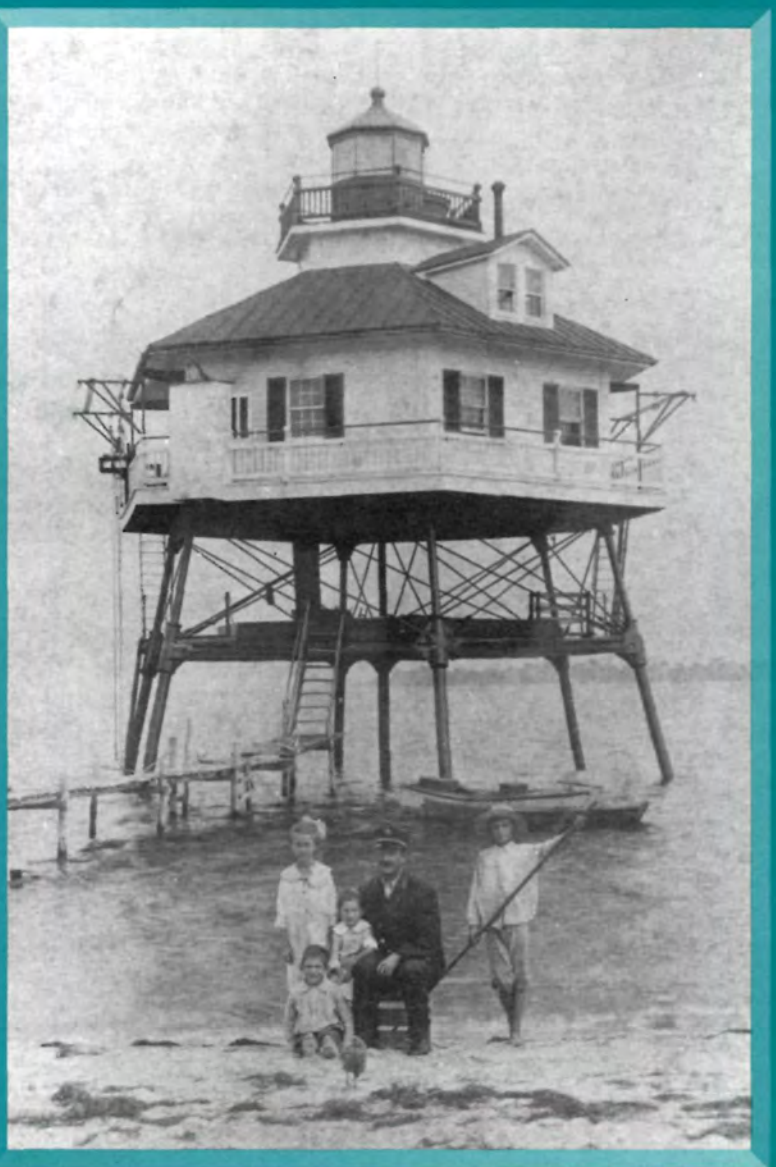
CRM

CULTURAL RESOURCE MANAGEMENT
Information for Parks, Federal Agencies, Indian Tribes, States, Local Governments, and the Private Sector

VOLUME 20 NO. 8 1997

Keeping Lighthouses

A New Breed of Keepers Focus on Preservation



U.S. DEPARTMENT OF THE INTERIOR
National Park Service
Cultural Resources

PUBLISHED BY THE NATIONAL PARK SERVICE

To promote and maintain high standards for preserving and managing cultural resources

Contents

VOLUME 20 NO. 8 1997
ISSN 1068-4999

Keeping Lighthouses

Cover photo: Drum Point Lighthouse, MD. See story, page 19.

An electronic version of this issue of *CRM* can be accessed through the *CRM* homepage at <http://www.cr.nps.gov/crm>.

Candace Clifford

New Priorities for Lighthouse Keepers

The increasing popularity of lighthouses in American culture is reflected in their frequent use in logos, product labels, backdrops for television commercials, settings for novels, and as subjects of newspaper articles, picture books, web sites, and television documentaries. Throughout our nation's history, lighthouses have served not only as vital aids to mariners, but also as popular tourist destinations. Early on, the U.S. Lighthouse Service in its *General Instructions to All Light Keepers* instructed that "Keepers must be courteous and polite to all visitors and show them everything of interest about the station at such times as will not interfere with lighthouse duties." Currently, over 255 light stations are known to be accessible to the public, including 34 in our national parks (see sidebar, "Lighthouses within the National Park System"). In addition to popular tourist destinations as parks and museums, lighthouses also serve as inns, youth hostels, research and educational facilities, Coast Guard housing, nature preserves, and private homes.

One of Three Sisters Light towers accessible at Cape Cod National Seashore in Massachusetts. NPS photo by Candace Clifford, 1995.

The National Maritime Initiative, part of the Park Service's National Register, History, and Education Programs, compiled an inventory of 632 light stations around the country which was published as the *1994 Inventory of Historic Light Stations*. Although the published version is currently out of print, the Initiative continues to update the computerized inventory. In 1994, the Initiative and the Park Service's Historic Preservation Training Center (formerly the Williamsport Historic Training Center) entered into a cooperative partnership with the U.S. Coast Guard, DoD Legacy Management Program, and the U.S. Lighthouse Society to address issues related to maintaining and preserving these unique structures. One of the resulting products, to be published this summer, is the *Historic Lighthouse Preservation Handbook*, which focuses on the diverse environmental and maintenance problems associated with the many different materials and construction techniques used in these structures. The Handbook will be made available to every lighthouse manager in the country, both public and private. Two of the articles—"Lighthouse Construction Types" and "Recent Rehabilitation of Anacapa Island Lighthouse: A Case Study"—are taken from this handbook.

Both the Anacapa Island case study and the article on the Pooles Island stabilization project at Aberdeen Proving Ground in Maryland outline the logistical challenges of performing preservation work in isolated locations which are subject to harsh marine environments. Interagency coopera-

tion and the support of local communities are key to the success of these preservation projects.

"Lighthouse Management: A Balancing Act by the U.S. Coast Guard" points out challenges faced by the agency with the responsibility of maintaining the majority of this nation's lighthouses. Given limited funding and personnel, the Coast Guard has developed a system whereby lighthouse properties are leased or transferred to outside groups who will maintain and preserve them. Generally in these situations the Coast Guard retains access only to the optic and/or fog signal. Most recently, much public attention has focused on the Coast Guard's transfer of 36 lighthouses along the coast of Maine to the Island Institute which will in turn lease them to groups able to care for them under the "Maine Lights Program." Another large group of lighthouses are also being excessed in Michigan. "Partners in Lighthouse Preservation" gives the perspective of the U.S. Lighthouse Society on how these public/private partnerships evolved and have succeeded.

Two articles describe relocating lighthouses, an expensive, but often necessary activity to save the structures: "Moving a Lighthouse: A Brief History of the Efforts to Restore Drum Point Lighthouse" and "Relocation of Highland Lighthouse, North Truro, Massachusetts." Currently the Park Service is facing the challenge of moving the Cape Hatteras Light Station away from the eroding shoreline at Cape Hatteras National Seashore. This nationally-significant lighthouse is also the subject of a National Historic Landmark nomination being prepared by the Initiative.

Lighthouse education is taking many different forms. "Split Rock Lighthouse: Interpretation at Historic Lighthouses" discusses onsite education for the general public. "Preservation Education at Cape Blanco Lighthouse" describes the use of a lighthouse in a project by university students. "Keeping the Lights for Kids" shows how the appreciation of lighthouses can start at an early age and enhance social studies curriculum.

The increasing popularity of lighthouses and the need for a national constituency to further their preservation was in part the impetus for members of the major lighthouse organizations to meet recently and discuss the feasibility of developing an American Lighthouse Center and Museum; its mission would be to broaden the public's appreciation and understanding of America's lighthouse heritage. The hope is that this facility would not only create a museum, but also be an archive and foster research; conduct a variety of educational programs; support other lighthouse museums, organizations, and sites; and serve as a central clearinghouse for public inquiry and assistance.

Much has been accomplished in the preservation of lighthouses over the last decade, but there are still many challenges facing the caretakers of this popular resource. Over the next several years, the Initiative will continue its work with the U.S. Coast Guard by assisting them in nominating for listing in the National Register those historic lighthouses under their jurisdiction that are eligible but have not been listed. The resulting multiple property nomination documentation form (MPDF) will include a general context statement about the significance of the U.S. Lighthouse Service in American history, an overview of the various lighthouse construction types, and a general guideline for registration requirements for subsequent nominations.

We live in an era when lighthouses are no longer vital aids to navigation, but growing awareness of their unique role in our nation's history increases their value in our collective imagination. Increasing numbers of citizens, public and private, are willing to devote time and resources to their preservation. Their efforts should be welcomed and augmented with encouragement and assistance whenever possible.

Candace Clifford is a consultant to the National Park Service's National Maritime Initiative through a cooperative agreement with the National Conference of State Historic Preservation Officers (NCSHPO). Lighthouse owners and managers who have not already requested a copy of the Historic Lighthouse Preservation Handbook *or wish to update their entries in the computerized light station database, may contact her by writing to National Maritime Initiative, National Park Service (2280), 1849 C Street, NW, Washington, DC 20240 or by email to <candace_clifford@nps.gov>.*

Lighthouse Construction Types

Example of an offshore skeletal tower, Sombrero Key Lighthouse (1858), Florida. Photo of lighthouse in 1959 courtesy U.S. Coast Guard Historian's Office.

Most lighthouses can be categorized by construction method, shape, building material, or foundation types. A lighthouse can also be classified as terrestrial or aquatic, i.e., onshore or offshore. The majority of today's 634 lighthouses are land based; close to one-fourth of them have foundations built in the water. The major construction types for historic lighthouses described below are wooden, masonry, wave-swept, concrete, cast-iron plate, skeletal, straightpile, screwpile, diskpile, crib, caisson, and Texas tower. Lighthouses were built on land, in the water, on islands, on top of ledges and cliffs, on breakwaters and piers, on caissons, and at least five are on fort walls. Some light towers are stand-alone structures, while others are attached or integral to the keeper's quarters or fog signal building. In addition to a light tower, a land-based light station could consist of a keeper's quarters, oil house, fog signal building, workshop, cisterns, privy, landing wharf, boathouse and ways, barn, roads, walks, and fences.

Plymouth (Gurnet Point) Lighthouse (1843), Massachusetts, is the earliest surviving wooden tower. Photo by Candace Clifford, 1995, courtesy NPS.

Politics, need, cost, location, and geography of the site, as well as technology available at the time of construction influenced lighthouse designs. Before the mid-19th century, lighthouse construction technology required solid rock or other stable foundation soils; onshore towers sometimes proved inadequate to warn ships off a shoal located offshore. In some locations, a lighted buoy or a lightship solved this problem. Riverine and estuarine environments, however, often had unstable muddy and/or sandy bottoms which could not support the heavy masonry towers then in vogue. In areas such as the Chesapeake Bay, Delaware Bay, the Gulf of Mexico, the Mississippi River delta, and the coral reefs of the Florida Keys, the development of newer technology using screwpile, diskpile, caisson, and skeletal tower lighthouse construction was essential to adequately lighting the marine hazards.

Wooden tower. Most early wooden towers have burned and/or been replaced; however, at least 71 wooden towers are still in existence. Prospect Harbor Lighthouse (1891) in Maine is a good example of a stand-alone, conical wooden light tower. Plymouth (Gurnet Point) Lighthouse (1843) in Massachusetts is the earliest surviving wooden tower.

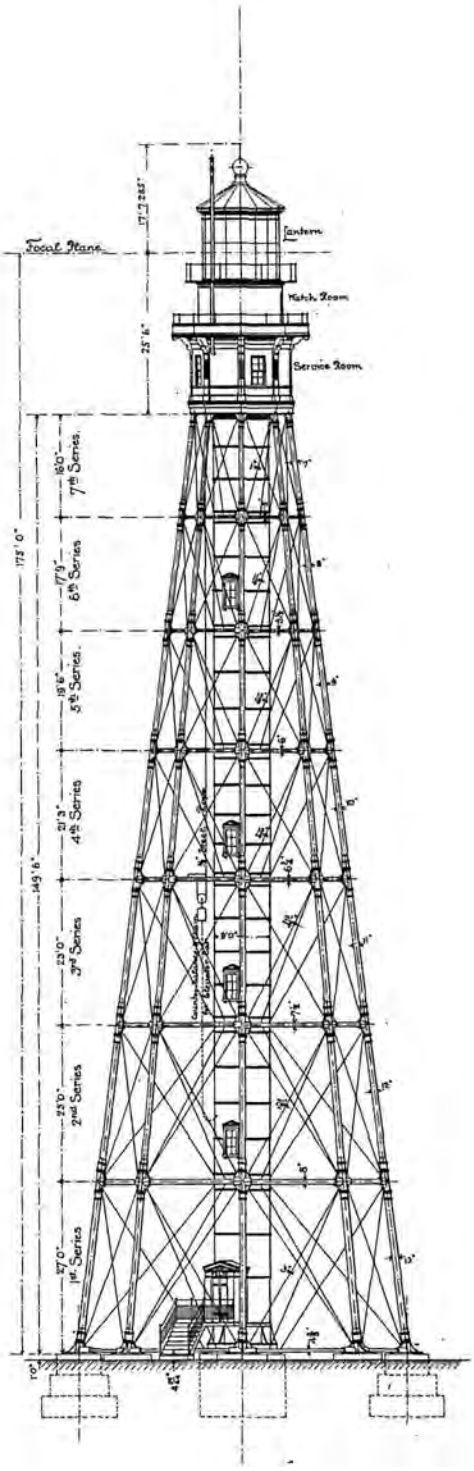
Masonry tower. Masonry towers were constructed of rubble stone, cut stone (dressed stone), brick, or concrete. Masonry is the most popular lighthouse construction material with at least 203 surviving towers constructed of brick and another 123 of stone. The oldest standing masonry light tower in the United States is the 85'

tall Sandy Hook Lighthouse (1764) in New Jersey built of cut stone. Towers over 150' high are referred to as tall towers. The 208' Cape Hatteras Lighthouse (1870) in North Carolina is the tallest lighthouse in the United States.

Wave-swept tower. Wave-swept lighthouses were built on low rocks or submarine ledges and constructed of interlocking stones to withstand the fury and power of waves in heavy seas. One of the first wave-swept towers built in the United States was the 114' Minot's Ledge Lighthouse

The second Cape Henry Lighthouse (1881), Virginia, is the tallest cast-iron-plate tower in the U.S. at 163'. Photo courtesy NPS.

(1860) offshore in Massachusetts which replaced a pile-type lighthouse that was destroyed by a storm. It was considered the "most important engineering work" constructed by the Lighthouse Board at the time.



Construction drawing for the skeletal tower for Cape Charles Light Station (1895), Virginia. Drawing courtesy the National Archives.

Concrete tower. Concrete towers began to replace brick masonry towers at the beginning of the 20th century; a tower of reinforced concrete was first used in the United States at the 115'-tall Point Arena Lighthouse (1908) in California. At least 46 concrete towers exist today.

Cast-iron-plate tower. Cast iron was lighter than stone or brick, relatively inexpensive, strong, watertight, and had a slow rate of deterioration. The second Cape Henry Lighthouse (1881) in Virginia is the tallest cast-iron-plate tower in the United States at 163' high. Steel and wrought-iron plate was also sometimes used. This construction type can be dismantled and moved.

Skeletal tower. Onshore skeletal towers were built of metal and were typically constructed on concrete foundations. Offshore skeletal towers were also built of metal and typically constructed with straight or screwpile foundations (discussed below). Manitou Island Lighthouse (1861) and Whitefish Point Lighthouse (1861) in Michigan, both built from the same plan, were the earliest onshore skeletal towers built in the United States. Like the cast-iron-plate tower, skeletal towers could also be dismantled and moved. There are at least 130 existing iron lighthouse towers of both

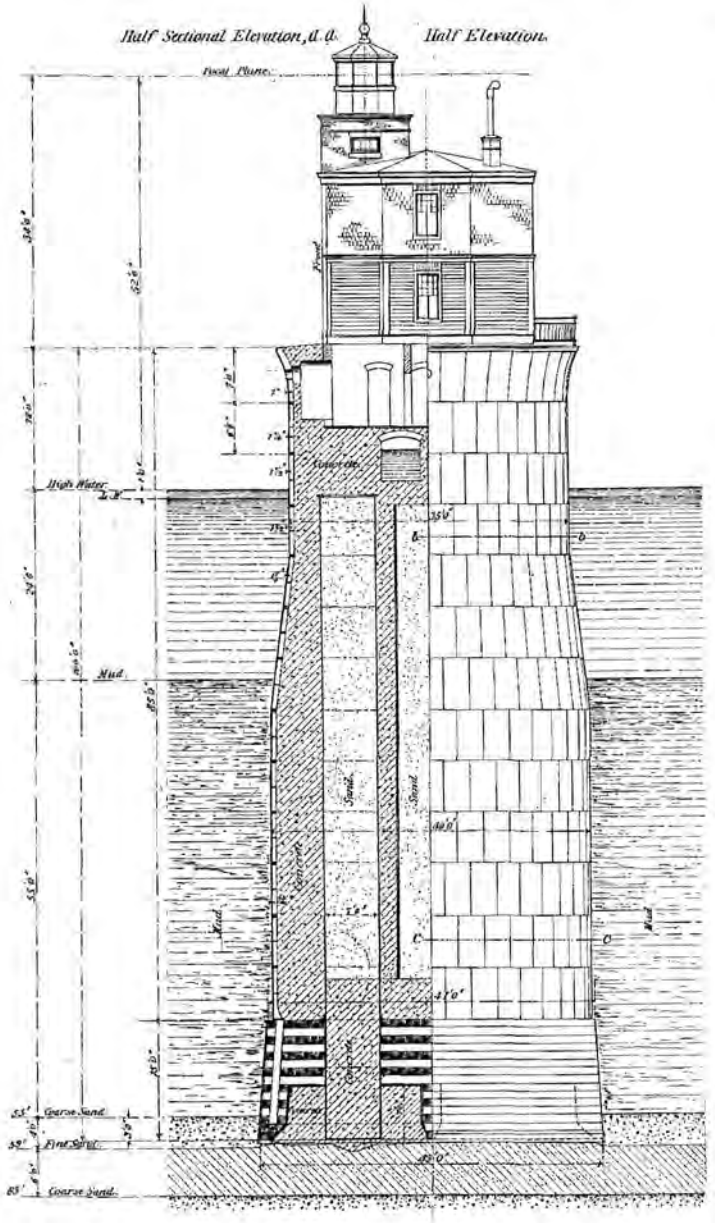
Thomas Point Shoals Lighthouse (1875), Maryland, the only screwpile lighthouse remaining in situ on the Chesapeake Bay. Photo by R. B. Ressler, 1990, courtesy USCG.

the cast-iron plate and skeletal variety with another 56 built of steel.

Straightpile. The pile foundation lighthouse utilized the principal of least resistance. Waves would pass through rather than crash against the foundation. This design of lighthouse structure was used offshore, even in wave-swept locations. The earliest surviving straightpile tubular skeletal tower lighthouse is Sombrero Key Lighthouse (1858) in Florida.

Screwpile. To increase the holding power of the pile, a screw-like flange was fastened to the bottom of the pile and wound like a screw into the substrate. There are two principal screwpile type lighthouses: low spider-like foundations for rivers, bays, and sounds and tall offshore coastal towers. Perhaps as many as 100 spider-like screwpile lighthouses were built throughout the Carolina sounds, the Chesapeake Bay, Delaware Bay, along the Gulf of Mexico, and one even at Maumee Bay (1855) on Lake Erie in Ohio. Thomas Point Shoals Lighthouse (1875) in Maryland is the oldest extant, unmoved, spider-like screwpile lighthouse in the United States. Some offshore screwpile skeletal tower lighthouses built on coral reefs used foot plates or disks to help disperse the weight of the tower. The first of the tall skeletal screwpile coastal towers built in the United States was Carysfort Reef Lighthouse (1852) in Florida, which still stands. At least 24 lighthouse towers with pile foundations are known to survive.

Construction drawing detailing the caisson foundation for Baltimore Lighthouse (1908), Maryland. Drawing courtesy National Archives.



Crib. The wooden crib, constructed onshore, towed to the site, and then filled with stone to sink it in place was a lighthouse foundation type used extensively in the Great Lakes, usually to replace lightships. Once settled and leveled, the cribs were capped with concrete or some other masonry upon which the lighthouse structure was constructed. Perhaps the two most significant crib foundation lighthouses are the 93' Spectacle Reef Lighthouse (1874) on Lake Huron in Michigan, located 10 miles from the closest land; and the 110' Stannard Rock Lighthouse (1882) on Lake Superior in Michigan, located 23 miles from the nearest land. Crib foundations were best suited for hard rock bottoms typically found in the Great Lakes. Thirty-eight lighthouses with crib foundations are known to survive.

Caisson. Caisson foundations were best suited for unconsolidated bottoms composed of sand or mud. The caisson lighthouse type used a large cast-iron cylinder, which was sunk on the

Chesapeake Lighthouse, a Texas tower at the entrance to the Chesapeake Bay in Virginia. Courtesy U.S. Coast Guard Historian's Office.

bottom and filled with rock and concrete to form a foundation. The caisson foundation was sturdier and better able to withstand heavy stress than the pile foundation lighthouses, so it is not surprising that caisson lighthouses were built in areas where moving ice was a hazard. The Craighill Channel Lower Front Range Lighthouse (1873) in Maryland, is an early surviving example. Where bottoms were harder, contained rocks, and/or needed greater depth of penetration into the substrate, the pneumatic process was used. The substrate within the caisson was removed and the caisson allowed to sink further into the bottom. Eleven pneumatic caisson lighthouses were built in the United States. The Sabine Bank Lighthouse (1905) in Texas is the most exposed, located 15 miles offshore in the Gulf of Mexico—the only successful caisson south of the Chesapeake Bay. Fifty-nine lighthouses exist today with caisson foundations.

Texas Tower Type. A relatively recent technological development in lighthouse construction was the Texas tower lighthouse type which replaced exposed lightships offshore. These so-called Texas towers were adaptations modeled on the offshore oil drilling platforms first employed off the Texas coast. The first Texas tower lighthouse type in the United States was the Buzzards Bay Light, located in Buzzards Bay, Massachusetts, and commissioned on November 1, 1961. It has been extinguished and may be dismantled. A total of six Texas tower lighthouses have been constructed.

Adapted from *Historic Lighthouse Preservation Handbook* section written by Ralph Eshelman

National Lighthouse Organizations

U.S. Lighthouse Society

244 Kearny Street - 5th Floor
San Francisco, CA 94108
(415) 362-7255

USLHS provides its members with *Keepers Log*, an illustrated quarterly journal, lighthouse tours, and a general information service on lighthouse and lightship preservation

Great Lakes Lighthouse Keepers Association

Henry Ford Estate
4901 Evergreen Road
Dearborn, MI 48128
(313) 436-9150

GLLKA provides its members with a quarterly journal and hosts annual meetings

Lighthouse Preservation Society

4 Middle Street
Newburyport, MA 01950
(800) 727-2326
(508) 499-0011

LPS is largely an advocacy and fundraising group for lighthouse preservation issues and projects; membership includes the monthly magazine *Lighthouse Digest*

World Wide Web

For more information on publicly accessible lighthouses, visit the National Maritime Initiative's site on the World Wide Web, <http:/www.cr.nps.gov/history/maritime/ltaccess.html>. For a listing of lighthouse-related internet sites around the world visit <http://www.maine.com/lights/www_vl.htm>.

Wayne Truax

Recent Rehabilitation of Anacapa Island Lighthouse
A Case Study

(Below and top right) Close-up of the deteriorated conditions of Anacapa Island Lighthouse before rehabilitation and finished metal work on the lantern after rehabilitation. Photos courtesy USCG.

Anacapa Lighthouse is located on Anacapa Island, 11 miles off the coast of Port Hueneme, California. Built in 1932, it was the last lighthouse built by the U.S. Lighthouse Service. Until the 1995-1996 Coast Guard rehabilitation, Anacapa Lighthouse had never undergone any major repairs.

Determining the Scope of Work

The U.S. Coast Guard Civil Engineering Unit, Oakland's Facility Inspection Team, originally identified the need for this rehabilitation during an inspection of the lighthouse in 1992. The entire lighthouse was in such poor condition

that it was labeled the worst lighthouse on the West Coast. Although most large Coast Guard projects normally take five years before being funded, Anacapa was in such poor condition that it was given a high priority; design work started within two years. In late 1994, the architect assigned to the project made his first site visit. He determined that the best way to repair the badly deteriorated cast-iron lantern house was to remove it from the concrete tower via heavy-lift helicopter and transport it to the mainland for overhaul. Further investigation, however, disclosed several insurmountable obstacles; the architect was forced to consider a more conventional but far from easy onsite rehabilitation of the entire lighthouse. The following scope of work was identified and budgeted for $325,000:

- replace all broken lantern glass;
- replace the missing vent ball with a new fully functional replica cast 304 stainless steel (S/S) vent ball;
- replace the severely deteriorated ladder rails on the lantern room roof with 304 S/S replicas;
- restore the solid bronze lantern room door and lock to a fully operational condition;
- abate all lead and asbestos coatings;
- restore all vents to an operational condition;
- repair all decorative concrete details and structural concrete;
- replace all missing ventilation hoods and covers with historically-accurate replacement parts fabricated from 304 S/S;
- replace the severely deteriorated galvanized iron windows with new galvanized steel windows;
- install new coatings that require minimal maintenance by Coast Guard personnel.

Logistics and Planning

Because Anacapa Island is home to several endangered bird species, the rehabilitation had to take place during the winter months and be completed before the late spring nesting season. The island is difficult to access; all materials had to be brought to and from the site either by boat or helicopter. Transportation costs ranged from $300 per hour for a barge to $500 per hour for helicopter services. Constant changing winter weather, rain, fog, 100 mph winds, and rough sea conditions often ruined the best logistical plans. Some days the landing area for the boat would go from calm at 6:00 a.m. to very rough by 10:00 a.m., forcing the contractor's supply boat to turn around and wait another day. Other days the wind was so strong that materials could not be delivered by boat or helicopter. Since the island was so remote, the workers had no choice but to stay on the island for four days at a time and work ten-hour days.

Everyone learned just how abruptly work could come to a stop when equipment broke down or supplies failed to arrive. There was no quick run to the parts store or to the equipment rental

center. A breakdown was either corrected onsite or the work was delayed until parts could be brought out to fix it. Sometimes the work could be postponed until another scheduled supply run was made to the island. There were a few times, however, when the helicopter had to fly out with nothing but a small part because no one else was coming out to the island for several days. A simple $30 item then cost the contractor $250 in helicopter services.

Dissimilar Metals

Anacapa Lighthouse did not have damage caused by dissimilar metals; however, a lot of new stainless steel (S/S) replacement parts were introduced and care taken to prevent any future problems. A barrier was applied in all cases where S/S was attached to the cast-iron or bronze areas of the lanternhouse. S/S fasteners were coated with a modern anti-seize compound to prevent galvanic reaction and to take the place of the original white lead. A thick gasket made of roofing felt and coated with a silicone caulk was installed between the new S/S vents, vent hoods, and cast-iron lanternhouse walls. The gasket was made from 15 lb. roofing felt which was inexpensive, easy to apply, and did not crush when the vents were bolted in place. Installing the new S/S ladder rail ring stanchions required a two-step process. First a coat of primer was applied and allowed to dry. Then a heavy coat of primer was applied and the stanchions were installed while the primer was still wet creating a watertight seal. This last step was needed because when the original stanchions were removed, a heavy coat of red lead was found sealing the joint.

On previous lighthouse rehabilitations, broken bolts were replaced with 316 S/S to avoid painting the non-ferrous metal on more recent rehabilitations; however, a bolt that would develop a green patina to match the mullions was selected. All the broken bronze bolts on the lanternhouse window mullions were replaced with marine grade silicone bronze instead of stainless steel. Use of the silicone bronze bolts also removed any concerns of dissimilar metal reaction, and they are equal in strength to stainless steel for this application.

Because the lanternhouse was sealed off from the rest of the tower while being blasted, chemical stripping of the paint could take place on the exterior tower walls and windows. The stripper was water-based and applied by brush and airless sprayer. After soaking for at least 1 1/2 hours, it was scraped off. The stripped area was then neutralized with water and finished with power sanding where necessary. The interior lead-painted walls which were originally only to be lightly scraped and painted were causing problems. The paint was so old and brittle it continually flaked off. The abatement contractor asked for a change order to completely remove the paint because the current finished product was proving to be unacceptable. Chemical stripping of the interior walls had been selected over light blasting to save on the costs of transporting more blasting media to the island. Air-driven needle gun scalers using low pressure air, however, proved to be a more cost-effective method. The paint was so brittle, it shattered when struck by the needles, leaving the concrete virtually paint free. There was no damage to the concrete and only lead paint chips were left to be swept up and disposed of. This method could not be used on the exterior concrete because of the 3/8" white mortar skim coat that had been applied as a finish coat when the light was built in 1932.

After the interior walls were complete, the cast-iron spiral stair case was the last item to be abated. The blaster started at the top floor of the lantern house and backed his way to the front doors. This process took three days and prevented

The rehabilitation of Anacapa Island Lighthouse took place during the winter months, so no repair work could begin until the contractor completed an enclosure around the lighthouse. The enclosure served several purposes: containment of hazardous materials, protection of workers from severe weather, and a dry environment for the repair, prepping, and painting of the lighthouse. The first step in building the enclosure was the erecting of a scaffolding completely around the 30' concrete tower. Next was a weather-tight plywood enclosure for the cast-iron lanternhouse, complete with pitched roof to shed heavy rain. The final step was sealing the scaffolding in heavy shrink-wrap to provide weather protection and containment of any hazardous materials. The entire enclosure phase of the project took two weeks because of difficulties in handling the plywood and applying the shrink wrap in high winds. After the enclosure was complete, all deteriorated metal pieces that were scheduled to be replaced and did not require abrasive blasting were removed. Photos courtesy USCG.

Close-up of the damaged concrete gallery deck after the loose concrete has been removed and before the damaged concrete was repaired using pressure-injected epoxy grout. The finished concrete repair is virtually invisible after the surface has been painted. Photos courtesy USCG.

any other interior work from taking place because of the dust. After the blasting was complete, the entire structure was swept and vacuumed before being rinsed down to remove the remaining dust. The water did cause flash rusting on the newly blasted cast-iron staircase but that was expected and did not pose a problem. All surfaces were then wire brushed, prepped, and primed by a three-man team who only prepped what they could prime within an hour. Although the primer used was designed for use over flash-rust, we did not want to chance a coating failure. Generic paint systems were selected based on durability, performance over minimally prepared surfaces, non-toxicity, and permeability.

Concrete Repair

The 3/8" white mortar finish coat that had been applied over the exterior concrete when the light was built in 1932 was not identified in any of the original drawings. As a result, no one looked during the work site visit for signs of delamination. After the scaffolding was in place, however, several areas were found to be loose between the 10- and 30' elevations. The foreman became concerned that other unidentified delaminated areas would fall out after the job was complete and ruin his work. The foreman inspected the entire tower and found an additional 100 square feet of delaminated mortar. After receiving approval to repair any bad mortar, he personally chipped away all the loose mortar and applied a two-part masonry patch material. The repair work was of such high quality that the patches were unnoticeable when the tower was repainted.

Of the 12 tower windows, eight required extensive exterior concrete repairs. Rusted rebar had spalled the concrete and caused severe damage. The old rebar was removed, new holes drilled and the new rebar epoxy injected in place. The rebar was then covered, packed, and reshaped with a two-part Sika Flex product.

One major area of concern was the concrete gallery deck located outside the lanternhouse. This deck had considerable damage in two areas without any evidence of the cause. The outer rebar showed signs of corrosion but the damage went 18 to 24 inches deeper into the concrete. Since freezing was not an issue, the cause of the damage was at first unknown. Closer examination revealed signs of an explosion inside the concrete, and we noticed bolt patterns for two old antenna mounts directly above the area. We determined lightning to be the cause. There was no practical way to dig out the broken concrete; the project was already over budget. We decided to do a pressurized epoxy injection and fill all the voids. The area was prepped and pumped full. The outer three inches were left unfilled so the two-part mortar patching compound could be used to restore the damaged area.

Wayne Truax was formerly Chief Warrant Officer with the U.S. Coast Guard Civil Engineering Unit in Oakland, California.

Views of finished lantern and overall shot of the rehabilitated lighthouse. Photos courtesy USCG and NPS.

Teresa Kaltenbacher

Pooles Island Lighthouse Stabilization Project

Cultural Resource Management at Aberdeen Proving Ground

Located on the northwest side of the upper Chesapeake Bay, Pooles Island is situated at the mouth of the Gunpowder and Bush Rivers in Harford County, Maryland. Constructed in 1825 by master builder John Donahoo of Havre de Grace, Maryland, Pooles Island Lighthouse is the oldest standing lighthouse in the state. The beacon is a conical, land-based masonry tower standing 40' high, with a cast-iron lantern at the top. The original lantern, built of wood with a soapstone floor, was similar to one at Concord Point Lighthouse. The rough cut granite used for the tower was locally quarried in Port Deposit, Maryland. The existing door, believed to be an original, is made out of mahogany. None of the windows remain, and the three openings were bricked in some time ago.

Current Preservation Efforts

Before commencement of the stabilization project, the Pooles Island Lighthouse was in fair structural condition with the exception of some major areas of mortar joint failures and cracks. The poor condition of the joints allowed sand to continually blow into and against the lighthouse. Left unaddressed, the joints would have continued to deteriorate, compromising the integrity of the structure. In order for the lighthouse to retain its architectural integrity, including its overall design, materials, and setting associated with its original 19th-century construction, immediate stabilization actions were imperative.

At the prompting of Aberdeen Proving Ground's higher command who recognized the historical significance of the lighthouse, a major restoration and stabilization project was undertaken by the Cultural Resource Office. This task consisted of several phases: cleaning the structure, logistics, actual stabilization, and visual elements. In adhering to requirements for National Register-eligible properties, all stabilization work met the guidelines as established by the Secretary of the Interior and the National Park Service.

Cleaning and Logistics

Logistics proved to be a challenge: the lighthouse is located on an island several miles from the mainland and there is no access to electricity or fresh water. The Aberdeen Test Center (ATC) was called in to transport a 1200-gallon water tank and all the materials and tools needed for the job. Since a pier only existed at Pooles Island in the mid-to-late 19th century, an all-terrain forklift aboard a barge with a landing ramp maneuvered onto the sandy shore to deliver the items.

Many of the structural aspects of the project were completed in the summer of 1996. Within the Aberdeen Proving Ground (APG) organization, the Directorate of Public Works (DPW) Lead Abatement Team wire-brushed, primed, and painted the cast-iron lantern with a hi-gloss acrylic polyurethane enamel top coat in black. The primer used was a moisture-cured urethane aluminum coating, designed to adhere to rusty metal surfaces. These high quality industrial coatings are designed to resist extreme weather conditions, and should endure for at least five years. The DPW team also cleaned the dark stain around the midsection of the masonry tower with a phosphate-free detergent, low pressure washer, and scrub brushes. The pressure was set at 1500 psi and increased to 3000 psi at some locations of heavy staining. The rust on the lighthouse was caused by organic residue from the ivy growing on it for many years, algae and mildew buildup, and quite

Since a pier only existed at Pooles Island in the mid-to-late 19th century, an all-terrain forklift aboard a barge with a landing ramp maneuvered onto the sandy shore to deliver all the materials and tools needed for the job. Photo courtesy Aberdeen Proving Ground.

Acrylic panes were installed in the lantern with stainless steel clips and bolts that utilized the existing cast-iron lantern parapet for support. This method ensured secure installation without alteration of the lantern itself. The existing lantern vents, the operational ventilator ball, and the unsealed acrylic panes all contribute to the positive air flow throughout the lighthouse. Courtesy Aberdeen Proving Ground.*

possibly rust accumulation from rainwater dripping from the lantern over a long period of time.

Masonry Tower Stabilization

The actual mortar repair work was performed by the U.S. Coast Guard Reserves Lighthouse Maintenance Unit. Based out of Curtis Bay, Maryland, this 10-member team spent its two-week annual training stabilizing the lighthouse. The active-duty Coast Guard donated personnel and its new "Buoy Boat" to deliver the necessary equipment. After erecting scaffolding and anchoring bowson's seats onto the lantern, the men opened up the bricked-in windows and began the tedious process of re-pointing the existing mortar. This work consisted of scraping out loose mortar from the joints and replacing it with a freshly mixed mortar that was intended to duplicate the original mortar as closely as possible. The mortar was then softly brushed to even out the seams and provide a uniform appearance. The exterior was not pargeted, as historic photos illustrated that it had never received a smooth stucco finish. One particular area under a window needed extensive repair, as the granite had fallen out and left a gaping hole in the side of the lighthouse.

Components of the mortar included aggregate (sand conforming to ASTM C144), white portland cement (ASTM C150), and lime putty (ASTM C5-79 and ASTM C207)—a new product designed specifically for historic restoration projects. Manufactured by GenLime Group, Niagara Mature Lime Putty is a fully slaked, pure, aged dolomitic lime mined in northwestern Ohio. This ready-to-use putty, when mixed with aggregate, had great workability and plasticity, with enough tensile strength to accommodate structural movement, plus flexibility to absorb normal stresses from winds and vibration. The ratio of materials used was 1:1:6 of lime putty, portland cement, and sand respectively. Appropriate amounts were determined after consulting with historic preservation experts, following the guidelines provided by GenLime, and assessing the current condition of the granite and weather exposure.

The Coast Guard combined the materials with a cement mixer powered by a generator, as well as by mixing the mortar the old-fashioned way with a hoe and a mud pan. According to the master mason on the team, the resulting mortar was easy to work with and set up nicely. Unlike straight portland and sakrete mortar mixes, the lime putty mortar will prevent efflorescence, and its self-healing properties will repair fine cracks that will occur over time. The flexibility of the mortar will also compensate for the inevitable contraction and expansion resulting from weather extremes, protecting the friable granite from further deterioration.

Visual Elements

The DPW Carpentry Shop handcrafted six-over-six double-hung sashes for replacement-in-kind windows. Before the construction of the three pine windows, ventilation was a major concern. This issue was handled by leaving out one top and one bottom pane of glass to facilitate air flow through the lighthouse. From a distance, the open panes are barely visible, and present a more complete image than permanently opening the lower sash. The windows were painted white as historically indicated on a 1910 photograph of the lighthouse.

Vandalism was another consideration before replacing the windows. Pooles Island is off limits to the public at all times, and the area is randomly patrolled by the Federal Marine Police. Nevertheless, the lighthouse has been defaced in the past. One solution was to install ventilated 1/4" acrylic panes directly onto the frame of the wooden windows. These protective panels can be removed at a later date if necessary, and do not significantly affect the overall appearance of the lighthouse.

Acrylic panes were also installed in the lantern with stainless steel clips and bolts that utilized the existing cast-iron lantern parapet for support.* This method ensured secure installation without alteration of the lantern itself. The existing lantern vents, the operational ventilator ball, and the unsealed acrylic panes all contribute to the positive air flow throughout the lighthouse.

After the mortar had cured for over two months, the lighthouse needed the final touches of paint. Tim Hamilton, a local Aberdeen area resident and painter by trade, volunteered his time to paint the lighthouse. Assisted by two Cultural Resource employees, the job was finished in several days. High-quality, Sherwin Williams products were applied to the masonry tower. A heavy coat of Loxon Exterior Masonry Acrylic Primer in white designed to resist efflorescence and prep the surface was applied. The following day, SuperPaint Exterior Latex Flat House & Trim in white was applied using several lambswool rollers. A paint sprayer was deemed unsuitable because of the constant wind on the island and the lighthouse's proximity to the Chesapeake Bay.

Future Plans for the Pooles Island Lighthouse

The only remaining exterior work to be accomplished is replacing the mahogany door. According to Dr. Ralph Eshelman, a consultant to the Maryland Historic Trust, the tongue-and-groove door is identical to the one at Concord Point Lighthouse, and is probably an original. An outline of the iron key box remains on the door, and the cast-iron hinges are still intact. A sizable piece of the lower left-hand side of the door appears to have been scraped and burned away. Plans for the door include replacement-in-kind and sealing the wood with a UV protectant. The original door will be displayed in the Cultural and Natural Resource Visitor's Learning Center. In addition, Terminix of Harford County has volunteered its services to treat the lighthouse for pests.

The interior of the lighthouse is also in need of extensive repair. The exposed mortar is much softer and more friable than that of the exterior; the joint repairs made by the lighthouse keeper(s) over the years were most likely exterior rather than interior, using more portland cement as it became available. Analysis of the inside mortar reveals only lime and sand, with bits of hair and other materials; no oyster shell was noted. The U.S. Coast Guard Lighthouse Maintenance Reserve Unit has offered their services to the U.S. Army to repair the interior as one of their weekend drills.

An in-house maintenance team will be organized to check on the condition of the lighthouse periodically. Any minor joint failures and other potential problems can then be corrected on a regular basis. Finally, the U.S. Army would like to relight the beacon as a "private aid to navigation." The Cultural Resource Office is awaiting the required paperwork from the Coast Guard. A plastic Fresnel lens and a solar panel, similar to what is in place at nearby Turkey Point Lighthouse, will be used for illumination.

By implementing restoration projects such as the one at Pooles Island, the U.S. Army Garrison at Aberdeen Proving Ground, in cooperation with the DSHE-ECRD Cultural Resource Program, continues to prove its ongoing commitment to preserve our nation's heritage. The undertaking at the lighthouse demonstrates that in-house cooperation, interagency military coalitions, and community support can work together to get the job done.

Many of the supplies and much of the labor needed to rehabilitate Pooles Island Lighthouse were contributed by the community. Courtesy Aberdeen Proving Ground.

Note

* Use of acrylic is acceptable as a temporary protective measure; however, glass should be used as a permanent solution as acrylic breaks down with exposure to UV and salt etching.

References

Goodwin, R. Christopher & Associates, Inc., National Register of Historic Places Nomination Form, 1994.

Speweik, John P., *The History of Masonry Mortar in America: 1720-1995* (Arlington, VA: National Lime Association, 1995).

Teresa Kaltenbacher is an environmental planner with the U.S. Army Garrison, Aberdeen Proving Ground, DSHE-ECRD, Cultural Resource Office, Aberdeen Proving Ground, Maryland.

This research was supported, in part, by an appointment to a Postgraduate Internship in the Cultural Resources Program within the Directorate of Safety, Health and the Environment at Aberdeen Proving Ground, administered by the Oak Ridge Institute for Science and Education through an interagency agreement between the U.S. Department of Energy and United States Army Center for Health Promotion and Preventive Medicine. Thanks also to the personnel of the U.S. Coast Guard (Active and Reserve); Tim Hamilton, Hamilton Painting; and Mrs. Peg Cohee, for historic family photos and oral history.

Lighthouses within the National Park System

California

Cabrillo National Monument, San Diego:
Point Loma Light (Old)
Owner/Manager: National Park Service
Current Use: National Park exhibit
Open to the Public: Open daily
Access: 1800 Cabrillo Memorial Drive (Route 209)
Phone: 619-557-5450

The 40' Point Loma Lighthouse (1855), one of the first lighthouses built on the West Coast, sits on a cliff bringing its focal height to 462'. Photo by Kirby Harris, courtesy Cabrillo National Monument.

Channel Islands National Park, Port Hueneme:
Anacapa Island Light
Owner/Manager: U.S. Coast Guard/National Park Service
Current Use: Active aid to navigation in National Park
Open to the Public: Grounds only
Access: Boat from Ventura
Phone: 805-658-5700

Fort Point National Historic Site, San Francisco:
Fort Point Light
Owner/Manager: National Park Service
Current Use: National Park exhibit
Open to the Public: Fort open Wednesday through Sunday
Access: Marine Dr. N. of Crissy Field (under south anchorage of Golden Gate Bridge)
Phone: 415-556-1693

Golden Gate National Recreation Area, San Francisco:
Alcatraz Island Light
Owner/Manager: U.S. Coast Guard/National Park Service
Current Use: Active aid to navigation in National Park
Open to the Public: Grounds only
Access: Boat from Fisherman's Wharf
Phone: 415-556-0560

Point Bonita Light
Owner/Manager: U.S. Coast Guard/National Park Service
Current Use: Active aid to navigation in National Park
Open to the Public: 12:30-3:30 on weekends
Access: Off U.S. 101 (requires one-mile walk from parking lot)
Phone: 415-331-1540

Point Reyes National Seashore, Inverness:
Point Reyes Light
Owner/Manager: National Park Service/U.S. Coast Guard
Current Use: Active aid to navigation in National Park
Open to the Public: Thursday through Monday (10-4:30)
Access: Sir Francis Drake Blvd. off U.S. Route 1 (requires 1/4 mile walk to visitor center and 308 steps to reach lighthouse)
Phone: 415-669-1534

Florida

Dry Tortugas National Park, Key West:
Dry Tortugas (Loggerhead Key) Light
Owner/Manager: National Park Service/U.S. Coast Guard (optic only)
Current Use: Active aid to navigation in National Park
Open to the Public: Self-guided tour
Access: Boat
Phone: 305-242-7700

Tortugas Harbor (Fort Jefferson) Light
Owner/Manager: National Park Service
Current Use: National Park exhibit
Open to the Public: Grounds only
Access: Boat or seaplane from Key West
Phone: 305-242-7700

The Tortugas Harbor Lighthouse (1876) was constructed of wrought iron because a brick structure on the wall of the Fort would create dangerous fragments if hit by an exploding shell. Photo by Ralph Eshelman, 1996 courtesy NPS.

Georgia

Fort Pulaski National Monument, Tybee Island:
Cockspur Island Light
Owner/Manager: National Park Service
Current Use: National Park exhibit
Open to the Public: Self-guided tour
Access: Private boat
Phone: 912-786-5787

Maine

Acadia National Park:
Baker Island Light
Nearest City: Islesford
Owner/Manager: U.S. Coast Guard/National Park Service
Current Use: Active aid to navigation in National Park
Open to the Public: Grounds open summers
Access: Boat
Phone: 207-288-3338

Bass Harbor Head Light
Nearest City: Bass Harbor
Owner/Manager: U.S. Coast Guard
Current Use: Active aid to navigation in National Park
Open to the Public: Grounds only
Access: Routes 3 and 102
Phone: 207-288-3338

Bear Island Light is also within park boundaries but is not accessible to the public.

Maryland

Fort Washington Park, Fort Washington:
Fort Washington Light
Owner/Manager: U.S. Coast Guard/National Park Service
Current Use: Active aid to navigation in National Park
Open to the Public: Grounds open daily
Access: Rt. 210 to Fort Washington Road
Phone: 301-763-4600

Massachusetts

Salem Maritime National Historic Site, Salem:
Derby Wharf Light
Owner/Manager: National Park Service/U.S. Coast Guard
Current Use: Active aid to navigation in National Park
Open to the Public: Self-guided tour or by park guide
Access: Pier at Derby Street
Phone: 508-740-1660

Cape Cod National Seashore, Eastham:
Three Sisters Lights (Three Towers)
Owner/Manager: National Park Service
Current Use: National Park
Open to the Public: Tours and open houses during summer season; grounds open daily
Access: Cable Road off Ocean View Dr. (short walk)
Phone: 508-255-3421

Also visible within the park, but not accessible to the public: Cape Cod (Highland) Light, Nauset Beach Light, and Race Point Light.

Michigan

Isle Royale National Park, Houghton:
Isle Royale Light
Owner/Manager: U.S. Coast Guard
Current Use: Active aid to navigation in National Park
Open to the Public: Grounds only
Access: Private boat
Phone: 906-487-7153

Passage Island Light
Owner/Manager: U.S. Coast Guard
Current Use: Active aid to navigation in National Park
Open to the Public: Grounds only
Access: Concession boat
Phone: 906-487-7153

Rock Harbor Light
Owner/Manager: National Park Service
Current Use: National Park
Open to the Public: Self-guided tour/tower open daily during summers
Access: Concession boat
Phone: 906-487-7153

Rock Of Ages Light
Owner/Manager: U.S. Coast Guard
Current Use: Active aid to navigation in National Park
Open to the Public: Grounds only
Access: Private boat
Phone: 906-487-7153

Pictured Rocks National Lakeshore, Grand Marais:
Au Sable Light
Owner/Manager: National Park Service/U.S. Coast Guard (optic)
Current Use: Active aid to navigation in National Park
Open to the Public: Guided tours during summer/grounds open daily
Access: Off County Road H58
Phone: 906-387-2607

Sleeping Bear Dunes National Lakeshore, Leland:
South Manitou Island Light
Owner/Manager: National Park Service
Current Use: National Park exhibit
Open to the Public: Guided tour of tower
Access: Ferry from Leland
Phone: 616-326-5134

New Jersey

Gateway National Recreation Area, Sandy Hook Unit, Highlands:
Sandy Hook Light
Owner/Manager: National Park Service
Current Use: Active aid to navigation in National Park
Open to the Public: Grounds only
Access: Fort Hancock Historic District at the north end of Sandy Hook
Phone: 908-872-5970

The Outer Island Fog Signal Building as it looked in 1893. Photo courtesy National Archives.

New York

Fire Island National Seashore, West Islip:
Fire Island Light
Owner/Manager: National Park Service lease to Fire Island Lighthouse Preservation Society
Current Use: Active aid to navigation in National Park
Open to the Public: Grounds open daily; tower and visitor center open weekends during Spring/Fall, Wednesday through Sunday during summer
Access: Robert Moses State Park; parking at Robert Moses Field 5
Phone: 516-661-4876

North Carolina

Cape Hatteras National Seashore:
Bodie Island Light
Nearest City: Nags Head
Owner/Manager: U.S. Coast Guard (tower)/National Park Service
Current Use: Active aid to navigation in National Park
Open to the Public: Grounds open daily/museum in keepers open in summer
Access: Route 12
Phone: 919-473-2111

Cape Hatteras Light
Nearest City: Buxton
Owner/Manager: U.S. Coast Guard/National Park Service
Current Use: Active aid to navigation in National Park/asst. keepers is a visitor center
Open to the Public: Visitor center open daily; tower open spring through fall
Access: Route 12
Phone: 919-995-4474

Ocracoke Island Light
Nearest City: Ocracoke
Owner/Manager: U.S. Coast Guard/National Park Service
Current Use: Active aid to navigation in National Park/keepers serves as NPS housing
Open to the Public: Grounds only
Access: Rural Road 1326
Phone: 919-473-2111

Cape Lookout National Seashore, Beaufort:
Cape Lookout Light
Owner/Manager: U.S. Coast Guard/National Park Service
Current Use: Active aid to navigation/keepers is visitors center in National Park
Open to the Public: Visitor center open daily
Access: Ferry from Harkers Island
Phone: 919-728-2250

Cape Hatteras Lighthouse (1870). The tallest lighthouse in the U.S. stands 208' from the bottom of its foundation and 197' above ground level. Photo by Candace Clifford, 1994, courtesy NPS.

Puerto Rico

San Juan National Historic Site, San Juan:
Port San Juan (El Morro) Light
Owner/Manager: U.S. Coast Guard/National Park Service
Current Use: Active aid to navigation in National Park
Open to the Public: Grounds only
Access: Fort
Phone: 809-729-6653

Virginia

George Washington National Memorial Parkway, Alexandria:
Jones Point Light
Owner/Manager: National Park Service
Current Use: National Park exhibit
Open to the Public: Grounds only
Access: Off U.S. 495 near Woodrow Wilson Bridge
Phone: 703-285-2598

Wisconsin

Apostle Island National Lakeshore, Bayfield:
Devils Island Light
Owner/Manager: U.S. Coast Guard/National Park Service
Current Use: Active aid to navigation in National Park
Open to the Public: Tower open summers
Access: Boat
Phone: 715-779-3397

Michigan Island Light (1st Tower)
Owner/Manager: National Park Service
Current Use: National Park exhibit
Open to the Public: Tower open summers
Access: Boat
Phone: 715-779-3397

Michigan Island Light (2nd Tower)
Owner/Manager: U.S. Coast Guard/National Park Service
Current Use: Active aid to navigation in National Park
Open to the Public: Tower open summers
Access: Boat
Phone: 715-779-3397

Outer Island Light
Owner/Manager: U.S. Coast Guard/National Park Service
Current Use: Active aid to navigation in National Park
Open to the Public: Tower open summers
Access: Boat
Phone: 715-779-3397

Raspberry Island Light
Owner/Manager: U.S. Coast Guard/National Park Service
Current Use: National Park
Open to the Public: Tower open summers/Living History Program
Access: NPS concession boat
Phone: 715-779-3397

Sand Island Light
Owner/Manager: U.S. Coast Guard/National Park Service
Current Use: Active aid to navigation in National Park
Open to the Public: Tower open summers
Access: NPS concession boat (requires one-mile walk to lighthouse)
Phone: 715-779-3397

Also within the park boundaries, but not accessible to public—Chequamegon Point Light and Lapointe (Long Island) Light.

Other Lights within National Park System Boundaries, but not Accessible to the Public—

Boston Harbor Light, Boston Islands National Recreation Area, Massachusetts
Cape Spencer Light, Glacier Bay National Monument, Alaska
Fort Wadsworth Light, Gateway National Recreational Area,
Fowey Rocks Light, Biscayne National Park, Florida
Molokai (Kalaupapa) Light, next to Kalaupapa National Historical Park, Hawaii

---

Compiled by Candace Clifford from the Inventory of Historic Light Stations.

The Molokai (Kalaupapa) Light (1909) is adjacent to the Kalaupapa National Historical Park in Hawaii. Photo by Stephen T. Kozosky, 1996.

Ralph Eshelman

Moving a Lighthouse

A Brief History of the Efforts to Restore Drum Point Lighthouse

Drum Point Lighthouse keeper William Yeatman with his children, September 9, 1918. The wooden bridge at left connects the lighthouse to the shore. Courtesy Calvert Marine Museum.

Costing about $5,000, Drum Point Lighthouse was built in 1883 near the mouth of the Patuxent River where it meets the Chesapeake Bay. This screwpile "cottage-type" lighthouse, one of over 40 such structures built in the Chesapeake, safely guided mariners in and out of Patuxent River for 79 years until it was decommissioned on September 6, 1962. The lighthouse property was transferred to the State of Maryland and plans were made to restore the structure and open it to the public, but land access to the site was blocked by several miles of private property. Ownership of the property eventually reverted to the General Services Administration.

Abandoned, the lighthouse soon suffered from a lack of maintenance and vandalism. The lighthouse was originally built off the end of Drum Point in water deep enough for small boats to pass between it and the shore. Over the years, however, the point accreted so that it was accessible by foot. Vandals easily entered the lighthouse. John Hanson, Drum Point's last civilian keeper, who lived nearby, related that he avoided the point because he "could not bear to see the condition of the structure." In 1966, the Calvert County Historical Society decided to acquire and restore the lighthouse as a special project. The federal government, however, was unwilling to deed the land to the society or to the county, and government funding agencies were unwilling to assist the project until a legal deed was in hand and a viable method was found to get the public to the site. As an interim step to help save the lighthouse, the historical society was instrumental in having the structure listed in the National Register of Historic Places.

Meanwhile, the lighthouse continued to suffer. A fire had been started in one room of the structure, but fortunately it was extinguished before major damage resulted. Vandals had by this time torn down all the doors and windows and knocked out the lantern glass; the cast-iron lens pedestal had been ripped from the lantern deck and tossed over the side. There was evidence of attempts to loosen the bolts which held the fog bell in place. A grass-roots level of support grew, however, as people learned about the plight of the lighthouse and efforts underway to save it. A local marine contractor took his barge and crane out to the lighthouse and removed the fog bell for safekeeping. A neighbor near the lighthouse donated the lens pedestal after he found it lying in the sand.

Much of this article is based on Ralph Eshelman, *A History of Drum Point Lighthouse,* Special Publication no. 1 (Solomons, Maryland: Calvert Marine Museum, 1979); and Dennis L. Noble and Ralph Eshelman "A Lighthouse for Drum Point," *The Keeper's Log,* Summer (1987), pp. 2–9.

In the spring of 1975, the seven, 10"-diameter, solid cast-iron piles of the Drum Point Lighthouse were severed at the water line while a 110' boom, steam-operated crane placed on a barge lifted the entire three-story lighthouse and rested it on the side of a barge for its trip to the museum. Courtesy Calvert Marine Museum.

Pros and Cons of Moving Lighthouses

Recently, there has been much publicity over moving several lighthouses in an effort to save them from impending dangers such as erosion. Relocating lighthouses is not a modern phenomenon. When the Lighthouse Establishment approved the first Sharps Island Lighthouse, built in 1837 in Chesapeake Bay, the plans called for a small wooden keeper's house surmounted with a lantern and designed with "wheels" so it could be easily moved in the event that erosion threatened the structure. The lighthouse was so moved in 1848, presumably on these wheels.

With advances in building technology, cast-iron-plate towers were designed so they could be disassembled and re-erected as needed on shifting and eroding beaches. The pre-fabricated curved cast-iron panels were easily bolted together or dismantled. Cape Canaveral Lighthouse (1868) in Florida, and Hunting Island Lighthouse (1875) in South Carolina, are examples of this design, both subsequently being successfully moved.

At Cape Hatteras National Seashore sandbags used for shoreline protection in front the Cape Hatteras Lighthouse are replaced after a 1994 storm. Photo by Candace Clifford.

The National Park Service has conducted studies which conclude the safest method to preserve Cape Hatteras Lighthouse, presently being threatened by erosion, is to move it back from the beach front. Ironically, some citizens argue such a move will destroy the integrity of the lighthouse setting. Actually, when the Cape Hatteras Lighthouse was built in 1870, it was located approximately one-half mile inland to protect it from beach erosion. But erosion of the beach has encroached to the point where it now endangers the structure. The inland movement of the lighthouse and its other station structures would in reality reflect the setting of the lighthouse as it appeared when it was first completed.

Should a lighthouse be moved? The best answer is "no," unless the structure is threatened by destruction. While any historic structure is best in its original location, a historic structure in a non-original location is better than no historic structure at all. If a move is necessary to save the structure, every effort should be made to maintain as much of the original station integrity as possible. The lighthouse tower should normally have the same orientation to the water as it had before the move. Other station structures should be similarly moved to demonstrate the same relationship of one structure to the other. Landscaping can also be used to help restore the original setting of the station. Before any move of any historic structure is undertaken, the State Historic Preservation Officer (SHPO) should be contacted. Any historic structure listed in the National Register of Historic Places may lose such designation once moved. If a move is absolutely necessary and approved by the SHPO, the move should be conducted by a reliable experienced moving company.

—Ralph Eshelman

Drum Point Lighthouse, restored and on exhibit at its new location. Courtesy Calvert Marine Museum.

After continual lobbying of Congress, the federal government agreed in 1974 to give the lighthouse, not the land, to the Calvert County government. By this time, the historical society had established the Calvert Marine Museum. The plan was to seek the funds to move the lighthouse to the grounds of the museum, restore it, interpret it, and open it to the public. Thanks to a grant from the Maryland Historical Trust, funding the move of the lighthouse about two nautical miles to the museum's waterfront was accomplished in the spring of 1975. Fortunately, because a new bridge was being constructed nearby, the B. F. Diamond Construction Company of Savannah, Georgia, was in the right place at the right time. The seven, 10"-diameter, solid cast-iron piles were severed at the water line while a 110' boom, steam-operated crane placed on a barge lifted the entire three-story lighthouse and rested it on the side of a barge for its trip to the museum. Tugs slowly towed the barge, and the crane lifted the lighthouse onto its new foundation while a large crowd gathered to watch and celebrate the event.

Ironically, because the lighthouse was moved from its original location, the structure was removed from listing in the National Register. After the move, successful restoration according to the Secretary of the Interior's Standards, with the understanding that moving the lighthouse was the best way to ensure its preservation and make it more easily available to the public, the Drum Point Lighthouse was relisted in the National Register.

The Calvert Marine Museum was fortunate in that Anna Weems Ewalt, who was born in the lighthouse in 1903, was willing to head up a group to find appropriate furnishings for the interior, largely based on Anna's memory. Anna also donated a few family items such as china that was used in the lighthouse. Additional funding from the Maryland Historical Trust, the historical society, and donations from private sources were used to restore and interpret the lighthouse. The lighthouse was officially dedicated on June 24, 1978, amid much fanfare and officialdom. Then Maryland Governor Blair Lee cut the dedication ribbon.

The Calvert Marine Museum conducts daily tours of the lighthouse. Occasionally, special programs including living histories are held at the lighthouse. Each Christmas the lighthouse is decorated for the holiday season and open to the public. Each spring the museum's volunteer corps conducts its annual lighthouse cleanup. Curtains, rugs, and linens are washed and pressed; the entire exterior and interior are thoroughly cleaned; windows washed inside and out; stove polished; etc. Local grocery stores and fast food establishments donate food for the workers. This spring cleanup has become an annual ritual, getting the lighthouse ready for the upcoming busy summer season. After the cleanup, the museum's maritime curator conducts an annual inspection of the lighthouse, similar to the earlier white glove inspections by Lighthouse Board Inspectors. The inspection includes a complete review of cleanliness, needed repairs, and long-term maintenance needs which are then addressed in upcoming budgetary processes. An endowment for the maintenance of the lighthouse was also established to help meet these costs.

Today the Drum Point Lighthouse is featured in local tourism ads; it is used as a logo by several area businesses, and generally is considered a local icon. The dedication of the Calvert County Historical Society, Calvert County Government, and the Calvert Marine Museum prevented the loss of the lighthouse and turned it into an important source of community pride and reminder of the region's heritage.

Former director of the Calvert Marine Museum, Ralph Eshelman serves as a maritime historian to the National Maritime Initiative of the National Park Service through a cooperative agreement with the U.S. Lighthouse Society.

Lee Radzak

Split Rock Lighthouse

Interpretation at Historic Lighthouses

Lighthouse visitors are just as interested in the day-to-day life at a light station as they are in the technical aspects of the keeper's job. An interpreter demonstrates wash day—1920s style. Courtesy Minnesota Historical Society.

The keeper finished cranking the 250-pound cast-iron weights up the 40' weight-way tube running up through the center of the lighthouse. He removed the crank handle from the clockwork mechanism and pulled a handkerchief from the pocket of his midnight-blue wool uniform coat and wiped a few smears from the polished brass of the lens assembly. As he took a moment to admire the sparkling prisms of the Fresnel lens he heard strange voices coming up the spiral staircase. An eager family came puffing into the lens room to stare wide-eyed at the glittering 4-1/2 ton marvel of French technology revolving above them. They then turned to look out the window at Lake Superior 160' below. "Welcome to Split Rock Lighthouse," said the keeper. "I'll bet you're wondering why the lighthouse service would build a lighthouse way up on top of this cliff."

At an annual Children's Day special event at Split Rock, young people are given an opportunity to record impressions of their visit to the lighthouse. Such activities can make their visit more memorable. Courtesy Minnesota Historical Society.

This scene could have occurred in the late 1920s as easily as the late 1990s. The major difference is that in the 1990s the "keeper" is a historic site interpreter employed by the Minnesota Historical Society; in the 1920s, he was a lightkeeper employed by the U.S. Lighthouse Service. For the first 14 years the Split Rock keepers and their families led an isolated existence. But in 1924 the North Shore highway was opened from Duluth, Minnesota, to the Canadian border; it ran only a half mile from the light station. By the mid-1930s the head lightkeeper was recording 60,000 visitors annually off the new highway. The lighthouse service told him that he should meet and greet all visitors to the lighthouse in a clean dress uniform. In 1939, when the U.S. Coast Guard assumed responsibility for the country's aids to navigation, they said that Split Rock was "one of the most frequently visited lighthouses in the United States." Although Split Rock Lighthouse was decommissioned as a navigational aid in 1969, visitors continued to stop at the popular landmark. The light station is now a Minnesota state historic site; preservation and interpretation are the responsibility of the Minnesota Historical Society (MHS). Visitation peaked at 212,000 in 1989, the year of the U.S. Lighthouse Service bicentennial.

With the well-preserved light station and with public interest and high attendance a given, Split Rock was a natural addition to the Minnesota historic site system in 1976. As with all open-air museums, the interpretive program at Split Rock has been developed and customized to fit specific conditions. Visitation patterns, audience interest and demographics, the physical environment of the site, availability of historical and research information, and, of course, financial resources, are among some of the considerations when developing an interpretive plan for any historic site.

For an interpretive program to succeed at a historic lighthouse, the administering entity needs to have a clear vision of what they want visitors to understand about the site. This can only be done by first developing a concise interpretive plan that sets objectives for what story is to be told at the site and how it is to be told. At Split Rock we were very fortunate: when we began research on the site in the mid-1970s, several sons and daughters of the early keepers who actually lived at the light station in the 1910s, 1920s, and 1930s were helpful in providing us with first-hand information about life at Split Rock. They were a very valuable source of anecdotal information, and even provided written records and early photographs of life

at the lighthouse. This information was corroborated by the official logs for the light station that were kept by the keepers. From these, and other archival sources, we had an excellent base of information on which to build an interpretive program, as well as good documentation for restoration projects that have returned the buildings and grounds to their pre-1924 appearance.

Solid and well-researched documentation provides the fuel that will drive a successful interpretive program. For us, the next step was to look at the resources we had and how best to present them to the visiting public. First, an interpretive staff manual was developed. While this is updated annually, the basic information it contains gives an interpreter a primer in interpretive technique, as well as an in-depth background on the history of lighthouses, shipping, the Great Lakes, the U.S. Lighthouse Service, and Split Rock Lighthouse. A detailed interpretive outline for guided tours is included along with expected learner outcomes for each of the stations on a tour. In-depth staff training, though expensive, is the key to an effective and successful interpretive program. Each spring we hold two full days of training for our entire staff of 22 to 24 employees.

After being open to the public for 20 years, Split Rock Lighthouse historic site's program evolved into one that gives visitors a variety of options for touring the light station. For the casual visitors, self-guiding brochures allow them to see the buildings and grounds of the light station at their own pace and to interact with stationed interpreters as they wish. Hour-long guided tours are led by site interpreters to seven tour stations, or stops, on the light station. Beginning in the 1996 season, the decision was made to expand our interpretive program to include costumed interpreters who role-play either the keepers or their wives from the time period of 1925. We chose that year as our target date for the first-person interpretation because it was the first year that the new highway allowed tourist access to the isolated light station. The head lightkeeper's log for 1925 shows that the isolated life at Split Rock was changing and that they were dealing with tourist traffic on a regular basis. The highway is a perfect interpretive vehicle or bridge—excuse the puns—between that historical period and our interpretation of it. Visitors today still travel the same road to see the same lighthouse, and they can relate to the historical connection between the keepers and their early visitors.

The lives of the Split Rock lightkeepers and their families in the 1920s is portrayed for visitors to the site by present-day interpretive staff and volunteers. Courtesy Minnesota Historical Society.

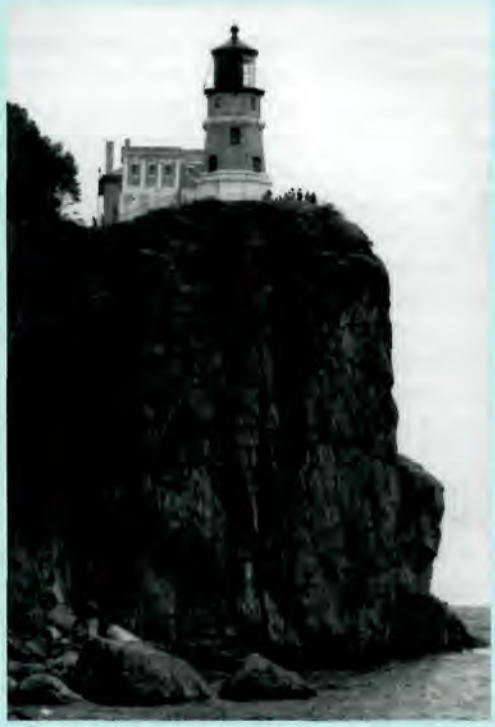
Adding a living history component to an interpretive program can greatly enrich a visitor's appreciation and understanding of a site and its content. If done right, first-person, costumed role-playing can be very effective; however, much care, forethought, and a high level of commitment to accuracy must accompany the decision. At Split Rock we had used costumed role playing to a limited extent for special events; because of the very positive reception, we have now incorporated it into our daily interpretation. Every day, three of our seven interpreters portray either a keeper or a wife of a keeper. A limitation at our site is that only the lighthouse and one of the three lightkeeper's dwellings is totally restored to the 1920s, complete with period furnishings, so the first-person interpretation is most effective inside these two buildings.

If living history is to be done with any credibility, it has to be done right. That means no short cuts on costuming—accurate period keepers' uniforms and 1920s vintage reproduction house dresses for the women. Only appropriate jewelry and hairstyles are to be worn by costumed interpreters, and even the language and slang that the interpreters use while in character have to fit the 1920s. Since the time period that we are interpreting at Split Rock is relatively recent we do not portray actual keepers and family members that served at Split Rock Lighthouse. Instead, through extensive research, we have developed composite characters based on historical information specific to Split Rock and generic qualities shared by lightkeepers of the time period. Biographical histories were developed for six fictional characters so that an interpreter is assigned a specific character to portray for the day.

At Split Rock we use a form of modified first-person that we call "my eyes, your eyes." If a visitor asks the "keeper" why there is a light bulb in the lens, the interpreter will drop character enough to say, "To your eyes you see a 1000-watt light bulb that was used after the light station was electrified in 1940, but to my eyes in 1925 it looks like an incandescent oil vapor lamp that burns kerosene." At Split Rock we have found that many visitors have needs and questions that just cannot be answered fby someone locked into a different time period. For them we will briefly break

Split Rock Light Station

Completed by the U.S. Lighthouse Service in 1910, Split Rock Light Station was soon one of Minnesota's best known landmarks. Restored to its 1920s appearance, complete with its 3rd order, bivalve, Fresnel lens and operating clockworks, the lighthouse offers visitors a glimpse of lighthouse life in this remote and spectacular setting. The 10 buildings that comprised the original light station have been restored to their original appearance; the fog signal building and one of the three lightkeeper's dwellings are also open to the public. A history center built in 1986 features an award-winning film; exhibits on navigation, shipwrecks, and Lake Superior; and a museum store.



Split Rock Lighthouse owes its existence to the storms of 1905, especially to a record gale on November 28, that damaged nearly 30 ships on Lake Superior alone. The under-powered freighters and iron-ore carriers, unable to cope with the northeast winds in excess of 60 miles per hour that raged continuously for more than half a day, were driven across the lake toward the rocky north shore.

Location and Hours. Split Rock Lighthouse Historic Site is located within Split Rock Lighthouse State Park, 45 miles northeast of Duluth on Highway 61. The site is open with a full interpretive program from May 15 through October 15, 9:00 a.m. to 5:00 p.m. daily. Winter hours, October 15 through May 15, are Friday through Sunday, noon to 4:00 p.m., with only the history center and the grounds open (closed in December).

Split Rock Lighthouse is listed in the National Register of Historic Places and is part of Minnesota's State Historic Site Network that includes 32 sites and is administered by the Minnesota Historical Society.

character if it will help interpret a concept or idea to them.

Additional methods of interpretation can strengthen a site's program. Each historic site has a unique story that should be told. There are many very good methods to facilitate the telling of that story. Interpretive film can be an extremely effective way to illustrate facts and ideas that can be difficult to convey in other ways. In our 22-minute film, "Split Rock Light: Tribute to the Age of Steel," we show how the growth of the Minnesota iron ranges led to the need for lighthouses on Lake Superior. In an age when every visitor relates to video, even short two- or three-minute audio-visual programs can be effective, and made inexpensively. A museum store should also support and reinforce the interpretive theme of the site. Sale items such as period crafts appropriate to the theme of the site and publications will take the visitor one step further in their understanding of the site. An exhibit gallery can provide interactive displays or describe or illustrate ideas that supplement what the interpreters are able to do.

While all of these interpretive tools are a means to an end—understanding the past—we will never be able to recreate history. In some ways interpreting the past is like the mariner studying the lighthouse from the watery distance. Using his compass and his light list for guidance, and hoping that fog or a snow squall do not alter the beam, he keeps an eye to his one true contact with land. The actions of the past are a constant focal point; our interpretations of these actions in the present can affect how clearly we are able to see the past as it truly was.

References

Alderson, William T. and Shirley Payne Low, *Interpretation of Historic Sites* (Nashville: American Association for State and Local History, 1976).

Blatti, Jo, Editor, *Past Meets Present: Essays about Historic Interpretation and Public Audiences* (Washington, DC: Smithsonian Institution Press, 1987).

Grinder, Alison L., and E. Sue McCoy, *The Good Guide: A Sourcebook for Interpreters, Docents and Tour Guides* (Scottsdale, AZ: Ironwood Press, 1985).

Minnesota Historical Society, *Split Rock Lighthouse* (St. Paul, MN: Minnesota Historical Society Press, Minnesota Historic Sites Pamphlet Series, No. 15, 1993).

U.S. Coast Guard, *Guide to Historically Famous Lighthouses in the United States* (Washington, DC: U.S. Government Printing Office, 1939).

Lee Radzak is Historic Site Manager at Split Rock Lighthouse for the Minnesota Historical Society.

Joseph J. Jakubik

Relocation of the Highland Lighthouse, North Truro, MA

Preparatory work begins on the lighthouse, including bracing all the windows, installing masonry reinforcement, bracing the chimneys, and concrete cutting and coring for the placement of beams.

International Chimney Corporation was contracted by the Army Corps of Engineers to relocate the 450-ton Highland Lighthouse (commonly known as the Cape Cod Light) approximately 450' back from an eroding cliff. The project was funded by the National Park Service, Cape Cod National Seashore, and the U.S. Coast Guard CEU Providence, and with contributions from a local preservation group.

A support grid is installed underneath the lighthouse and the structure raised in order to facilitate placement of travel beams.

Travel beams are installed under the structure (left).

A secondary set of jacks is employed to lower the building vertically. Horizontal movement is achieved through the use of push rams activated between the travel beams and the main beams (right).

While this project is still underway at the time of this writing, the lighthouse has been successfully relocated to its new foundation, consisting of an 18"-thick reinforced concrete slab with solid structural brick serving as infill and forming the foundation walls.

International Chimney Corporation's plan for the relocation called for the entire lighthouse, complete with equipment room and connector building to be relocated in one piece. An attached keeper's quarters of wood frame construction was initially separated from the masonry structure and placed in storage for relocation at a future date.

Preparatory work for the relocation of the Highland Lighthouse included bracing all openings, repainting stress cracks in the masonry tower, installing reinforcing on and through the masonry, and grouting three independent widths of brick together at the base of the tower and connector building.

The masonry structure did not have a conventional footer and foundation wall; rather a 3'-deep brick footprint had been constructed on native sand. The lack of a proper footer increased the difficulty of the move and required careful excavation of sandy soil to prevent undercutting the masonry.

International Chimney Corporation's concrete cutting and coring division installed precisely cut holes in the masonry to allow for placement of support beams and grillage. The steel support beams, commonly known as cross steel, were in contact with the masonry and were themselves supported by duplex beams commonly known as

The Highland Light was relit in its new location on November 3, 1996.

mains. The mains were equipped with a series of 60-ton hydraulic jacks installed in an inverted position.

The purpose of the main beams was to spread the load of the cross steel and allow for even jacking. The structure was initially lifted off its present foundation under the Unified Lifting System. The Unified Lifting System allows for pressure on the jacks to be placed evenly; thus, all points come up at the same time.

Once lifted, the lighthouse was placed on roll beams supported by wooden cribbing. The hydraulic jacks installed in the mains were activated and cradled in roller dollies which allow for movement on the roll beams. At this point, the hydraulics were arranged for three zone travel, allowing for compensation between the zones should unanticipated settlement occur.

Movement was accomplished when hydraulic rams, interconnected between the roll beams and the main beams were activated, pushing the hydraulically suspended lighthouse on roller dollies down the roll steel.

Unique to this relocation project was an ingenious method of lowering the structure evenly to account for a 10' drop in grade. A secondary set of jacks was installed in the main beams, which were activated in unison and suspended the building while roll beams were lowered to compensate for grade. The building was then lowered in increments, and placed upon the newly set roll beams.

The relocation was accomplished during the latter half of July 1996 and the beginning of August 1996.

Joseph J. Jakubik is Project Manager for International Chimney Corporation. Photos courtesy International Chimney Corporation

---

David Pinyerd

Preservation Education at the Cape Blanco Lighthouse

Cape Blanco Lighthouse (1870) with altered workroom roof and enclosed entry vestibule.

The Cape Blanco Lighthouse comes with several superlatives: it's the highest lighthouse in Oregon at 256' above sea level; it's the westernmost lighthouse on the mainland in the lower 48 states; it's the oldest operating lighthouse in Oregon (1870); and it had the longest serving lighthouse keeper on the Pacific Coast, James Langlois, who was stationed at Cape Blanco for 42 years. As with all lighthouses open to the public, its current operation is a joint effort. Through a cooperative agreement, the Coast Guard operates the light and owns the land on which it sits, the Bureau of Land Management (BLM) interprets the site and maintains the lighthouse and grounds, Oregon State Parks manages the 1,895-acre park that buffers the lighthouse property and coordinates the docents that interpret the lighthouse, and the Friends of Cape Blanco provide docents and help fund lighthouse projects. And to add to the mix, this past summer, the University of Oregon became involved with the lighthouse.

Rebecca Gershow, Art Corliss, and Justin Gray inspect the modifications made to the workroom roof structure.

As part of the second annual University of Oregon Historic Preservation Field School, students became familiar with the lighthouse by performing a condition assessment on the structure. Lighthouses are ideal vehicles for preservation education because of their relatively open structure and use of a variety of materials and structural systems. They suffer from accelerated deterioration problems, making excellent weather laboratories for students. And, finally, they are simply captivating structures on the natural landscape.

The BLM and Oregon State Parks contracted with the University of Oregon Historic Preservation program to provide a professional condition assessment report on the lighthouse during our summer field school. Lisa Sasser, then Assistant Chief Historical Architect with the National Park Service, Washington, DC, volunteered to lead the assessment. Along with her extensive experience in building assessment, Lisa brought several lighthouse assessment reports completed by the staff of the NPS Williamsport Preservation Training Center (WPTC). Using these assessments as models, Lisa led us through a full condition assessment of the Cape Blanco Lighthouse.

Art Corliss and Marilou Aquino preparing to use the borescope on an air intake vent.

We started the assessment with an orientation by Stephen Samuels of the Coos Bay BLM. He gave us a complete history of the Cape Blanco headland from 7000 B.P. up through the present. The site saw its first human litter in the form of discarded shells, the beginnings of an enormous midden that covers a good portion of the headland up to 7' deep in spots. The site is one of the oldest on the Oregon Coast primarily because it is a headland and not subject to the rapid erosion experienced by the rest of the coastline. The name Cape Blanco was attached in 1603 by Spanish explorer Martin d'Anguilar. Shipping traffic was light along the Southern Oregon Coast until 1853 when gold was discovered on the beaches just south of Cape Blanco. By the mid-1860s, after many shipwrecks at the headland, the federal government started appropriations for a light at Cape Blanco.

In 1867, the Lighthouse Board purchased 48 acres comprising most of the headland with the intent of constructing a lighthouse to serve the growing coastal traffic. In 1868, Col. Robert Williamson arrived to supervise the clearing of the heavily wooded headland and the production of bricks for the lighthouse. Two hundred thousand bricks were fired locally for the tower and keeper's residence. The original design height for the lighthouse was 18'; however, it was positioned so far back from the edge of the headland it had to be increased to 50'. Attached to the tower was a combination workroom and oil room. Sitting 206' above the ocean, its fixed first-order Fresnel lens could be seen for 22 miles when lit on December 20, 1870.

The lens was replaced in 1936 with an electrified, revolving second order lens. World War II turned the lighthouse site into a massive Loran Station. As with many Coast Guard facilities, buildings were razed when they became surplus. The keepers' dwellings were demolished in the 1960s. In fact, most of the historic structures have disappeared from the site and all that remains is the lighthouse and attached workroom, miscellaneous antennas, several modern garages, a modern duplex, and ubiquitous underground tanks. The lighthouse became fully automated in 1980. With a less active role at the site, the Coast Guard in 1994 granted an interagency permit to the BLM to interpret the site for the public.

Once the field school participants had a handle on the history, we divided into three teams of four participants each and proceeded to evaluate the condition of the structure from stem to stern, finial to foundation. Each team worked the entire structure so that when we were finished, we had three different takes on each element of the lighthouse. We used Architectural Assessment Feature Inventory Data forms provided by the NPS on which to take notes. This forced each group to

Art Corliss using a velocimeter to measure the draft through an air intake vent.

break up the structure into a series of features (e.g., air intake vents at the watch room level), so that all the groups worked within the same parameters and definitions. In addition to the standard tools such as flashlights, clipboards, and our eyes, we used a borescope and a velocimeter to evaluate the structure. The borescope allowed us to peer through cracks to look at such features as the arched structural members within the canopy. The velocimeter showed us the speed at which air flowed through certain areas of the structure.

The students found that the main problem at Cape Blanco, as with many lighthouses, is moisture. Lighthouses were built to breathe, using a draft to provide air to and exhaust smoke from the open flame in the lantern. Any interior moisture would be mopped up daily by the keeper on duty. Today, electrification and threats of vandalism have turned many lighthouses into terrariums, sealed tight with no air flow. This is the case at Cape Blanco.

In the past, the keepers would constantly adjust the draft through a series of louvers on six vents encircling the tower. This provided air for the flame and kept condensation to a minimum. Smoke would then exhaust out the ball finial. Today, constant monitoring is impossible and some of the vents are inoperable. Since condensation was accumulating so rapidly, there was a fear that water was being trapped behind the interior plaster work. So, several years ago the Coast Guard sand-blasted the entire interior, removing both the plaster and the baked "skin" of the bricks. This has created a serious problem in which waterborne salts migrate through the brick to the interior surface and are deposited in the form of a white powder, i.e., efflorescence. These salt crystals in the surface pores lead to the crumbling of the soft brick surface. With a plaster coat, the salts migrate to the surface of the plaster instead of the brick where they can be harmlessly brushed off. Since re-plastering is cost prohibitive, we suggested increasing the tower's ventilation to decrease the moisture level and thereby decrease the rate of efflorescence. One approach is to turn the lighthouse into a giant chimney by replacing the two modern interior doors with heavy mesh doors (allowing only air passage) and then opening up the floor hatch to the crawl space to allow the foundation vents to help vent the entire structure out the ball finial. This suggestion will be tried during 1997.

As with any structure of its age, we were surprised by some of its modifications and accretions. For example, there used to be a decorative king post element in the gable over the entry appropriate to its 1870 construction. We found the king post's tie-beam recycled as a rafter in the workroom roof, complete with mortise and chamfered edges.

Since we were under a time constraint (this evaluation was just one project of three during the final two-week session), we used several time-saving technologies. We used a digital camera to take photos of problem areas on the lighthouse. We then took the camera back to our home base, downloaded the images into our word processor, and attached labels and captions. We also scanned drawings into the assessment document so as to eliminate any need for last-minute paste-ups when it came time to print the document. Being students used to extremely tight deadlines, it made us all laugh when Steve Samuels of BLM asked if we might have the document ready for him within two months—we had it ready for him in four days: two days in the field and two days to produce the assessment report.

This winter term, architecture and historic preservation students at the University of Oregon are participating in a studio to design a new visitor's center for the lighthouse. The project is once again being led by the Bureau of Land Management. The education continues at the Cape Blanco Lighthouse.

References

Beckham, Stephen Dow, *Cape Blanco Lighthouse: Historical Investigations* (North Bend, OR: Coos Bay BLM District, 1995).

Coos Bay BLM District, *Cape Blanco Lighthouse Site: Final Interim Management Plan* (North Bend, OR: Coos Bay BLM District, 1996).

Donovan, Sally, "Cape Blanco Lighthouse," National Register Nomination, Oregon State Historic Preservation Office, 1991.

David Pinyerd coordinated the last two University of Oregon preservation field schools. He is currently working on his thesis concerning the preservation of Life-Saving Service and Coast Guard architecture in the Pacific Northwest.

Photos by the author.

Elinor De Wire

Keeping the Lights for Kids

Fifth grade students at Charles Barnum Elementary in Groton, Connecticut, worked on a special advanced research project about lighthouses with Elinor De Wire in 1996. The girls used stamps, patches, advertising materials, books, maps, and the Internet to learn about lighthouse locations, their architectural styles, and daymarks. Courtesy Ann Pasquier.

On a snowy day last December, I visited the Edgewood Elementary School in Yardley, Pennsylvania, a small community north of Philadelphia. I was greeted by 130 second graders, who had recently done a mini-unit on Abbie Burgess at Matinicus Rock and were eager to share their love for lighthouses.

I wore a colorful lighthouse sweatshirt for the occasion, and a Nauset Light pin, complete with a blinking red beacon. As the classes filed into the all-purpose room where I had prepared a slide show and a table of "lighthouse memorabilia," there was a crescendo of delighted squeals and gasps. I quickly found myself surrounded by excited children, who proceeded to spin me in all directions and give me a head-to-toe exam:

Ooohh, I know that one on her shirt! It's Cape Hatteras!
Hey! I've been to this one on her sleeve!
Where'd you get that pin, Lighthouse Lady? I might get one too!"
Wow! She's even got a lighthouse watch!
Do you live in a lighthouse? Do you know Abbie Burgess?

Did I know Abbie? Not personally; but I had a picture of her home on Matinicus Rock and a photograph of her grave in Spruce Head, Maine, and I knew a story about how she wanted a gravestone in the shape of a lighthouse.

How did she die? And when?
Why did people forget to put a lighthouse on her grave?
Who took care of her pet hens after she died?
Did her ghost come back and haunt the lighthouse?

Such questions seem unimportant, even silly, when measured against the significance of Abbie's accomplishments and her unusual status as a youthful lady lightkeeper at a time when duty at a remote lighthouse was beset with unimaginable hardships. But these are the things seven-year-olds wonder about. I call them seed questions, because they grow into larger opportunities for learning. The kids at Edgewood Elementary had interest, involvement, and commitment. They had begun to care for Abbie Burgess as a real person, and all their future learning about lighthouses would be an extension of their relationship with this special girl from the past.

Often we forget how sensory and concrete kids are in their perceptions of the world, including the past world. History means little to them unless it's made meaningful in some personal way that connects with their own lives. The best education, we know, is first-hand, and second to that is vicarious experience. For kids, it requires imagining themselves in someone's place and superimposing their world on another.

Not long ago, I was fortunate to visit Cape Cod during Maritime Week, when the lighthouses were open for visitors. Lines outside the towers were long, and there were many families with excited kids. Inside the base of Highland Light a volunteer gave an interesting talk on the history of the lighthouse. While he stood on the stairs above us, reciting dates and building specifications, we waited patiently to climb the tower—all of us except two youngsters. To their parents chagrin, they busily inspected everything, ignoring all pleas to "listen to the nice man" and "not touch." Minutes later, when the group began its long ascent up the spiral stairs, the children's excitement echoed loudly.

Up on the windy lantern gallery, the lecture continued. But almost everyone had ceased hearing it and had begun to stare out to sea, mesmerized by the altitude and panorama—a seagull's

view of the great gray expanse of the Atlantic. Talk faded into the background, as the immediate experience of standing in the lightkeeper's shoes overwhelmed all of us.

For me, such encounters with children are "lighthouse heaven." What might have been a lost experience for a child—a history lecture filed in a dead-letter slot in his mind's mailroom—instead became a meaningful event on which he could build future learning. The children left that day knowing first-hand that lightkeepers had unusual challenges, that courage and determination were surely part of their fiber. It was a start. Perhaps it even sent them in search of a lighthouse book the next time their parents took them to the library.

Connecting kids with lighthouse history and lore means allowing them to explore space and access information using all the senses. Play is important, though it may not seem so. Running, jumping, touching, shouting, and other boisterous activity is often viewed as mischief, yet provides important information that helps very young children form concepts, or schemata as learning theorist Jean Piaget called them. The child's concept of "lighthouse" might contain details such as tall, big, round, cold, red, windy, open, noisy. A separate concept called "lightkeeper" develops, yet remains connected to "lighthouse." As children grow and access more information, concepts increase in complexity and give way to broader, more abstract learning.

But, let's not overlook the most obvious reason for all that liveliness. It's a celebration of discovery: "Wow! This is something new and exciting, and I just can't be still and quiet about it!" Teachers call this "educational noise" and recognize its value in a structured, guided environment.

Of course, we cannot have kids running up dangerous spiral stairways, jumping about on high parapets, and climbing the lantern railings. But we can design activities and interactive displays that allow for movement and exploration of the physical surroundings. Maine's Shore Village Museum has kid-friendly rooms that allow children to sound a foghorn, wind up clockworks, and stand inside a prism lens. At Michigan Maritime Museum, a large chalkboard mounted in the lighthouse display area lets kids sketch lighthouses and write their own poems. Mystic Seaport's interactive play about the lightkeeper's daughter invites kids to don simple costumes and take acting roles.

Opportunities for learning can be created inexpensively to reflect the technology, history, and lifestyle at lighthouses: nautical knot boards invite busy fingers, as do poles for hoisting signal flags, costume trunks for dressing up, felt or acrylic story boards, and bells with various tones; plastic prisms and colored plastic can investigate the properties of light, a block and tackle will show how to rig for lifting, geometric patterns make tower shapes and daymarks, period games like stilts and hoops on the lawn invite play, along with a boat to sit in; mystery boxes invite exploration; storytelling and

Elinor's Lighthouse Box

A plastic tote box with handles and a lid holds everything you need for a fun off-site program. Many of these ideas also work well on-site. Here are some items to collect and share with kids:

- a plastic prism, mirror, and pen light for demonstrating how a lens works
- postcards and calendar pictures to show various daymarks & architectural styles
- a replica keeper's hat, buttons, and Lighthouse Service flag
- small resin models of lighthouses with pretty daymarks and various architectural forms
- postage stamps sealed in clear laminate
- lots of product labels that feature lighthouses
- rubber stamps and non-toxic stamp pad to decorate kids hands and papers
- souvenir stickers or cards (to give away)
- a poem to read (sometimes we create one together!)
- a stuffed animal for storytelling (I do Jinx the dog at St. Simons Lighthouse)
- prints of archival pictures mounted and sealed
- patches and pins (I sometimes wear these)
- a piece of rope as long as Cape Hatteras Light is tall (we go outside, measure and marvel!)
- my favorite lighthouse books
- small laminated print of Edward Hopper's "Two Lights"
- a bibliography of recommended books and videos for parents and teachers

Elementary kids enjoy making something to remember their lighthouse experience. I usually have teachers or scout leaders get simple, inexpensive materials. Paper cup lighthouse models, bookmarks, collages, and fog pictures are excellent activities to do on or off site. Consider having a camera and film on hand to capture the fun and learning. Display pictures on a bulletin board in your museum or visitor center. It's great publicity and sends a clear message that "kids are welcome visitors at lighthouses."

dramatic play recreate the keeper's world; and demonstrations can show how erosion occurs or fog forms. Not surprisingly, adults will have as much fun with these things as the kids do.

Interpreting on-site presents a greater challenge, but it can become wonderfully effective when interpreters connect with their own childhoods. What was important to us as children is still important to kids today—family, pets, playing, toys, feeling safe and happy, looking forward to holidays. These are the starting points for introducing bigger ideas.

During my visit to Cape Hatteras Light in July 1996, volunteer interpreter Rany Jennette shared his memories of growing up at the lighthouse in an unusual way. Rather than simply talking about it, he pulled out a shoebox in which he kept his "lighthouse farm." Kids got to hold the cow, the sheep, the horse, the dog, the cat—various kinds of shells Jennette had found on the beach. As he explained the reasoning behind the names and showed how he and his siblings played farm with such simple objects, kids begin to participate in the past and sense that growing up at a lighthouse required lots of imagination. Toys came from the sea, and a boy had to create his own amusements.

For interpreters, the urge to barrage children with information is enormous. We sometimes feel we haven't done our job if children walk away without an abundance of facts jammed into their heads. Sadly, such information is lost quickly if not tied to some meaningful experience. And usually there's just too much for a small mind to assimilate. It's far better, I believe, to tickle the brain than to squeeze it. Present a few ideas—ideas you like and can get excited about—then allow kids to absorb and process them. Involve youngsters in thoughtful experiences that include a variety of senses and cause them to think critically and solve problems. And above all, interact with children. They absorb almost nothing when they are passive listeners who cannot respond aloud or in some physical way.

For primary age kids, basic skills like counting, comparing, categorizing, identifying, patterning, and imitating are excellent ways to involve them and build on their concept of "lighthouse." Ask: What shapes do you see in the windows? How many steps are there in each course? Can you feel the air moving up the tower? How is this side of the lens different from that side? Where is the shadow of the lighthouse and where is the sun? Let's imagine we're in a storm! Lean forward and walk into the wind; squint your eyes so the blowing sand doesn't get in them!

Older kids can think more deductively, make complex predictions and decisions, see cause and effect, and, by age 10, many are able to think abstractly. Ask: How is the lightkeeper going to get clean drinking water? How would you know a storm is coming? The keeper's wife is ready to have her baby, but he needs to get the lighthouse lit for the night so ships won't hit the rocks. What will he do? A bad storm has disabled the lens, and it won't turn. What can you do? You're out of meat and eggs. Where might you find them? It's 2:00 a.m. and you're on watch. What will you do to stay awake? What might happen if you don't?

Off-site, interpretation and teaching becomes more challenging because we don't have the raw experience of tower, beacon, wind, sand, and sea at hand. I've done many elementary and middle school programs about lighthouses in the last 20 years and teach a mini-unit about lighthouses every spring to my fifth grade class. The best advice I can give is "start collecting and get excited!" A box of "lighthouse stuff" is essential to provide the sensory input kids miss when not on-site. I usually have an interactive slide show, telling stories as I go and doing a kind of "I Spy" game with the pictures I show. I try to set up a small display, usually of books and a poster or two. My box contains an assortment of "lighthouse" things that can be touched and discussed. It's a mystery box, because each item is revealed slowly with clues to pique curiosity.

Most importantly, I let my love for lighthouses shine when I'm with kids, and I let them know I enjoy being with them too. Enthusiasm is infectious. Any hobby or special interest, even a passionate one like mine,

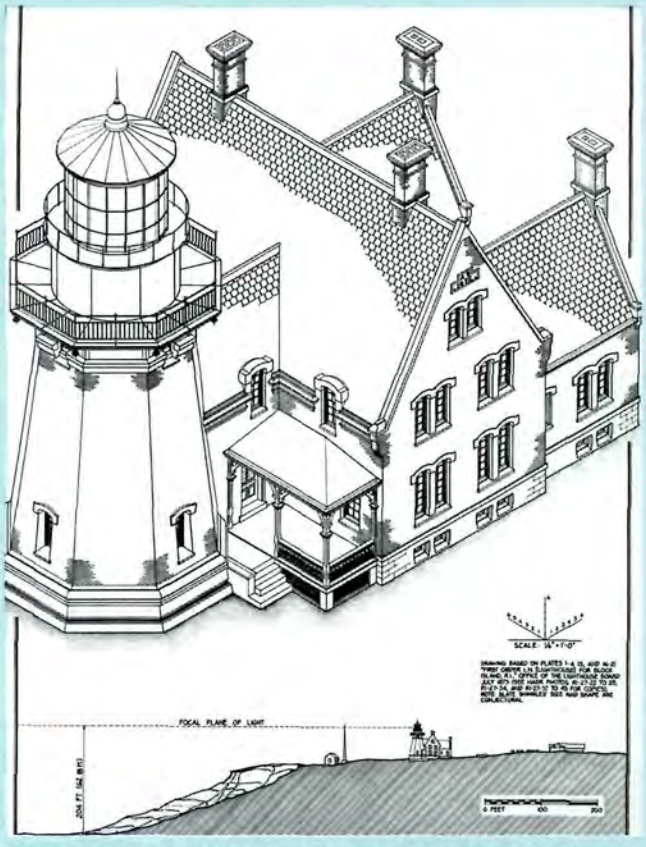
The author's son, was transfixed by the huge lens of Point Arena Lighthouse when he visited the tower in 1985 at age seven. Lighthouse optics offer an unique opportunity for first-hand learning on important concepts of physics. Photo by Elinor De Wire.

needs to be modeled for kids. They leave my programs thinking, "Wow! She's really into this. She loves lighthouses. Maybe I would enjoy this too."

Elinor De Wire has authored five books about lighthouses, including the Lighthouse Activity Book *for kids, and written numerous articles on lighthouses for popular magazines. Her personal initiative to involve children in the history, lore, and preservation of lighthouses has taken her to schools and youth organizations around the country. In her own elementary classroom in Connecticut, she teaches an interdisciplinary unit on lighthouses and has produced a home page devoted to the topic. Currently, she is at work on a young readers' novel called* Libby at the Lighthouse.

Documenting Historic Lighthouses

In many cases, the first step in the preservation of a lighthouse, or any historic property, is documentation. The existing site should be recorded with drawings, photographs, and historical and descriptive reports to define the characteristics and significance of that site. The Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) program of the National Park Service was created in 1933 to develop this type of documentation, establishing a standardized collection of the American-built environment, held for perpetuity within the Prints and Photographs Division of the Library of Congress. This collection is available to the public and reproductions of the records can be obtained.



Isometric drawing from HABS documentation of Block Island Southeast Light Station, Block Island, Rhode Island. (HAER RI-27)

The HABS and HAER programs vary slightly in the process by which a site is recorded. HABS generally prepares documentation that reflects the "as is" existing condition of a site with historical background information in a written format. Little notation is made on the drawings. HAER generally prepares a record that interprets the site for its significant engineering or function. Often, the interpretive drawings use existing documents as a basis for the measurements rather than measure the structure in the field; the objective is to interpret a concept, not an existing condition, so that the structure can be rebuilt exactly in all its historic details.

The documentary record explains the form or function of lighthouses using a variety of graphic techniques. The basic drawing includes measured elevations, plans, and sections. More intricate interpretive drawings use axonometric techniques to explain the three-dimensional forms and arrangement of parts. These include planometrics (a rotated plan with vertical elements projected from it), or isometric projections which utilize a 30° angle in its base axis. Axonometrics are also used to develop "exploded" or "peel-away" views that illustrate how pieces fit together. Photographs or conceptual information are often translated into illustrations or sketches that further explain a process or character of the structure. Large-format black-and-white photography is used to capture the actual physical attributes of the structure and express its context in the landscape and relationship to other structures around it. Photography also provides greater textural details of the material's weathered condition.

Written documentation provides the basic data necessary for understanding the site's development and evolution throughout its working life. Specific descriptive information is recorded, and historical research explains the context, functions, alterations, and theories related to its operation. All materials are produced to archival standards and specific formats that assure a consistent product throughout the collection.

—Todd Croteau
Architect

Michelle Smay and Terri Seltz

South Manitou Island Light Station
A Collection of Diverse and Inter-related Cultural Resources

Many historic property types are recognized for only one of their elements, usually a built structure. One such example is the light station; it is often thought of as a single structure—a lighthouse. Light stations, however, often consisted of several interrelated elements, both natural and built, such as a dwelling (which, in some cases, could house up to three families), a light tower, an enclosed passageway connecting the tower to the dwelling, a fog signal building to warn ships of hazards when fog was too thick for the light to be seen, a brick oil house to store the highly flammable kerosene that was the light's fuel, a metal oil house (and paint locker), at least one privy, a boathouse, a stable (often later converted to a garage), a barn, and other multi-functional secondary buildings. In addition to these built features, gardens and extensive circulation systems were almost always an integral part of the station.

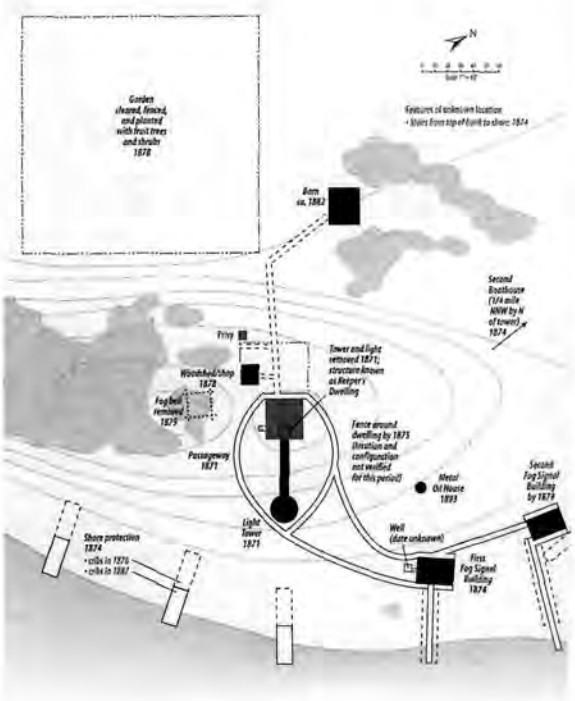
The South Manitou Light Station, located in Lake Michigan, 15 miles southwest of Leland, Michigan, within the Sleeping Bear Dunes National Lakeshore, is nationally recognized for its diverse collection of historically-significant built and natural features. It is listed in the National Register of Historic Places and serves as a tangible reminder of early commercial navigation and the important role that light stations once played in navigating ships through the Great Lakes. Constructed between 1839 and 1840, the station guided ships through the Manitou Passage, one of the busiest shipping channels on the western Great Lakes. It was not until 1958 that technological advances rendered the station obsolete, and the U.S. Coast Guard discontinued its service.

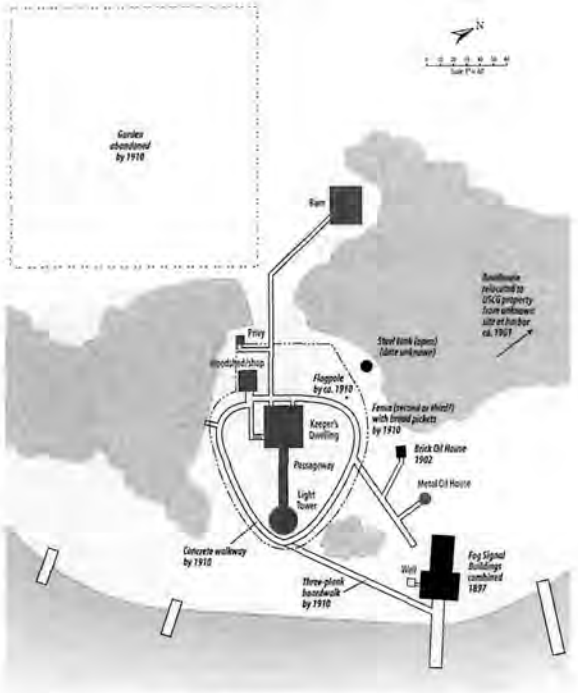
Aerial view of the South Manitou Island Light Station, 1930. Courtesy U.S. Coast Guard.

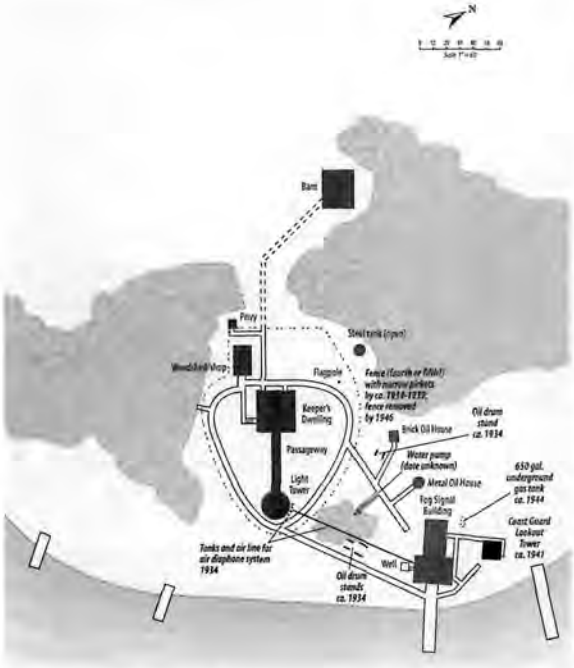
The remnants of the functional landscape are as important to the station's history as is the extensive amount of remaining historic architectural fabric. Both the natural and built features of the station should be considered together in order to truly appreciate not only its history and evolution, but also its role in the history of the island on which it is located, its role in Great Lakes shipping, and its role in terms of the U.S. Lighthouse Service as a whole.

The National Park Service recognizes the diverse nature of the South Manitou Island Light Station and its many historic roles. As a result, the project team was challenged—one of the first such challenges in the Park Service's history—to combine a Historic Structure Report (HSR) and a Cultural Landscape Report (CLR) into a single document that thoroughly investigates the South Manitou Island Light Station. Typically, an HSR and a CLR are prepared and used independently of one another. An HSR focuses on the historic integrity of a structure or structures, as well as on the cultural and social influences that have affected it or them, while a CLR evaluates the history and integrity of a historic landscape, including any changes to its geographical context, features, materials, and use. At the same time, both types of reports seek to provide a comprehensive understanding of the property's history and evolution and, subsequently, to determine a treatment strategy that preserves and accentuates the historic integrity of the property while frequently accommodating a contemporary use.

Because the station changed continuously throughout its operation, the project team preparing the HSR/CLR for the National Park Service determined that interpretation should focus on the interrelationship between the buildings and the natural environment during its entire period of operation (1840-1958). Subsequently, rehabilitation, with its respect for the evolution of the station and its leniency toward introducing new elements necessary for barrier-free accessibility and other visitor amenities, was determined to be the most appropriate treatment.







Drawings depicting the appearance of the site at different periods during its history. Drawings produced by Land and Community Associates, 1995.

Based on rehabilitation as the treatment approach, several alternatives were suggested for the contemporary use of each building and the treatment of all other elements. Such alternatives included the creation of several period rooms that depict the life of the keeper and his family, as well as contemporary exhibits that interpret the history of the U.S. Lighthouse Service, and specific people and artifacts that were involved in the operation of the station. Additionally, it was recommended that the locations of previous gardens and other elements of the functional landscape be marked and interpreted for visitors, and that the historic circulation continue to be used to guide visitors through the station.

All too often, only particular elements of historically significant properties are studied and interpreted, leaving gaps in the information and full understanding of those properties. This can, and has, led to improper maintenance and interpretation, and a general misunderstanding of the resource as a whole. If, on the other hand, the interrelationship of the built and natural historic resources of historic properties are studied and interpreted together, a much clearer and comprehensive understanding of the properties is garnered. Undertaking the combined HSR/CLR for the South Manitou Island Light Station represents an innovative, efficient, and comprehensive way of accomplishing this goal.

Michelle Smay was an architect with Quinn Evans / Architects in Ann Arbor, Michigan, from 1994-1996, where she was instrumental in preparing the HSR/CLR for the South Manitou Island Light Station. She continues to be active in historic preservation as an architect with Eifler and Associates, Architects in Chicago, Illinois.

Terri Zegart Seltz is a historic preservation planner with Quinn Evans / Architects and was a member of the HSR/CLR project team which also included David S. Evans, AIA, of Quinn / Evans Architects; and J. Timothy Keller, Genevieve Keller, and Fred Schneider of Land and Community Associates, Charlottesville, Virginia, and Ames, Iowa. Additional members included Tom Fitzpatrick of Robert Darvas Associates for structural engineering; SWS Engineering for mechanical and electrical engineering; Seebohm, Ltd., for historic paint analysis; and JJR, Inc., for the study of shoreline protection.

Wayne Wheeler

Partners in Lighthouse Preservation

In the 1960s and 1970s, the Coast Guard undertook a massive program to automate their light stations which eliminated the need for personnel to tend the aids to navigation. The rationale was to save housing structure maintenance costs and free billets. These freed billets would then be used to staff the new and expanding Coast Guard programs mandated by Congress such as Fisheries and Drug Interdiction.

Unfortunately, vandals quickly made their ugly mark on deserted stations. No amount of protection (alarms, boarding up windows, etc.) could stay the tenacious vandal. Additionally, Congress passed the National Historic Preservation Act of 1966 which required federal agencies with structures listed in the National Register of Historic Places, or even eligible for inclusion, to take into consideration what impacts any of their actions would have on these properties. The Coast Guard's cost-saving program was flying directly in the face of portions of the Act.

Beginning in the early 1980s, the Twelfth Coast Guard District in Northern California, hit upon a plan to protect the historic properties and associated automated aids to navigation, and provide public access at the same time. The first step was to convince Coast Guard headquarters that the standard year-to-year license should be expanded to a longer term to make the stations more attractive to potential recipients. Coast Guard Headquarters agreed and the term of licensing was extended to 20 years. A San Francisco Bay Area nonprofit group requested, and was granted, a 20-year license for the 1874 East Brother Light Station. In less than a year, the group restored the historic Victorian light station to its 19th-century splendor and opened it as a nonprofit bed and breakfast.

Since the East Brother license, the Coast Guard has extended the ability of local districts to issue 30-year licenses; many districts also issue five-year licenses. Each license has a provision allowing either party to rescind the license, by letter, within 90 days.

Following quickly on the heels of this successful East Brother Light Station project was the licensing of two northern California stations to the State of California. The state, in turn, licensed them to the American Youth Hostel Organization. Other stations were licensed to a port authority and nonprofit groups.

The Twelfth District's action spread to other Coast Guard Districts and today many light stations are in the hands of nonprofits. These groups have spent labor and funds to restore and open stations in a variety of creative ways.

There is an erroneous notion among some people that the Coast Guard can sell, or give away, light stations. In fact, if the Coast Guard, or any government agency, declares land in its inventory surplus to its needs, it is transferred to either the Bureau of Land Management (BLM) or the General Services Administration (GSA). If the agency's property was withdrawn from public lands, it is transferred to BLM; if the property was purchased for government purposes, it is transferred to GSA who in turn offer the property to other federal, state, and local agencies. If there are no government "takers," the property is sold to the highest bidder which in the case of historic light stations could be a disaster. The preferred scenario has been when the Coast Guard has formed partnerships with nonprofit groups willing to take on the restoration and maintenance of the properties, this not only protects the properties, but makes them available to the public in a variety of ways. It also takes the financial burden off the government and protects the Coast Guard's aids to navigation equipment.

All across America, the "greening" of our historic light stations has been an outstanding success. They have been repaired, restored, and relocated. Each community has sought various means of raising funds to return their light station to the public domain. Three are under the care of the American Youth Hostel organization, a few are bed and breakfasts, some serve as offices for nonprofit groups, but most are opened to the public as museums.

The various efforts are profound and dramatic. The Junior Service League of St. Augustine, Florida raised $650,000 to restore the duplex keeper's quarters. They then raised $90,000 to repair the first-order lens, which was damaged by gun fire. Continuing their work, they then raised over $200,000 to paint the interior and exterior of

the 161' high tower. All this from a small group in a city of 17,000 people.

The Fire Island Lighthouse Preservation Society raised 1.6 million dollars from the private sector to restore their tower and keeper's dwelling and set aside a fund to maintain the structure in perpetuity. Local groups were formed to move Rhode Island's huge Block Island Southeast Lighthouse and Massachusetts' Cape Cod and Nauset Beach Lighthouses. Four stations in the Hudson River have been restored and a group is working on a fifth. Throughout the Great Lakes, groups are chipping and painting their local light stations.

East Brother Island Light Station (1874), in San Francisco Bay, was one the first lighthouses to be leased by the Coast Guard to a nonprofit group for an extended period. It continues to serve as an active aid to navigation and bed & breakfast. Courtesy U.S. Coast Guard.

In addition to nonprofit groups, other partners have evolved over the years—some by accident. When the Coast Guard, or old Lighthouse Service, abandoned a property located within the boundaries of another government agency's property, the structure became the responsibility of that agency. Today, the U.S. Forest Service has five light stations in Hiawatha National Forest and is involved with another in Oregon. The Fish and Wildlife Service has spent funds to restore the Thacher Island's north tower and the Monomoy Point station. As of this writing, our Society holds a license for two Coast Guard light stations: New Dungeness in Washington and Plymouth in Massachusetts. The Great Lakes Lighthouse Keepers Association has spent the past several years restoring the St. Helena Light Station on the northern shores of Lake Michigan. That group has successfully used Boy Scout Troops to assist their efforts, which has proven educational to all parties.

In spite of all the success the preservation of light stations have achieved, there is still work to be accomplished and decisions to be made. Not all light stations can, or should, be saved. Several are in remote locations difficult to access and subject to harsh weather conditions. Others have lost most of their historic integrity over the years. A case in point being the Sankaty Head Lighthouse on Nantucket Island. All the ancillary buildings have been razed. Years ago the Coast Guard removed the lens (it's in a local museum) and the lantern room. Local objections caused the Coast Guard to fashion a replacement lantern and install it on the tower, but even a quick glance shows it to be an ersatz lantern. Finally, at some point the interior cast-iron stairway was replaced with an aluminum staircase. Thus, what we have today, perched on an eroding cliff, is a chimney—a ghost of it's former self. Funds to move this structure back from the eroding cliff would be better spent on a light station with more of its historic fabric intact.

In some cases the Coast Guard has used the quarters of automated light stations to house service personnel. Several light station quarters are used for enlisted personnel and three stations house Coast Guard admirals. But, as stations outlive their usefulness as housing, we hope the Coast Guard will continue to explore placing light stations with appropriate nonprofit groups. The thought that a light station might pass through the hands of the GSA into ownership of a profit entity is anathema to the U.S. Lighthouse Society way of thinking.

Overall, as we enter the 21st century, light stations are shining bright again and pointing the way for others seeking means to preserve other historical structures.

Wayne C. Wheeler, a former officer and civilian with the Coast Guard, is founder and president of the 10,000 member U. S. Lighthouse Society.

David Reese and Robert Browning

Lighthouse Management

A Balancing Act by the U.S. Coast Guard

This nation's lighthouses have served as beacons for the safe passage of mariners for over 200 years. Lighthouses were originally constructed by the federal government to provide safe and easy navigation into the harbors of the United States. As the federal heir to the functions and responsibilities of the Lighthouse Board and the Bureau of Lighthouses, the U.S. Coast Guard is the nation's largest single owner of lighthouse properties. Lighthouses came under the management of the U.S. Coast Guard in 1939, when the Bureau of Lighthouses was merged into that agency as part of the Department of the Treasury. Today, lighthouses continue to function within the U.S. Coast Guard, Department of Transportation, as a part of the federal navigation system.

The lighthouse structure serves as an aid to navigation in several ways. Lighthouse towers, placed in highly visible coastal locations, provide navigators with distinct visual landmarks. At night and during inclement weather, the characteristics of the light beacons provide a visual aid. Lighthouse properties can also contain fog signals, fog detectors, and radiobeacons. Many of the traditional light stations included a complex of mutually-supporting structures. Before automation, maintenance of the light and supporting structures involved a variety of activities that could only be provided by resident keepers. The remote location of most of the lighthouses required housing and transportation for the keepers. Hence, in addition to the light tower, a light station might include an oil house, keeper's dwelling, cistern, boathouse, fog signal building, and sufficient property to grow crops and raise livestock for subsistence and manage waste materials. In the case of offshore lights, the tower was often built to include space for a dwelling, cistern, fog signal, and storage for a boat and oil.

Traditional lighthouse construction methods and materials assumed that keepers would devote frequent attention to maintenance. Changes in technology following World War II allowed the automation of many lighthouse functions, which perform the same functions, but at a lower cost. Lighthouse properties, however, still require frequent attention by human beings to maintain the integrity of the structures and materials. This level of maintenance, however, can no longer be adequately provided by U.S. Coast Guard personnel.

At present, all historic lighthouses managed by the U.S. Coast Guard are automated, except for Boston Light which remains staffed, as required by law. Keeper's dwellings at a small number of additional shoreside lights, where the property is convenient to nearby staffed Coast Guard units, continue to house U.S. Coast Guard personnel. The towers themselves have become less valuable to the service because, with modern automated beacons, it is more cost effective to construct and maintain an aid to navigation on a steel structure or buoy, rather than inside the lantern of a traditional lighthouse tower. Thus, in many locations, the traditional lighthouse tower has been found to have little value to the U.S. Coast Guard mission, other than to provide a visual aid to mariners during daylight and good weather.

Because automated lights do not require the day-to-day care of keepers to keep the light signals operating, the structures no longer receive the preventive maintenance that the keepers normally provided. Without this daily attention to maintenance, the normal deterioration of the tower and outbuildings accelerates. Lighthouses are particularly susceptible to the harsh natural environment in which they were constructed. In the last 40 years, the U.S. Coast Guard has found that current maintenance requirements that meet the standards of the National Historic Preservation Act have become very costly.

Federal management of historic lighthouses is a complex endeavor. A variety of legal mandates and public processes also influence their care—historic preservation mandates, federal budget processes, federal property management requirements, technological advancements, public and Congressional interests. The U.S. Coast Guard has a strong focus, with substantial Congressional and public support, on the mission of assisting safe navigation for mariners. Historic lighthouses are only one tool that provides a visual aid in performing this mission. As the money and personnel resources within the U.S. Coast Guard have become more constrained, the resources available to maintain historic lighthouse structures have also become more scarce. Thus, the U.S. Coast

Guard has been forced to seek alternative means to maintain historic lighthouse structures.

Federal property management requirements also substantially impact lighthouse management. The federal government, in general, is mandated to continually review its real property holdings, with the intent of divesting those holdings that cannot be justified for agency missions. The Coast Guard periodically reviews the operational need for each light and the property on which it is located. Decisions are made with input from various navigation users such as other military services, harbor pilots, commercial shipping concerns, commercial fishermen, and recreational boaters. If a lighthouse site, or a significant portion of a site, is no longer required as an aid to navigation, the Coast Guard considers whether it might be used for other missions. The mandates of federal property management dictate that lighthouse properties or marketable portions of properties no longer needed by the Coast Guard for its missions be reported to the General Services Administration (GSA) for transfer or sale to others.

Historic view of Boston Harbor Light Station, the only remaining station to be manned through an Act of Congress. Courtesy U.S. Coast Guard Historian's Office.

The federal budget process is another substantial influence on the Service's management of lighthouses. The Coast Guard has always maintained a strong operational focus which, in the case of lighthouses, has meant the proper functioning of the aids to navigation signal for mariners. Preservation efforts, recognized by the Coast Guard as important, have a lower priority than the Service's primary mission of providing reliable and cost-efficient aids to navigation. More importantly, Congress mandated preservation of historic properties without attaching the appropriate funding required for complete preservation and maintenance of lighthouses. Recent developments in the federal budget process, such as the Government Performance Review Act and public support for a smaller federal government, have only made lighthouse preservation efforts more difficult.

In order to meet the public's expectations and to comply with the National Historic Preservation Act, as well as the other complex property management and budgetary mandates, the U.S. Coast Guard has pursued several approaches. As funds are available, the Coast Guard undertakes lighthouse maintenance and rehabilitation projects. Leasing of historic lighthouse properties has been successfully used for several years as a means to improve lighthouse maintenance and public access. Transfer of excess property, through the GSA, has successfully placed lighthouse properties under the management of organizations better equipped to preserve their historic nature. The U.S. Coast Guard also generally supports legislative mandates, initiated by others, to transfer lighthouse properties to federal and non-federal preservation groups.

Leasing of historic lighthouses has been successful in improving maintenance of these properties where the lighthouse is easily accessible to the general public. Since 1985, the U.S. Coast Guard has operated its leasing program under a programmatic agreement among the Department of Transportation, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers. Typically, the U.S. Coast Guard seeks to lease the property for up to 30 years to an entity which will use and maintain the property in a manner that is compatible with its historic nature. As a result of a Congressionally-mandated review of lighthouse management policy in 1992, the Coast Guard has also developed a more aggressive strategy to market the availability of lighthouse properties for leasing, in the hope of benefitting more lighthouse properties. While the U.S. Coast Guard retains the authority to decide which lighthouse properties are appropriate to lease, available properties will be more widely advertised. The more aggressive marketing process is contained in an amended programmatic agreement executed in 1996.

As a result of a lighthouse policy review conducted in 1992, the U.S. Coast Guard has been evaluating lighthouse properties on the basis of its minimum operational needs and, at several loca-

tions, has identified the tower, associated structures, and land as possible excess property. Lighthouse properties that are no longer needed as aids to navigation are identified as excess to mission needs and are normally transferred out of U.S. Coast Guard management through the process managed by GSA and defined in current federal property management regulations. In some cases, state and local interests have been able to obtain ownership of excess historic lighthouse properties directly, by convincing their Congressional representatives to support legislation to mandate a transfer from the federal government.

In cases where the only U.S. Coast Guard mission need is for the lighted aid to navigation, the tower, associated buildings and land holdings may be excess property. In these cases, U.S. Coast Guard operational interests may continue to be served by identifying the excess property and retaining easements for servicing the navigational signal. The excess property may be made available to historic preservation interests through the normal GSA process or through legislative mandates. Most recently, in The 1996 Coast Guard Authorization Act, Congress mandated that a total of 44 lighthouse properties be transferred to other parties better able to maintain their historic nature, while retaining easements for the lighted aid to navigation.

As trustee of the nation's maritime safety, the U.S. Coast Guard has been generally successful in managing over 450 lighthouse properties. When the towers are needed to support an active aid to mariners, the service continues to maintain and preserve historic lighthouse properties. The U.S. Coast Guard, however, must balance the requirements of its numerous missions, federal property management, historic preservation, and the federal budgetary processes. The U.S. Coast Guard has and will continue to explore alternative methods of preserving these significant historic structures through leasing and transferring their management. These structures are, and will always be, a significant part of the history and traditions of the service. Mindful of the more than 200-year history of the federal lighthouse service, the U.S. Coast Guard will make every attempt to find effective means of securing adequate preservation of historic lighthouses.

David Reese is the Federal Preservation Contact for the U.S. Coast Guard.

Robert Browning is the Coast Guard's Chief Historian.

Portland Head Light Station, Cape Elizabeth, Maine, was recently transferred from the Coast Guard to the town of Cape Elizabeth which maintains the keeper's quarters as a museum. Since the light continues as an active aid to navigation, the Coast Guard has access to the optic and sound signal. NPS photo by Candace Clifford, 1994.

For Further Reading

Cipra, David, *Lighthouses, Lightships, and the Gulf of Mexico* (Alexandria, Virginia: Cypress Communications, 1997).

Clifford, Mary Louise, and J. Candace Clifford, *Women Who Kept the Lights: An Illustrated History of Female Lighthouse Keepers* (Williamsburg, Virginia: Cypress Communications, 1993).

De Wire, Elinor, *Guardians of the Lights* (Sarasota, Florida: Pineapple Press, 1995).

_____, *Guide To Florida Lighthouses* (Englewood, Florida: Pineapple Press, 1987).

de Gast, Robert, *The Lighthouses of the Chesapeake* (Baltimore: Johns Hopkins University Press, 1973).

Dean, Love, *The Lighthouses of Hawaii* (Honolulu, Hawaii: University of Hawaii Press, 1991).

Holland, F. Ross, Jr., *America's Lighthouses: An Illustrated History* (New York: Dover Publications, 1981 reprint).

_____, *Great American Lighthouses* (Washington, DC: Preservation Press, 1989).

_____, *Maryland Lighthouses of the Chesapeake Bay: An Illustrated History* (Crownsville, Maryland: Maryland Historical Trust, 1997).

Hyde, Charles, *The Northern Lights* (Detroit, Michigan: Wayne State University Press, 1995).

Lowry, Shannon, and Jeff Schultz, *Northern Lights: Tales of Alaska's Lighthouses and Their Keepers* (Harrisburg, Pennsylvania: Stackpole Books, 1992).

Putnam, George R., *Lighthouses and Lightships of the United States* (Boston: Houghton Mifflin Co., 1917 and 1933).

Shanks, Ralph, and Lisa Woo Shanks, ed., *Guardians of the Golden Gate: Lighthouses and Lifeboat Stations of San Francisco Bay* (Petaluma, California: Costaño Books, 1990).

Shanks, Ralph C, Jr., and Janetta Thompson Shanks, *Lighthouses and Lifeboats of the Redwood Coast* (San Anselmo, California: Costaño Books, 1978).

Turbyville, Linda, *Bay Beacons: Lighthouses of the Chesapeake Bay* (Annapolis, Maryland: Eastwind Publishing,1995).

U.S. Lighthouse Establishment, Instructions to Light Keepers and Masters of Light-House Vessels, 1902 Reprint (Allen Park, Michigan: Great Lakes Lighthouse Keepers Association, 1989).

CRM

VOLUME 20 • NO. 8
Cultural Resources
Washington, DC

U.S. Department of the Interior
National Park Service
Cultural Resources
1849 C St., NW
Washington, DC 20240

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

FIRST CLASS MAIL
Postage & Fees Paid
U. S. Department of the Interior
G-83