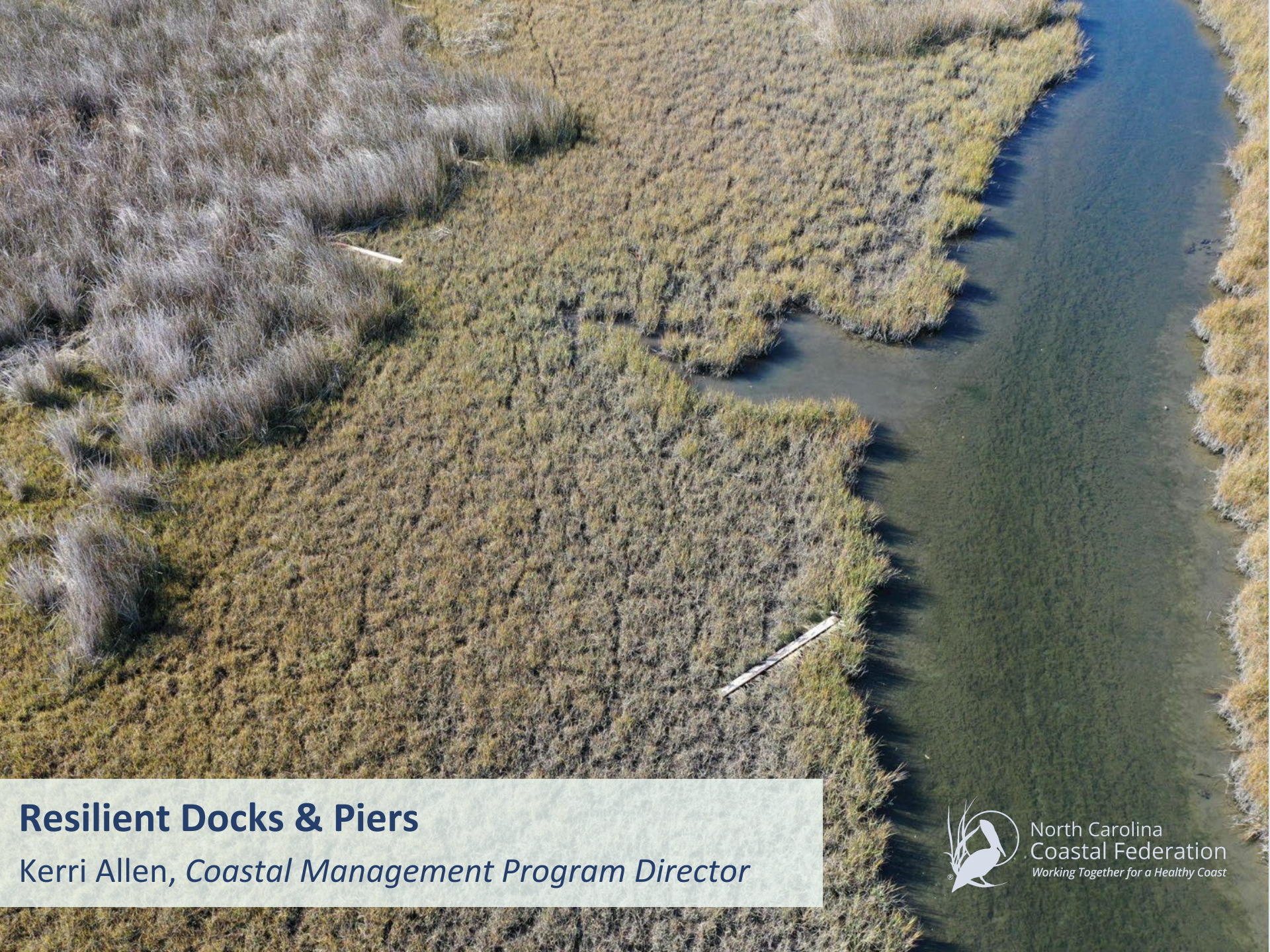




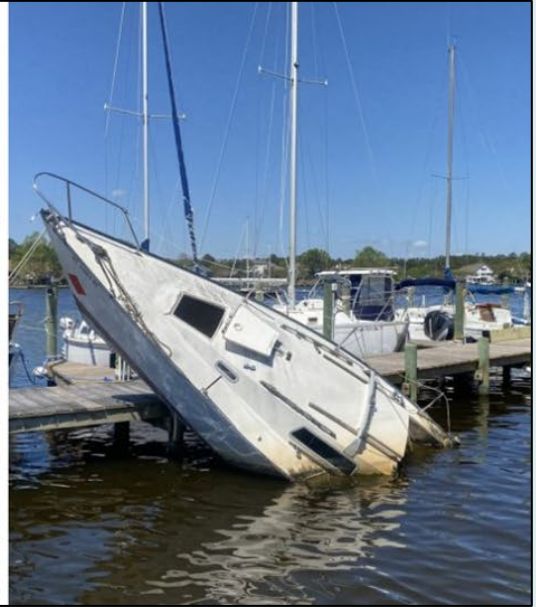
Resilient Docks & Piers

Kerri Allen, *Coastal Management Program Director*



North Carolina
Coastal Federation
Working Together for a Healthy Coast

Marine Debris: The Problem



Resilient Docks & Piers: A Case Study



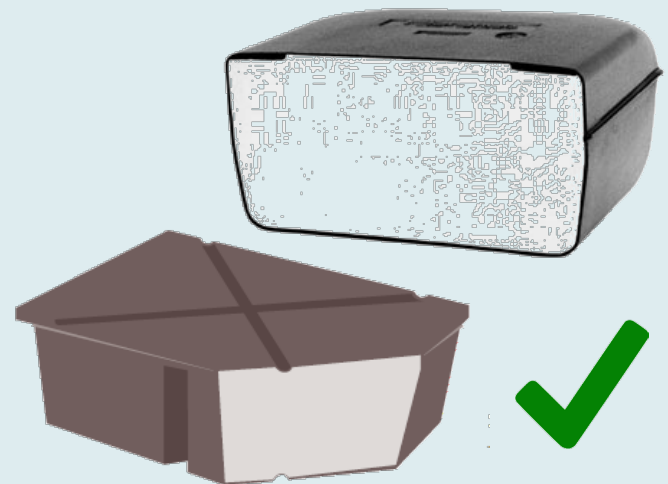
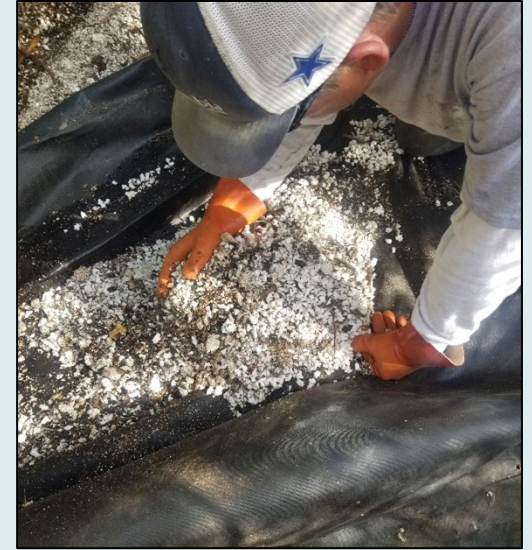
Area	Estimated Total Docks	Visibly Damaged Docks	Percentage Damaged
Harkers Island	143	103	72%
Taylors Creek, Beaufort	159	37	23%
Bogue Sound (Mainland, AB bridge to EI bridge)	417	290	70%
Bogue Sound (Island, AB bridge to EI bridge)	638	440	69%
Cedar Point (EI bridge to twin bridges)	100	56	56%
Swansboro (twin bridges to Hammocks Beach State Park)	96	60	63%
New River, Sneads Ferry, Chadwick Bay	192	110	57%
Topsail Island (New River Inlet to Topsail Inlet)	608	205	34%
Corcus Ferry Road to Figure 8 Bridge	225	109	48%
Figure 8 Bridge to Masonboro Inlet (Wrightsville Beach)	600	260	43%
Masonboro Inlet to Snows Cut	320	175	55%
Snows Cut to Carolina Beach	338	158	47%

Field Observations



- Significant amounts of debris persist, hidden in marsh, primarily from recent storms, but also debris layers present from past storms
- ~85% of debris comprised of dock lumber, pilings, dock floats
- High number of lost crab pots and oyster farming gear
- Marine construction treated wood “cut-offs” (old/new) pervasive and significant issue
- Floating dock polystyrene pervasive and difficult to recover

Unencapsulated Polystyrene





ORDINANCE NO. 2022-002

AN ORDINANCE OF THE TOWN BOARD OF COMMISSIONERS OF THE TOWN OF TOPSAIL BEACH, NORTH CAROLINA, AMENDING THE TOWN CODE OF ORDINANCES, CHAPTER 6, BUILDINGS AND BUILDING REGULATIONS, ARTICLE III PIERS AND DOCKS, DEFINITIONS AND SECTIONS 98 AND 100, TO PROHIBIT UNENCAPSULATED POLYSTYRENE DOCKS.

WHEREAS, during a coastal debris cleanup sponsored by the Coastal Federation, large quantities of Polystyrene were found in all areas of our waters and marshlands along our coast. Polystyrene is a petroleum product, commonly known as Styrofoam. It is often used in dock floats because of its buoyancy; and

WHEREAS, polystyrene is neither readily recyclable nor biodegradable and takes hundreds of years to degrade in the environment. When exposed to the elements, it fragments into unsightly, small, nonbiodegradable pieces that may be ingested by marine life, wild and domestic water birds and other wildlife blocking the digestive system and killing them through starvation; and

WHEREAS, the deterioration of larger polystyrene floats into beads and smaller pieces create a pollution line along shorelines, intertidal land and other places where buoyant debris collects. Such pollution must be picked up and removed at the expense of the public and private citizens.

WHEREAS, to prevent such degradation, pollution and hazard to water dependent mammals and birds, polystyrene floats should be encapsulated in a hard polyethylene shell, which prevents the deterioration and spread of beads and smaller sections of polystyrene floats.

NOW, THEREFORE, BE IT ORDAINED by the Topsail Beach Town Board of Commissioners that Chapter 6 of the Land Development Code, Article III – Piers and Docks, Definitions and Section 98 and 100 is hereby amended subsequent to read as follows:

1. Section 16-33. Definitions. *(by adding the following definitions to be inserted according to alphabetical order)*

Polystyrene is a thermoplastic polymer or copolymer comprised of at least 80 percent styrene or para-methyl styrene by weight. (Commonly known as Styrofoam)

Unencapsulated polystyrene means polystyrene that is not completely encased within a polyethylene shell or within other comparable materials that protects against cracking, peeling, sloughing, and deterioration from ultraviolet exposure and physical trauma.

Hold the foam? Topsail Island looking at ordinance to prohibit foam docks



Chase Jordan

Wilmington StarNews

Published 6:00 a.m. ET March 18, 2022 | Updated 11:09 a.m. ET March 21, 2022

[View Comments](#)



Topsail Beach was the **first town in NC** to adopt an ordinance restricting polystyrene in floating docks. Now North Carolina is the **first state in the country** to do so!

Resilient Docks & Piers Toolkit

nccoast.org/docks

Build stronger, safer, and more sustainable waterfront structures.

The North Carolina Coastal Federation is proud to share this **comprehensive toolkit** for homeowners, contractors, and local governments looking to design and build resilient docks and piers along North Carolina's coast. This resource combines practical guidance with real-world examples from communities across the state to make resilience achievable and relevant for all coastal areas.

What You'll Find in the Toolkit

- **Best Practices for Design and Construction:** Step-by-step guidance for building docks and piers that withstand storms and reduce environmental impact.
- **Permitting Guidance:** Information to help navigate local permitting and approval processes.
- **Case Studies and Local Examples:** Insights from property owners, contractors, and communities who have successfully built resilient waterfront structures.

Toolkit Resources:

- [Homeowner's Guide to Resilient Marine Construction](#)
- [Docks and Piers Info Sheet](#)
- [Tie It Down! A Coastal Property Owner's Guide to Preventing Marine Debris](#)
- [Press Release](#)
- [Social Media Posts](#)
- [Photos for Use](#)
- [Helpful Videos](#)
 - [Resilient Docks and Piers: Questions and Answers with a Marine Contractor](#)
 - [Why Resilient Docks and Piers Matter](#)
 - [Building a Resilient Dock](#)



Building Better Docks in Coastal North Carolina

For Waterfront Homeowners Who Want a Dock That's Safe, Strong, and Storm-Ready

If you own coastal property in North Carolina, building or maintaining a dock is more than just a weekend project; it's a long-term responsibility. From choosing the right materials to following state regulations, there's a lot to consider. The North Carolina Coastal Federation's guide (available at nccoast.org/docks) walks you through how to design and build a dock that's not only beautiful, but also durable, environmentally responsible, and fully compliant with state code. Here are a few highlights to help you get started:

Key Elements of a Resilient Dock

Decking

- Flow-through or slatted decking allows water to pass through during storms, reducing pressure and potential damage.
- Increase deck board spacing to help prevent boards from lifting during high water or wave events.
- Use treated or composite materials for durability.

Structural Support

- Fasten with galvanized or stainless-steel bolts (not nails) to prevent corrosion and provide long-term stability.
- In high-risk areas, structural supports can be tied to helix anchors before a storm for added protection.

Pilings

- Use driven pilings, not jetted ones. Driven pilings offer a tighter, more secure fit.
- As a general rule, 1/3 of the piling should be buried below ground, and 10–12 feet above high tide to allow for storm surge.

Floating Docks

- Use only fully encapsulated foam floats—they're longer lasting and prevent pollution.
- Unencapsulated foam can break apart and scatter debris into marshes and waterways.

NCCOAST.ORG/DOCKS

Why Building to Code Matters

- **Safety** – Reduce the risk of injuries and accidents.
- **Durability** – Withstand storms and rising sea levels.
- **Legal Compliance** – Avoid fines or penalties.
- **Financial Protection** – Reduce costly repairs and replacements. A resilient dock can save up to \$100,000 over 35 years.
- **Environmental Stewardship** – Prevent marine debris and protect natural habitats.



STEPS TO BUILD A CODE-COMPLIANT DOCK

1. Hire Qualified Professionals

Choose a licensed marine contractor and engineer with strong references and coastal experience. Jobs over \$40,000 require licensed professionals in NC.

2. Design with Compliance in Mind

Ensure your design meets the NC Building Code (Section R327) and Coastal Area Management Act (CAMA) regulations.

3. Select the Right Materials

Use weather-resistant, marine-grade materials (e.g., composite decking, marine-grade lumber, UCSB and UCSC lumber, saltwater splash lumber, galvanized fasteners) and avoid cheap or non-treated wood, especially near seawater.

4. Monitor Construction

Have your engineer inspect progress to ensure the structure is built as designed and keep documentation of any changes or inspections.

5. Final Inspection & Certification

Secure a final inspection from your local authority and keep copies of all permits, plans, and approvals for future reference.

Extra Tips for Long-Term Durability

- Breakaway panels help reduce structural damage during major storms.
- Raise the deck height to reduce flooding risk during high tides or surges.
- Reinforce bracing and anchoring—especially in storm-prone or high-energy areas.
- Use stainless steel tie-down cables and rubber bumpers for floating docks to extend lifespan and reduce wear.



North Carolina
Coastal Federation
Working Together for a Healthy Coast

Protect Your Dock—and the Coastline

Building a strong, code-compliant dock protects more than your investment—it helps reduce debris in our coastal waters, keeps wildlife safe, and ensures your dock is still standing after the next big storm.

VISIT NCCOAST.ORG/DOCKS FOR VIDEOS, DIAGRAMS, REFERENCE GUIDES, AND MORE

This work has been funded by the National Oceanic and Atmospheric Administration Marine Debris Program.

Tie It Down! A Coastal Property Owner's Guide to Preventing Marine Debris



Many coastal property owners have a hurricane plan for their family and home, but **yards, docks, boats, and construction sites** are often forgotten or overlooked. Unsecured boats, water toys, yard furniture, and construction equipment can be damaged - or even blown or washed away - during hurricane events. When unsecured objects enter our waterways, they become **marine debris** - which pollutes the water and harms marine life.

This hurricane season, do your part to help prevent marine debris accumulation in our local waterways. Before and during a hurricane event, monitor local and national news outlets to stay up to date on the storm. Have an evacuation plan and make sure your property will stay safe.



What is marine debris?

Marine debris is any man-made object that is found in our waterways. It can be small, like a tiny piece of a polystyrene dock float, or big, like a large sailboat that broke free of its mooring.

80% of the recovered marine debris following Hurricane Florence was lumber.

How is marine debris removed from our waterways?

After a hurricane or other major storm, local crews come together with flat-bottom boats and ATVs and collect marine debris by hand. Following Hurricane Florence, 60 crew members collected over 3 million pounds of marine storm debris and over 100 abandoned vessels.

How can I prevent my property from becoming marine debris?

Make sure that you follow all government recommendations and tightly secure all pieces of property. See the back of this flyer for a checklist to follow to make sure that you protect your property and local waterways from storm damage and marine debris.

Visit nccoast.org/docks for more information

Tie It Down! A Coastal Property Owner's Guide to Preventing Marine Debris



Boat:

- 1. If possible, remove your boat from the water.
- 2. If leaving your boat in the water, choose a spot on your dock that is protected from wind and waves.
- 3. Ensure the boat is sufficiently tied down at the bow, stern, and middle.
- 4. When securing your boat, use long lines and leave slack to prevent damage from wave action.
- 5. Remove all non-secured items from the boat (including bininis).
- 6. Add extra fenders if available to protect your boat and dock.
- 7. Drop an anchor if needed to keep your boat from floating away.
- 8. Check insurance policy to see if there are specific preparation requirements.
- 9. More information can be found [here](#).

Yard:

- 1. Place all non-secured items inside your house or garage.
- 2. **Commonly forgotten items:** trash cans, bird feeders, lounge chair cushions, and outdoor decorations.
- 3. Secure all objects that you cannot bring inside, such as heavy lawn furniture.

Construction site:

- 1. Remove all equipment possible, including dumpsters and portable restrooms.
- 2. Take a detailed inventory of all remaining equipment and supplies.
- 3. Secure all objects that were not removed.
- 4. Lumber should be tied together then secured to an immobile object, such as a piling.
- 5. Take care to remove or secure any chemicals that may pollute the waterway if spilled.
- 6. Evaluate the risk of wind damage to cranes and remove them if necessary.
- 7. If needed, seal the building to prevent water and wind damage.
- 8. Make a plan for water removal following the storm.

Dock:

- 1. Inspect your dock and make sure it is securely attached to pilings. Repair and secure as needed prior to storm arrival.
- 2. Tie down or remove all unused fenders.
- 3. Close and lock all dock boxes.
- 4. Remove all non-secured items from the dock (such as lounge chairs and coolers).
- 5. Consider helix anchors and tie downs in high energy sites.

Visit nccoast.org/docks for more information



YouTube

Search or ask a question



Parris Tipton
Ennett Marine Construction

Questions and Answers with a Marine Contractor



NCCoastalFed
532 subscribers



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Ask

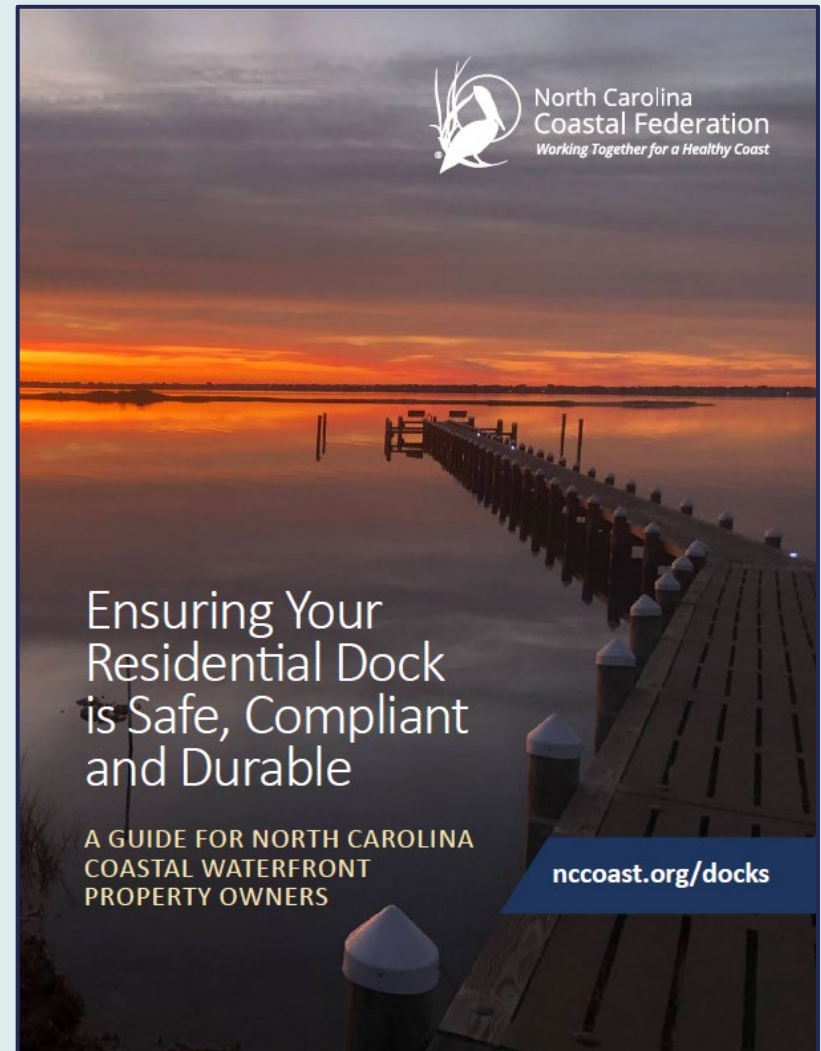


Save



A Coastwide Effort

- ➔ Technical recommendations
- ➔ Helping property owners choose a contractor
- ➔ Pre-hurricane preparedness
- ➔ Coastwide public education campaign
 - Local gov't toolkit
 - Cost benefit analysis
 - Guidebook
 - Video testimonials
 - Social media posts



What does a resilient dock look like?

As a coastal waterfront property owner, ensuring your dock is safe, compliant, and durable is crucial.

This guide will help you understand why and how to build a residential dock designed and built to meet the North Carolina Building Code.



PILINGS

- Pilings driven, not jetted in
- Ensure that ~ 1/3 of a piling is driven below grade

STRUCTURAL SUPPORT

- Attach structural supports with galvanized/hot dipped through bolts
- Structural supports can be tied to Helix anchors before a storm



DECKING

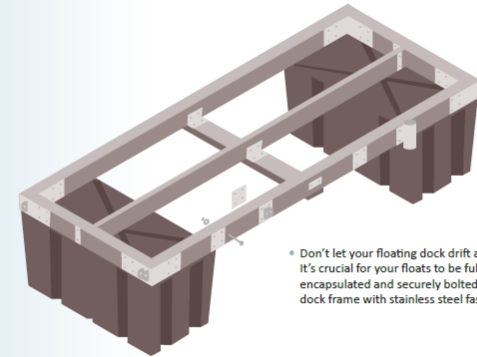
- Flow-through/slatted decking allows waves and water to easily flow through the structure and keep boards in place
- If using wood, make sure it is treated, and is washed regularly
- Increase deck spacing to minimize "lift" during storm events



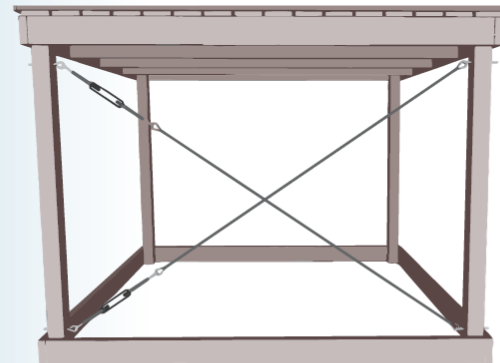
FLOATS

- Foam inside floating structures should be fully encapsulated

To ensure the appropriate design, location, and construction of your dock or pier, it's important to identify the needs and conditions of your soundside property and select a licensed, reputable marine contractor with adequate experience, expertise, and a commitment to quality and responsible construction techniques.



- Don't let your floating dock drift away! It's crucial for your floats to be fully encapsulated and securely bolted to the dock frame with stainless steel fasteners.



- Depending on your wave energy, cross ties can significantly increase the resiliency of your structure. Structural supports can also be tied to helix anchors before storm events for extra durability.

MATERIAL CHOICE

Flow-Through/Open-Slatted Decking

Materials

Flow-through/open slatted decking involves composite or heavy rubber-coated flow-through decking, which is sold in varying sizes of decking modules.

Composite docks are made of durable dock surface materials. In both freshwater and saltwater environments, these polyethylene docks will not rot or splinter like wooden docks.

Design and Construction Methods

Open-slatted or other open designs that allows water to easily flow through during storm events, preventing boards from popping off due to high wave energy.

Upkeep

There is minimal upkeep compared to wooden or aluminum docking options.

Warranties for composite docks average about 50 years under normal conditions.

Benefits

Allows for water to easily flow through, potentially reducing the pressure and potential failure of the structure during periods of extreme storm surges and waves associated with coastal storms and hurricanes.

The open structure allows for significant light penetration below the deck, preserving marsh and coastal plants' growth, leading to greater stabilization of the shoreline during storms.

The mobility of the relatively lightweight sections could allow for the removal of some or all of the sections prior to hurricanes, extreme storm surges, etc. If a resin or plastic dock section is damaged, it can be easily replaced.



Examples of flow-through decking at the Morris Landing Clean Water Preserve

Marine Pilings

When determining the best type of dock piling, you should consider the water conditions that your dock will have to withstand as well as the overall weight and load of the dock.

Pile Driving vs. Jetting

A driven pile is a relatively long, slender column that offers support or resistance to forces and is made of material with a predetermined shape and size that can be physically inspected prior to and during installation. It is installed by impact hammering, vibrating, or pushing into the earth. Driven piles maintain their shape during installation, do not bulge in soft soil conditions, and are typically not susceptible to damage from the installation of subsequent piles.

Driven piles displace and compact the soil. Other deep foundation options can require the removal of soil and considerable subsidence, which can undermine the support of adjacent structures and cause excessive deformations, both of which can result in structural problems.

"Pile jetting" is a technique that is frequently used in conjunction with, or separate from, pile-driving equipment for pile placement. Pile jetting utilizes a directed and pressurized flow of water to assist in pile placement. The application of a concentrated jet of water at the pile tip disturbs a ring of subgrade soils directly beneath it. The jetting technique liquefies the soils at the pile tip during pile placement, reducing the friction and interlocking between adjacent subgrade soil particles

Pile Driving Techniques

Drop Hammer (left), Screwing (right), and Steam (not shown)

