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NATIONAL PARK SERVICE
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Memorandum

To: Regional Directors, National Capital, Northeast, Western, Southeast, Southwest
Superintendents, Acadia, Cape Cod, Fire Island, Assateague, Cape Hatteras, Cape Lookout, George Washington Birthplace, Colonial, Fort Caroline, Fort Frederica, Fort Matanzas, Fort Pulaski, Fort Raleigh, Castillo de San Marcos, Fort Sumter, Fort McHenry, Everglades, Fort Jefferson, Virgin Islands, Buck Island Reef, San Juan (Puerto Rico), De Soto, Padre Island, Cabrillo, Channel Islands, Olympic, Glacier Bay, Katmai, Hawaii Volcanoes, City of Refuge, Isle Royale, Pictured Rocks, Indiana Dunes

From: Marine Resources Programs Coordinator, National Park Service

Subject: Publications relating to Marine Resources

The following publications that relate to marine resources will be of special interest and use to you and members of your staff.

1. "Public Seashores -- their Preservation and Use." by Robert H. Rose. (Reprinted from the Proceedings and Papers of the IUCN 10th Technical Meeting in Lucerne, June 1966.)
2. "Public Use of Underwater Resources." by Paul E. Schulz. (Reprinted from the Proceedings and Papers of the IUCN 10th Technical Meeting in Lucerne, June 1966.)
3. "Conserving Our Coastal Resources." by Dr. Stanley A. Cain. (Remarks presented at the First State-wide Conference of the Georgia Conservancy, Inc., Athens, Georgia, January 20, 1968.)

D. J. Wallis

Enclosures (3)

PUBLIC SEASHORES — THEIR PRESERVATION AND USE

by

ROBERT H. ROSE

Research Geologist,
National Park Service,
United States Department of the Interior,
Washington D.C., U.S.A.

Since man has become the ecological dominant in his environment and a geologic force of no inconsiderable magnitude, he must concern himself with the changes he imposes upon seashores as well as those produced by natural influences and processes. Moreover, to achieve at least a modicum of effectiveness in seashore preservation, planning and development, he must evaluate these changes in terms of their immediate and long-range benefit or harm. He needs to recognize that the seashore is both a great arena of conflict between the sea and the land and also, paradoxically, an area of comparative stability. A state of compatibility and interdependency prevails among the living things and the physical features within this environment of eternal struggle. A balance of nature is achieved wherein the elements of a complex system of interacting and mutually dependent components become equilibrated and interrelated. Indeed, within the intertidal zone and its fringes the living things are so dependent upon these cyclic changes and contrasts that they would perish if these natural influences and processes were to be seriously disturbed or removed from the scene.

In addition to concern for changes produced by artificial and natural influences, man places his life and property in jeopardy when he projects himself into this area of conflict. He must successfully match wits with the capriciousness of the tides, the waves and the sea storms if he is to exploit the scenic, scientific and economic resources of the seashores for his benefit and enjoyment.

SOME NATIONAL SEASHORES IN THE NATIONAL PARK SYSTEM

Cape Hatteras, North Carolina

Cape Hatteras National Seashore consists of three barrier islands of the Outer Banks of North Carolina aggregating about 70 miles in length and ranging from a few hundred yards to three miles across. The average distance of these islands from the mainland is about 20 miles. The Outer Banks are fascinating to scientist and layman alike and are recognized as one of the unusual coastal features of North America.

Some descriptions of areas near and within the barrier islands of the National Seashore date back to the era of English discovery, exploration and colonization during the latter part of the sixteenth century. While these descriptions contain but little detailed information on specific localities, they clearly prove that man's introduction of domestic animals and his overexploitation of the forests and other vegetative resources started a chain reaction of accelerated devastation. Stabilizing grasses and other vegetation were removed enabling the winds to pick up the sand and carry it inland. Dunes developed and moved, overwhelming the grasses, then the shrubs and finally much of the remaining forests. Wave action and overflow by salt water transformed much of the Outer Banks into a wasteland dealing further staggering blows to the vegetative cover, wildlife and to industries based on the marine and fresh-water resources of the region.

Early during the decade between 1930 and 1940, the decision was made to initiate a project large enough to check the ravages of the sea against the entire Outer Banks and to rehabilitate their devastated terrain rather than surrender in despair. Some pioneer work had been previously accomplished, but these small projects were woefully inadequate to check the massive deterioration which had been in progress for so long. This large-scale project, employing as many as 1,500 men at its peak, was sponsored by the State of North Carolina and was supported by Federal funds. A. Clark Stratton, project supervisor, and James R. Hollowell, engineer, gathered extensive information from informed local people and from reports on work done along similar lines on coastal areas of France, Germany, Denmark, New Zealand, and elsewhere. They established a sand laboratory, collected data on weather and climate, and conducted field experiments on hitherto untried methods and techniques of sand fixation and beach erosion control. They discovered, for example, that piles of brush anchored to the ground surface and sand fences of the same material of just the right thickness, dimensions and positions, were highly effective. They made similarly significant discoveries with regard to artificially reconstructed dunes; grass, shrub and tree plantings; and the use of sand fences of panel and other types of construction.

In their book, *Nature on the Rampage*, Ann and Myron Sutton vividly describe this project. After explaining how brush fences are used to reconstruct a continuous barrier dune by repairing the breaks wrought by wave action and storms of the past, they go on to say that "one fence after another was built on the crest of each succeeding dune until the desired height had been reached. Then to pin the dune for good, the planting of grass began. Months passed and the grasses grew and thrived. After that, shrubs could be planted, for now the roots of larger plants would settle into firmer sand—their chances for survival vastly increased."

The Suttons continue by saying that "by the time the job was completed in 1940, a barrier dune stretched from the Virginia line to Hatteras Inlet. The dune was from 10 to 25 feet high and 75 to 300 feet thick at its base, an enormous construction job in which man's ingenuity was aided by the work of the wind and the sea. The workers had set in 600 miles of fencing, and planted more than two and a half million seedlings of trees and shrubs."

Commenting on the results of this work the Suttons say: "and then as if by a miracle, the Outer Banks saw their world come back to life. Songbirds and

waterfowl returned. Fresh-water fish swam into Currituck Sound. Oyster beds were planted again. And historic Hatteras lighthouse, symbol of the Banks, had been saved from crumbling into the sea ". Following this initial effort, projects of the same kind on a less extensive scale have been continued.

The sand fixation and beach erosion control projects are tending toward restoration of the natural conditions and primeval beauty of the woods, marshes, sand flats, dunes, and beaches of the National Seashore. These changes are also enhancing the permanency and stability of areas required for buildings, camp and picnic sites, parking space, roads and trails, and related facilities and services. With this added assurance of safety to life and property, the planning and development for visitor enjoyment and use of the seashore are moving forward. Photography, sport fishing, boating, sailing, swimming, sunbathing, picnicking, camping, bird study and nature walks are now among the activities which may be enjoyed with comparative security and safety. Selected points of particular recreational, scenic or historical interest are being made more accessible by new parking areas and approach roads. However, some of the more remote and significant natural areas are being protected from man's intrusion to preserve their significant scientific resources.

Cape Cod, Massachusetts

Cape Cod is a great peninsular arm thrusting outward and upward from the southeastern corner of Massachusetts some 70 miles into the Atlantic Ocean. Cape Cod National Seashore embraces an area between the Cape's wrist and lower elbow. It narrows to a coastline fringe in its southern portion. The Seashore is a treasure-trove of significant scenic, scientific and recreational resources and contains the last expanse of uninterrupted natural beach of its size in New England.

Grass, shrub and tree plantings, sand fences, and mechanical methods of terrain stabilization and modification have been carried out for a century or more, but such work was not accomplished on a large scale until after the turn of the century. As at Cape Hatteras, the sand fixation and beach erosion control work is designed in places to check the devastation resulting from man's misuse of the land and to effect the restoration of natural conditions. In other places the purpose of these control measures is to achieve greater permanency and stability of areas utilized intensively for recreation and to alleviate danger to life and property.

At Cape Hatteras the barrier islands have been "snatched from the jaws of death" and time has been required to allow nature to heal the wounds of many years of misuse and neglect. At Cape Cod, on the other hand, plant and animal life have been abundant in protected areas from the start, and luxuriant forests have continued to thrive in places.

The legislation authorizing the Cape Cod National Seashore as a part of the National Park System makes it clear that the area's rich and varied scenic, scientific, historic and recreational resources are to be protected and to be given due consideration in the development of these resources for human enjoyment and use. A visitor center, parking areas, roads and trails, wayside exhibits, campfire talks, and interpretive tours and walks have been provided. These facilities and services will be expanded as funds and personnel become available.

Padre Island, Texas

Padre Island, approximately 115 miles long and ranging from a few hundred yards to nearly three miles in width, lies along the Gulf of Mexico coast of Texas from Corpus Christi on the north to Mexico on the south. It is separated from the mainland by Laguna Madre, a narrow and shallow lagoon with a maximum width of 10 miles. Portions of each end of the island have been developed by counties and private individuals. However, the area within Padre Island National Seashore encompasses an uninhabited primitive strip of coast more than 80 miles long and comprises the longest natural undeveloped beach along the shores of the contiguous 48 states of the United States.

The preparation of a master plan for the development and management of this seashore has just been started. While much of the area will be retained in its natural condition, campgrounds, picnic sites, parking areas, trails and facilities and services to enhance visitor enjoyment and use of the seashore will be provided.

Point Reyes, California

The Point Reyes National Seashore is located on the Pacific Ocean within the Point Reyes Peninsula, a triangle of land with its 25-mile long base running the length of Tomales Bay, Olema Valley, and the northern portion of Bolinas Lagoon. Point Reyes, on the seaward vertex of the triangle, is some 15 miles west of this base line and is located about 30 miles north of San Francisco. The depressed land surface extending beneath Tomales Bay and continuing southward through Olema Valley under Bolinas Bay delineates a segment of the great San Andreas fault zone. The National Seashore as authorized contains about 53,000 acres of the total of 64,000 acres on the peninsula.

Much of the land to be included in the National Seashore is still in private ownership and is closed to public use. Some 25,000 acres of cattle and dairy ranchland may continue in private ownership indefinitely as a pastoral zone unless the owners should eventually elect to sell their holdings to the Federal Government. However, the present plan is to proceed with the purchase of some 28,000 acres of private lands as fast as available funds will permit and to include them within the areas to be developed for public enjoyment and use.

Since a large portion of Point Reyes Peninsula is underlain by bedrock, sufficient sites of comparative stability and permanence are available for public use facilities such as buildings, parking areas, campgrounds, and picnic areas. Several beaches are now open to the public. Long range plans provide for a judicious balance among governing factors such as development for public use, preservation of natural values, and the maintenance of the pastoral zone, all of which are important. Interpretive facilities and services, and developments for boating, fishing, horseback riding, and other recreational activities, are contemplated in the future.

Fire Island, New York

Fire Island National Seashore encompasses all of 31-mile-long Fire Island and some nearby bayside islands and extends for a distance of 1,000 feet into the Atlantic Ocean and up to 4,000 feet into Great South Bay, and into Moriches Inlet to the northeast. About 5,700 acres of land will eventually be included within its boundaries. The Island is a narrow offshore barrier beach of relatively flat terrain. Sand dunes up to 40 feet high comprise the highest part of Fire Island. The western end of Fire Island is located about 50 miles from the center of New York City and is easily accessible by private automobile travel and public transportation.

Extensive recreational use is being made in scattered sites encompassing about one-quarter of the area of Fire Island. Some of the beach areas are already in public ownership as county and state parks and these will be further developed to accommodate intensive use. The future plan envisions Federal acquisition of much of the fine beaches, dunes, marshes, and holly forest still in private ownership. In the development program emphasis is placed on providing people of the New York metropolitan area with opportunities to enjoy the natural values of seashores as well as added facilities and services for activities such as swimming, boating, fishing, picnicking, and camping.

Vegetative plantings, sand fences, and mechanical methods of terrain stabilization and modification have been utilized rather extensively at Fire Island and on nearby Long Island for a century or longer. However, rather large sections of Fire Island are still relatively undeveloped and natural. The highest degree of protection practicable in the circumstances will be brought to bear on those sites and areas utilized intensively for recreational purposes. The management plan for the area recognizes that some of the natural habitats are to be maintained in their primitive condition. Except for the offsetting of major influences such as hurricanes and seastorms, such habitats will remain undisturbed as a rule.

NATIONAL SEASHORE PRESERVATION AND DEVELOPMENT

Basic Considerations

Clair Brown, Stratton and Hollowell, and others stress the imperative need for comprehensive ecological, geological, and other scientific studies as a requisite to national seashore planning, development, and management. Much learning by trial and error will be involved in both the pure and the applied sciences aspects of these responsibilities. Stratton and Hollowell, for example, conducted extensive experiments with respect to the specifications and the location and orientation of sand fences, and on the selection of the proper plantings for each type of terrain. As an illustration, extreme risks are involved in the use of exotic plants some of which may meet the immediate requirements as effective sand binders but which may be invasive or ultimately prove harmful in other ways.

Preceding these steps, however, basic problems must be resolved with regard to the selection of those sites and areas suitable for recreational use and other sites where preservation of natural habitats is the prime consideration. Control of access is a corollary problem.

By applying wise advance planning with respect to the suitability, location, and accessibility of areas to be utilized for recreation and the selection of natural habitats to be preserved, an important first step toward development and use will have been taken. Under natural conditions, nature may be doing, or may be trying to do, many of the things which must be done along the shore and on the land if the land is to oppose the sea on something approaching equal terms. Often the installation of sand fences and the planting programs can be done in such manner as to assist nature in achieving the desired results. As man steps into the arena of battle between these mighty protagonists, he must, however, prepare himself to sidestep their powerful thrusts, absorb the impact, or to "roll with the punches" if he is to eventually reduce the violence.

Conclusion

Man must concern himself with changes he imposes upon natural seashores. Especially must stabilizing grasses and other vegetation be planted if natural dunes are to be maintained in a condition conducive to public enjoyment. Apart from photography, boating, swimming, and other familiar uses, nature walks and similar interpretive activities are being conducted with a great deal of success. Visitor centers, museums, campgrounds, and self-guiding trails are also being provided as public seashores become more and more developed for human enjoyment and use.

RÉSUMÉ

La notion de « National Seashores » est récente et originale dans le système des territoires dépendant du service américain des parcs nationaux. L'auteur commence par en analyser la signification et la valeur, en relation avec les besoins et avec le comportement de l'homme moderne. Il examine ensuite la structure des écosystèmes constituant cet habitat voisin de la mer. Puis il aborde la description successive des « National seashores » : Cape Hatteras, en Caroline du Nord, Cape Cod, dans le Massachusetts, Padre Island, au Texas, Point Reyes, en Californie et Fire Island, dans l'Etat de New York.

Le rapport se termine par des considérations sur la place que les réalisations étudiées occupent dans l'ensemble du système des parcs nationaux américains.

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PUBLIC USE OF UNDERWATER RESOURCES

by

PAUL E. SCHULZ

Naturalist, United States National Park Service,
Washington, D.C., U.S.A.

SKIN DIVING

The nonconsumptive aspects of skin diving, such as aquatic conservation studies, fish, counts, and collecting specimens for display in aquariums, are becoming increasingly popular. Skin diving techniques are employed extensively in rescue, salvage, inspection, exploration and warfare. Underwater archaeological studies and recoveries have been dramatic and sometimes financially rewarding, but a major value of this activity is the adventure and recreation it affords the diver. Important historical and archaeological discoveries are not only by-products, but often primary objectives of skin divers.

SCUBA DIVING

Scuba, or aqualung, diving provides an optimum recreational use of and intimacy with the underwater world, though it requires professional equipment and instruction, involving more than nominal expense. The interpretive possibilities of scuba are limited by factors of depth and time, and trips should usually not exceed an hour. Underwater communication is also a problem because hand and face signals are difficult or ineffective. Practical electronic communication is still in its infancy. The recently introduced "Watercom" audio system consists of a mask with a built-in transistorized microphone. This self contained battery unit has a 100-meter diver-to-diver range and requires no listening device.

SNORKELING

Snorkeling consists of floating face down on the water and wearing a transparent mask with a breathing tube held in the mouth. Through this, air is breathed from above the water surface. Snorkels are inexpensive and easy for young and old to use. There is a dangerous tendency, however, for poor swimmers to rely on the buoyancy of their face masks for flotation.

Communication is somewhat easier than between scuba divers, but may be quite difficult among weak swimmers. Some progress has been made, but two-way underwater communication needs further development.

CONDUCTED SKIN DIVING TRIPS

In spite of communication difficulties, interpretation conducted by a skilled leader can be successful for both scuba- and snorkel-equipped swimmers. The leaders' enthusiasm and resourcefulness are important factors. The less experienced the participants, the more difficult the task, because of safety and communication responsibilities. Experience with such trips in Bermuda and the Virgin Islands has shown that the parties should be kept small.

In Virgin Islands National Park and Buck Island Reef National Monument interpretive trips may include as many as 15 snorkelers at a time. Visitor benefits diminish quickly with increasing size of the party, and safety hazards intensify. Towable, plastic foam floats with hand-holds are valuable for tired snorkelers or those with leaking masks or other problems, even on short trips, because inexperienced participants do not realize the limitations of their skill and equipment, nor do they reckon with the thrashing of companions and the difficulty of trying to speak. Light rafts towed by the leader, are advisable not only where water is deep, but where the bottom is rough or unsuitable for footing because of sea urchins, fire coral, or delicate formations.

SELF-GUIDING INSTALLATIONS

Land-oriented self-guiding trails normally consist of an introductory exhibit and a short trail, usually a loop a kilometer or two in length. One type utilizes text-in-place signs, each with a short text, and sometimes a simple explanatory sketch. Another type involves a series of plaques bearing conspicuous numerals. These marker-signs are placed on or adjacent to objects to be interpreted, and keyed to a printed folder or booklet available free or at nominal cost from an honor-system box, vending machine, or nearby museum or station. Both types of self-guiding systems have proved so successful that, even if funds for live interpreters were not limited, self-guiding trails would persist on their own merit.

In 1958 the Virgin Islands National Park staff inaugurated a novel technique conceived jointly by the late Conrad Limbaugh, of Scripps Institute of Oceanography, and National Park Service Aquatic Biologist Orthello Wallis: a self-guiding underwater "trail" or route in Trunk Bay, St. John Island. On shore an introductory sign is mounted on twin posts. This carved wooden sign explains in words and with paintings how to use the trail and, sketchily, what might be seen underwater. From this beach two small buoys are visible offshore a hundred meters distant. The explorer makes his way to the nearest buoy and starts using his mask and snorkel or scuba gear. Lying below the nearest buoy on the coral reef three meters down, is the first of a series of concrete blocks about half a meter long and weighing 50 to 75 kilograms. Set in the upper inclined face of each is a glass plate, the underside of which carries brief text, and occasionally

a drawing and directional arrow, all large enough to be read by the snorkeler. After reading about the particular coral, sea fan, or fish to be seen at each stop, the swimmer moves along to the next. This trail is about 100 meters long.

Weekly cleaning of the glass is needed to dislodge marine organisms. The concrete blocks are heavy to prevent movement by wave action, thus avoiding damage to the natural formations. When hurricanes threaten, however, it becomes necessary to hoist the heavy blocks out of the water by boat and winch. The blocks may be cast with bronze eye rings protruding or with a cylindrical horizontal hole from end to end through which a cable or a bar may be slipped to facilitate handling.

Leakage under the glass may cause discoloration of the interpretive message. This is now being combatted by laminating the text inside a sturdy, sealed, transparent sandwich and placing this under the recessed glass plate, which is cemented in with saltwater-resistant mastic.

A second underwater self-guiding trail has been installed on a barrier reef in the deeper water of Buck Island Reef National Monument near the Island of St. Croix, in the Virgin Islands. In this case, the safety of snorkelers often is jeopardized by their enthusiasm which induces them to exceed their swimming capabilities. Hence two or three sizeable floats have been moored along this trail. In 1962 about 9,000 persons swam these trails.

SUBSURFACE CRAFT

Enjoyment of underwater resources may be improved by subsurface transportation. So-called "wet submarines" carry one or two (sometimes more) persons. Occupants propel such water-filled machines by pedaling or by rotating propellers, which more than doubles the speed and cruising range as compared with speed and range of scuba divers. Occasionally, electric motors are employed.

In the more conventional dry-type submarine the occupant is not only dry but in an airtight compartment, breathing under normal atmospheric pressure regardless of the depth of the dive. Several one and two-man submarines are commercially available. Perry Cubmarine Sales Company builds its own and handles West German submarines starting from three meters in length, 60 kilos in weight, 50-meter depth capability, five-knot speed, and eight-hour submergibility, and there are craft with up to five-man capacity. These range in price from \$4,000 to \$75,000. Increasingly they are employed for research, photography, inspection, and manipulation of cables and other underwater work, and for patrols. There are perhaps 50 such dry submarines in use.

Dr. Jacques Piccard, for the 1964 Swiss National Fair at Lausanne, designed and built a successful tour submarine with a capacity of 40 persons, each seat with its individual porthole. A television screen serves each four seats. The craft, with its crew of three and a stewardess, entered Lac Léman at Geneva. Flood lights aboard illuminated the scene at depth, and the ship made successful daily dives without mishap. It carried more than 20,000 passengers to depths up to 310 meters in 3½ months of the fair.

Other smaller submersible craft have been developed, some capable of descent to considerable depths. So far, these have been eminently successful: some are

provided with escape and re-entry hatches; others have remote control, arm-like devices for collecting samples, and for performing other external manipulations. All, of course, provide external illumination and are propelled by electricity. These are largely research vehicles. Deeper diving vehicles are slow and more expensive, but they do make the depths observable to man.

The only two bathyscaphes (both of Piccard origin) are the French "Archimede", and the U.S. "Trieste". The latter made a record dive of 11,000 meters in the Pacific. It was also from this vessel that Dr. Charles Drake of Columbia University, descended in the Atlantic to 6,700 meters. As far as we were able to learn, there is a third underwater vehicle capable of descending to 6,100 meters, depths that permit man to observe 98 per cent of the ocean floor. This category includes the three-man "Aluminaut". Several other types of vehicles have maximum depth-range limits from 180 to 1,830 meters (Alvin, Deepstar, Denise, some Cubmarines, Deep Jet, and the mesoscaphe "Auguste Piccard").

Captain Cousteau's "flying saucer"-like, two-man vehicle, "Denise", was widely publicized in a motion picture documenting the Conshelf n° 2 project. "Denise" employs electrically-operated waterjets for propulsion and effective maneuverability.

Vehicles that can operate up to 50 meters in depths are more practical for pleasure use due to their relatively low price, the ease with which they can be moved on land by trailers, their simplicity of operation, and various built-in safety features.

SURFACE CRAFT

These can also provide impressive experiences in shallow water. In such places as Rainbow Springs, a fresh water lake in Florida, about 20 passengers "go below" into a covered hull and sit next to portholes about 50 centimeters in diameter and 50 centimeters below the water surface. The viewing angle is wide and slanted slightly downward, affording excellent visibility of the aquatic environment. A one-meter porthole is in front. The motor operator above provides the narration and tosses food overboard to lure fish for close viewing, a service that would be enhanced by a trained interpreter in the passenger area. Water depth required for this craft is less than two meters. Either inboard or outboard motors could be used.

Glass-bottom boats, though satisfactory, are ordinarily less effective. They enjoy considerable popularity in fresh water springs and lakes and in coral reef areas in the Atlantic, Pacific, Caribbean, and Hawaii. A roof should cover the viewing glass to prevent reflections. The faster the cruising speed and the shallower the depth, the less effective the viewing. Looking downward with the boat in motion tends to make people feel dizzy, and if the bottom is close to the glass, only fleeting glimpses are possible. The lateral viewing field is extremely limited. Interference from others with whom the viewing glass is shared further detracts. Communication for interpretation purposes is more easily accomplished than for porthole viewing because passengers are likely to be viewing the same objects.

Small skiffs for rowing, sailing, or propelling by outboard motors are available in clear transparent plastics. These can be effective in giving users an interesting underwater experience, but if the hulls are opaque, good viewing may be had by using glass bottom buckets from stopped or slowly moving boats.

The opportunity to enjoy underwater resources in a "boatcade" is not as prevalent, chiefly because of communications difficulties. The "boatcade", which appears to have originated in Everglades National Park, Florida, consists of a group of small motor craft led by a ranger in a patrol boat. The ranger points out such items of interest as birds, alligators, porpoises, manatees, and interesting vegetation, sometimes stopping to provide special information or to answer questions.

Also, in the surface craft category are one-man floating rafts or "mattresses" made of wood, plastic foam, or inflatable materials and equipped with bottom viewing ports using the glass-bottomed bucket principle. These can be used along self-guiding underwater trails or on conducted aquatic trips.

The conventional tour boat affords relatively little opportunity for public enjoyment of underwater resources. However, an articulate interpreter aboard can do a great deal to make passengers aware of what goes on in the water, especially if he were to be assisted by closed-circuit underwater television. A good narrator can identify plants and animals both in the water and ashore, and can make the river bank or tidal zone and estuarine habitats come alive and become more meaningful to passengers.

Surface self-guiding "trails" or routes for small private boats may use either numbered stake and leaflet systems of identification or text-in-place systems. These may also provide limited public use of underwater resources by interpreting littoral or fresh water shoreline objects. Terrestrial self-guiding trails are also practical for pedestrians along lakes, streams, and seashores. In Everglades National Park, Florida, all three of these techniques are employed successfully, though on a limited scale.

SUSPENDED WALKWAYS BELOW OR ABOVE THE WATER SURFACE

The potential of this medium is enormous. In Bermuda a wooden bridge spans the 15-meter Devils Hole, a land-locked marine grotto apparently connected by subterranean passages to the sea. Guests walk over this bridge to observe creatures which they themselves entice by hookless baited poles. Thus the visitor angles for marine life—not to catch it, but to view it.

In Everglades National Park and in the Audubon Society's Corkscrew Swamp, in Florida, several winding elevated trails are built of rot-resistant bald-cypress. On these, guided and self-guided techniques provide interpretation of the abundant and diverse aquatic life: swamp, pond, lake, and estuary—largely freshwater in character. To date, underwater viewing devices have not been provided along such walks, but direct vision or electronic periscope devices may be feasible.

Although funds are not now available for necessary experimentation, other schemes to allow non-swimmers to see underwater features are being considered for Virgin Islands National Park. These may take the form of underwater tunnel-like walkways with viewing ports. Under consideration for Mary's Bay in the same park is an open-air walkway suspended like a partially submerged bridge, with supporting pylons or anchored floats. Such a walkway would have railings just above the water about waist height on which glass bottom bucket-type viewing devices would ride, pushed along by users as they stroll the trail waist deep in water.

SUBMERGED CHAMBERS

Providing lesser but substantial viewer participation are stationary underwater rooms, auditoriums, tunnels, wells, or other observation chambers. One hears much about the feasibility of tunnel and well installations but not many are in operation. Construction and maintenance costs may be high, especially in marine situations. Attention to vulnerability from storms is important and protective breakwaters may be necessary. Maintenance of clean outer surfaces of the transparent viewing medium is essential—and it may prove costly.

Engineers have confirmed the practicality of constructing transparent tubes or tunnels for shallow underwater viewing by pedestrians, but I know of none that has actually been built. Viewing wells into which a person may descend are also feasible. In the construction of submerged chambers great care would have to be exercised to avoid harming the features to be viewed. This is particularly true among coral reefs and other delicate environments.

Moreover, the danger of possible changes in the environment must be studied. Such subtle factors as currents, wave action, and lighting may be critical to the existence of aquatic life. Particularly vulnerable are sessile aquatic invertebrates, such as corals and sea anemones, whose planktonic food supplies depend upon sustained local currents. The slightest deviation of these currents from normal patterns may result in wholesale death.

Also conceivable for the viewing of stream and river habitats are underground passages with subsurface windows, or viewing ports, or transparent tunnel tubes that rest on the bottom.

In the Mediterranean just offshore from Monte Carlo is a partly immersed parabolic dome some 95 meters in diameter. Visitors reach this facility by footbridge. Two of the four floors are below the sea's surface. The sea bed, viewable through large portholes, is illuminated with spotlights. A "sea garden" is visible from submarine lounges. Three of the four levels have both fresh and salt water aquarium viewing tanks. The building enjoys heavy public underwater use; visitors watch skin divers and aquatic ballets, and may even eat in a restaurant with aquascapes.

UNDERWATER PRESERVES

United States national parks with natural aquatic values, even if only a few streams or lakes, fall in this category. The most notable are Acadia, Buck Island, Channel Islands, Everglades, Fort Jefferson, Hawaii, Olympic, Virgin Islands, and the several National Seashores and National Recreational areas. In some cases commercial fishing is permitted; in all, regulated sport fishing (angling) is allowed.

Among the States, California has established Point Lobos State Preserve and is considering a proposal to set aside substantial examples of coastline and bay and estuary marine life communities in each of the State's three ecologically distinct coastal provinces.

In 1963, Florida, with the cooperation of the United States Department of the Interior, established Pennekamp Coral Reef State Park, with 2,500 hectares of water and 85 of land. Currently, the Department of the Interior is forwarding

a proposal to set aside in public ownership, part of the upper Florida Keys, together with portions of the adjoining waters.

In other countries of the world a parallel trend exists. Preserves have been set aside in the Bahamas (Exuma Cays), the Palau Islands, and the Galapagos Islands, to mention those which have come to our attention. At the Eighth General Assembly of the International Union for Conservation of Nature and Natural Resources at Nairobi, 1963, resolutions were adopted recommending the establishment of a marine national park north of Mombasa, Kenya, and another on the shores of the Red Sea in Sudan. We understand that the former has been established.

SUMMARY

Public use of underwater resources without impairment includes a wide spectrum of activity, and is becoming increasingly popular. Skin- and scuba-diving and snorkeling are means by which underwater conducted trips are being instituted. Trail labels are being installed underwater. And among other techniques in use or being contemplated for educational purposes are underwater tunnels and chambers, submersible viewing craft, various kinds of surface craft, guided boat tours, and suspended walkways. Because of the increasing aesthetic and economic importance of these activities, and because of the national heritage involved, it is essential to encourage the establishment of new underwater parks and reserves.

RÉSUMÉ

Le scaphandre autonome a récemment ouvert la voie à une possibilité d'exploration que l'homme a rapidement mise à profit pour élargir le champ de ses distractions et activités récréatives. D'autres formules s'y ajoutèrent (submersibles, maisons sous-marines, etc.) qui à leur tour entraînèrent des interférences humaines plus ou moins sensibles dans la vie des fonds marins.

Le rapport commence par décrire ces techniques nouvelles: skin-diving, scuba-diving, snorkeling, etc., puis leur mise au service des sportifs: organisations d'excursions collectives guidées, promenades autonomes, utilisation des engins submersibles de tous types. Dans certains cas, la perturbation peut exister même si le touriste lui-même n'est pas en plongée, mais utilise des embarcations à fond transparent. D'autres techniques sont encore passée en revue: télévision sous-marine, aquariums, océanariums, etc., qui permettent aux foules, toujours plus nombreuses, de prendre un contact direct avec la vie fascinante, chatoyante et mystérieuse des profondeurs marines.

L'article se termine par quelques remarques sur la nécessité de réglementer ces nouvelles activités de l'homme moderne et, notamment, de créer des parcs nationaux sous-marins.

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★ news release

Glancing over American history, we find that conservation's earlier efforts were directed largely toward preservation -- preservation of forests and other natural areas -- by establishing boundaries somewhere within which the consumptive uses of natural resources were proscribed or circumscribed. To the developer, proscription has meant the locking up of exploitable natural resources -- no timber cutting, no mining, no hunting, no damming of streams for power production, flood control, provision of irrigation water, and the like. In its restricted sense, conservation was largely a matter

of establishing sanctuaries free from the works of man and their consequences for plants, animals, and the landscape. For some of us the motivation has been largely in the interest of the species, especially if it were rare and threatened with extinction; but many others want to visit such areas to have the personal pleasure of seeing the plants and animals in their natural, unimpaired habitats. So, in this purest of cases, we are confronted with a management problem. Whereas cautious and knowledgeable visits to a sanctuary by a few persons for scientific and natural history studies and for the pleasures of observation and photography may not be detrimental to the species and their natural habitats, there can easily be too much such innocent use of a preserve, reserve or sanctuary.

There seems to be no escape from this problem except by the establishment of controls. There is no conservation except where there are conservators with the authority to enforce regulations, for too numerous visits by people can themselves be a form of consumptive use. This produces the management problems so typical of wildlife refuges, parks, and wilderness areas. Such areas are established for limited uses from among the many potential uses, not for non-uses, as critics so often complain.

I have started with the most limited aspect of conservation and have arrived at the point where I am convinced that all conservation requires management of the environment by restrictions on the uses which people will be allowed to make of it.

Now I skip to the word "resources" in my title, with the implicit understanding that we are talking about natural resources, not human resources. Whereas "natural resources" are generally thought of as things in the environment -- such as forests for their useful trees, grasslands for their plants palatable to livestock or wildlife, soil for its support of agriculture, water for the habitat in which sport and commercial fish live, rocks for their iron, copper and other minerals, or, more specifically, the tree, grass, animal, or mineral itself -- we now have broadened the concept of natural resources to include a condition of nature, such as a salubrious climate, and a process, such as falling water, that can be put to work. A useful definition, then, is that a natural resource is any thing, condition, or process in the environment that man finds useful.

If such a definition is acceptable, conservation is concerned with the uses of the environment for the extraction of products from it, for taking human advantage of conditions and processes, and even for non-consumptive and non-disturbing uses of nature. But use is the key, and use requires special management for determined purposes.

This brings me to two other matters that are derivative from the above conclusions. The first is the recent public concerns for natural beauty (which President Johnson equated a few years ago with conservation in his message to Congress on natural resources) and for quality of the environment. This is conservation's most significant forward step because it marks the Nation's growing concerns with the pollution of air, water and soil, with the disposal of solid wastes, with the uglification of the landscape by signs and strip mining, for example, with urban sprawl and central city deterioration, and with the loss of natural areas, including estuaries. In short, we have been brought up short with a growing realization that we have been progressively "de-humanizing" our environment at great cost to health, welfare, and enjoyment.

The second point that is derivative from this examination of the meaning of conservation and resources is that in every facet of management we are confronted with conflicts of opinion as to proper uses of the environment. There is no question that man must make use of his environment; the questions and problems arise when needed and desirable uses are incompatible at a given place.

But there is not only the competition for use of a natural resource -- including the decision, for example, to construct or not to construct at a given place a road, a paper mill, a power plant, a residential development, or to establish some sort of public area -- there is the fact that what goes on at a given site can have consequences elsewhere, even at remote places. This is illustrated by the spreading from points of origin of the substances that produce pollution, including radionuclides, pesticides, fertilizers, and the pouring into air and water of waste products of thousands of kinds. We are now including also within the scope of conservation management of the environment the effort to diminish "sight and sound pollution" by seeking controls over

billboards, sonic booms from planes, and manipulations of the terrain itself.

Let me move back, then, to the middle term of my title, the word "coastal," as a modifier of resources. Congress has given us a charge to examine our coastal resources by passage of the Marine Resources and Engineering Development Act of 1966. This Act covers the entire marine field, including the coastal zone, not only of the seas but of the Great Lakes also. It established a Commission to recommend the organization of Government and long-range program for its marine interests, and a Council to examine current substantive matters.

The Commission consists of a representative cross-section of persons in industry, education and state government, as well as the Federal Government. The Council, headed by Vice President Hubert H. Humphrey, is composed of the Secretaries of certain departments and directors of non-cabinet agencies. In addition to its professional staff, the Council has established five inter-agency committees to advise and assist it, of which I am chairman of the one on Multiple Use of the Coastal Zone. This Committee consists of representatives of a dozen major agencies: the Atomic Energy Commission, the Coast Guard for the Department of Transportation, the Corps of Engineers for the Department of Defense, the Environmental Services Administration for the Department of Commerce, the Department of Health Education and Welfare, the Department of the Interior, the National Aeronautics and Space Administration, the Council of Economic Advisers, the National Science Foundation, the Office of Science and Technology, the Smithsonian Institution, and the Department of State.

Working with the Council staff, this Committee decided that the term "coastal zone" would include the shoreline in a specific sense -- the Continental Shelf seaward, especially its inshore portions, and the estuaries on the landward side.

The objectives of this Committee are to examine the characteristics of the coastal zone and the programs of agencies operating within it, to find ways to improve coordination among the programs, and to suggest guidelines for an orderly Federal approach to coastal-zone problems.

The coastal zone, containing a great variety of natural resource complexes, has always supported a variety of human uses of vital importance to the Nation's people and their economy. I will mention some of them.

... Ocean Transportation. Except for Indians who came by land from Asia many thousands of years ago, immigrants who settled the country came to our shores by water: Spanish, French, British, Dutch, and before them the Scandinavians to Vineland. Transoceanic commerce commenced early and despite the rapidly growing air traffic, most such cargo still moves by sea. The coastal zone provides harbors, external and inland waterways for coastal shipping, and access to navigable rivers. Federal agencies with directly related responsibilities include the Maritime Administration, Customs Service, Public Health Service, Immigration Service and the Corps of Engineers.

... National Security. The earliest forts to protect our Nation had coastal locations at strategic points with respect to harbors, giving rise to the three-mile zone of territorial waters on a basis of cannon range. Today the coastal zone is the favored location for satellite and rocket installations, as it is for many modern military airfields as well as Navy yards.

Federal agencies related to commerce, navigation and security include the Coast and Geodetic Survey, Maritime Administration, and the Coast Guard, as well as the Navy and Air Force.

... Harbors and Docks. Commerce and security require transshipment facilities: docks, warehouses, railheads, etc. Deep-dredged channels and harbor basins as well as protective breakwaters are needed. The large bulk cargo carriers, especially tankers, are calling for ever-deeper and wider channels that may extend miles out on the Continental Shelf, through estuaries, and for miles up rivers. The modernization of harbors will require many docks to be reconstructed, especially to accommodate deep-draft vessels and containerized cargo handling. Agencies involved include the Corps of Engineers, the Coast Guard, the Department of Housing and Urban Development, and the Maritime Administration.

... Commercial and Industrial Sites. Many kinds of commercial and industrial firms find the coastal zone attractive because

of the combination of land and water transport, ease of waste disposal, and cheap land. As to the last point, filling behind bulkheads, especially by solid wastes and nearby dredged materials, creates new land worth many times the cost of producing it, a private windfall from public resources.

... Non-living Resources. Bromine and other chemicals are extracted directly from seawater, and iodine is taken from seaweeds. There is a promise of important pharmaceuticals from the sea. Sand, gravel, and shell are dredged from estuaries and inshore coastal waters. There is promise of hard minerals to be recovered from the seabed, including gold from underwater placers. Oil and gas production in the coastal zone has grown remarkably in recent years. All these operations have resulted in factories, mills, distillation plants, and oil and gas tank-farms being located on coasts and in estuarine areas.

... Living Resources. Commercial fisheries have a heavy dependence on the coastal zone, not only for the landing and processing of round fish from open ocean fisheries, but from estuaries which are extremely fertile production areas for a large percentage of our ocean fisheries, including crustacea and shellfish. The coastal zone supported subsistence fisheries for the colonists and before that the Indians, and today it supports an important sport fishery.

The location of commercial and industrial plants and the acquisition and processing of living and non-living resources of the coastal zone get the attention of several Federal agencies, including the Geological Survey, Bureau of Mines, Bureau of Commercial Fisheries, Bureau of Sport Fisheries and Wildlife, the Atomic Energy Commission, and the Federal Power Commission.

... Recreation. In addition to sport fishing on the waters of the Continental Shelf, there is surf fishing, and fishing in quiet estuarine waters. Recreation includes hunting, sailing, motor boating and water skiing, surf boarding, swimming, beach and dune walking, collecting sea shells and nature observation, picnicking and camping. Vacation shore cottages have long been popular. Today whole new subdivisions are being developed by dredging and filling where estuaries once existed. Atlantic City and Miami Beach with their great hotels are another essentially recreational

use of the coastal zone. Federal agencies that are involved include the Bureau of Outdoor Recreation, the National Park Service, the Bureau of Sport Fisheries and Wildlife, the Coast Guard and the Corps of Engineers.

... Natural Beauty. The aesthetic appreciation of nature is an important use of the coastal zone where the beauty of the sea and sky, the experiencing of weather, the sweep of the coastline with beaches, dunes, marshes, cliffs and headlands, and many interesting and attractive plants and animals abound, often near large centers of population. For many coastal cities estuaries may be the only remaining natural areas that are easily accessible.

The Federal agencies involved with recreation are also concerned with natural beauty, and so are the Bureau of Commercial Fisheries, the Federal Water Pollution Control Administration and the Department of Housing and Urban Development.

... Waste Disposal. Doing an about-face from natural beauty to waste disposal, we have long used the coastal zone for the direct disposal of sewage and sludge from sewage disposal plants, to rid ourselves of solid wastes, chemicals, and garbage, and more recently of nuclear wastes with low levels of activity and a long half-life.

Federal agencies in this field include the Federal Water Pollution Control Administration, the Department of Health, Education and Welfare, the Coast Guard, Corps of Engineers, the Atomic Energy Commission and the Bureau of Commercial Fisheries.

If these are the major classes of our use of the coastal zone, and I think they are, we should next notice that their development has been essentially laissez-faire, that is, with a minimum of governmental interference with property rights. The coastal zone has suffered two kinds of adverse change from this approach. First there has been a loss of quality from pollution. Some of this has resulted from the assumption that the capacity of the ocean and estuaries to absorb pollutants was essentially boundless. Some pollution has resulted from leaks and accidents on ships carrying hazardous cargoes and from shore installations; some has come from purposeful dumping, and much of the pollution has been inadvertent

because of our failure to appreciate the consequences of waste disposal in the coastal zone.

After pollution, which deteriorates but does not destroy the coastal zone, we must notice that there is physical destruction also. Whereas pollution can be stopped, although at great effort and cost, much if not all physical destruction is irreversible, at least economically. Dredging, whether for sand, gravel, shell, clay or peat, is destructive of natural bottom and its associated organisms, which may not recover for many years. Bulkheading and filling open estuaries and related fresh and salt water marshes mean that they are gone forever. A little bit here and a little bit there may not seem important, but over time we have in some places along our coasts lost 25 to 50 percent or more of our estuarine acreage with consequent loss to many important uses.

Today we find ourselves confronted by a series of problem complexes which seem freshly acute, perhaps only because the public at long last is dissatisfied with our traditional laissez-faire approach.

At every turn we find that we know very little about our coastal zone. This is true of our scanty knowledge of its geology and hydrology. It is true of our understanding of the life histories and ecology of important species, and of the ecological systems to which they belong. We know little about pollutants, especially their chronic effects on the ecosystems of the coastal zone. We have vast needs for survey, inventory, and research, especially on the natural features of the coastal zone. We are little better off when we look at the interplay among commercial and industrial transportation and other uses and our national needs in the coastal zone.

Whereas cities have been receiving considerable planning study in recent years, extra-urban regions, including seacoasts and estuaries, have been largely ignored. Planning studies are desperately needed, and subsequent to them there will be a need for putting plans to work. This is largely a matter of the separation from one another of conflicting uses. Saying this another way, this is a matter of allocating areas of the coastal zone to separate uses.

Among the many possible and often conflicting uses of the coastal zone, some have been preempted by governmental action. This includes the military installations and the national parks, seashores, and wildlife refuges, and comparable areas of state and local governments. Harbor and transportation authorities, often involving several units of government, produce certain developments that preclude other uses or affect them adversely. Cities and counties may have zoning for business, industrial, or residential uses. States may establish bulkhead lines and the Corps may grant permits for dredging and filling behind them.

Such are the limited controls on laissez-faire, but speaking generally, the power of zoning lies at the local level of government which is often a weak defender of intruding economic interests. The Federal Government seems not to have general zoning powers and can move into the coastal zone only through its power of eminent domain or special authorities, such as those of the Federal Water Pollution Control Administration.

All of this may sound pretty dismal for the protection of the national interest in the coastal zone, but recent years have seen a number of heartening actions at all levels of government. I will mention only enough to illustrate the point. Whereas there was only one national seashore before 1961, Congress has subsequently authorized eight more. The Federal Water Pollution Control Administration now has broad powers under the Clean Water Act to enforce abatement and ultimate control of pollution. The Corps of Engineers is now paying close heed to recommendations of the Fish and Wildlife Service and the National Park Service under the Coordination Act, and recent decisions of the Federal Courts are affecting the Federal Power Commission, as in the Storm King case on the Hudson River and the High Mountain Sheep Dam case on the Snake River. The work of the Marine Council's Committee on Multiple Use of the Coastal Zone is facing up squarely to Federal interagency and the intergovernmental problems.

Some of the States are moving to give the coastal zone protection, as in the case of Massachusetts, and California for San Francisco Bay. Many municipalities and some counties are moving to halt the despoilment of their beach water front and estuarine areas.

I believe that it is fair to say that all such conservation developments are arising from public pressures. The people are leading their elected representatives. In addition to the several national conservation organizations, such as the National Audubon, the Wilderness Society, the National Parks Association, and the Sierra Club, there are now hundreds of local citizens' groups. Some proceed directly, using their own funds to save a piece of marsh as a bird sanctuary or fields and woods as open space, but most of them act as pressure groups to encourage government to act in the cause of conservation. I end, then, with one more example -- The Georgia Conservancy, Inc. -- with the firm expectation that you will do great things to preserve some of your State's natural beauty and its valuable natural areas for the everlasting benefit of your people.