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WHEN THE COAST FALLS SILENT

UNDERSTANDING SUDDEN WILDLIFE DIE-OFFS IN THE OUTER BANKS

THE SCIENCE BEHIND COASTAL MORTALITY EVENTS

HARMFUL ALGAL BLOOMS

LOW OXYGEN "DEAD ZONES"

DISEASE OUTBREAKS

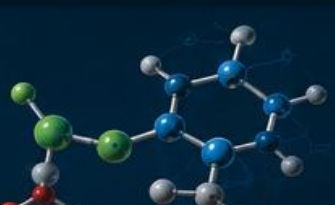
POLLUTION & CHEMICAL SPILLS

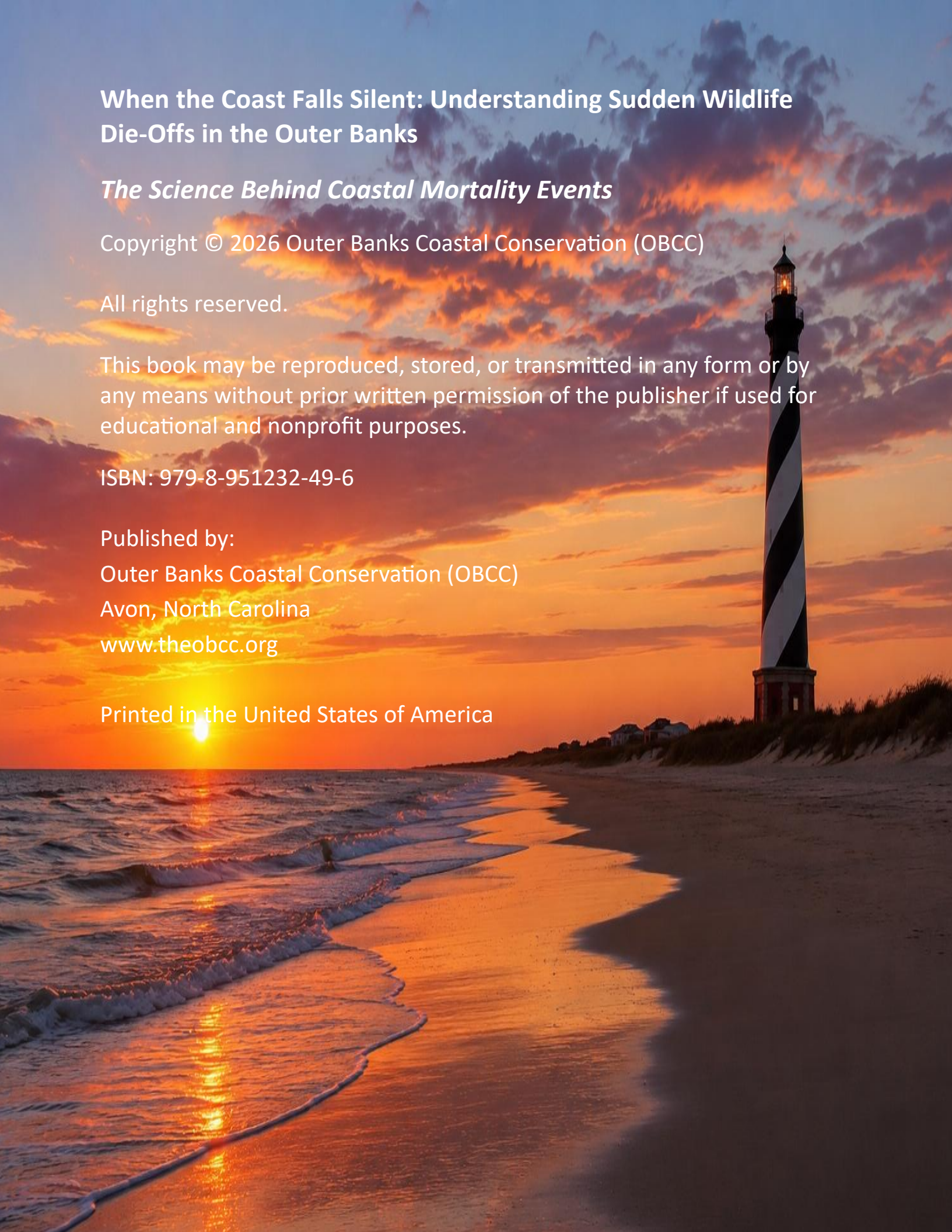
EXTREME HEAT & WEATHER

CHANGING WATERS

HUMAN DISTURBANCE

MULTIPLE STRESSORS





When the Coast Falls Silent: Understanding Sudden Wildlife Die-Offs in the Outer Banks

The Science Behind Coastal Mortality Events

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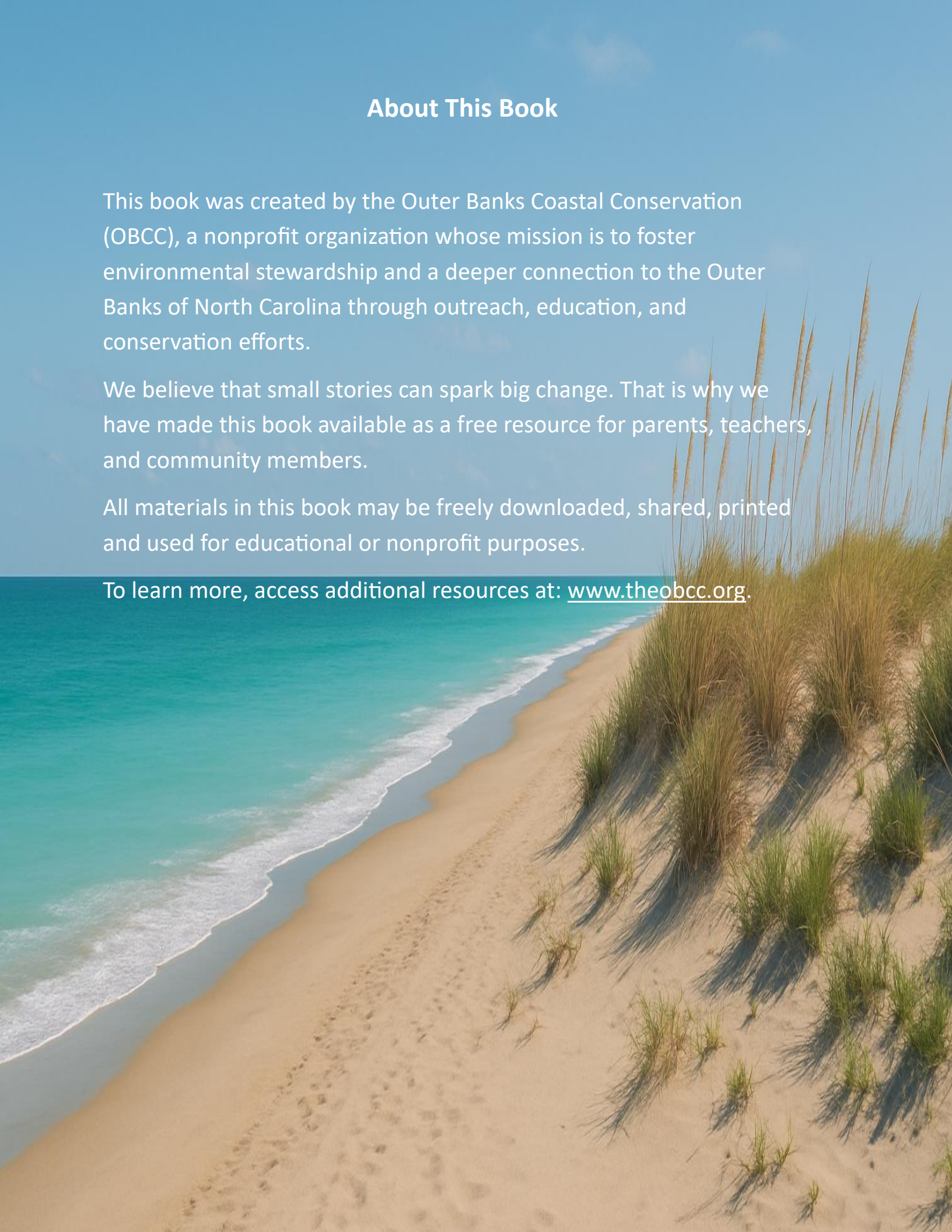
About This Book

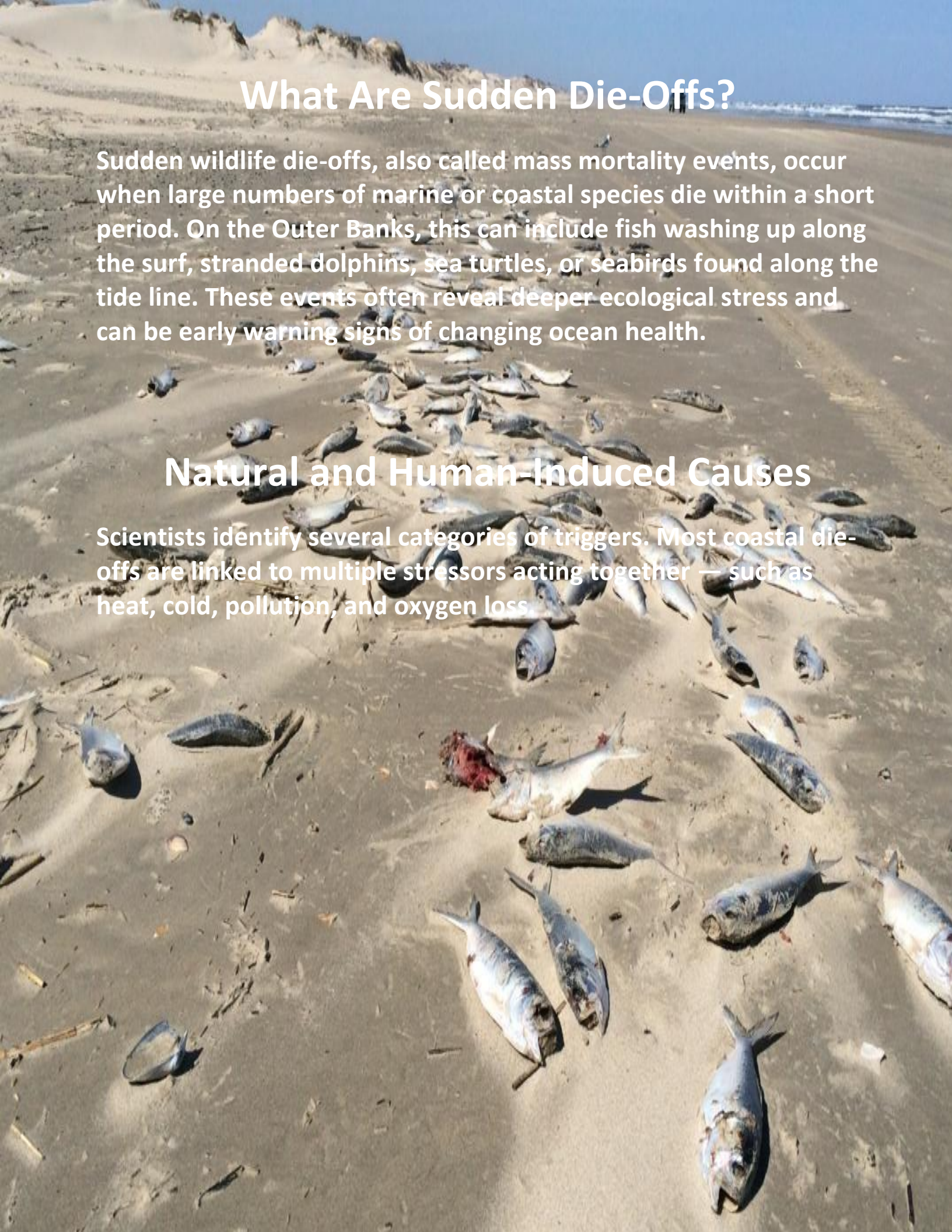
This book was created by the Outer Banks Coastal Conservation (OBCC), a nonprofit organization whose mission is to foster environmental stewardship and a deeper connection to the Outer Banks of North Carolina through outreach, education, and conservation efforts.

We believe that small stories can spark big change. That is why we have made this book available as a free resource for parents, teachers, and community members.

All materials in this book may be freely downloaded, shared, printed and used for educational or nonprofit purposes.

To learn more, access additional resources at: www.theobcc.org.





What Are Sudden Die-Offs?

Sudden wildlife die-offs, also called mass mortality events, occur when large numbers of marine or coastal species die within a short period. On the Outer Banks, this can include fish washing up along the surf, stranded dolphins, sea turtles, or seabirds found along the tide line. These events often reveal deeper ecological stress and can be early warning signs of changing ocean health.

Natural and Human-Induced Causes

Scientists identify several categories of triggers. Most coastal die-offs are linked to multiple stressors acting together — such as heat, cold, pollution, and oxygen loss.

Harmful Algal Blooms (HABs) — "When the Ocean Turns Toxic"("Red Tide")

What Happens

Harmful algal blooms occur when microscopic algae—tiny plantlike organisms—multiply explosively. Certain species (such as *Karenia brevis*, *Alexandrium fundyense*, and *Pseudo-nitzschia*) produce toxins that poison fish, shellfish, and marine mammals.

As these blooms expand, they discolor the water (often rusty red, brown, or green) and block sunlight. When the algae eventually die and decompose, oxygen levels plummet, suffocating marine life.

Causes

- Nutrient Overload: Fertilizer and wastewater runoff from lawns, farms, and septic systems feed excess nitrogen and phosphorus into coastal waters.
- Calm, Warm Conditions: Long stretches of hot, still weather allow algae to multiply rapidly.
- Climate Change: Rising water temperatures extend bloom seasons and intensify their severity.

Effects

- Fish, sea turtles, and dolphins suffer toxin exposure through contaminated prey.
- Seabirds feeding on affected fish die from neurotoxicity or starvation.
- People can get respiratory irritation from airborne toxins and shellfish poisoning if closures are ignored.
- HABs can devastate local economies by closing beaches and fisheries.

Outer Banks Relevance

While large-scale "red tides" are more common in the Gulf of Mexico, smaller algal blooms do occur in Pamlico and Albemarle Sounds. Stormwater runoff and warm summer conditions can cause fish kills and shellfish closures.

Low Oxygen (Hypoxia) or “Dead Zones”

What Happens

Oxygen in water is essential for aquatic life. When decaying algae or organic matter consume oxygen faster than it can be replenished, oxygen levels fall below 2 mg/L—a condition called hypoxia. Fish and crabs either flee or suffocate.

Causes

- Nutrient pollution from agriculture or storm drains.
- Decomposition of algal blooms or sewage.
- Warm water holds less oxygen, so heat waves worsen the problem.
- Poor tidal mixing in shallow estuaries.

Effects

- Mass fish kills where species like menhaden, croaker, or spot float to shore.
- Shellfish and bottom dwellers (oysters, clams, crabs) perish because they cannot escape.
- Long-term habitat loss and “biological deserts” on the sea floor.

Seen After: Heavy rains, sewage discharge, and late-summer heatwaves.

Outer Banks Relevance

Hypoxia frequently affects Pamlico River, Neuse River, and Albemarle Sound after summer storms. These are among the most nutrient-sensitive waters in North Carolina, often monitored by the NC Department of Environmental Quality for fish-kill advisories.

Disease Outbreaks — “Invisible Killers Beneath the Waves”

What Happens

Viruses, bacteria, and fungi can sweep through wildlife populations, especially when animals are stressed by heat, pollution, or crowding.

Common Examples

- Sea Star Wasting Disease: Caused by densovirus; leads to disintegration of sea stars.
- Avian Influenza (H5N1): Affects pelicans, gannets, and terns; outbreaks have reached the Outer Banks.
- Fibropapillomatosis in Sea Turtles: Causes tumor growth linked to herpesvirus and pollution stress.
- Mycobacteriosis: Chronic bacterial infection in striped bass populations in North Carolina estuaries.

Causes

- Warm, stagnant water favors pathogen growth.
- Stressed or malnourished animals have weaker immune systems.
- Human and agricultural waste introduce bacteria into the ecosystem.

Effects

- Sudden die-offs of a single species or group (e.g., one bird colony).
- Long-term population declines in species already at risk.
- Potential transmission to other species or even humans through contact or seafood.

Outer Banks Relevance

NC Wildlife Resources Commission regularly tracks turtle and bird diseases. During summers with high temperatures or runoff, diseases can spread rapidly, especially among species sharing nesting or feeding areas.

Pollution and Chemical Spills — “Toxic Tides”

What Happens

Pollution kills directly and indirectly. Chemical spills, oil releases, or chronic runoff introduce toxic compounds into the water. These substances poison animals outright or disrupt their reproduction and development.

Sources

- Oil and fuel leaks from boats and vehicles.
- Pesticides and herbicides from lawns and agriculture.
- Heavy metals (mercury, lead, arsenic) from industrial emissions.
- Microplastics that absorb and spread toxic chemicals.

Effects

- Immediate fish kills and bird deaths after exposure.
- Long-term contamination of sediments, making it unsafe for oysters and crabs.
- Bioaccumulation in food chains—predators like dolphins and pelicans carry the heaviest load.
- Reduced fertility and deformities in hatchlings.

Outer Banks Relevance

The Outer Banks’ narrow barrier islands are highly vulnerable to fuel spills from boats, ferries, and marinas. During storms, runoff can transport fertilizers, detergents, and oil residues into the sound. Even small spills in the Pamlico Sound can persist for years.

Extreme Weather & Temperature Shifts — “Nature’s Shock Events”

What Happens

Sudden environmental changes cause physiological stress or death in marine species.

Examples

- Cold Stun Events: Sea turtles and fish become lethargic and die when water temperatures drop below 50°F.
- Heat Stress: During prolonged hot spells, surface waters warm beyond tolerance limits.
- Storm Surges: Hurricanes push pollutants and sediments into shallow habitats, smothering organisms.

Effects

- Cold-stunned sea turtles wash ashore, appearing dead but often still alive.
- Fish suffocate when high temperatures reduce oxygen solubility.
- Corals and seagrass beds may die back after prolonged turbidity.

Outer Banks Relevance

“Cold-stun” events are common along Cape Hatteras and Ocracoke after Arctic fronts.

Hypersalinity or Freshwater Flooding — “Too Salty or Too Fresh”

What Happens

Marine species need stable salinity to survive. Extreme rainfall or drought can shift this balance drastically in estuaries and sounds.

Causes

- Droughts: Evaporation concentrates salt levels, stressing species adapted to brackish water.
- Heavy Storms or Flooding: Influx of freshwater lowers salinity, causing osmotic shock.
- Stormwater Runoff: Carries sediments and nutrients that compound the problem.

Effects

- Fish and shellfish suffer osmotic imbalance and die off.
- Sudden changes can trigger secondary algal blooms or bacterial explosions.
- Long-term changes shift which species can live in an area.

Outer Banks Relevance

The Pamlico Sound is the largest lagoonal estuary in the U.S., where freshwater from rivers meets salty ocean water. After hurricanes, salinity can drop sharply, causing fish and crab deaths. Conversely, during dry summers, salinity spikes can devastate oyster beds.

Human Disturbance or Acoustic Trauma — “The Sound of Stress”

What Happens

Marine mammals depend on sound for communication, navigation, and hunting. Loud underwater noises can injure their hearing or disorient them.

Sources

- Naval sonar and seismic testing.
- Pile-driving and offshore construction.
- Ship traffic and explosions.

Effects

- Whales and dolphins may strand en masse after sonar exercises.
- Internal bleeding and disorientation cause death even without visible injury.
- Chronic exposure interferes with feeding and reproduction.

Outer Banks Relevance

Off the NC coast, Navy training zones and seismic surveys for offshore wind or oil can overlap with migratory whale routes. Public awareness ensures monitoring and mitigation measures are in place to protect marine mammals.

Combined Stressors — “When Everything Hits at Once”

What Happens

Most mass mortality events result from multiple stressors acting together rather than a single cause. For instance:

- A heatwave triggers algal blooms.
- The bloom decays, leading to oxygen depletion.
- A storm then pushes pollutants into already stressed waters.

Why It Matters

These compound events are becoming more frequent as climate change amplifies heat, cold, rainfall extremes, and ocean chemistry shifts. Wildlife already stressed by one factor (disease, pollution) may not survive an additional shock.

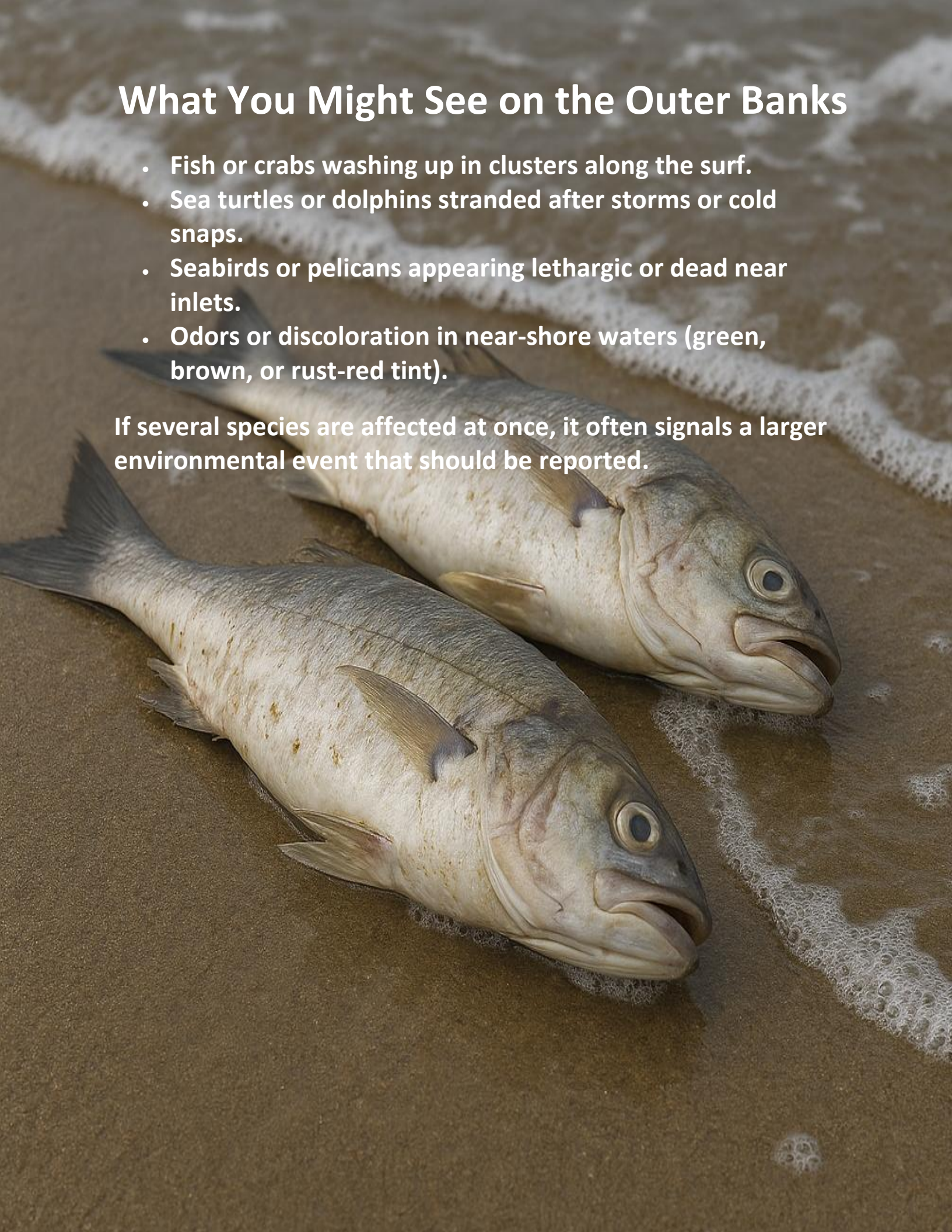
Outer Banks Relevance

In 2021, thousands of fish died in NC estuaries following heavy rainfall, nutrient runoff, and lingering heat. Combined stressors can affect turtles, fish, and birds simultaneously—signaling broad ecosystem distress.

What You Might See on the Outer Banks

- Fish or crabs washing up in clusters along the surf.
- Sea turtles or dolphins stranded after storms or cold snaps.
- Seabirds or pelicans appearing lethargic or dead near inlets.
- Odors or discoloration in near-shore waters (green, brown, or rust-red tint).

If several species are affected at once, it often signals a larger environmental event that should be reported.



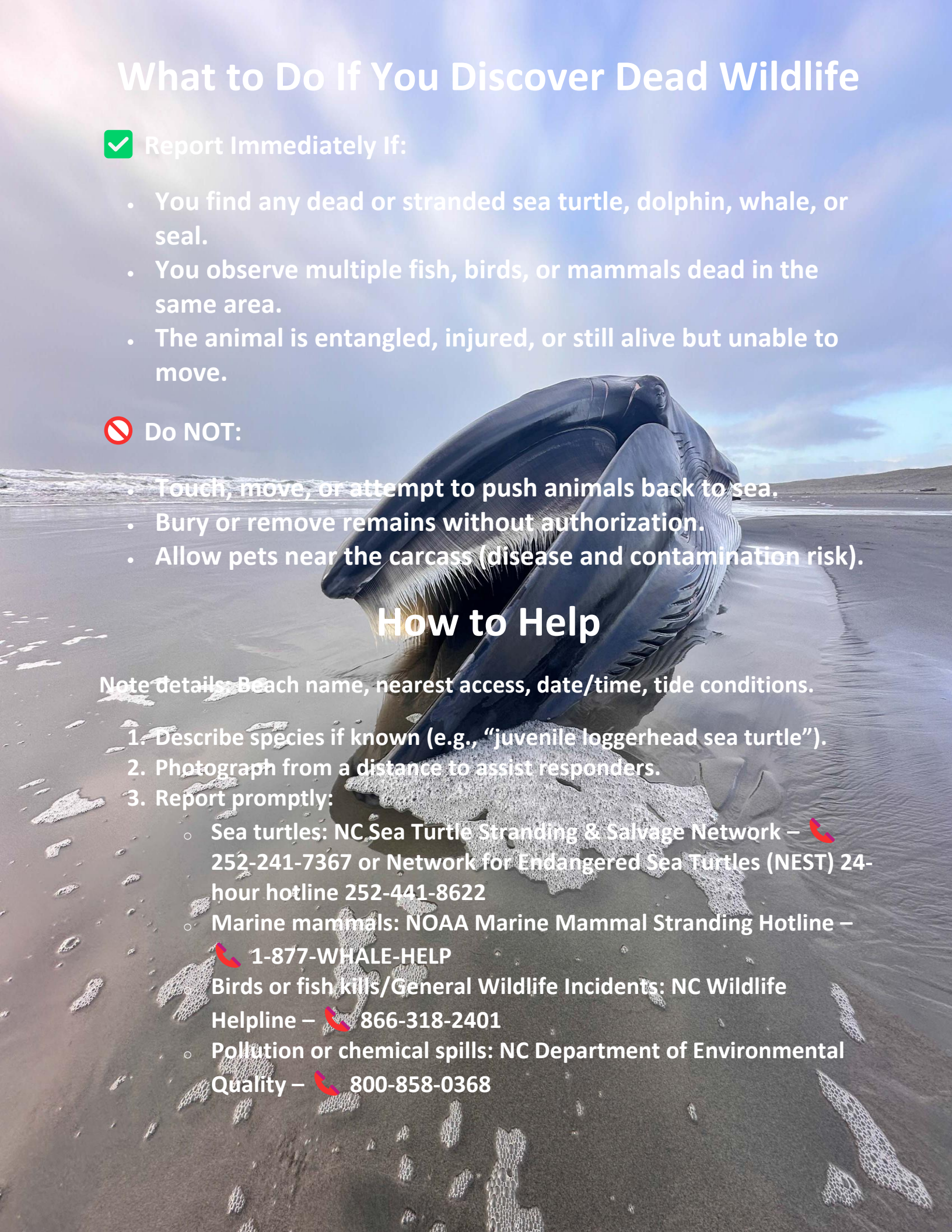
What to Do If You Discover Dead Wildlife

✅ Report Immediately If:

- You find any dead or stranded sea turtle, dolphin, whale, or seal.
- You observe multiple fish, birds, or mammals dead in the same area.
- The animal is entangled, injured, or still alive but unable to move.

🚫 Do NOT:

- Touch, move, or attempt to push animals back to sea.
- Bury or remove remains without authorization.
- Allow pets near the carcass (disease and contamination risk).



How to Help

Note details: Beach name, nearest access, date/time, tide conditions.

1. Describe species if known (e.g., “juvenile loggerhead sea turtle”).
2. Photograph from a distance to assist responders.
3. Report promptly:
    - Sea turtles: NC Sea Turtle Stranding & Salvage Network – 📞 252-241-7367 or Network for Endangered Sea Turtles (NEST) 24-hour hotline 252-441-8622
    - Marine mammals: NOAA Marine Mammal Stranding Hotline – 📞 1-877-WHALE-HELP
    - Birds or fish kills/General Wildlife Incidents: NC Wildlife Helpline – 📞 866-318-2401
    - Pollution or chemical spills: NC Department of Environmental Quality – 📞 800-858-0368

Why Reporting Matters

- Each report adds to a statewide database used by NOAA and NC agencies to monitor ocean health.
- Tissue samples, stomach contents, and water tests can reveal toxins, diseases, or pollutants.
- Early detection allows scientists to issue health advisories or close shellfish beds to protect people and wildlife.

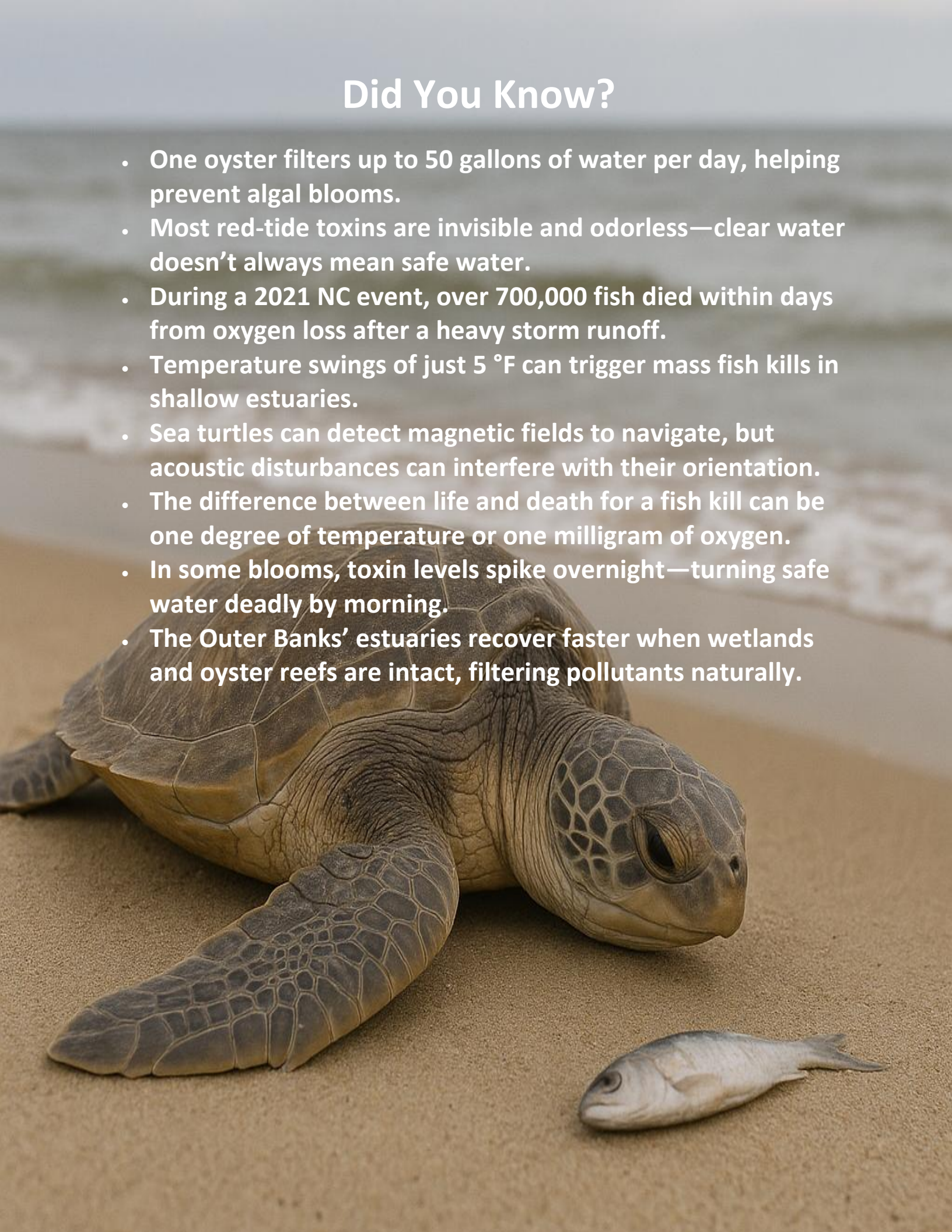
Preventing Future Die-Offs

Everyone can help reduce risks by:

- Limiting fertilizer use and preventing yard runoff.
- Properly disposing of chemicals, paint, and oils.
- Supporting dune and wetland restoration, which filters pollutants.
- Respecting wildlife zones and minimizing light and noise pollution.
- Reporting strandings and unusual events promptly for investigation.

Did You Know?

- One oyster filters up to 50 gallons of water per day, helping prevent algal blooms.
- Most red-tide toxins are invisible and odorless—clear water doesn’t always mean safe water.
- During a 2021 NC event, over 700,000 fish died within days from oxygen loss after a heavy storm runoff.
- Temperature swings of just 5 °F can trigger mass fish kills in shallow estuaries.
- Sea turtles can detect magnetic fields to navigate, but acoustic disturbances can interfere with their orientation.
- The difference between life and death for a fish kill can be one degree of temperature or one milligram of oxygen.
- In some blooms, toxin levels spike overnight—turning safe water deadly by morning.
- The Outer Banks’ estuaries recover faster when wetlands and oyster reefs are intact, filtering pollutants naturally.



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The Science Behind Coastal Mortality Events

Sudden wildlife die-offs in the Outer Banks are important warning signs of environmental stress rather than isolated events. This guide explains the major causes—including harmful algal blooms, oxygen depletion ("dead zones"), disease outbreaks, pollution, extreme weather, salinity changes, underwater noise, and the combined effects of multiple stressors—and how they impact fish, sea turtles, dolphins, seabirds, and other coastal wildlife. It also helps readers recognize warning signs, report stranded or dead animals to the proper authorities, and take simple conservation actions that protect coastal ecosystems and improve the health of the Outer Banks.

About the Publisher

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