



Dr. Jack Engle, on board the NPS vessel Pacific Ranger, uses an Apple computer to determine adequacy of samples taken for monitoring population dynamics of kelp forest organisms in Channel Islands NP. (Photo by D. Gotshall, California Dept. of Fish and Game)

Channel Islands NP Develops Microcomputer Based Info System

By Gary E. Davis

Channel Islands NP began an ambitious natural resources monitoring program in 1980. The basis of the program is a series of 16 research projects. Each project designed a population dynamics monitoring system for a major taxonomic group such as sea birds, island plants, or marine invertebrates. In addition to providing managers with information they need to protect and manage park resources, the monitoring program will satisfy Section 203 (a) of Public Law 96-199, which requires that the status and probable future condition of plant and animal populations in the park be determined and reported to Congress biennially.

At the outset, with normal constraints on manpower and funds, it was apparent that an automated system was needed for managing and analyzing population dynamics data and for preparing species lists and reports. The design of this Resource Information Man-

agement System was the No. 2 priority research project for the monitoring program and its design process followed four steps:

1) definition of the task, 2) selection of available application software (programs) to do the job, 3) selection of hardware available to support the software, and 4) implementation and modification of the selected hardware and software for the specific tasks of the resource monitoring program.

The first three steps have been completed. The fourth step is an ongoing process that integrates the results of the research design studies as they are completed into a unified monitoring program. Minor modifications probably will continue at a low level as long as the system is in use.

Task Definition

Natural resource monitoring at Channel Islands NP requires management of population dynamics data, bibliographic information, and textual material. Data

on the abundance, distribution, reproductive efforts, recruitment, phenology, population age and sex compositions, growth rates, and mortality rates of a diverse assemblage of plants and animals must be stored, manipulated, and retrieved. Taxonomic data for the nearly 2,000 species that occur in the park must be maintained to provide ready reference for scientists and managers, and to produce specialized species lists for individual islands, biogeographic zones, or interpretive programs.

The scientific literature on the park's natural resources is extensive (over 4,000 citations) and is growing steadily. A system for managing this bibliographic information is needed to provide managers with the best available information for timely decisions, and to allow scientists and resource managers to efficiently review previous work on particular resources in the park. Preparation and presentation of professional reports on the status of park resources

requires sophisticated word processing and high quality printing capabilities. In summary, this system must be able to store, manipulate, retrieve, and provide hard copy of digital, graphic, and textual material.

The work environment also is an important aspect of defining the task. Channel Islands NP consists of five islands, isolated from the mainland by 11 to 36 miles of ocean: fully one half of the park consists of submerged lands and waters surrounding the islands. Much of the resource monitoring activity, even of island-based resources, utilizes relatively large NPS vessels, which can provide quasi-reliable electricity and shelter from the weather for extended periods of field work. Under these circumstances, it is desirable and possible to take some aspects of the information management system into the field to evaluate the adequacy of samples or confirm unusual observations without incurring the extraordinary expense of additional field trips. The major data management functions of the system must be self-contained and at least partially portable to provide this capability.

Another factor important to defining the requirements of the system was that little, if any, information would be exchanged with other automated data bases. This system should be able to function as an independent tool as well as being linked with other systems to exchange information.

Selected Software

The nature of these tasks and the anticipated low volume of information indicated that a microcomputer system would be adequate. Hewing to the axiom that simple is best, we set out to select the best available microcomputer software for data management and word processing. Two things overwhelmed us at once: the vast array of inexpensive applications software on the market and the extremely high rate at which it was growing. After struggling for years with massive programs costing hundreds of thousands of dollars, it was astonishing to find similar data management capabilities in programs costing \$90 to \$500!

At this time our system utilizes 10 software packages for data management, modeling, statistical analysis, graphic presentation, and word processing. Three programs were selected initially for data management, and a fourth was added when it became available two years later. The Channel Islands system currently manages data bases with The Data Factory, DB Master, and MDBS. Data bases using dBase II are being developed. These generalized programs range in complexity and capability from extremely simple to sophisticated. They permit resource managers and scientists with little or no computer programming ability to create and use customized data files and reports for their individual needs.

An electronic spreadsheet program, VisiCalc, is used to model boat and visitor use in the park for the monitoring program and has a number of administrative uses as well. Statistical analyses of resource monitoring data are conducted with Microstat, which provides a wide array of descriptive statistics, analysis of variance, correlation and regression, time series, and nonparametric tests. DB Master's Stat Pak has a more limited menu of analyses, but is very convenient for use with data stored in DB Master files and provides most of the standard analyses. The Apple Stepwise Multiple Regression program provides the capability of sophisticated analyses of environmental factors and population dynamics.

In addition to the graphical displays available in these statistical programs, a program called Apple Plot provides the system with the ability to present

data in a variety of graphical formats. Wordstar, with its auxiliary programs, Mailmerge and Spellstar, provide professional word processing capability.

Selected Hardware

In 1980, when the Channel Islands NP Resource Information Management System was being designed, the selection of microcomputer hardware was more limited than it is today. Among the companies that had established reliable reputations and would probably survive long enough to support the resources monitoring program, Apple computers had a clear advantage in the array of available software that would provide future flexibility for the system. Nevertheless, there were several important programs needed for the information system that required a different operating system than that offered by Apple. This problem was solved by placing a Z-80 microprocessor in an Apple II Plus computer to provide both Apple and CP/M operating systems in one machine. Wordstar, Microstat, and dBase II run under CP/M, and the rest of the programs in the information system run under the Apple operating system. Both letter quality and graphics printing were required, and a printer that could withstand the rigors of shipboard operations was needed. These diverse requirements were best met with two printers: one an expensive, complex impact type, a Qume Sprint 5, for office letter quality products, and the other an inexpensive dot matrix type, an Epson MX-80, for shipboard operations and graphic displays. This configuration of hardware: an Apple II computer with a Z-80 microprocessor, four 5 1/4" floppy-disk drives, a high resolution viewing screen, and two printers, supports the application software needed for the Channel Islands NP Resource Information Management System.

System Implementation

Implementation of the information system is progressing slowly as data are acquired and analytical and reporting requirements are defined by the research design studies. Population dynamics data on sea birds, pinnipeds (seals and sea lions), marine invertebrates, marine plants, and fishes presently are managed with DB Master and Data Factory files. These data are analyzed with Microstat and DB Master Stat Pak programs. Parkwide species lists are maintained on DB Master files. A 4,000-entry bibliography on park resources is maintained on an MDBS file. A model for monitoring boating activity in the park runs on VisiCalc. Weather data files are being developed with The Data Factory and DB Master, and dBase II files are being studied for management of vegetation records. The first biennial report to Congress required by PL 96-199 was prepared using Wordstar, and the preparation of a large number of other reports, manuscripts, and correspondence has been facilitated by the system's word processing capabilities.

Park operations beyond research and resource management have benefitted from the establishment of the Resource Information Management System. Property inventories, SCUBA dive logs, and case incident records are managed with The Data Factory and DB Master. Routine status of funds reports are prepared using DB Master, and monthly public use report data are developed and maintained on VisiCalc files. Preparation and revision of lengthy reports and plans have been facilitated by the word processing capabilities of the system. Significant cultural data bases on the park's archeological and historical resources are being prepared for inclusion in the information system. Bibliographic information on cultural resources already has been incorporated.

As the process of translating research results into

management action continues at Channel Islands, the Resource Information Management System will become the focal point of critical decisions involving the future of park resources. While it will be crucial that the system be able to manage the *information*, it will be even more important that park managers and scientists be able to effectively manage the *system*.

The kind of information developed here at Channel Islands NP has the potential of solving one of the National Park's most pressing challenges: how to do more high quality work with fewer people in less time. Today's managers and scientists need to become "hands-on" users of these information systems if we are to keep pace with developments outside of the parks and continue to protect the integrity of park resources.

Davis is Research Scientist at Channel Islands NP