

An entertaining, informative book rich with details and behind-the-scenes stories of artificial reef work in the United States. An excellent introduction to a wide range of artificial reef projects, from sunken destroyers to special structures.

Islands in the Sand: An Introduction to Artificial Reefs in the USA

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Islands in the Sand:

An Introduction to Artificial Reefs in the USA

By

Charlie Hudson

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Preface

“Too much data is a better problem to have than too little,” a professor friend of mine said mildly as I spoke of the stacks of paper that I had accumulated doing research for this book.

If you enter “artificial reefs” into a search engine, you will receive over a million references. As a nonscientist, I knew that I had to find scientific experts who have been a part of the diverse efforts, but I also wanted to increase my understanding of the underlying principles and try to convey those in a reader-friendly manner. The same can be said for government documents and reports that are filled with fascinating, useful information written in a style that doesn’t always hold a reader’s attention. In addition to achieving a better grasp of the facts, I especially wanted to capture the human aspect of artificial reef work. As it turned out, each successive interview was like multicolored thread that enabled me to weave a richer tapestry than I had anticipated.

The backgrounds of people that I spoke with contain some common traits as is to be expected, yet are not remotely similar in other ways. Passion for the underwater world links them, and I enjoyed delightful conversations with individuals whose names are quickly recognized within the marine sciences community as well as others who are not likely to be familiar beyond their region. A word about interviews is needed here since personal recollections of events are rarely identical. I took down anecdotes of events such as the deployment of certain vessels, yet it is distinctly possible that someone reading of a particular project might well have different views of what occurred when.

The Focus of the Book

A core purpose of planned artificial reefs is to help relieve the incredible stress on, and depletion of, natural reef systems and sustainable marine life. The principal focus of this book, however, is the recreational aspect of artificial reefs combined with urging responsible behavior of those who enjoy sportfishing, scuba diving, or other water-related activities.

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The particular government documents that I have referenced emphasize artificial reefs for recreational purposes, instead of mitigation of natural reef damage or commercial fishing/aquaculture interests. It is not that those subjects don't deserve discussion; it is rather that they are complex subjects that are often approached in a different manner than when artificial reef efforts are aimed at creating marine habitats that simultaneously serve recreational purposes. Some of the organizations discussed in this book are engaged in projects that do deal in mitigation and commercial fishing as well as recreational application. In addition, federal, state, and local governments frequently have distinct and separate rules and regulations that apply to mitigation and commercial fishing.

The recurring theme of the book is not simply recreation for recreation's sake. It is that we can easily combine stewardship of our oceans and waterways with having fun. When we create new marine ecosystems in what were once open stretches of sand, artificial reefs can help relieve pressure on any nearby natural reefs. If there are no natural reefs, artificial reefs can bring pleasure to people and boosts to local economies through ecotourism. Scuba divers, snorkelers, anglers, and others who previously had to travel to reefs can find underwater environments closer to home—a thriving reef that can be sustained for generations if it is properly managed.

Ships, especially big ships, bring drama as artificial reefs, and they are featured first as we go on this journey across the entire country. From a size perspective, huge offshore oil and gas platforms are next in the lineup, and then the intriguing array of ideas and concepts that branch off in other directions. Coastal areas are the predominant sites of artificial reefs, although lakes have their share and may, indeed, see greater proliferation in the future.

Why This and Not That

There is a practice in the Army of designating a “good idea cutoff date” when planning an operation. You can almost always come up with one more good idea, yet at some point, you have to stop in order to practice the operation and make required adjustments to your plan. I wanted to cover the entire country over a period of

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decades, but to do so, I had to establish a “good idea cutoff point.” This is one of the reasons that I restricted my work to the United States; attempting to explain the worldwide movement was simply too unwieldy. Even with that, for every person who I interviewed, for every noteworthy organization that works with our oceans and waterways, and for every project that I discuss, there were hundreds that I did not. I chose representative projects, for example, such as highlighting the USS *Spiegel Grove* and not the USS *Oriskany*. I will offer upfront apologies for the favorites that I neglected, but like the lyrics in the Bob Seger song, “Against the Wind,” I had to make choices, “about what to leave in, what to leave out.”

More than anything, I wanted to discuss how artificial reefs focused on recreation can be a viable outdoor opportunity in most of the country. I wanted to share some of the history, stories of successes and stumbles, and stories of lessons learned along the way. I wanted to show the expanse of projects that range from the deliberate sinking of former U.S. Navy ships to specially cast, modular “balls” that can be quickly created. There are multimillion-dollar efforts and low-key endeavors scattered along a spectrum of a movement that has been a part of this country for longer than most people realize. There are men and women, some with degrees in the marine sciences and some who embrace the world beneath the water’s surface from a nonscientific view. No matter their profession or age, these are individuals who have taken steps to help create new marine habitats.

Even though artificial reefs are not without controversy, I read through mounds of documents, spoke with dozens of people, wove in my own scuba diving experiences, and gained a greater appreciation for the momentum that is building. I hope that I have adequately presented the wealth of information that has come to me from the different sources.

Chapter One

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December 19, 1985. Professionals had rigged the explosives—they understood what it would take to bring down a steel-hulled, 268-foot-long freighter. Expertly timed booms blasted across the water, steel shuddered, and within minutes, the *Eagle* began to sink below the surface.

“Yes, we did it! Great job!” Cheers and congratulations erupted as horns and bells of the small flotilla joined in to celebrate the successful submersion. Unlike life-destroying disasters at sea, the *Eagle* project was carefully planned to be the first ship deliberately sunk in the Florida Keys as an artificial reef. It settled on its starboard side to become one of a string of vessels along Shipwreck Trail. As with other ships, some dating back to European Colonial times, the *Eagle* would now create a habitat for marine creatures.¹

In December 1985, Florida was among the states actively engaged in creating planned artificial reefs that targeted sportfishing and the growing popularity of recreational scuba diving. Even though artificial reefs have been intentionally developed in the United States since the 1800s, the movement gained notice throughout the country beginning in the 1970s as it expanded beyond fishing interests, became more organized, and picked up momentum. From intermittent, exciting discoveries of genuine shipwrecks to complex planning required to properly emplace a once formidable naval destroyer, this book chronicles the history, current efforts, and possible future of artificial reefs in the United States.

Visionaries, risk takers, inadvertent pioneers, scientists, engineers, entrepreneurs, ardent environmentalists, celebrities, and others belong to an extraordinary range of people who make headlines or work quietly around, and across, the country to restore and create reefs of all sizes. Not every project has been successful, and administrative processes are far more involved than most people

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realize, yet few participants would trade the time they spent in bringing a project to completion.

“I got into this by accident,” explained Larry Beggs of the Reef Ball Foundation. “Now it’s my passion, and I do little that isn’t Reef Ball related. There are months when I’m not sure we’ll meet the payroll, but it’s worth it.”²

Larry’s story and that of the specially designed modules called Reef Balls[™] are detailed in a later chapter and are among the intriguing examples of men and women who help bring about these underwater islands in the sand. In a time when we are seeking ways to demonstrate our increasing concern for the health of our planet, individuals and organizations are joining together to respond in practical, promising ways to give back to the oceans and other bodies of water. This book is dedicated to their inspirations, dreams, and efforts—setbacks and triumphs alike.

The hundred-plus years of artificial reef work in the United States has significantly changed over the decades as technology, techniques, and accessibility to resources have improved and public awareness has grown. The recreational aspect of artificial reefs has expanded beyond small pockets of anglers or scuba divers and is attracting the attention of wider groups who see that they can also be a part of this exciting movement. My intent in writing this book is to take the reader on a scenic tour around our coasts and across the country, pointing out selected artificial reefs along the way. I will highlight some of the people and groups that have chosen to embrace projects that, when properly planned and executed, can bring teaming, visible underwater life to what had previously been expanses of sand.

It is important to understand that the objective of artificial reefs is not to detract from magnificent natural reefs, but rather to create additional structures that provide haven for marine life. While thousands of projects are designed and implemented specifically for marine conservation purposes, these new ecosystems can also bring recreational pleasure for people, enhance awareness of the fragility of our oceans and waterways, and provide economic boosts to surrounding communities. As with virtually every ecological effort,

however, the concept of artificial reefs is not without opposition—an issue discussed in a later chapter.

Naturally Artificial

What exactly are artificial reefs? In the simplest definition, artificial reefs encompass a wide variety of objects not designed by nature that enter the water and become part of a marine ecosystem. In one of its policy statements, the National Ocean and Atmospheric Administration (NOAA) uses this definition: “For the purposes of this policy, artificial reef development is defined as the act of deliberately placing any material or matter in an area of the marine environment where that structure does not exist under natural circumstances for the purpose of protecting, regenerating, concentrating, or increasing populations of living marine resources, or for enhanced recreational, commercial, or educational use of the area.”³

That then leads to the difference between unintended and planned artificial reefs. Frustrating an enemy was initially the favored reason for deliberately sinking large items into the approaches to harbors and bays. In the time of Alexander the Great, those defending the island of Tyre lowered huge stone blocks into their harbor to stave off Alexander’s fleet. Even though that and other tactics were unsuccessful, it was a conscious effort to manipulate objects into the sea for a specific purpose.⁴

Setting aside the famous tale of legendary Atlantis sinking out of sight, natural disasters have also played roles on a massive scale as when entire sections of Port Royal, Jamaica—the notorious refuge of seventeenth-century pirates—collapsed into the sea and the city was abandoned to its new destiny.⁵ Less spectacular, but routine, are countless ships, planes, bridges, and so forth that fall victim to storms, accidents, or combat operations. Add to that mix human errors that have certainly contributed their share of leaky boats and faulty structures unable to withstand the stresses of pounding water and raging winds, and you have man-made objects that come to rest on sand.

No matter the root cause, once these objects are claimed by water, they transform. Within days, or even hours of when the object

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touches bottom, animals dart inside for shelter and larger fish come to cruise looking for smaller prey. Simplistically speaking, an object settles to the bottom whether by accident or through a planned project. For the sake of this example, the bottom is adequate to support the weight of the object so that it does not disappear into the sand and the object is of a material that is conducive to marine growth. Invertebrates such as sponges, soft corals, sea whips, barnacles, and anemones are dispersed through open water in a larval stage. If they survive predation and other factors and reach a suitable surface such as our newly submerged object, they cling to it and begin to colonize. Marine plants such as algae, an important building block of a reef, also begin colonization, and the elemental food chain is now in place. Algae produces oxygen and carbohydrates as well as provides food for certain fish species, sponges help filter bacteria from water, and reef-building corals secrete skeletons of calcium carbonate (limestone) that will slowly build structure. The existing plants and some animals that have taken up residence release nutrients into the water, spurring more plant and animal growth. With adequate shelter, juvenile creatures reach maturity and continue to spawn, and if all is well, the prey-to-predator balance is properly maintained. Even though the initial results of an artificial reef is to draw smaller creatures looking for haven and larger creatures looking for a meal, the follow-on proliferation of permanently attached plants and invertebrates are critical in transforming the man-made object/objects into a healthy marine habitat. A lobster seeking refuge doesn't distinguish protection from a crevice in a rocky ledge carved out when tectonic plates shifted and the convenient cover of a sunken ship or collapsed pier. To the lobster, the objective of shelter is achieved.⁶

Although most of the individuals who I interviewed are involved with planned artificial reefs, many people have been diving or sportfishing on reefs created in an unplanned manner. In fact, fishing boat captains were familiar with unplanned artificial reefs well before the scuba diving community got in on the act. Natural reefs are often annotated on navigation charts, while "accidental" artificial reefs may easily remain unknown for a long time. Fishing boat

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captains are always on the lookout for locations that aren't common knowledge. When they find, or learn of, something big lying on the bottom, they know it will be a habitat for smaller fish that draws in larger fish seeking a meal. Such locations might be shared with other favored boat captains, but most are carefully guarded secrets. Maybe a ship lost to tumultuous waves is below; maybe it's a huge pile of rock and rubble churned up by a storm. Prior to high-tech electronics and the prevalence of scuba diving, fishermen couldn't look to see what such objects really were. Other times, they didn't need to look for one of these hidden spots because they knew precisely what the location was and the identity of the item. After all, if you have a craft you no longer needed, why not tow it out and put it to good use? [Author's note: This approach, while not uncommon in the past, is illegal in most states, can cause adverse impact to marine habitats, and should be avoided as a practice.]

"Man, we were young and foolish," a boat captain from the Florida Keys confided during an interview. "And yeah, there was booze involved, too. A couple of friends and I figured, hey—we can do this. We dragged a twenty-three-foot skiff out and started blasting away with shotguns. As it started to sink, we realized how much noise we were making, and how many regulations we might be breaking, and decided to get the hell away for a while. The really funny thing about it was that we were in such a hurry we didn't take a good reading and never did find the damn thing again." He grinned. "It seemed like a good idea at the time."

The particulars of his admission might be unique, yet the uncontrolled creation of artificial reefs continues to be a serious matter of concern, as it should be. Emphasizing to people the value to be gained from properly constructing artificial reefs is an important step in eliminating problems that have occurred in the past with inappropriate materials and/or improper site selection.

Breaking the Breathing Barrier: The Quest That Led Us Underwater

While most people enjoy the water from boats, the shore, or other keep-your-feet dry platforms, free divers—those capable of

holding their breath for extended periods underwater—have frolicked and harvested marine bounty for thousands of years. All free divers, no matter how accomplished, have distinct limitations of only minutes to remain submerged. Like the dream of flying, inventing the means to breathe underwater spurred some bizarre as well as logical ideas as men yearned to do more than remain on the surface. The History of Diving Museum at Mile Marker 83 on Highway 1 in Islamorada, Florida, is housed in a modest building with a fabulous exterior mural. Drs. Joe and Sally Bauer spent decades bringing together a wonderful collection of early artifacts that displays a fascinating timeline of four thousand years of diving history.

Passing by depictions of rather ingenious concepts and moving beyond Halley's intriguing Diving Bell, you come to the age of modern diving where two men jostled for recognition in bringing the fundamentals of Self-Contained Underwater Breathing Apparatus (SCUBA) to the world's attention. Jacques Cousteau will be instantly recognizable, and perhaps also Hans Hess, an Austrian, who was another pioneer in the 1940s. Despite their fame, they were hardly alone in what they accomplished, and a quick Internet search engine entry will reveal thousands of books and articles that describe the contributions of other notable figures.⁷

Notwithstanding the temptation to digress into the rich history of scuba diving, the point is that even with depth and air capacity restrictions, the barrier to physically existing underwater was irrevocably conquered by men and women who refused to believe it couldn't be done. Advancing technologies have given us submarines and submersible buildings, but it is scuba that allows a person to plunge below, to come face-to-face with the extraordinary aquatic world, and to glide in reduced gravity. Scuba gives you the freedom to temporarily inhabit an incredible place, and when you are forty feet below the waves, it is an exhilarating feeling to look up. Your bubbles stream above you, and the sun slants through the water as fish swim around you and marine plants sway.

Cumbersome equipment kept scuba diving as an extreme activity through the 1970s and somewhat into the 1980s until research, engineering, and marketing broadened its accessibility and

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appeal. Recreational diving has exploded into big business and is well on the way to being a mainstream sport with millions of certified scuba divers in the United States alone. Singles, couples, families—from adolescents to octogenarians—gear up and go under.

Not living near diveable bodies of water is no impediment. Arranging travel to popular dive destinations is easily done, and *popular* is defined as having interesting marine life and topography/structure. Like the lobster hunting for a safe space, divers flock to coral reef systems, underwater walls, or systems of rocky ledges, but places with old bridges and piers abandoned to nature are sources of enjoyment, too. Unless you're into microscopic finds, you won't get a lot of pleasure from finning across seemingly barren stretches of sand with only an occasional fish to see. The reality is that divers want to be able to say, "Wow, that was great!" Big, small, friendly, or alien-looking—living creatures and plants are primarily what divers look for.

While cruising along colorful reefs provides awe-inspiring sights, a unique structure is also appreciated. Ask any diver about the thrill of descending along an anchor line to touch down on the deck of a once seagoing vessel. As you approach what may well be the only "island in the sand," the shape looms into view and large ships such as the USS *Schurz* stir a response in all but the most jaded. The 295-foot USS *Schurz*, which lies off the North Carolina coast, was brought to the attention of the scuba diving world by George Purifoy, founder and owner of Olympus Dive Center in Morehead City, North Carolina. George was among a small percent of divers who can lay claim to discovering and identifying authentic shipwrecks. "I was in high school, back in the early sixties, when diving was a hobby for me," he said during a telephone interview. "I had no idea at the time what it would lead to." More than seven thousand dives and several discoveries later, George was one of the first to encourage opening artificial reefs to divers at large. His Olympus Dive Center is renowned for charters around what is called the Graveyard of the Atlantic.⁸

While George Purifoy's talent for finding wrecks outmatch most, improvements in positioning devices such as Global Positioning

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Satellite (GPS) units and depth finders have assisted other boat captains in narrowing down the hunt for ships. Sure, a 170-foot trawler is pretty large, but as they say, “It’s a big ocean.” Finding an actual ship requires intense work combined with luck and can take years. Unlike fishing captains who might want to keep a discovery quiet, dive operations proudly advertise charters that include shipwrecks as well as reefs.

The Desire for More: Planning Artificial Reefs for Recreation

The limitation to “natural” artificial reefs such as ships that sink due to Mother Nature, combat operations, mechanical flaws, or human error is that these events do not occur with convenience for scuba divers/anglers in mind. After all, if a vessel sinks near shore, there is a high probability that it will either be pounded to bits by waves and rocks, or salvaged. If a vessel is lost well away from shore, it will probably be in deep water. Accessibility is a primary reason why shipwreck diving often belonged in the realm of technical divers whose specialized equipment and training enabled them to manage greater depths for longer periods than purely recreational divers.

Robert Kurson’s best-selling book, *Shadow Divers*, is a superb narrative that describes the adventures of technical divers who located and eventually identified the German U-boat, *U-869*, which was sunk off the waters of New Jersey during World War II. Their incredible find is an excellent example of unexpected discovery, and Mr. Kurson provides detailed descriptions of the rigors of technical diving. The Professional Association of Dive Instructors (PADI) uses this common definition for technical diving: “Technical diving—tec diving for short—is sport diving that uses extensive equipment and procedures to dive beyond the limits of recreational diving, deeper than 40 meters/130 feet. Technical diving may also include stage decompression, diving in an overhead environment, accelerated decompression, and/or the use of different gas mixtures on a single dive.”⁹

One of the fundamental differences between recreational and technical diving is that recreational, no-decompression diving is

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restricted to a maximum depth of 130 feet. The standard scuba tank is filled with between 2,800 and 3,000 pounds per square inch (PSI) of compressed air. The amount of time you can spend underwater is determined by how quickly you consume air and how rapidly nitrogen builds in your system. As you go deeper, you use air at a faster rate and nitrogen builds more quickly within your bloodstream. As a general rule, a diver can safely remain at a depth of forty feet for approximately an hour, yet for only approximately twenty minutes at a depth of one hundred feet.

Running out of air is an obvious problem, and nitrogen buildup can result in the potentially fatal condition of decompression sickness, often called “the bends” or DCS. Simplistically speaking, when a diver descends, excess nitrogen is absorbed into the body. Decompression sickness occurs when divers surface with too much nitrogen, which forms bubbles in their bloodstream. These bubbles can result in pain in the joints and, in the most serious cases, damage to the nervous system, which can result in death. To prevent this, divers follow safe limits of time and depth underwater. These limits have been determined through intensive research and testing. Every diver is taught not only those limits, but also to watch for symptoms such as joint pain, tingling, dizziness, difficulty breathing, and paralysis. Appropriately limiting your time and depth while underwater is one key to avoiding DCS. Also important is a slow ascent from depth, which in the case of technical diving may include a series of decompression stops. (Decompression stops are when a diver “hangs” underwater at a specified depth for a specified number of minutes.)¹⁰ Learning to avoid the hazards of running out of air and decompression sickness is core training from novice students to advanced level practitioners, and scuba diving is not a dangerous sport when you follow the rules.

One of the rules, however, is that no matter how alluring a shipwreck might be, that allure cannot alter laws of physics. Diving below 130 feet requires specific training, additional equipment, and perhaps the planning of underwater decompression stops to “off-gas” nitrogen from your body. Since the extraordinary find of the *U-869*

depicted in *Shadow Divers* is at a depth of 230 feet, it clearly crosses from recreational diving into the realm of technical diving.

On the other hand, two of George Purifoy's famous discoveries are quite accessible; the HMS *Bedfordshire* sits at 105 feet and the *U-352* at 115 feet. Neither is a dive for a beginner, although they are both easily achievable for an experienced diver. Charter operators who provide recreational divers with trips to sunken ships are especially popular with divers.

Somewhere during scuba diving's transition toward a mainstream sport, an idea that anglers were already practicing blossomed within the scuba community: If much of our coastline was not blessed with natural reefs, shipwrecks were not as common as we wanted, and only the occasional abandoned pier was around, why not intervene in a planned manner?

After all, if a ship could be sent to a scrap yard or used for navy bombardment practice when it was no longer seaworthy, couldn't it be taken to a site instead and sunk shallow enough for recreational scuba divers? And if it was a good thing to do with a ship, weren't there other objects that could be used in the same way? What about old bridges ready for destruction or offshore oil platforms nearing the end of their usefulness? Dozens of examples caught people's imagination.

Whatever the motivation, and whatever came before, the 1980s and early 1990s marked a surge in organized artificial reef programs within the United States. The U.S. government issued the original National Artificial Reef Plan in 1985, and how much more official can you get than that?¹¹ Opinions vary as to how much federal, state, and local governments should be involved in artificial reef programs, but involved they became.

This book takes you on the journey of this progression, from accidental participants and tentative *what-ifs*, to eye-popping, sometimes controversial projects that may be small or stupendous in scope. It is a salute to the men and women who are Reef Builders and Reef Wranglers; individuals and groups whose passion is fueled and whose imaginations have been unleashed.

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Although underwater cities once touted by Jacques Cousteau and others haven't exactly materialized as envisioned, the artificial reef movement is forging ahead in multiple directions with intriguing results.

An entertaining, informative book rich with details and behind-the-scenes stories of artificial reef work in the United States. An excellent introduction to a wide range of artificial reef projects, from sunken destroyers to special structures.

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