

Chapter 11: Park Science

The management of park natural resources and a park's scientific activities are closely linked. Although it is now almost axiomatic that any program of resource management must be based on sound science, the NPS was slow to come to this realization. As historian Richard Sellars has shown, the NPS has a long tradition of applying a utilitarian approach to natural resource management. The utilitarian bias has frequently elevated the visitor experience and efficient park administration over science in the management of natural resources. Often in the past, NPS's top managers have marginalized biologists and other scientists. It has only been since the emergence of a national environmental movement in the 1960s and 1970s that the NPS has accorded science a broader role in park management and operations. This evolution was largely the result of pressure from those outside the Service rather than NPS initiatives. Although it is impossible to make rigid separations, in general, this chapter focuses on the park's scientific endeavors, while chapter 12 addresses wildlife issues, and chapter 21 deals with the natural resource protection activities of the ranger force.⁵³⁵

Given that biological values were an important factor in the decision to set aside a portion of the Everglades as a national park, the NPS has been more supportive of a strong science program there than at other units. The recurring issues with water supply and water quality in the Everglades beginning in the early 1960s made the need for adequate scientific studies readily apparent. In 1966, Everglades became the second national park to have a natural sciences research plan. Assistant Secretary of the Interior Nathaniel Reed, a South Floridian with a lifelong interest in the Everglades, spearheaded the 1977 creation of the South Florida Research Center (now the South Florida Natural Resource Center). This was a pioneering move within the NPS and gave science a greatly enhanced status at Everglades. Even so, the effort to better coordinate scientific activities in the park and focus them on broader ecosystem studies has been ongoing. Various reorganizations within NPS and Interior have adversely affected the science program at Everglades and other units. Notable among these were the 1993 creation of the National Biological Survey and the subsequent placement of Interior biologists within the U.S. Geological Survey.⁵³⁶

The NPS typically identifies any scientific endeavor in Everglades or other parks as research. The term research has both a general meaning and a more restricted meaning in scientific circles. In general usage, research typically means exhaustive, systematic inquiry or investigation. In scientific circles, the term research often is restricted

⁵³⁵ See Richard West Sellars, *Preserving Nature in the National Parks: A History* (New Haven: Yale University Press, 1997), in particular pages 1-5, 149-150, 217-220.

⁵³⁶ Oron Bass, interview by author and Nancy Russell, May 23, 1022; Michael Soukup interview, July 25, 2012.

to activities carried out under the scientific method. In this usage, research means identifying a question or stating a hypothesis, collecting data and/or conducting experiments, and arriving at a conclusion that answers the research question or confirms, refutes, or qualifies the hypothesis.⁵³⁷ In this chapter, research often carries the more general, rather than the specifically scientific, meaning.

Ten years before the park was established, Dan Beard, who would become the park's first superintendent, undertook the first park-specific scientific inquiries. As an NPS assistant wildlife technician stationed in South Florida in 1937 and 1938, Beard surveyed the area by plane, boat, and automobile and on foot. He compiled a list of proposed studies for the park area, focusing on basic inventories of wildlife and representative plant communities. He also recommended studies of surface water flow and the status of exotic plants and animals. Beard saw the need for more comprehensive ecological studies but felt they would have to wait until inventories had been compiled. Beard's investigations resulted in his October 1938 *Wildlife Reconnaissance*. This work is primarily descriptive, containing information on physiographic areas and known bird rookeries as well as brief summaries of the status of rare species. The document places considerable emphasis on resource management issues, detailing the effects of various types of human use of the Everglades and offering preliminary suggestions on how those effects might be reversed. Acknowledging that the Service lacked the scientific personnel to conduct needed Everglades investigations, Beard recommended relying on researchers from cooperating colleges and universities.⁵³⁸

Early Emphases of Park Science

Once established, Everglades National Park was slow to implement scientific investigations. Superintendent Beard and his staff were preoccupied with securing the park area, curbing illegal hunting, and establishing basic visitor services. It took years for park staff to gain a basic understanding of the natural environment, and they could not be expected quickly to design and implement scientific activities. In addition, science had a low priority and minimal funding throughout the NPS in the 1950s. Director Conrad Wirth was preoccupied with the Mission 66 program, which overwhelmingly emphasized construction to meet visitor needs. It is revealing that in 1958, the entire NPS budget for scientific research, exclusive of salaries, amounted to

⁵³⁷ See definitions in *Merriam-Webster's Collegiate Dictionary*, 11th ed. (Springfield, Mass.: Merriam-Webster, Inc., 2003), 1059, 1112.

⁵³⁸ Daniel B. Beard to RDR1, Dec. 28, 1937, WNRC, 79-85-8, box 13; Beard, *Wildlife Reconnaissance*. In addition to surveying the Everglades, Beard was also coordinating the work of CCC camps at state parks in South Florida.

\$28,000, and about one-quarter of that was devoted to fishery studies in Everglades National Park.⁵³⁹

Everglades National Park in the 1950s relied heavily on others to conduct scientific activities in the park. The U.S. Geological Survey (USGS) continued to maintain its water gauging stations in the park. Superintendent Beard attempted to get assistance from U.S. Fish & Wildlife Service (FWS) scientists, but found that they were stretched thin and could offer little help. The park's first biologist, Joseph C. Moore, came on duty in the fall of 1949 and stayed for several years.⁵⁴⁰ Moore worked primarily on inventory and monitoring of bird populations, but also started some preliminary investigations of crocodiles, manatees, dolphins, and squirrels (see chapter 12). Park naturalists, who mainly worked on interpretive programs, also helped with inventory and monitoring. The NPS was very concerned about the future of sportfishing in the park and how commercial fishing affected fish stocks (figure 11-1). In 1951, the park contracted with the Marine Laboratory of the University of Miami for a study of the pink shrimp population in the park. The park was an important spawning ground for shrimp. Shrimp were both a major food source for species of fish sought by sportsmen and the basis of a commercial fishery in the Gulf of Mexico. This was the beginning of a long association between the park and the marine laboratory. In 1957, the park entered into another contract with the laboratory for a multiyear study of marine fish stocks. From 1958 through 1969, researchers interviewed sportfishermen at Flamingo, recording their catches and the amount of time they were out (known as a catch-and-effort study). Long-time park biologist Dr. William B. Robertson later acknowledged that this study was "at the lower limit of sampling reliability." As early as 1952, biologist Moore thought a permanent marine biologist position was needed in the park.⁵⁴¹

A second major focus of Everglades science in the 1950s was wading bird and raptor populations and their breeding success. Dr. William B. Robertson began his study of Everglades birds as a University of Illinois PhD candidate in 1948. After working in the park as a fire control aide in the early 1950s and holding term positions, Robertson got a permanent position as a biologist in June 1956. Known to most as

539 Sellars, 164-168; Asst. Sec. Roger Ernst to Congressman Dante Fascell, May 27 1958, NARA II, RG 48, DOI, Office of the SOI, box 327.

540 Some sources state that Dr. William Robertson was the first biologist in any unit of the National Park System east of the Mississippi, but this is erroneous. Determining whether Moore was the first such appointment is beyond the scope of this history.

541 SMR, Sep. 1949; Supt. Beard to RDR1, May 23, 1952, NARA II, RG 79, NPS AF, box 2331; Priority List for Natural History Research, Aug. 1954, NARA Ph, RG 79, 79-67-A-661, box 100; Memorandum of Understanding, NPS and Marine Laboratory of University of Miami, Mar. 22, 1951, NARA Ph, RG 79, 79-58A-360, box 8; Supt. to RDR1, Feb. 12, 1962, EVER 55853, box 61; Moore to Supt., Apr. 23, 1952, NARA II, RG 79, NPS AF, box 2331; Gary E. Davis and Edith B. Thue, *Fishery Data Management Handbook, Everglades National Park*, June 1979, <http://www.nps.gov/ever/naturescience/upload/SecureTRT-546.pdf>.

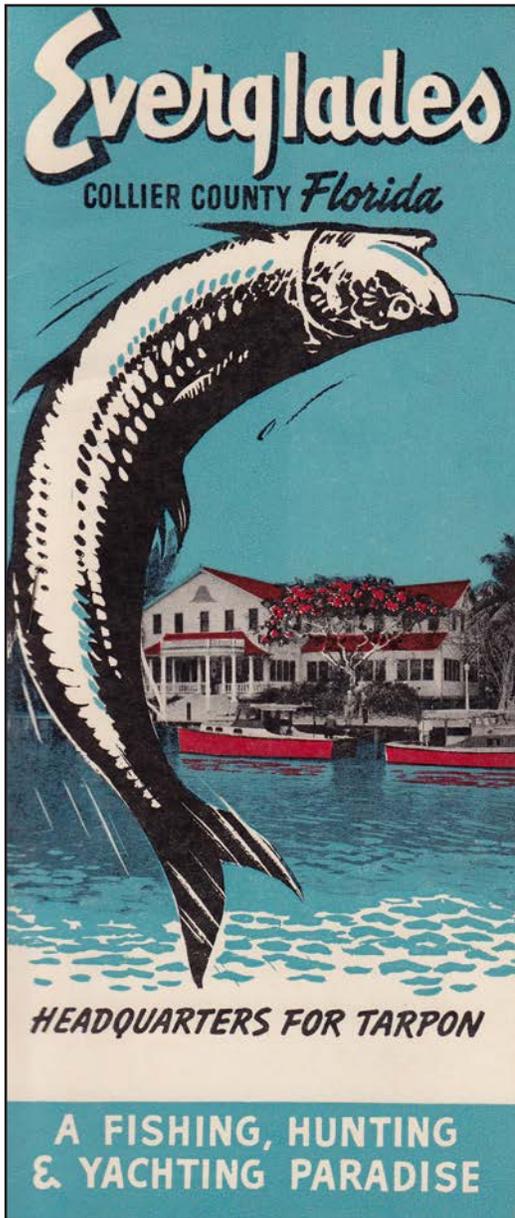


Figure 11-1. Gamefish stocks were a focus of early research

“Dr. Bill,” Robertson worked in the park until his retirement in 1997. Much of his time was devoted to bird studies, but Dr. Robertson also participated in vegetation studies and emerged as a key source of counsel to park managers and others in South Florida on a host of biological issues. Early on, Robertson recognized the value of long-term databases. The bald eagle study that he began in 1959 continues today as one of the longest continuously maintained databases on any species. His pioneering work on the effects of fire on ecosystems is covered in chapter 15.⁵⁴² The early emphasis on studying fish stocks and wading bird populations reflected the then-prevalent NPS tilt toward science that served visitors. Bird watching and sportfishing were among the premier attractions for park visitors, so scientific investigations informing management decisions that would enhance these activities were favored.

1957 Park Research Conference

Superintendent Beard and his staff considered scientific endeavors of sufficient importance to convene a three-day research conference in the park in June 1957. The conference was intended as the first step “toward establishment of a comprehensive research program” in the

⁵⁴² SMR, June 1956; “Pioneering Biologist Discovered Value of Fire,” *Miami Herald*, Oct. 23, 1997; “William B. Robertson II, Glades Scientist,” *Miami Herald*, Feb. 2, 2000; Bass interview. Robertson’s greatest legacy may be his 40-year study of terns at Dry Tortugas National Park, but that is a story for that park’s administrative history. The park has named the old Iori Farms bunkhouse/commissary in honor of Dr. Robertson.

park.⁵⁴³ Fifty-six outsiders and 15 NPS representatives attended, most of them authorities in the biology, geology, and hydrology of South Florida. Although the emphasis was on the natural sciences, three of the outside attendees and one NPS attendee were historians or archeologists. The vast majority of the academics in attendance were from the Universities of Miami and Florida. Five came from the University of Miami Marine Laboratory. The Florida Game & Fresh Water Fish Commission, the USGS, the FWS, the U.S. Department of Agriculture, the Corps of Engineers, the Central & South Florida Flood Control District, and the Office of Naval Research were also represented. Echoing Ernest Coe's vision, the attendees passed a formal resolution calling for the inclusion of a section of coral reef off Key Largo in the park. The conference did not entice many outsiders to conduct research in the park, but it did raise the park's profile in academia and furthered cooperation between outside experts and park scientists and managers.⁵⁴⁴

The succession of drought years that the park experienced beginning in 1962 brought about changes in the park's scientific focus (figure 11-2, 1960s droughts affected the nesting of great blue herons). The severe stress caused by low water highlighted the need for more hydrological work and more comprehensive ecological studies. Park managers began to realize that a lot more research was needed to understand how varying water levels throughout the year affected Everglades environments and individual species. In July 1959, the University of Miami Zoology Department had started a study of fresh water marsh ecology in the park, but it seems to have been poorly designed and produced little useful information. Faced with severe drought in the winter of 1961/1962, the park decided to have the University of Miami Marine Laboratory review and evaluate a host of existing data in an attempt to estimate the park's water needs. These studies included J. B. Reark's work on freshwater marsh fishes discussed below in chapter 12. The park felt that more extensive ecological studies should follow this review and evaluation. At the same time, criticisms of the park science program nationally from the nascent environmental movement led Secretary of the Interior Stewart Udall to commission two evaluations of NPS research from prestigious scientists.⁵⁴⁵

543 Ronald F. Lee, Chief, NPS Div of Interpretation, May 7, 1957, to Dr. Richard J. Russell, LSU School of Geology, NARA Ph, RG 79, 79-68-A-2955, box 48.

544 "Report of Proceedings, Everglades National Park Research Conference," June 6, 7, and 8, 1957, WNRC, 79-85-8, box 11.

545 Sellars, 200-201; Supt. to RDR1, Feb. 12, 1962, EVER 55853, box 61.



Figure 11-2. 1960s droughts affected the nesting of great blue herons

The 1963 Leopold and National Academy of Sciences Reports

Secretary Udall in 1962 commissioned a study of NPS wildlife management policies and a second study of Service natural history research needs. The principal author of “Wildlife Management in the National Parks” was A. Starker Leopold, a well-regarded professor of biology at the University of California, Berkeley, and son of Aldo Leopold. Released in the spring of 1963, what became known as the Leopold Report strongly recommended that scientific research “form the basis for all management programs” in the NPS.⁵⁴⁶ Udall chose the National Academy of Sciences (NASc) to thoroughly examine the Service’s scientific efforts. The chair of the NASc committee and chief author of its report was biologist William J. Robbins of the National Science Foundation. Because of the critical situation at Everglades National Park, Robbins convened a week-long committee meeting in South Florida in January 1963. The committee spent a day touring the park and then held sessions in Coral Gables. The NASc committee’s August 1963 report was highly critical of NPS science efforts. It strongly urged that park science adopt an ecosystems orientation and expand its focus beyond

⁵⁴⁶ Sellars, 215.

charismatic megafauna. The NASc report echoed the findings of a largely ignored 1960 internal report written by Dan Beard (in WASO at the time) that lamented the inadequacies of NPS science. In the view of historian Richard Sellars, NPS management reacted defensively to the NASc report and ensured that it got limited distribution. Nonetheless, the Leopold and NASc reports were a milestone for the Service and began the slow process of elevating the status of science in the parks and pushing it toward a more ecological approach.⁵⁴⁷

On the national level, the NASc report led to the 1964 establishment of a division of natural science studies in the NPS Washington office. A second result was the preparation of a natural science research plan for Everglades National Park, the third such plan ever prepared within the NPS.⁵⁴⁸ Park scientists, NPS Chief Scientist George Sprugel Jr., and others worked on the plan in 1965 and 1966. Several academics, including Archie Carr and John H. Davis of the University of Florida and Clair P. Idyll and Durbin C. Tabb of the University of Miami, helped prepare the plan. Released in September 1966, the plan constituted, rhetorically at least, a firm commitment to an ecologically based research program. The plan stated: “Long-range research efforts in the Park should build toward an eventual understanding of the *organization* and *interrelationships* of the various [natural] communities represented [emphasis in original].” Nevertheless, the plan recognized that crisis conditions in the park often might require management actions in advance of research results, noting that “priority should be given to projects that have a direct and immediate bearing on the survival of the features which the Park was established to preserve.” Further, staffing and funding limitations were recognized as impediments, and no suggestions of additional funding sources were included. The plan made a clear distinction between natural history surveys and research. It recognized the importance of surveys, but branded them “more in the province of housekeeping duties of management than research.”⁵⁴⁹

The 1966 natural science research plan was followed by a 1967 Everglades National Park Resource Management Plan. This was a pilot effort in the NPS, but apparently never was used by the park. Neither plan resulted in substantially more funding for park science or in freeing the park’s scientists from paperwork, resource management, or advisory tasks that pulled them away from their research. Longstanding inventory and monitoring programs, focused on bird populations, mostly continued. Dr. Robertson also studied and wrote about the effects of 1960’s Hurricane Donna on vegetation and wildlife, and in late 1966, he was able to hire John Ogden, just the third

547 Sellars, 169-170, 215-217; SMR, Jan. 1963; “Glades Park Needs Told,” *Miami Herald*, Jan. 16, 1963. The NASc report was “A Report by the Advisory Committee to the National Park Service on Research,” Aug. 1, 1963.

548 Isle Royale National Park and Sequoia-Kings Canyon National Park preceded Everglades.

549 William B. Robertson Jr, George Sprugel Jr, Lowell Sumner, ed., “Everglades National Park Natural Sciences Research Plan” (Washington, D.C.: NPS, Sep. 1966).

wildlife biologist in the park's history. The USGS expanded its efforts in the 1960s to include ecological research in three Everglades environments: open glades, alligator holes, and the brackish zone. This research apparently was limited to correlating the presence of aquatic species with variations in water cover, salinity, and other properties. The USGS also undertook an effort to trace vegetation changes by comparison of aerial photographs from 1940 and 1964. Scientists from the University of Miami continued to work in the park, for a time maintaining research stations on Pigeon Key and in the old Iori Farms bunkhouse.⁵⁵⁰

In 1969, Bill Robertson offered this summary of the first twenty years of park science:

[T]he present [science] program just grew (though not very far) and was shaped by its environment, rather than being carefully planned according to the priority of needs. The "program" has always consisted of a very few people with very limited funds. What we've done is no measure of what we thought was needed, but rather a measure of the realistic possibilities.⁵⁵¹

Everglades National Park scientists were involved in the South Florida Environmental Project, an obligation undertaken by the Department of the Interior as a result of the January 1970 Everglades Jetport Pact (see chapter 8). Scientists from a number of agencies worked on the study, which ultimately produced 51 reports in the first half of the 1970s and a 1976 summary report. Beyond establishing criteria for the selection of a new site for the jetport, the project was meant to provide a comprehensive series of reports on the broader South Florida ecosystem. Park biologists Bill Robertson and John Ogden worked on some of the study's reports. Gary Hendrix, a recent University of Miami PhD in marine biology, was a co-author of the summary report.⁵⁵²

By the early 1970s, the park had resource management coordinator position, which had responsibility for coordinating science efforts. The park's research budget had grown somewhat, allowing it to hire Richard Klukas as a terrestrial biologist and Gary Davis as a marine biologist. The resource management coordinator, L. Lee Purkerson, moved to the NPS Washington office in August 1974, and Gary Davis was acting resource management coordinator until November, when Gary Hendrix took on that position. John Ogden also left in 1974 for a position with the National Audubon Society and was replaced by James Kushlan. Some of these personnel changes appear

550 Milton C. Kolipinski and Aaron L. Higer, "Ecological Research in Everglades National Park," *National Parks Magazine* 40/229 (Oct. 1966); John Ogden, interview by Brian Gridley, April 10, 2001, University of Florida Proctor Oral History Center, 5; Asst Supt, ENP, to Chief Ranger, Oct. 2, 1975, EVER 42242, ser. IV.

551 Bill Robertson to Supt., Feb. 13, 1969, EVER 55853, box 61.

552 B. F. McPherson, G. Y. Hendrix, Howard Klein, and H. M. Tyus, *The Environment of South Florida: A Summary Report* (Washington, D.C.: GPO, 1975), <http://sofia.usgs.gov/publications/papers/pp1011/pp1011.pdf>; Gary Hendrix interview.

to have been engineered by Nathaniel Reed, who took a very active interest in Everglades National Park after his 1971 appointment as assistant secretary of the interior for fish, wildlife, and parks. Reed recalls that Audubon was in great need of an expert biologist and that he encouraged John Odgen to apply for the position.⁵⁵³

Creation of the South Florida Research Center

In the 1970s, Nathaniel Reed accomplished a transformation of the research program at Everglades National Park. Reed, a prominent Florida Republican, had served as environmental advisor to Claude Kirk, the first Republican governor of Florida since Reconstruction. In 1971, President Nixon appointed Reed to the assistant secretary position, under Secretary of the Interior Rogers C. B. Morton. There were three NPS directors during Reed's tenure: George B. Hartzog Jr. (to December 1972), Ronald H. Walker (January 1973 to January 1975), and Gary Everhardt (January 1975 to May 1977).⁵⁵⁴ Reed had first-hand knowledge of the environmental problems in the Everglades and worked to beef up the park's science program. In 1974, he began pressing for a bonafide research center in the park with an adequate budget. Reed and Director Everhardt visited the park in April 1975, then Reed requested a report from a team headed by NPS Chief Scientist Theodore W. Sudia. After visiting the park in September, Sudia's team called for a substantial increase in the park's science effort, recommending an annual budget of \$2.975 million and 21 permanent positions. At the time, the park's research efforts involved eight permanent professional positions and a \$300,000 annual budget, including the hydrology program, which was separate from the natural science program. Everglades Superintendent Jack Stark thought that Sudia's proposed program was too ambitious and reflected the biases of the study team. The superintendent welcomed the idea of getting more equipment, facilities, and support staff, but wanted no additional permanent scientist positions in the park. Director Everhardt passed these views along to Reed.⁵⁵⁵

Nathaniel Reed saw Stark's position as typical of Park Service managers, few of whom had a science background. Most superintendents had advanced through the ranger ranks and they zealously guarded their management prerogatives. All superintendents

⁵⁵³ 1974 Research Accomplishments and Activities, Feb. 20, 1975, EVER 22965; Nathaniel Reed, personal communication, Aug. 5, 2013.

⁵⁵⁴ Ronald Walker was a former White House aide with no background in land management or conservation; Nathaniel Reed was the de facto director of the NPS during Walker's tenure.

⁵⁵⁵ Reed interview; SAR, 1975; Sellars, 236-237; Asst. Sec. Reed to Dr. Sudia, Aug. 8, 1975; Assoc. Dir., Park System Mgmt., to Dir., Oct. 20, 1975; NPS, WNRC, 79-85-8, box 10; Supt. to RDSE, Oct. 10, 1975, EVER 42242.

and regional directors were white males, and the last thing they wanted was a young PhD scientist, most especially a woman, having input into decision-making.⁵⁵⁶

Unhappy with the NPS response to Chief Scientist Sudia's recommendations, Reed decided to get an evaluation from distinguished outside scientists. He called on George Gardner, a former special assistant in Interior who at the time was working on a PhD in ecology at the University of Florida. Gardner was joined by another University of Florida scientist, Ariel E. Lugo, who had worked on the South Florida Environmental Project.⁵⁵⁷ Together they prepared a report, *An Assessment of Research Program Needs and Priorities for Everglades National Park*, dated January 1976. The Gardner-Lugo report found that the park was at a critical point because of the rapid growth of South Florida and the intensifying competition for water. Further they judged "the Park's research program unable to counteract these threats to the Park with scientifically accurate, relevant information on which to base programs to defend the Park's interests." Gardner and Lugo called for a substantially expanded and reorganized research effort. They proposed a four-part research program:

1. Water-related research, including the study of delivery mechanisms for water to the park, water quality monitoring, and flow measurement. This was seen as the top research priority.
2. Studies of "hot spots" within the park, such as Shark River Slough, the headwaters of Taylor Slough, Canal C-111, and the Hole-in-the-Donut.
3. Community or mosaic ecosystem studies that would go beyond earlier "species by species descriptive approaches."
4. General studies to include completion of fundamental resource inventories, mapping of vegetation, soils, and topography, and a study of fire ecology.⁵⁵⁸

Other recommendations included a comprehensive library of all park-related research, an outside scientific advisory board for the park, an internal park research and resource management policy group, an annual Everglades science symposium, an environmental management data system, and a park research center either in a new building or a repurposed existing building.⁵⁵⁹

Reed pressed the NPS to implement the Gardner-Lugo proposals throughout 1976, often finding Director Everhardt and his staff less than enthusiastic and responsive. The director wrote Reed in April 1976 that the Service was in basic agreement with the report's recommendations, but Reed in June complained to Everhardt that he had yet to receive a "fully fleshed out plan" for implementing them. The Florida

⁵⁵⁶ Reed interview.

⁵⁵⁷ Asst. Sec. Reed to Dir., Dec. 9, 1975, NPS, WNRC, 79-95-8, box 10.

⁵⁵⁸ George Gardner and Ariel Lugo, *An Assessment of Research Program Needs and Priorities for Everglades National Park* (Gainesville: n.p., 1976), vi-ix.

⁵⁵⁹ Gardner and Lugo, ix-xi.

congressional delegation got a \$300,000 add-on for the Everglades science center for FY1977, and the NPS reprogrammed another \$160,000.⁵⁶⁰ This provided a budget of \$695,000 for what was christened the South Florida Research Center. The NPS agreed with the report's suggestion that the new center serve Biscayne National Monument as well as Everglades and Fort Jefferson. The center's FY1978 budget was set at \$1.4 million and remained a separate line item, distinct from natural resource management funding. Reed was fortunate to accomplish all of this before the November election, which denied Gerald Ford a term of his own and meant that Reed's days as assistant secretary were numbered. Not long after the election, NPS officials indicated that they might try to scale back the mission of the research center. In December, the regional director wrote newly installed superintendent John M. Good that he wanted the park's research program to be "results oriented, i.e., research pointed toward application to management program [sic]. I was gratified that you share this desire and hope to keep long-term research efforts to a minimum."⁵⁶¹ It is a testament to Nat Reed's forceful personality and bureaucratic savvy that he was able to permanently establish the science center at the tail end of the Ford administration. Once out of office, however, he could not control its funding level.

Beginning in the fall of 1976, the park moved to get the research center up and running. Gary Hendrix's title changed from resource management coordinator to research director.⁵⁶² The new center had five program areas, plus an administrative branch. The five scientific programs were wildlife ecology, plant ecology, marine ecology, fire ecology, and hydrology. At about this time, Frank Nix, whose position as hydraulic engineer had always reported to the superintendent, retired. Hydrology then became one of the center's program areas, with Pete Rosendahl as its head. James Kushlan and Gary Davis, already at the park, had the wildlife and marine programs, respectively. Hendrix then hired Lloyd Loope to lead the plant ecology program and Dale Taylor for fire ecology.⁵⁶³

As center staff was added, some were given offices in the headquarters building and others got trailers in the Pine Island complex. The NPS considered constructing

⁵⁶⁰ Some of the funds were taken from an NPS science center established in 1973 at Bay St. Louis, Mississippi, a pet project of Mississippi Senator John Stennis. The center in Mississippi was largely project-funded and never was enthusiastically received within the Service. It was closed in 1977, the same year that the Everglades Center opened. Sellars, 238-239.

⁵⁶¹ Asst. Sec. Reed to Dir., Apr. 1, 1976; Assoc. Dir. to Asst. Sec. Reed, Apr. 23, 1976; Asst. Sec. Reed to Dir., May 13, 1976; Asst. Sec. Reed to Dir., June 16, 1976; Dir. to Asst. Sec. Reed, July 12, 1976, NPS, WNRC, 79-85-8, box 10; Bass interview; Reed interview; RDSE to Supt. Morehead, Dec. 27, 1976, EVER 55853.

⁵⁶² It appears that for a few years the term South Florida Research Center was applied just to the building and the staff was known as the research division. Soon both were being called the research center.

⁵⁶³ Hendrix interview; Resource Management Coordinator to Supt., Feb. 9, 1976, attachment to 1978 SAR.

a new building for the center, but decided to use the old Iori Farms building, an option that had been mentioned in the Gardner-Lugo report. The NPS Denver Service Center got the job of converting the building and astounded park staff with some of their initial suggestions. The scientists at Everglades were able to make some changes to the plans for the building and grounds, notably persuading the folks from Denver that native plants would thrive more readily than blue spruce trees. Park staff also fought to have windows placed in the building, and ended getting only very narrow, vertical ones. By early 1979, director Hendrix believed that the center was successfully established as a “multidisciplinary research program for the South Florida parks.” The remodeled Iori building contained a wet lab, a dry lab, library, computer center, conference room, 15 offices, and study areas for 20 technicians. The permanent staff has risen to 14 and the budget for FY1979 was \$1.346 million (figure 11-3, touting the new science program).⁵⁶⁴

Having little experience with scientific research, the NPS lacked policies on publication. Center director Hendrix established a program of center technical publications to disseminate important data and results that were not appropriate for peer-reviewed journals. Centers scientists also were encouraged to submit articles to journals, and Hendrix reviewed manuscripts from staff before they were submitted to journals. The South Florida Research Center was a pioneering effort within the NPS and it was important to show its value through published work.⁵⁶⁵

The initial team of program heads, scientists, and technicians was excited about being part of this new NPS commitment to science and the prospect of better understanding the South Florida ecosystem. John Good, Everglades superintendent from October 1976 to February 1980, had been selected for the post by Assistant Secretary Reed because his training was as a biologist and he supported science-based management. By all accounts, the first four or five years of the center were a golden age, marked by productive collaboration among the staff. The concept of systems ecology, which emphasizes a holistic approach to interactions among species and systems, was gaining ground in the 1970s. Many of the young scientists who joined the research center in its early years, James Kushlan in particular, brought this approach to their work. Within the center, wildlife ecology and hydrology were the biggest programs; at one point wildlife ecology had eight or nine technicians, more than any other program (figure 11-4, checking on a tranquilized panther). Each program competed for funding and those decisions were made by the research director following informal discussions

⁵⁶⁴ Research Manager to Supt., Feb. 9, 1979; James Kushlan, interview by author, May 25, 2012, Hendrix and Bass interviews.

⁵⁶⁵ Bass and Hendrix interviews. Reports from the South Florida Research Center and the South Florida Natural Resource Center are catalogued as EVER 42242 in the South Florida Collections Management Center.

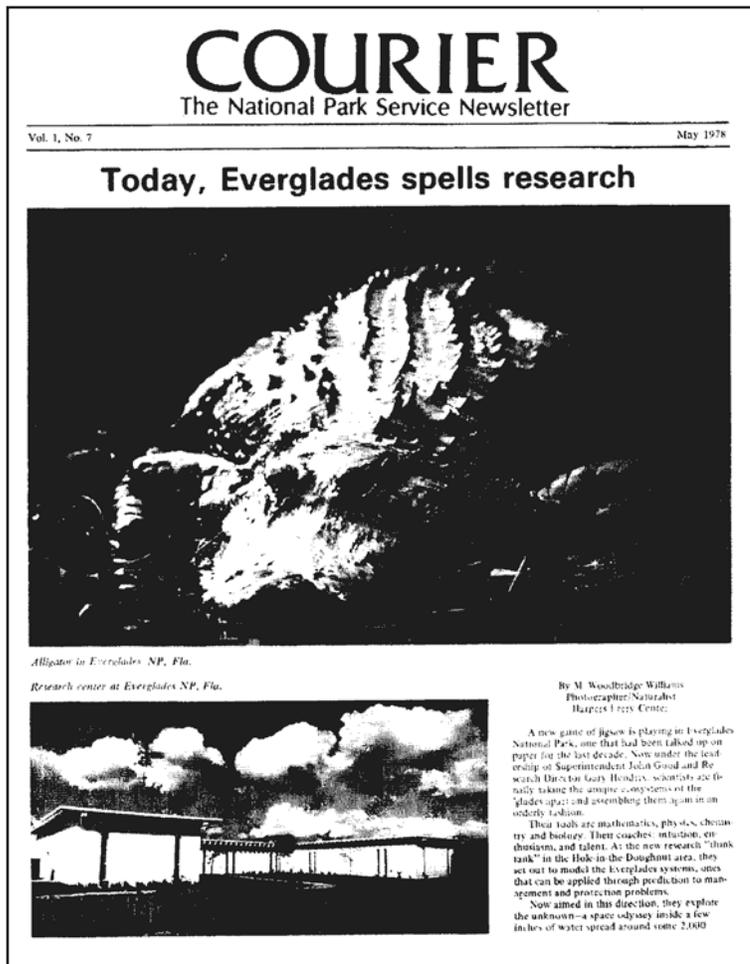


Figure 11-3. Touting the new research program at Everglades National Park, May 1978

do more to achieve a truly “integrated ecosystems approach.” Existing research was found to be focused primarily “on structural aspects of ecosystems” with much emphasis on inventory and monitoring. “A total or integrated ecosystem approach is highly desirable and will require better integration and some reorientation of research programs.”⁵⁶⁷

After several years, tensions arose among the center staff. These tensions seem to have had their origins in professional differences about the volume and timing of water deliveries to Everglades National Park. James Kushlan’s work led him to believe

⁵⁶⁶ Gary Davis, interview by author, Aug. 1, 2012; John Good, interview by author, Sep. 6, 2012; Hendrix, Kushlan, and Reed interviews.

⁵⁶⁷ Acting RDSE to ENP Supt., July 14, 1981; James L. Cooley, University of Georgia, John D. McCrone, Western Carolina University, and James N. Layne, Archbold Biological Station, “Everglades Science Program Evaluation,” Dec. 1981, EVER-00470. .

with the program leads.⁵⁶⁶

In 1981, the NPS Southeast Regional Office initiated an evaluation of the first four years of the research center. A three-member team concluded that the research center provided good research, was well managed, and “relatively” well funded. Center staff chronically believed they lacked the funding needed to accomplish their missions, but found themselves the object of considerable envy among NPS scientists from other areas who got even less. The report’s authors believed that the center needed to



Figure 11-4. Checking on the health of a tranquilized Florida panther

that the annual winter drying out of the ridge and slough areas served to concentrate prey in pools and that the park was asking for too much water, to the detriment of wildlife. Pete Rosendahl's investigations and modeling of water flows prior to the construction of the Central and Southern Florida Project led him to believe that pre-project flows to the park had been substantially larger than what the park was getting circa 1980. Research Director Hendrix and Superintendent John Morehead (May 1980 to February 1986) supported Rosendahl's view. Additionally, there were disputes between James Kushlan and park management over publication in peer-reviewed journals and the ownership of data collected by a scientist in government employ. Evaluating the various positions in these disputes is beyond the scope of this history; what is relevant is that the disputes led to acrimony and dissention within the research center, which clearly lessened its productivity for some years.⁵⁶⁸

⁵⁶⁸ For additional insight, consult the transcripts of the author's interviews with Gary Hendrix, James Kushlan, and John Morehead in the park's archives.

The center's functioning was also adversely affected by the failure of its funding to keep up with inflation and the rise in salary levels as scientists advanced in their careers. The center was funded at \$1.35 million in fiscal year 1978 and \$1.47 million in fiscal year 1988. Just to keep up with inflation, the 1988 figure would have needed to be \$2.45 million. In the early 1980s, the NPS adopted a compensation system for its research scientists known as research-grade evaluation. Under this system, promotions were dependent on publication in peer-reviewed journals. Scientists who were well-published rose rapidly in grade, adding to the center's salary costs. Essentially level funding for the center that did not keep up with inflation limited its effectiveness. In some cases, for example, when a senior scientist left, he was replaced by a less experienced scientist with a lower salary cost.⁵⁶⁹

In 1988, Research Director Hendrix took a leave of absence before moving to the NPS Southeast Regional Office, and center marine biologist James Tilmant was acting director for a time. Superintendent Michael Finley (July 1986 to August 1989) invited Michael Soukup, a limnologist (specialist in freshwater systems) and chief scientist in the NPS North Atlantic Region, to become center director. Soukup understood that the center had gone through a troubled period and sensed that it had become "more of a technician operation and a routine monitoring kind of site rather than a research site." He liked a challenge and agreed to take the position. Acting U.S. Attorney Dexter Lehtinen had filed the water quality lawsuit against the state in October 1988 (see chapter 9). Soukup and center staff immediately found themselves caught up in supporting the government position in the case. The center staff was divided in its opinions on whether the lawsuit was a good move or a distraction that kept scientists from other research. In 1990, the research center completed a move from the remodeled Iori building to the former headquarters building of the Nike base, which had been turned over to the park and named the Daniel Beard Center.⁵⁷⁰

The South Florida Research Center achieved some notable results. The work of center scientists was an important factor in convincing Congress to approve the Everglades National Park Protection and Expansion Act of 1989. Studies of the fish and invertebrate populations of the northwest versus the northeast portions of the Shark Slough showed that water flows in the northeast, then outside the park boundary, had seriously declined. Superintendent Finley was then able to use this data to back the

569 SAR, 1978, 1988; Michael Soukup, interview with author, July 25, 2012. James Kushlan believes that PhD scientists who left were replaced with less-credentialed scientists because the latter were less likely to assertively press for science-based management decisions. Kushlan interview.

570 SAR 1988, 1990; Hendrix and Soukup interviews. In the late 1980s, Superintendent Michael Finley removed several center scientists from research-grade evaluations because the system did not provide credit for center-published technical reports. Research Dir. Gary Hendrix to Program Managers, June 29, 1987, EVER-00470.

argument that the East Everglades needed to be added to the park and water flows there restored.⁵⁷¹

In 1991, the NPS announced a reorganization of the research center along functional lines. The new program areas were:

- Inventory and monitoring
- Data management
- Ecosystem analysis and modeling
- Resource management and science applications
- Research administration

Funding for the center had risen only to \$1.8 million by 1991. The park repeatedly requested a base funding increase for the center of at least \$1.1 million, but was unsuccessful.⁵⁷²

The scope of the center's responsibilities evolved during its first 15 years. The bulk of its research was conducted within Everglades National Park, but it also served Biscayne, Big Cypress, and Fort Jefferson. By the late 1980s, both Biscayne and Big Cypress had added scientific positions, and the center was focused almost exclusively on Everglades. As previously stated, there is considerable overlap between natural resource management and research, especially in the realm of inventory and monitoring. When the center was first established, resource management remained within the resource and visitor protection division. In the late 1980s, the park's resource management program was largely folded into the center, in a three-year process that was completed in early 1990. Because of the fuzzy line between resource management and research, superintendents had some leeway in allocating the center's funding. From time to time, there have been charges that too much of the center's time was devoted to resource management or that center funding for inventory and monitoring was diverted to the resource and visitor protection division, but not actually so used. In early 1993, for example, Nathaniel Reed observed "Funds intended for research were diverted to ranger and visitor protection. Researchers' time was diverted to resource management tasks."⁵⁷³

The center and its scientists played an important role in a major 1989 gathering of Everglades scientists, which resulted in a ground-breaking Everglades publication. Sponsored jointly by the NPS and the South Florida Water Management District, the week-long Everglades symposium on Key Largo brought together more than 200 scientists. John Odgen, who had returned to the research center from the National

571 William Loftus, interview by author, June 13, 2012; Finley interview.

572 SAR 1992; SFRC, Target Park Initiative for FY92 Funding Increases, revised Oct. 1, 1991, EVER-1707.

573 SAR, 1987; Nathaniel Reed to SOI Bruce Babbitt, Feb. 3, 1993, NPR papers, box 5.

Audubon Society, and Steven M. Davis of the district cochaired the event. In Ogden's words, it was "the first really large-scale organized effort to pull together all of the scientists who had worked in the Everglades and to really understand what we know and do not know about the system." Papers from the symposium were published in 1994 in *Everglades: The Ecosystem and Its Restoration*, edited by Ogden and Davis. The book had a strong interdisciplinary approach and was a milestone in advancing understanding of the ecology of the Everglades.⁵⁷⁴

The Advent of the National Biological Survey

President Bill Clinton's Secretary of the Interior, Bruce Babbitt, had some innovative ideas about the role of science in managing public lands. In March 1993, Babbitt announced his intention to create a National Biological Survey (NBS). He saw the NBS as an ecological counterpart to the U.S. Geological Survey (USGS), which long had conducted scientific research in the physical sciences. Among other things, Babbitt wanted to begin a systematic survey of the nation's ecosystems on both public and private land. Biological scientists working for agencies within Interior (the NPS, FWS, etc.) would move into a separate branch, the NBS, making them more independent of managers and better able to carry on research without pressure to support management's views. Babbitt's move produced significant backlash. Leaders of the property rights movement pounced on the idea of government scientists roaming private property to protect endangered species and provoked a storm of protest. Babbitt also failed to adequately consult with congressional leaders on his goals, and Republicans, who took control of the House in January 1995, opposed funding the new agency. Interior renamed the agency the National Biological Service, but this failed to satisfy conservatives. In a compromise with Congress, Interior in 1996 eliminated the NBS as a separate agency and moved its scientists into a new division within the USGS, the Biological Resources Division (BRD).⁵⁷⁵

As a result of the formation of the BRD, most of the scientists at the research center became employees of the USGS, although they remained duty stationed at Everglades. It was in this same period that the South Florida Research Center became the South Florida Natural Resource Center, clearly an attempt to shield it from conservative critics who opposed the idea of Interior doing "pure" research. A handful of scientists, including wildlife biologist Oron "Sonny" Bass, remained as park, rather than BRD, employees. At a national level, some park superintendents complained that

574 Acting Supt. Arnberger to Park Staff, Oct. 6, 1989, EVER-00470; John Ogden, interview by Brian Gridley, Apr. 10, 2001.

575 "Babbitt to Map Ecosystems under New Policy to Save Them," *New York Times*, Mar. 14, 1993; "Panel Backs Big Cuts in Plans for Environment, Safety," *New York Times*, June 21, 1995.

the removal of research scientists to the USGS deprived them of needed expertise to guide their management decisions. As Michael Soukup has pointed out, park superintendents did not always listen to what staff scientists told them, but they certainly did not want to see those positions taken away and placed under another agency. This dilemma was a major impetus for the expansion of the system of cooperative park study units (CPSU) at universities. CPSU's, which later were renamed cooperative ecosystem studies units (CESU), were conceived as a way to provide management-oriented technical assistance to superintendents and take advantage of the extensive resources available at universities. In 1993, center director Soukup spearheaded the formation of a CPSU involving both the University of Miami and Florida Atlantic University.⁵⁷⁶

The Restudy and the Comprehensive Everglades Restoration Plan Shift the Center's Role

The whole saga of the National Biological Survey/National Biological Service/Biological Resources Division was a distraction for the staff at the South Florida Natural Resource Center (SFNRC). At the same time that organizational drama was playing out, Secretary Babbitt was moving to make restoration of the Everglades ecosystem the central environmental priority of the Clinton administration. In 1995, Robert Johnson, a hydrologist who had been at the center since 1983, was named center director. As the Corps of Engineers moved through the reconnaissance and feasibility study phases of the restudy of the Central and South Florida Project, the budget and staff of the SFNRC grew. The park's fiscal year 1997 budget included \$3.36 million for science and natural resource management. From 1996 through 1999, park scientists played important roles in advising on and critiquing the feasibility study, leading to the 2000 enactment of the 2000 of the Comprehensive Everglades Restoration Plan (CERP). The center's role in the development and progress of the CERP is treated in more detail in chapter 28.⁵⁷⁷

Prior to the passage of the CERP in 2000, Congress in 1997 established the Critical Ecosystem Studies Initiative (CESI). CESI was created to support ecosystem restoration throughout South Florida. The Everglades superintendent manages the CESI, which is divided into four program areas:

1. **Baseline Research.** Baseline information helps to determine what should be monitored and factors into simulation modeling.
2. **Long-Term Monitoring.** Projects in this area evaluate the status of particular species and ecosystems, allowing the assessment of changes over time.

⁵⁷⁶ Michael Soukup, interview by author, July 25, 2012; Bass interview.

⁵⁷⁷ SAR, 2003; Robert Johnson, interview by author, Oct. 11, 2012.

3. Simulation Modeling. Predictive modeling is an important tool for planning and evaluating proposed modification to the Central and Southern Florida Project.
4. Environmental Assessments. Employing information and design ideas from the other three program areas, assessments lead to the development of decision-support tools for managers.⁵⁷⁸

The establishment of the CESI and the implementation of the CERP brought an unprecedented level of scientific attention to the Everglades ecosystem. They also brought about a sizable increase in funding for Everglades science. Scientists look back on the early 2000s as halcyon days. Combined CESI and CERP implementation funding reached \$9.5 million in fiscal year 2002, a figure that has not since been reached.

Since 1997, more than 200 projects have been funded through the CESI. NPS staff conduct some of these projects, while many are conducted by the USGS, the EPA, NOAA, the FWS, and scientists from universities. CESI funding was \$12 million in fiscal years 1998 and 1999, which scientists look back on as something of a golden age. Since 2004, funding has been in the \$3.8 to \$4 million range.

By 2003, the center's 70 employees could no longer be accommodated within the park. At the time, NPS policy discouraged new construction in parks for anything but visitor services. The center worked with the Government Services Administration to find space in an office building on Krome Avenue in Homestead. The center completed its move to the new location in May 2003 and held a dedication in July.⁵⁷⁹

Although the South Florida Natural Resource Center continued its many other responsibilities, after 2000, research and monitoring in support of Everglades restoration became its primary focus. As of this writing, the SFNRC receives about \$26 million in funding from operations of the National Park Service (ONPS), CERP, and the Critical Ecosystems Studies Initiative (CESI). ONPS largely funds the natural resource management staff, while CERP funds the ecosystem restoration staff. The CESI funding supports administrative functions and helps fund ecological monitoring and the Office of Ecosystem Restoration. Staff working on ecosystem restoration issues are at Krome Avenue, while those devoted to resource management are at the Beard Center in the park. The physical separation of the resource management staff from the ecosystem restoration staff is less than ideal in terms of casual interactions, those "hallway conversations" prized by scientists for sharing of ideas. The center also has water quality staff at the Arthur R. Marshall Loxahatchee National Wildlife Refuge, marine scientists at the Florida Bay Interagency Science Center on Key Largo (see chapter 13), and staff at Dry Tortugas (figure 11-5, modular laboratory building at Florida Bay Interagency Science Center). Given the nature of the CERP, the ecosystem restoration

⁵⁷⁸ NPS CESI website, <http://www.nps.gov/ever/naturescience/aboutcesi.htm>.

⁵⁷⁹ SAR, 2003.



Figure 11-5. Modular laboratory building at Florida Bay Interagency Science Center

staff has extensive contact with other agencies and spends a fair amount of time on the road. The SFNRC remains by far the largest scientific research operation within the NPS.⁵⁸⁰

As of this writing, the SFNRC is organized into four program areas:

1. Inventory and Monitoring. This program tracks the status and trends of key natural resources: hydrology and climate, vegetation, aquatic resources, and important indicator species.
2. Natural Resources Management Program. The program is concerned with the control of exotic species and the restoration of disturbed areas, notably the Hole-in-the-Donut.
3. Applied Science Program. This program undertakes internal and external research to fill information gaps related to Everglades restoration.
4. Restoration Assessments. The program provides scientific and technical contributions to restoration projects and programs and participates in interagency teams.⁵⁸¹

Much of the work of the SFNRC involves monitoring and assessing various projects aimed at restoring the Everglades. These projects include raising the Tamiami Trail, the operation of stormwater treatment areas, and the projects that are

⁵⁸⁰ Johnson interview; Carol Mitchell, interview by author, June 1, 2012.

⁵⁸¹ Briefing Statement, South Florida Natural Resources Center at Everglades National Park, Jan. 7, 2010, EVER 22965.

part of the Central Everglades Planning Project (CEPP) (see chapter 28). The center continues hydrological and biological monitoring efforts that allow assessments of Everglades restoration efforts. These monitoring efforts focus on water quality, water level, and water flow, as well as fish and macro-invertebrate communities and vegetation communities. The SFNRC also does work on threatened and endangered species, exotic species, and the projected effects of climate changes. Many projects involve the extensive use of computer modeling.⁵⁸²

⁵⁸² U.S. DOI, *Budget Justifications and Performance Information, Fiscal Year 2014, National Park Service* (Washington, D.C.: USDI, n.d. [2013]), 42-45, http://www.nps.gov/aboutus/upload/FY_2014_greenbook.pdf.