see the plastic mesh bags to their left. These bags require the attachment of plastic floats on either side to achieve buoyancy, whereas the cedar itself provides buoyancy enough.



Next Steps

One afternoon, my son was teaching a bee-keeping workshop at the farm at a time when the cedar crates were piled up in the yard while being outfitted for seed. A woman approached me and introduced herself as Sue Vanhook, aka The Mushroom Lady. She explained that over the years, she has figured out how to grow mycelium for packaging, and has recently taken that technology to the marine environment and is exploring the production of mycelium buoys. Although the project is in its infancy, I've seen the buoys she has produced and they're incredible. You can hardly tell the difference between her buoy and a Styrofoam buoy! Because of our shared commitment to taking plastics out of the marine environment, we are now collaborating together to put a mycelium pad on the bottom of our cedar crate, which will allow our cedar crate to periodically sit completely above water. It's standard practice in oyster farming to air-dry your oysters to remove bio-fouling inside of your gear. Although our gear would likely function just fine without the mycelium pad, we feel that allowing the crates to sit fully above the water periodically will result in much cleaner gear, greater water flow, and happier oysters. We're very excited to explore this idea further. Below are some initial tests of the mycelium pad.



Here we see the mycelium pads, laid out on drying racks at Sue Vanhook's studio space. They were created with a custom mold to fit the cedar crates. We're very excited to add this element to our design.

Key Results

Overall, we had very successful results with the cedar crates. They float level and the buoyancy was perfect, even when overloaded with oysters. The crates are proving very durable, easy to handle, and the stocking and retrieval of the oyster seed is less labor intensive than the process with our plastic gear. The labor savings and ease in handling the gear is much appreciated by the oyster crew. Additionally, these crates can be repaired easily, on-site or even in the water, with basic hand tools.

One surprising thing that we are beginning to notice is that it appears the growth in the cedar crates is visibly and substantially greater than the grow-out in the plastic floating bags. My hypothesis on this is that the plastic grow bags are off-gassing and that the oysters are not as enthusiastic about feeding. The tannins in the wood seem to not be effecting the oysters feeding. I believe that this should be further observed and studied by scientific organizations.

The only obstacle we ran into with sourcing materials is that we were trying to build the cedar crates in the spring when most cedar harvesters are operating in the winter. Next

year, we will order the raw cedar materials in late fall and build out the crates ourselves during the winter.

Summary

In short, the pros vastly outweigh the cons of using cedar crates over traditional floating plastic gear. Here's a summary of what we've found:

Pros:

- Cedar is a magical material: can be locally sourced, sustainable, regenerative, recyclable
- Streamlined manufacturing
- Ease of handling on the farm
- Aesthetically pleasing
- Potentially better growth rates
- Longer lasting than plastic gear
- Easily repairable with common hand tools. This cultivates a practice of stewardship and repair; we will put the effort into fixing our crates rather than just throwing plastic grow bags away when they break.
- Provides winter work for the farm crew (if they're making / assembling boxes)
- Stack more easily, actually saves space on the farm
- Decreases reliance on the fossil fuel industry and plastic derived farm products

Cons:

- If you're only ordering a few hundred crates at a time from a manufacturer, they cost about twice as much as the plastic gear equivalent. However, if you sourced the material and assembled the crates on-farm, it's likely that the cost would come out about the same.
- Because of the limited manufacturing, the crates should be sourced and built well ahead of time. This is not an off-the-shelf farm product.

Public Response

We've been posting regularly on Instagram, Facebook, and other social media platforms throughout the process. The response has been huge. Many farmers have already reached to me about where they can source these crates and how successful they are; growth rates, ease of handling, floatation metrics, and cost. Fortunately, because of our positive results so far working with these crates, I've been able to respond very positively to these inquiries. Several farmers have already told me they are committed to buying cedar crates for their next season.

Looking Forward

In the coming months, we plan to purchase more gear and raw materials in order to further our transition to a cedar crate flip farm. The average life span of a plastic oyster grow bag is 8 years, and they are non-repairable or recyclable. I've worked with cedar in the boat building industry for 30 years, and am confident that these cedar crates will last upwards of 20 years and are easily repairable on-farm at a very low cost.

We also have, on order, the fabrication of a custom flip farm apparatus, comprised of a stainless steel basket in a helical shape that attaches to the side of our skiff. When we position the basket under the cedar crates and put the boat into gear, the helical apparatus slides along the bottom of the crates and flips them over with relative ease. This apparatus will be custom sized and built to fit the new cedar crates that we designed.

We are also establishing a shop space on our farm that will enable us to make our own cedar crates on site, which will save a significant amount of capital in the future, and will allow us to have winter work for our crew.

The oyster farming community in Maine and beyond are all connected and in community. We work together on events and tips and tricks, and do our best to support each other in our work. Oyster farming is hard work, and our hope is that this wooden crate design could add to the longevity, enjoyability, and success of oyster farming in Maine.

Oysters are one of the most sustainable proteins in the world. 70% of oyster shells are captured carbon from the ocean. In our minds, the more oysters in this world, the better, for our health, for our communities, and for the planet. It only makes sense to use renewable, regenerative gear to grow our oysters. It doesn't make sense to grow one of the most sustainable shellfish in the world in carbon intensive, non-biodegradable plastic gear. It's time to put an end to that contradiction.

We thank you for the opportunity to make a positive change in our industry.



The full 2022 crew at North Haven Oyster Co.