Chaisson, Joseph M.

COASTAL ZONE

INFORMATION CENTER

RECOMMENDATIONS FOR A

MAINE NATURAL AREAS DATA MANAGEMENT SYSTEM

Prepared by

Joseph M. Chaisson,

for the

Data Management Subcommittee

Maine Land and Water Resources Council

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EXECUTIVE SUMMARY

Three current programs focus on conservation of significant Maine natural areas:

* Maine Critical Areas Program (CAP)
* Maine Endangered and Nongame Wildlife Program (ENWP)
* The Nature Conservancy Heritage Program

The Maine Coast Heritage Trust is also concerned with natural areas conservation, but does not produce natural areas data and is primarily concerned with scenic resource conservation.

A review of natural areas data management systems and needs of these programs found the following:

* Few resources are allocated to data management in any program; most resources are allocated to production of new data or to conservation activities; data production and management is well coordinated among the three major programs;

* Basic natural areas data file structure in all programs is quite similar and all organizations operate in an IBM-compatible PC computer environment;

* The TNC Heritage Program is the only fully developed and operational natural areas data management system within Maine natural areas conservation programs;

* The TNC Heritage Program natural areas data management system is well developed and documented; is jointly operated by TNC and state government in 46 states, and interfaces with national and international natural areas conservation programs;

* About 40% of CAP natural areas data is already entered into TNC's Heritage Program data base which is easily capable of current and contemplated CAP data retrieval and analysis requirements;

* D-Base III (used by TNC) and R-Base System V which has been chosen as the Department of IF&W "standard" data base management software are quite similar and compatible data base management systems that run on IBM-compatible MS-DOS personal computers; R-Base System V can read and write D-Base III files;

* The ENWP has much larger files than either TNC or the CAP, and also has substantially more sophisticated data analysis requirements;

* The major problem with current natural areas data management systems is that it is difficult to easily or efficiently determine the presence of all significant areas that have

been identified by all three conservation programs within any given geographic area (for example within or nearby a proposed development project or within a town);

* Compatible automation of natural areas data within all three natural areas conservation programs is an effective pre-requisite to economical production of a text index and map series for natural areas data;

* Because it is well suited to CAP needs and much CAP data has already been entered into the TNC Heritage Program data base, the best and most economical way to automate CAP data is to enter remaining CAP data into the TNC data base and obtain a full set of CAP files from TNC;

* Automation of both CAP and ENWP data necessary to prepare indexes and maps for significant natural areas will require supplemental funding if such indexes and maps are to be produced in a timely fashion.

Based upon these findings, the following actions are recommended:

1. compatible automation of CAP, TNC, ENWP, and MCHT natural areas site data; and

2. preparation, distribution, and periodic updating of an index and map series to facilitate access to appropriate natural areas site information of use to land managers/owners and individuals and organizations involved in the land use planning and development process.

Estimated total costs (beyond current program resources) of these recommendations are:

* One-time, "start-up" costs - $34,095

* Annual costs - $950

INTRODUCTION

The purpose of this project is to analyze and develop recommendations for a natural areas data management system for the Maine Land and Water Resources Council. To do so, the following natural areas conservation programs were evaluated:

* Maine Critical Areas Program (CAP)
* Maine Endangered and Nongame Wildlife Program (ENWP)
* The Nature Conservancy Heritage Program (TNC)
* The Maine Coast Heritage Trust (MCHT)

The following issues were addressed in evaluating the above programs:

1. What data do the above agencies collect and how are they currently managing it?

2. Who are the major users of natural features information? (emphasis on State and local agencies)

3. What are the types of management issues for which users need data and in what format is it most useful?

4. What requirements should the software and hardware of a system meet?

5. How well does the Nature Conservancy's system meet these needs? Should it or another system be adapted or developed for state use and where should it be housed in order to make data readily accessible to users?

6. What is the cost to the State to maintain a computerized natural areas data base?

This project was conducted for the Data Management Subcommittee of the Maine Land & Water Resources Council. Specified natural areas conservation programs and their data management needs were reviewed in detail. Natural areas data users outside the specified programs were interviewed to determine their current and potential needs for natural areas information (see list of persons interviewed in Appendix A). Previous studies addressing natural resources data management in Maine were reviewed (see list in Appendix B).

The first part of this report describes objectives and data management needs of specified natural areas programs. The second part discusses natural areas data management problems and opportunities; and the third part presents recommendations for a L&WRC natural areas data management system. Background information of various types is included in Appendices to this report.

For purposes of this report "natural areas" are defined as sites important to the conservation of plant or animal species or

geologic conditions of national, state, or local significance.

This report concludes that while substantially improved accessibility to natural areas data for users outside State government is desirable, current natural areas program data management plans are already moving towards an effective, compatible data system. The report recommends a number of specific actions (building upon current data management plans) that should create a substantially improved State natural areas data management system.

MAINE NATURAL AREAS PROGRAMS

Maine Critical Areas Program:

The Maine Critical Areas Program (CAP) is authorized by 5 MRSA Sections 3311 - 3315 and housed within the Maine State Planning Office. The CAP legislation charges the SPO with a number of specific tasks:

* Compiling the Register of Critical Areas, "a statewide inventory and an authoritative listing of the natural, scenic and scientific areas of overriding state interest";

* to "establish and maintain the official list of native endangered and threatened plants of the state, the Official List of Endangered Plants; and

* to "develop and maintain the official list of Heritage Coastal Areas", which are "areas containing an assemblage of geological, botanical, zoological, historical or scenic features of exceptional state or nationwide existence".

The CAP statute further states that "the best ways to accomplish the [Critical Areas Program] objectives are through continued implementation of the state's land use laws which guide and control development in all areas of the state, including those listed in the [Register of Critical Areas]", "authorizes the State Planning Office to work with interested landowners on voluntary conservation of these areas", and states that "features identified within Heritage Coastal Areas shall be protected on a voluntary basis", directing that "Government agencies at all levels shall consider the importance of protecting the character of Heritage Coastal areas in land use control and other actions which they take".

The CAP has established detailed internal procedures for preparing the Register of Critical Areas. These procedures have involved establishing five separate but related files of natural sites:

* The Register of Critical Areas",
* Qualified But Not Registered Critical Areas",
* Nominated Critical Areas",
* Field-checked potential critical areas, and
* The Natural Areas Inventory.

Another "file" of sorts containing unchecked "leads" to potential critical areas exists. A considerable number of text reports containing much information about potential critical area topics and sites have been prepared and distributed as part of the process of compiling the Register

of Critical Areas.

The CAP is currently developing procedures for preparing the "Official State List of Endangered Plants" and identifying and listing "Heritage Coastal Areas". It is anticipated that The "Official State List of Endangered Plants" will have four subcategories and will include all species currently identified on the CAP compiled List of Rare Vascular Plants.

The CAP periodically undertakes such related activities as maintaining files from the Maine Rivers Study and undertaking the "organized community" lakes study, a counterpart to the recent LURC Lakes Study for areas outside LURC jurisdiction.

Key existing and prospective CAP data files are described in Table A; sample records from key files are presented in Appendix C. Sites on the Register of Critical Areas, and lists of Qualified But Not Nominated Critical Areas and Nominated Critical Areas are located in a map file of best available USGS topographic maps (7.5' or 15"). Field-checked potential critical areas are not located on these maps.

The CAP has established informal procedures for use of CAP data by DEP, LURC, DOT, TNC, IF&W and the MCHT. Most CAP data files are manual, with the exception of the obsolete Natural Areas Inventory, a text file of entries in the Register of Critical Areas, and a Knowledgeman file of a portion of the Register of Critical Areas. Currently, CAP data is not widely used in community planning and development review outside of state government, primarily because it is not easily obtained.

CAP staff estimate they spend 40% of their time responding to information requests. Information requests are about evenly divided between requests related in some way to conservation of specific natural areas and requests of a general "natural history" nature. Between 10 and 20 requests for information are received each year from regional planning commissions and less than five per year from towns. Automation of CAP natural area files (Registered, Qualified but Not Registered, Nominated, and Field-checked Areas) could improve CAP staff productivity in responding to information requests, and if such files were compatible with files held by the other natural areas conservation programs, retrieval and analysis of information across these programs would become feasible. This could greatly facilitate such CAP responsibilities as identifying Heritage Coastal Areas and facilitating CAP natural area data use in the public "land use control" process.

The annual CAP budget is about $114,000. Federal funding typically supports about 70% of the CAP budget. It is estimated that well under 10% of the CAP budget is allocated to data management.

Table A
Critical Areas Program Data Files

name	format	# records current	# records planned	comments
Register of Critical Areas	disc(1)	580	+20/yr.	
Qualified But Not Registered Critical Areas	manual	52	+5/yr.	
Critical Areas Locations	map (2)			locates areas in above files
Nominated Critical Areas	manual	135		
Field-checked Potential Critical Areas	manual	250		
Leads to Potential Critical Areas	manual	several hundred		various forms: letters, tel. conv. notes
Natural Areas Inventory	mag. tape	about 1500		last updated in 1980
List of Rare Vascular Plants	manual	about 300		annual update by TNC/CAP
National Natural Landmarks	manual	15		
State Endangered Plants			about 300	not compiled; will have 4 categories
Heritage Coastal Areas (3)				not yet compiled
Lakes (3)				not compiled; similar to LURC inventory
Rivers	manual			back-up files from Maine Rivers Study

Notes:

(1) The critical areas register was placed in Wang word-processing files when originally established. When the SPO converted from Wang wordprocessing equipment to IBM-compatible work stations, the Wang text file of CAP register entries was converted to an IBM readable text file. A portion of this text file was subsequently placed in a Knowledgeman data base system file. Conversion of data from the IBM-compatible text file to the Knowledgeman file requires considerable new work on each entry. CAP program staff have not experimented with the portion of the Critical Areas Register that has been placed in a Knowledgeman file.

(2) Areas are located on 7.5 quadrangles where available, otherwise on 15' quadrangles.

(3) These files were or will be prepared in cooperation with other L&WRC agencies.

Endangered and Nongame Wildlife Program:

The Maine Endangered and Nongame Wildlife Program (ENWP) was established in 1984 by the Department of Inland Fisheries and Wildlife (IF&W), the agency responsible for managing and protecting all wildlife species in Maine. Goals of the ENWP are to maintain or enhance Maine's nongame wildlife populations, to ensure a continuation of current levels of wildlife diversity and abundance, and to increase public enjoyment of nongame species. Nongame wildlife includes all unconfined terrestrial, freshwater, and saltwater species which are not ordinarily collected, captured, or killed for sport or profit. In addition, the ENWP is specifically charged by statute to "Maintain a list of all species....designated to be endangered or threatened,...specifying over what portion of its range each species so designated is endangered or threatened". The ENWP is supported by voluntary contributions to the Endangered and Nongame checkoff on Maine's income tax return as well as other state, federal, and private funds and volunteer resources. Upon being established, the ENWP assumed responsibility for a number of previous IF&W programs concerned with management of specific species and habitats, including the Bald Eagle, Piping Plover, Peregrine Falcon, and sea-bird nesting islands.

One difference between the ENWP and both CAP and TNC is that it is charged with conserving both rare and common non-game species, while these other natural area programs are oriented towards conservation of rare features.

The ENWP inherited data files from previously existing wildlife programs it took over. These files are described in Table B (sample records of key files are presented in Appendix F). The ENWP will design a new data base and file structure to support long-term program needs and is waiting for the results of this study to do so. Both existing files

and new data will be incorporated into the new ENWP data base. Both current and prospective ENWP data files are based upon three basic record types:

* species occurrance records (species type, date of observation, location, abundance, etc.),

* information on sites of certain species occurrence observations (for example, geographic location, bounds, elevation, cover-type, ownership, etc. for a seabird nesting island), and

* areas of concentration of species occurrence observations (for example as mapped in the current Penobscot Bay Coastal Habitat Inventory).

ENWP activities will involve the preparation (over time) and updating of management plans for most threatened and endangered wildlife species. Preparation of these plans requires long-term collection and considerable analysis of species occurrence records. Specific ENWP data analysis requirements include statistical tests, modeling of wildlife populations and habitats, investigating different aspects of population dynamics, and in-depth investigation of radio-telemetry and biological data. The ENWP also plans to identify and prepare management recommendations for critical Maine ecosystems essential to conservation of threatened, endangered, and common nongame wildlife species. Together these program needs require a much larger data base and considerably more sophisticated data analysis than occurs within the Critical Areas Program and TNC Heritage Program.

The Department of IF&W recently conducted a comprehensive study of its data processing needs (the Compumed Study), resulting in Departmental policies to decentralize much data processing, adopt IBM-compatible PC's as standard workstations, and select R-Base System V as standard data management software. R-Base System V was selected over D-Base III because it is somewhat more "user friendly" while having essentially the same capabilities.

The ENWP has requested permission to obtain an IBM PC AT with 30MB hard disk drive, math coprocesser, and streaming tape drive, along with R-Base System V, and SAS (statistical analysis) software. Current plans are to establish a new data base system for ENWP on the PC AT using R-Base System V. R-Base System V will be used because it is the Department standard and to ensure easy access to ENWP data by others within IF&W and compatibility with other IF&W data files. Currently automated ENWP data files are in SAS data sets that are readily transferable to R-Base. Primary IF&W users outside the ENWP will be regional biologists. These biologists have broad wildlife-related natural areas conservation responsibilities ranging from DEP and LURC

development permit reviews, to assisting municipalities in land use planning and development review and working with land owners/managers to ensure conservation of wildlife resources. Design and implementation of this new data base are "on hold" pending review of the results of this report to ensure compatibility of the new ENWP data system with a state natural areas data management system. At current funding levels, it will likely be at least three years before the ENWP data base is established and fully populated with existing data.

At the present time, "outside use" of ENWP data occurs primarily through through development reviews conducted by IF&W regional biologists and production and distribution of reports like the Penobscot Bay Coastal Habitat Inventory.

The annual ENWP budget is about $200,000. About one-half of these funds are from the Maine Income Tax "check off", with the remainder from various federal and private grants and contracts. It is estimated that well under 10% of the annual ENWP budget is allocated to data management.

Table B
Endangered and Nongame Wildlife Program Data Files

name	format	# records current	# records planned	comments
Coastal Islands	manual & SAS sets	10,000	25,000	
Eagle Nests	manual	5000 - 10,000		
Endangered Species/ Critical Habitats	manual	about 5000		Various disjointed files
Coastal Habitats	50% SAS 50% other automated files	40,000	100,000	Coastal habitats is only one of a number of anticipated ecosystem files; site data plus area data in mapped form

The Nature Conservancy Heritage Program:

The Nature Conservancy was established to "conserve biodiversity by establishing natural area preserves". The Heritage Program was established within TNC to gather and organize the scientific information necessary to prioritize TNC activities.

The Heritage Program is a natural areas data base system designed to meet both national (and international) and state program biological conservation needs. The system was designed, is supported, and is reviewed and updated quarterly by national TNC staff. Cooperative TNC/state government Heritage programs are underway in about 46 states. TNC wholly operates Heritage Programs in most other states.

The Heritage Program data management system consists of four major components:

1. Element files - the classification system, element (species or community) abstracts, and element manual files which together describe the "target" elements for Heritage inventory;

2. Element occurrence (EO) file - which stores species occurrence data in map, manual, and computer formats;

3. Managed area (MA) file - which organizes information on publicly and privately-owned areas within Maine that offer some degree of natural feature protection; and

4. Source file - which documents inventory information sources (for example CAP reports that document a site's features or significance).

Maine Heritage Program automated files run on an IBM PC AT with 30MB hard disk using D-Base III data management software. This system is located in the TNC Maine Chapter office in Topsham and can be linked when necessary by modem to national program systems.

The Heritage Program data management system has well developed and documented procedures for manual file creation, automated data entry and verification, data plotting on map files, and data documentation.

Status of current Maine Heritage Program files is shown in Table C. Heritage Program element occurrence (EO) and managed area (MA) records closely parallel basic ENWP species occurrence and occurrence site records. Critical areas (as contained in any of the four CAP "critical area" files) require a managed area (MA) and at least one species element occurrence (EO) record when placed in Heritage Program files. Element occurrence (EO) and managed area (MA)

files are interactive, allowing easy retrieval of all records that list features of a CAP "critical area". To date, TNC has incorporated much CAP critical areas data (about 40%) into its data base. The TNC data base does not currently include any information on abiotic natural areas (for example, significant geologic sites) but its file structure is easily adaptable to doing so. Most TNC natural areas data addresses sites with point locations. Sample Heritage Program file records are presented in Appendix D.

TNC receives regular requests (about two per week) for natural area and rare species information. Outside requests come from DEP, DOT, private consulting firms, and towns. Outside requests are about equivalent in number to internal TNC program requests for Heritage Program information. TNC has discussed making Heritage Program information available to DEP, LURC, and DOT. DOT now maintains a map file of Heritage Program natural area sites. No agreements have been established with LURC or DEP as yet for use of Heritage Program information.

The Heritage Program has provided substantial data and staff time to support listing of endangered vertebrate species by the Endangered and Nongame Wildlife Program; the LURC lakes study, the SPO Cumulative Impact Study, and to prepare annual listings of updated rare plant information for the Critical Areas Program.

Heritage Program professional staff time and budget are predominantly allocated to adding new data and updating existing data within the Heritage Program data base. This work is coordinated with similar work undertaken by the CAP and ENWP to avoid duplication of effort.

The TNC Heritage Program annual budget is about $90,000. The Maine Heritage Program is at present wholly funded by TNC and not jointly funded with state government as is the case in most other states. It is estimated that about 25% of the annual Heritage Program budget is allocated to data management.

Table C
The Nature Conservancy Heritage Program Data Files

name	format	# records current	# records planned	comments
Element Tracking	disk			
Element Occurrance	disk & map	1149	about 2000	basic "site" file
Managed Area	disk & map	25	about 1000	this file will include all properties that by virtue of ownership or management offer potential to conserve natural areas, for example: Registered Critical Areas, TNC and MAS preserves, state and federal public lands, etc.
Element Global Ranking	disk			
Element State Ranking	disk			
Vertebrate Character-ization Abstract		0	300 - 400	No Maine data has yet been entered
Source Abstract	manual	250	?	bibliographic sources for data in other files

The Maine Coast Heritage Trust:

The mission of the Maine Coast Heritage Trust is to conserve lands that essential to protecting the vital natural resources and special character of Maine, most particularly its coastline and islands. The MCHT works directly with landowners and also provides staff support for the formation and initial operation of community land trusts with similar goals to those of MCHT.

MCHT has a map file showing selected information about public and private conservation ownership along the coast. This information is plotted on copies of USGS 7.5' topographic maps. This is a "one-time" file with no current plans or resources for updating.

Ready access to CAP, ENWP, and TNC natural areas data would benefit MCHT by helping set priorities for potential easement sites and helping document "public values" of potential easements for tax purposes. MCHT, like the CAP is concerned with scenic resources.

PROBLEMS AND OPPORTUNITIES

Natural Areas Data Use:

Natural areas data use falls into three general areas:

* use within natural areas conservation programs;

* use by land owners/managers (public and private); and

* use by parties to the development process (developers, consultants to developers, municipal and state land use planning planning and development review activities, and regional planning commissions).

While data use within and among natural areas conservation programs can be improved, this is where most data held by these programs is used and such use occurs without major problems - largely because natural areas conservation program staff are generally well aware of each other's data holdings, coordinate their data collection and updating efforts, and frequently work together on joint projects. The relatively recent establishment and evolution of TNC's Maine Heritage Program has also helped sharpen the focus of natural area conservation programs on systematic organization, automation, and application of their data.

Compatible automation of species occurence and "site" data within the natural area conservation programs would provide a number of benefits:

* productivity of existing program resources would be somewhat

improved (productivity gains in this area depend upon program tasks and would be difficult to accurately estimate);

* Inter-program data access would become substantially easier; and

* Potential for retrieval and analysis of data across programs would greatly improve. For example, tasks like preparing a township-based index of natural area sites identified by any of these programs which would today be quite difficult and expensive, would become easy and inexpensive.

Existing and potential natural areas data users outside natural area programs are land owners/managers, and those involved in the development process: developers (public and private), community planning and development review activities, regional planning commissions, and state development review agencies (DEP and LURC). Parties to this process have substantially different data needs than do natural areas program managers, focusing on:

* location of natural area sites that should be considered by land managers and developers; and

* Information concerning the management needs of such sites.

Thus, while such users generally do not need access to the detailed species occurance and site data forming basic files of natural areas conservation programs, they do need to easily find out where such sites are and more importantly they need specific management information - which generally must be provide by appropriate natural areas program staff.

Because comprehensive natural areas information is not easily accessible to users outside natural areas programs, it is not widely used beyond state development review activities. ENWP data is available to regional IF&W biologists who review LURC and DEP development applications. LURC screens applications for potential impact on Registered Critical Areas, using a township index and associated site maps. DEP development project managers are responsible for selecting projects to be reviewed by the CAP. This screening is less than systematic. DOT has prepared a map file of Registered Critical Areas and Heritage Program natural area sites and uses this file in highway project planning.

To obtain natural areas information from any Maine natural areas programs, land owners, developers, or town planning and development review activities must know about these programs and make specific, direct information requests. This does not routinely occur today. Interviews with a number of these "outside" users identified a priority need for township-based index and map series for all known natural area sites (all sites would be listed in the index and non-sensitive site location would be shown on the maps). Such indexes and maps are essential to providing outside users adequate access to the natural areas

information they should be considering in the course of their activities. To adequately serve the outside user community, indexes and map sets should be distributed to at least DEP, LURC, DOT, SPO, IF&W, and the regional planning commissions. The regional planning commissions could make this information available to municipalities and developers as needed.

It is important to note that better access to natural areas information will substantially increase requests for information on why such areas should be conserved and how their management needs.

Data File Compatibility

Standard state codes have been used, where appropriate, in all existing natural area data files. TNC Heritage program file structure for element occurance (EO) and managed area (MA) data files, analysis, and reporting capabilities will easily accommodate data in all CAP natural area files that should be automatedas well as CAP data analysis and reporting requirements. Some minor changes to TNC file structure may be necessary to ensure CAP data could be readily retrieved as desired from TNC files if CAP files were to be entered into TNC files. For example, a field for coding of the status of non-registered sites might need to be added.

R-Base System V can read and write D-Base III files, so combined use of or transfers of information between TNC Heritage Program, CAP Heritage Program-based, and ENWP natural area files should be easy. D-Base III and R-Base System V data management software are widely used programs on MS-DOS/IBM compatible personal computers, which have become a de-facto industry standard. Thus, data files established on this software will likely be widely compatible with related current and future PC-based data files. Current ENWP data in SAS data sets is readily convertible into R-Base System V files.

State Geographic Information System Development

MEGIS, an automated state geographic information system being developed jointly by the Department of Conservation and the University of maine is described in some detail in the Phase One Study on a State Groundwater Data Management System (currently being prepared for the Data Management Subcommittee of the Land and Water Resources Council). At the present time system capabilities are limited to simple automated cartography tasks. Overlay analysis of different geographic data sets is not possible; such sets can however be merged and jointly plotted.

Basic requirements for data file compatibility with MEGIS are that records have a unique identifier and be geographically coded. TNC data files meet this requirement as do planned ENWP automated data files. As MEGIS develops more sophisticated analysis capabilities and as its costs decline, considerable potential exists for using MEGIS to analyze and map natural areas

information.

The natural areas mapping project proposed as part of the natural areas data management system recommended in this report was costed out both as an intern project and using MEGIS. Results of this analysis were as follow:

method	initial maps	annual update
intern (1:50,000)	$ 2,595	$ 950
MEGIS (1:50,000)	12,995	12,145
MEGIS (7.5' & 15')	87,002 (1)	66,080

note:

(1) This figure is for 472 maps and includes $16,362 for the purchase of new base map materials.

Because the proposed maps are very simple to produce and map originals could be easily updated by adding new points, they are less expensive to produce and update manually. No new digitized natural areas information would be created by producing the maps through MEGIS beyond location information that would already exist in existing TNC and proposed CAP and ENWP automated files.

To ensure future compatibility with MEGIS, design of the new ENWP data base and modification of TNC data file structure to accommodate CAP needs should be coordinated with MEGIS managers.

Policy and Program Issues Encountered -

A number of policy and program issues were encountered in the course of this study. While it is beyond study objectives to address these issues, they are worthy of mention and should be addressed in some other appropriate forum:

* Implementing the proposed natural areas data management system will provide much better and broader access to information about the presence of significant natural areas, which will in turn likely lead to a dramatic increase in demand on all three natural areas conservation programs for information on managing specific sites. Meeting this increased demand may well require changes in program structure or increases in program support.

* While current state growth management program studies are contemplating requiring more formal consideration of significant natural areas in the land use planning and development review process, state financial support for natural areas programs is less than solid. The TNC Heritage Program is completely funded by private sources and the CAP

and ENWP prgrams are heavily dependent upon non-state funding.

* Strong inter-relationships exist between Maine's three natural areas conservation prgrams. As more focused state policy regarding conservation of significant areas evolves in the context of state growth management policy, review of the structure of and relationship between these programs may be necessary to ensure optimal state natural areas conservation.

FINDINGS

* Few resources are allocated to data management in any program; most resources are allocated to production of new data or to conservation activities; data production and management is well coordinated among the three major programs;

* Basic natural areas data file structure in all programs is quite similar and all organizations operate in an IBM-compatible PC computer environment;

* The TNC Heritage Program is the only fully developed and operational natural areas data management system within the three Maine natural areas conservation programs;

* The TNC Heritage Program natural areas data management system is well developed and documented; is jointly operated by TNC and state government in 46 states, and interfaces with national and international natural areas conservation programs;

* About 40% of CAP natural areas data is already entered into TNC's Heritage Program data base which is easily capable of current and contemplated CAP data retrieval and analysis requirements;.

* D-Base III (used by TNC) and R-Base System V which has been chosen as the Department of IF&W "standard" data base management software are quite similar and compatible data base management systems that run on IBM-compatible MS-DOS personal computers; R-Base System V can read and write D-Base III files;

* The ENWP has much larger files than either TNC or the CAP, and also has substantially more sophisticated data analysis requirements;

* The major problem with current natural areas data management systems is that it is difficult to easily or efficiently determine the presence of all significant areas that have been identified by all three conservation programs within any given geographic area (for example within or nearby a

proposed development project or within a town);

* This problem could be alleviated by production, distribution, and regular updating of a text index and map series for significant natural areas;

* Compatible automation of natural areas data within all three natural areas conservation programs is an effective pre-requisite to economical production of a text index and map series for natural areas data;

* Because it is well suited to CAP needs and much CAP data has already been entered into the TNC Heritage Program data base, the best and most economical way to automate CAP data is to enter remaining CAP data into the TNC data base and obtain a full set of CAP files from TNC;

* Automation of both CAP and ENWP data necessary to prepare indexes and maps for significant natural areas will require supplemental funding if such indexes and maps are to be produced in a timely fashion.

PROPOSED MAINE NATURAL AREAS DATA MANAGEMENT SYSTEM

A much improved Maine natural areas data management system could be established by taking two steps:

1. compatible automation of CAP, TNC, ENWP, and MCHT natural areas site data; and

2. preparation, distribution, and periodic updating of an index and map series to facilitate access to appropriate natural areas site information of use to land managers/owners and individuals and organizations involved in the land use planning and development process.

Benefits -

This improved data management system would produce a series of benefits:

* Natural areas conservation program staff productivity would improve in tasks involving data handling and analysis (responding to information requests, etc.). This improvement would not likely be large, but should result in some increase in success accomplishing program goals. Also, substantially less staff time would be allocated to answering requests concerning location of natural areas.

* Significant natural areas would receive considerably more attention in state development review activities. This would occur because all projects could quickly be screened for potential impact on areas identified by all three natural

areas conservation programs. Thus all projects could be screened (not current practice) and all categories of areas considered (also not current practice).

* Municipal planning and development control activities could consider impact on significant natural areas within their community. Such consideration would be far from uniform, but it would at least become practical for communities that wish to do so. Community land trusts would also benefit from access to comprehensive natural areas locational information within their area of interest.

In aggregate, these benefits should substantially improve conservation of significant Maine natural areas.

Recommendations -

To establish such a system, the following specific actions are recommended:

1. Maine Critical Areas Program natural area data files should be automated using The Nature Conservancy Heritage Program data base management system (using D-Base III data management software). This should occur within twelve months to facilitate timely creation of comprehensive natural areas indexes and maps.

2. Endangered and Nongame Wildlife Program automated data file structure should be designed for optimal compatibility with the Heritage Program data management system. These files should use R-Base System V data management software (as planned) to ensure compatibility with other IF&W data and users. The ENWP data base should be established and populated with existing data within twelve months to facilitate timely creation of comprehensive natural areas indexes and maps.

3. The SPO should create and regularly update a significant natural area index file and accompanying map series for distribution to state regulatory agencies, regional planning commissions, public land managers, and other similar users. CAP, TNC, and ENWP managers should review how "sensitive" information should be presented in such a "user's" index.

4. File structure design for the Endangered and Nongame Wildlife Program and revisions to TNC file structure to accommodate CAP files should be coordinated with Department of Conservation geographic information system (MEGIS) managers to ensure that these files could use current and potential MEGIS capabilities.

5. The CAP/L&WRC lakes study should use the LURC lakes data base (which runs on R-Base data management software) to ensure compatibility with existing LURC lakes data files and ability to use analytic procedures developed in the LURC

study.

6. State government should allocate necessary funding to improve natural areas program data management if such programs are expected to provide sufficient natural areas information to those needing it to conserve such areas.

Implementation costs -

Estimated costs (beyond existing program commitments) to implement the recommended natural areas data management "system" are:

1. Automating Critical Areas Program natural area files:

   * Hardware -

     IBM/AT&T "PC" workstation with 20MB hard disk $2000

   * Software -

     D-Base III+ 400

     total $2400

2. Automating Critical Areas Program natural area files, to include modification of TNC file structure as necessary, preparation of data for entry, data entry, data editing, plotting of sites on master quadrangle file, delivery to the CAP of all Maine element occurence (EO) and managed area (MA) files pertaining to CAP identified natural areas, and training CAP staff to manipulate and retrieve records from these files:

   * estimated cost $10,000

3. Designing a data base system for the Endangered and Nongame wildlife Program and fully populating this system with existing data, to include data base design, report programming, transfer of existing automated files into the system, and data entry of existing manual files. This system would be modeled on the TNC Heritage Program and would run on R-Base System V.

   * estimated cost $19,100

4. Initial preparation and distribution of a significant natural areas index and reproducible map file (using state 1:50,000 base map series) locating natural areas on combined user's index and printing and distributing indexes and map sets to:

   * DEP
   * LURC

* SPO
* IF&W
* RPC's (full set for their planning areas)
* DOT

* Intern contract (cartographic labor)	$1500
* Cartographic base materials & copying	1095
Total	$2595

5. Annual updating of user's index and map series:

* Intern contract (cartographic labor)	$700
* Map & index copying & distribution	250
Total	$950

Estimated total system "incremental" cost:

* One-time, start-up costs	$34,095
* Annual cost	$950

APPENDICES

APPENDIX A

Persons Interviewed:

Name	Organization
Hank Tyler	State Planning Office, Critical Areas Program
Bob Mayer	State Planning Office
Paul Dutram	State Planning Office
John Albright	The Nature Conservancy, Heritage Program
Amy Forrester	The Nature Conservancy Heritage Program
David Dominie	DEP, Land Bureau
David Studor	DEP, Land Bureau
Tom Radsky	LURC, Division of Development Review
Fred Todd	LURC, Division of Planning
Bill Reed	Maine Dept. of Transportation
Dywane Scott	MDOT
Val Wood	Bureau of Data Processing
Janet MacMahan	Maine Audubon Society
Nancy Anderson	Maine Audubon Society
Alan Hutchinson	Dept. of IF&W, Non-game Wildlife Program
Art Ritter	Dept. of IF&W
Gary Donovan	Dept. of IF&W
Jay Espe	Maine Coast Heritage Trust
Marc Loiselle	DOC, Maine Geological Survey
Steve Dickson	DOC, Maine Geological Survey
Bob Tucker	DOC, Maine Geological Survey

Don Meagher	Eastern Maine Development Corp.
Pat Jennings	Eastern Mid-coast RPC
Madge Baker	Southern Maine RPC
Gwen Hilton	MACC
Ron Kreisman	NRCM
Riche Rothe	Maine Tomorrow

APPENDIX B

Reports Reviewed:

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1. Maine Land & Water Resources Council, Recommended Improvements in Computerized Management of Natural Resources Information, Augusta, ME, January, 1980.

2. Gary Higginbottam, Arthur Lerman Associates, Report on Estimated Costs and Responsibilities Associated with Adoption of the Nature Conservancy Heritage Inventory System by the State of Maine, Augusta, ME, June, 1982.

3. Maine Land & Water Resources Council, Phase I Study, State Groundwater Management System, Synopsis of Findings (Draft), Augusta, ME, 1986.

4. Maine Land & Water Resources Council, Investigation Into the Feasibility of Establishing a Natural Resources Geographic Information System for Maine, Augusta, ME, March, 1978.

Qualified but Unregistered July 21, 1978

U

Register of Critical Areas

The State Planning Office is charged with administering the Critical Areas Act. For further information, please contact the State Planning Office, Critical Areas Program, 189 State Street, Augusta, Maine, 04333, Telephone (207) 289-3155.

1. Name Nesowadnehunk Falls

2. Critical Area Number 10

3. Location

A. Piscataquis County
B. Township of T2 R10
C. Minor Civil Division Code Number - 21838
D. U.S.G.S. Quadrangle Harrington Lake 15"
E. Latitude 45° 50' 40" Longitude 69° 2' 0"

4. Owner's Name and Address

Mr. J. R. Goody, Manager
Timberlands and Forestry
Great Northern Paper Company
Millinocket, ME 04462

5. Boundaries and Size of the Area

Nesowadnehunk Falls is on the West Branch of the Penobscot River in T2 R10 Township and is located about 0.8 kilometers (0.5 miles) west of where Nesowadenehunk Stream meets the West Branch of the Penobscot.

The boundary of the critical area is defined by a circle of 150 meter (492 feet) radius circumscribed around the center of the largest (2 meter-6.6 feet) drop (see map). The total area of the critical area is about 7 hectares (17.5 acres).

6. A Description of the Area Including a Listing of its Unusual Qualities and the Reason(s) for its Inclusion on the Register

Nesowadnehunk Falls is a broad, horseshoe shaped falls with a drop of about 2 meters (6.6 feet). The flow of the River through the critical area is several thousand $ft.^3/sec.$ and is dependent on the regulation at Ripogenus Dam. The water color at the site is brown and odorless.

Date:

Nomination

The Maine Register of Critical Areas

1. Name Green Mountain Rare Plant Station

2.

3. Location

A. Somerset County
B. (Town) Comstock T.4. R.18)
C. Minor Civil Division Code Number -
D. Latitude: 45° 58' 00" Longitude: 70° 04' 30"
E. USGS Quadrangle: Penobscot Lake 15' (1956)

4. Owner's Name and Address

Great Northern Paper Company
Woodsland Department
Millinocket, Maine 04462

5. Boundaries and Size of Area

The critical area is located on the southeast slope of Green Mountain in Comstock (T.4 R.18). The boundaries of the critical area include about 600 acres and the boundaries are shown on the attached map.

6. A General Description of the Area Including a Listing of its Unusual Qualities and the Reason(s) for its Inclusion on the Register

As one travels west along the Golden Road to a point where Green Mountain is closest to the North Branch of the Penobscot River and the road, a large cliff face becomes visible. The exposed bedrock was described by St. John and Nichols who visited the area in 1916 as, "clay slate ledge". The cliffs nearest the road were explored gain in the summer of 1983 by Vickery (CAP), Campbell, Crosely and Eastman. They discovered Slender Cliff-Brake (Cryptogramma stelleri) a small rare fern never reported by the previous botanical expedition (1916). Cryptogramma stelleri is currently known only from Green Mountain and West Paris in Oxford County.

Slender Cliff-Brake is a very rare fern in Maine that is found in limestone areas. At Green Mountain, this fern grows on the limestone ledges on the south side of the mountain. There were an estimated 100+ individuals of the Slender Cliff-Brake in numerous clumps on the ledge.

For further information on the Slender Cliff-Brake, see the planning report by L. M. Eastman.

Field Data Form site

SITE SURVEY SUMMARY

Site Name: Crooked River - Ryefield Cem.

Quad Name: Norway

Quad Code: _____ 10/10 locator: _____

State: Me. County: Cumberland

Town: Otisfield / Harrison
or
Township/Range/Section: _____

Field Quad Margin #: _____

Source of lead:

Amy Forrester

Site Visit Chronology

Date: 2 Jy 86 Time: 11:00 to 1130 Source Code: F86R0020

Surveyor(s): Rooney & Forrester

Date: _____ Time: _____ to _____ Source Code: _____

Surveyor(s): _____

Date: _____ Time: _____ to _____ Source Code: _____

Surveyor(s): _____

Date: _____ Time: _____ to _____ Source Code: _____

Surveyor(s): _____

Date: _____ Time: _____ to _____ Source Code: _____

Surveyor(s): _____

Other individuals knowledgeable about site and/or EO's: Amy F.

Current use of site: Forestry

Tract ownership or managed area name (names, addresses, phone #). Continue on last page for others.

INDEX

List all listed species/communities sought, found, or reported from site.

Element Name	Code on Base Map	Occ.#	Date: 2 Jy '86 Found?	Transcr/ Updt?	Found?	Transcr/ Updt?	Found?	Transcr/ Updt?	Found?	Transcr/ Updt?	Found?	Transcr/ Updt?	Revisit needed? When?
Isotria medioloides		011	yes										

NATURAL AREAS INVENTORY

DATE: 5/19/78

NATURAL AREA IN ST GEORGE IN KNOX COUNTY

NATURAL AREA # 420 NAME ALLEN ISLAND
LATITUDE 43-52-00 LONGITUDE 69-19-00
COASTAL ISLAND # 63840
ESTIMATED ACREAGE: 420.0
OWNERSHIP: PRIVATE

BRIEF DESCRIPTION:
A LARGE UNDEVELOPED OFFSHORE ISLAND IN MUSCONGUS BAY THAT IS A REPORTED SITE OF CRONBERRY. PRIMARILY COVERED WITH SPRUCE.

VERIFICATION: BY CORRESPONDENCE/TELEPHONE-SPO

ESTIMATE OF SIGNIFICANCE: REGIONAL
DATA SOURCES: NATURAL AREAS INVENTORY 1971
SPO;ED MYERS OF ABONDONED FARMS IN SO BRISTOL
CRITICAL AREA: NO

EXTENT OF INFORMATION AND LOCATION:
MAPPED 1971 COMPLETED: 76-78 UPDATE SPO NAT AREAS

FIELD CHECKING: NO

CONTACT:
NAME: ED MYERS ADDRESS: ABONDONED FARMS
TOWN: SOUTH BRISTOL STATE: ME ZIP CODE: 04568 PHONE: 563-3935

MAJOR TYPE: BOTANY
GENERAL TYPE: RARE PLANT COMMUNITIES

DATE OF ENTRY: 6/21/77

Lead

Hank Tyler

State Planning Office

Critical Areas Program

189 State St.

Augusta, Maine 04333

Dear Hank,

You may be interested in the following find:

Gentiana crinita Froel.

York, York County.

old pasture, Route 1., just north of Berry Hill Farm on right going north. This land is owned by Central Maine Power of York. Fred Mathews, Manager, says the C.M.P. plans to build on this land on higher ground. There are thousands of gentians on the lower land. On the higher and drier ground I found and collected Aster laevis, also. I plan to put the specimens in the herbarium at U. of New Hampshire. Date: Sept. 26, 1986.

Also found a dead deer on the land.

Best wishes,

C. Paul Wight

23 Fort Hill Ave.
Old Orchard Beach, Maine 04064

Tel. 934 2015 - or 934 2844

C Paul Wight

The Nature Conservancy Heritage Program
File Descriptions and Selected Sample Records

ECCODE: [_____.___]
NAME: [_____]
COMNAME: [_____]
MARGNUM: [_____] TENTEN: [_____] EDENT: [__] EORANK: [___]
ECRANKCOMM: [_____]
SURVEYDATE: [____-____] LASTOBS: [____-____] FIRSTOBS: [____] GRANK: [_____]
SRANK: [_____] STATE: [ME] COUNTYCODE: [____ ____ ____ ____]
COUNTYNAME: [____ ____ ____ ____]
QUADCODE: [_____]
QUADNAME: [_____] PRECISION: [__]
LAT: [_____] LONG: [_____] S: [_____] N: [_____] E: [_____] W: [_____]
TOWNCODE: [_____]
TOWNNAME: [_____] RPC: [__] WMU: [__]
COASTALREG: [____] CAPNO: [____] PHYSPROV: [__] WATERSHED: [_____]

DIRECTIONS: [_____]
[_____]
[_____]

GENDESC: [_____]
[_____]
[_____]

ELEV: [_____] SIZE: [_____]

EODATA: [_____]
[_____]
[_____]
[_____]

COMMENTS: [_____]
[_____]

MACODE1: [_____] CONTAINED1: [__] MACODE2: [_____] CONTAINED2: [__]
MACODE3: [_____] CONTAINED3: [__] ADDLMAS: [__] MORELAND: [__] MOREPROT: [__]
MOREMGMT: [__] SITECODE: [_____.__]
SITENAME: [_____]
OWNER: [_____]
OWNERCOMM: [_____]
PROTCOMM: [_____]
MGMTCOMM: [_____]
MONITOR: [_____] MONITORNUM: [___ ___-____]

BESTSOURCE: [_____]
[_____]
SOURCECODE: [_____]
[_____]

DATASENS: [__] BOUNDARIES: [__] PECTOS: [__] OWNERINFO: [__]
TRANSCRIBER: [__-__-__ ___] CDREV: [__] MAPPER: [__-__-__ ___] QC: [__]
UPDATE: [__-__-__ ___]

Element Occurrence (EO) Record

EOCODE: PDLAU07010.002
NAME: LINDERA BENZOIN
COMNAME: SPICEBUSH
MARGNUM: 3 TENTEN: 10,8 IDENT: Y EORANK: C
EORANKCOMM: SM STAND; OLD PLANTS HEALTHY, BUT NO REPLACEMENT
SURVEYDATE: 1986-03-26 LASTOBS: 1986-03-26 FIRSTOBS: 1934 GRANK: G5
SRANK: S2 STATE: ME COUNTYCODE: ME031
COUNTYNAME: YORK
QUADCODE: 4307027
QUADNAME: DOVER EAST 7.5' PRECISION: SC
LAT: 430832 LONG: 704522 S: 0 N: 0 E: 0 W: 0
TOWNCODE: 31090
TOWNNAME: ELIOT RPC: SM WMU: 8
COASTALREG: 111 CAPNO: 61 WATERSHED: 01060003
DIRECTIONS: FRM YORK VILLAGE, S ON RTE 1 @5 MI TO RTE 101. TURN RT, N @ 2.5 MI, TURN LFT ONTO BEECH RD. PASS FIELDS & SM WOODS ON LFT & PARK @1/4 MI AT SWAMP ON LFT.
GENDESC: LOW SWAMP BORDERING A FOREST OF MIXED WOODS NEXT TO A PAVED RD. A FEW PLANTS GROWING AMONG SOME ALDERS ON FAR SIDE OF SWAMP.
ELEV: 20 SIZE: 1
EODATA: 1976: PLANTS IN EXCELLENT CONDITION (EASTMAN); 1986: 12-20 MATURE SHRUBS OVER @1/2 ACRE;

COMMENTS: OLDEST KNOWN STAND. PROBABLY IN SAME CONDITION AS WHEN DISCOVERED.
MACODE1: MESSPCAELI01 CONTAINED1: MACODE2: CONTAINED2:
MACODE3: CONTAINED3: ADDLMAS: MORELAND: MOREPROT:
MOREMGMT: SITECODE:
SITENAME: ELIOT SPICE BUSH
OWNER: MR & MRS DAVID LEAVITT
OWNERCOMM: 85 GOODWIN RD, ELIOT ME 03903
PROTCOMM: ZONED AS COMMERCIAL/INDUSTRIAL DISTRICT BY TOWN OF ELIOT
MGMTCOMM:
MONITOR: MONITORNUM:
BESTSOURCE: OSTERBROCK, A.J. 1986. FIELD SURVEY OF MARCH 26. ME NATURAL HERITAGE PROGRAM. TNC, TOPSHAM.
SOURCECODE: F86OST01ME B81CRI01ME U77CRI25ME B76EAS11ME

DATASENS: N BOUNDARIES: Y PHOTOS: N OWNERINFO: Y
TRANSCRIBR: 84-10-02 THM CDREV: Y MAPPER: 84-10-05 CRO QC: Y
UPDATE: 87-01-09 AJF

Managed Area (MA) Record

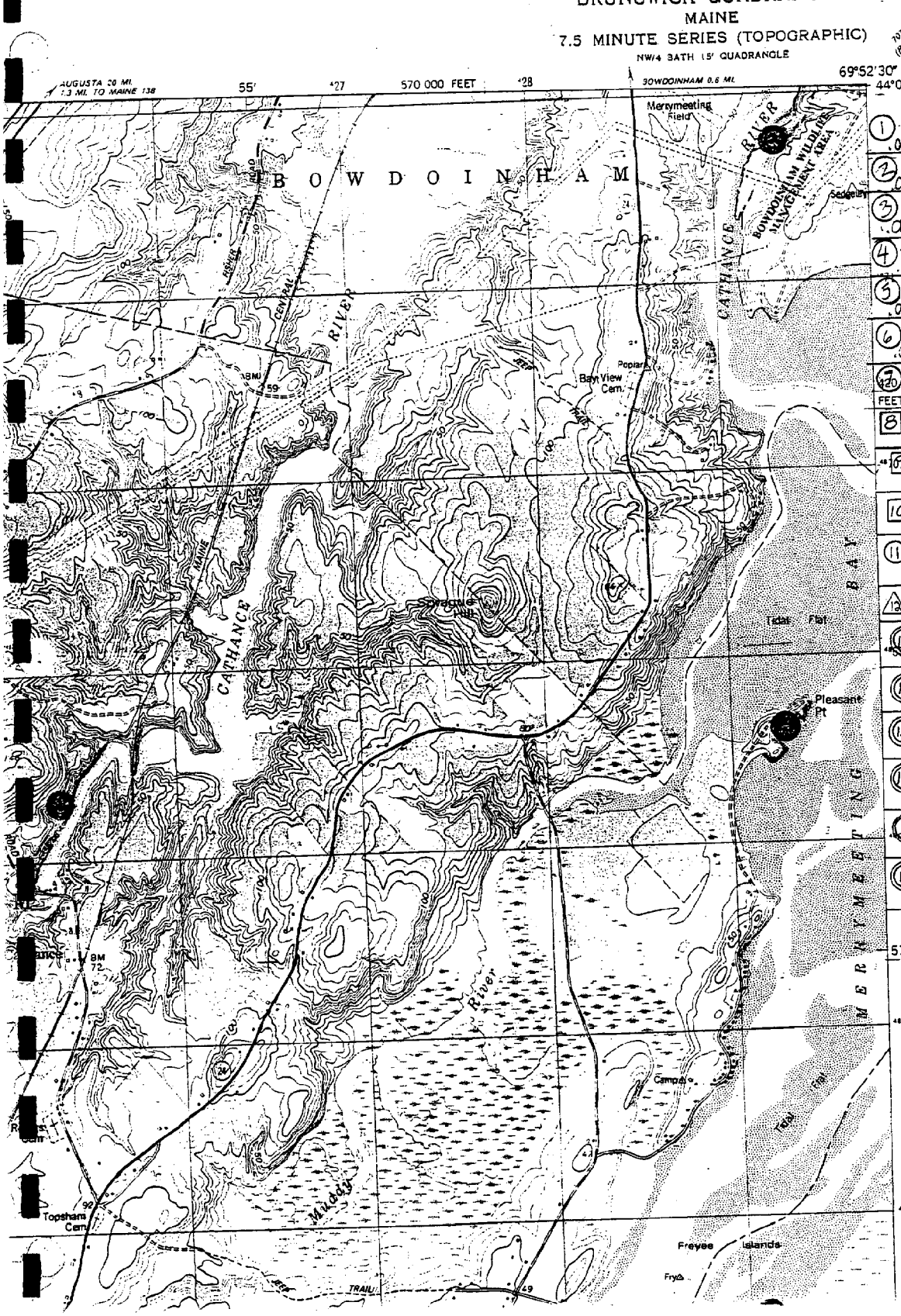
MACODE: MESSPCAELI01
OWNERCODE: PRI
MANAME: ELIOT SPICEBUSH
ESTABDATE: 1977-06-24 COUNTYNAME: MEYORK
TOWNCODE: 31090 TOWNNAME: ELIOT

QUADCODE: 4307027 LAT: 430830 LONG: 704525 S: 0 N: 0
E: 0 W: 0 CONTIG: Y
DESCRIPTN: LINDERA BENZOIN GROWING ON EDGE OF SM SWAMP. ALSO DIRCA PAL-
USTRIS IS PART OF UNDERSTORY
SIZE: 3 PROTSTAT: 3
MANAGER: MR & MRS DAVID LEAVITT
ADDRESS: 85 GOODWIN RD, ELIOT ME 03903

BOUNDARIES: N
MGMTCOMM:

MAJORMA:
COMMENTS: CAP#61

UPDATE: 87-01-09 AJF



1. Cardamine longii .001 1986 (5,3) see also 23-7
2. Eriocaulon parkeri .002 1982 (10-
3. Eriocaulon parkeri .005 1986 see #
4. Tillaea aquatica .001 1986 see #
5. Bidens eatonii .001 1981 see #
6. Bidens bipinnata .001 1981 see #
7. Mimulus ringens var colpophilu .000420 FEET .001 1986 see #
8. Bidens eatonii .005 1921 (8-7
9. Eleocharis obtusa .005 1911 (4-6
10. Eleocharis obtusa .006 1912 (9-5
11. Castanea dentata .002 1982 (3-7
12. Ammodramus savannaru .002 1995 (5-9
13. Eriocaulon parkeri .024 see also 14-16 1985 (10, 3
14. Samolus parviflorus .016 1985 (see #13
15. Tillaea aquatica .015 1985 (see #13
16. Cardamine longii .007 1985 (see #,
17. Xylena thoracica .002 1986 (4,9
18. Sagittaria montevidensis var. spongiosa .022 1986 (see #

Season Code N. F [illegible]

Season Name

Area Name Kimball I.

Area Code P190

APPENDIX E

Sample Endangered and Nongame Wildlife Program Records

Species Occurrence Records

Flight No. 04

Flight Date 11/14/85

Sp. Code	L	GE	MG	HG	E	GS		
Sp. Name								
Numbers Observed	1 1 1	1	2 2	25	252 55 37 15	1 9		
Totals	3	1	4	25	359	10		

Flight No.

Flight Date

Sp. Code								
Sp. Name								
Numbers Observed								
Totals								

DATE Mo. Day Yr. 7 2 0 7 7 TIME 1 1 4 5

OBSERVER Two initials, last name. P.M. BILLENGIER

(13)

COLONY NAME [illegible] ISLAND

VISIT # 2 For this colony for current nesting season

(Fill in if known)

Latitude 43° 21' 36" Longitude 70° 25' 54" Elevation (meters) 0007

LAND OWNER'S NAME:

LAND OWNER'S ADDRESS:

MAP ID

Colony size (ha) 0002 Island Size (ha) (if applicable) 0002 Subcolony number

Nearest Town:

County:

State/Province/Territory:

Country:

Species Occurrence Site Record with some Species Occurrence Records

SPECIES* Common or Scientific Name	Number of Breeding Birds	Total Population	Total Active Nests	Total Young Out of Nest	+Nesting Stage	++Nest Site Substrate	No. Banded This Visit
[illegible] GULLS		744			3,4,5	5,14,15	

+NESTING STAGE CODES: 1. Prenesting. 2. Pairing - territory establishment. (3.) Egg laying. (4.) Incubation. (5. Hatching 6. Downy young. 7. Feathered young. 8. Young flying or ready for flight. 9. Renesting. 10. Loafing

++NEST SITE SUBSTRATE CODES: 1. Trees - coniferous. 2. Trees - deciduous. 3. Trees - mixed. 4. Shrub - medium height (2-7m). 5. Shrub - low (2m or less). 6. Herbaceous (non-grass). 7. Grass - beach grass. 8. Grass - upland. 9. Marsh - salt. 10. Marsh - brackish. 11. Marsh - fresh. 12. Sand. 13. Sand-cobble-shell. (14), Cobble. (15) Rocks-crevices/holes. 16. Rock-cliff face. 17. Burrows. 18. Dirt bank 19. Man-made structure (specify)_____. 20. Other _____

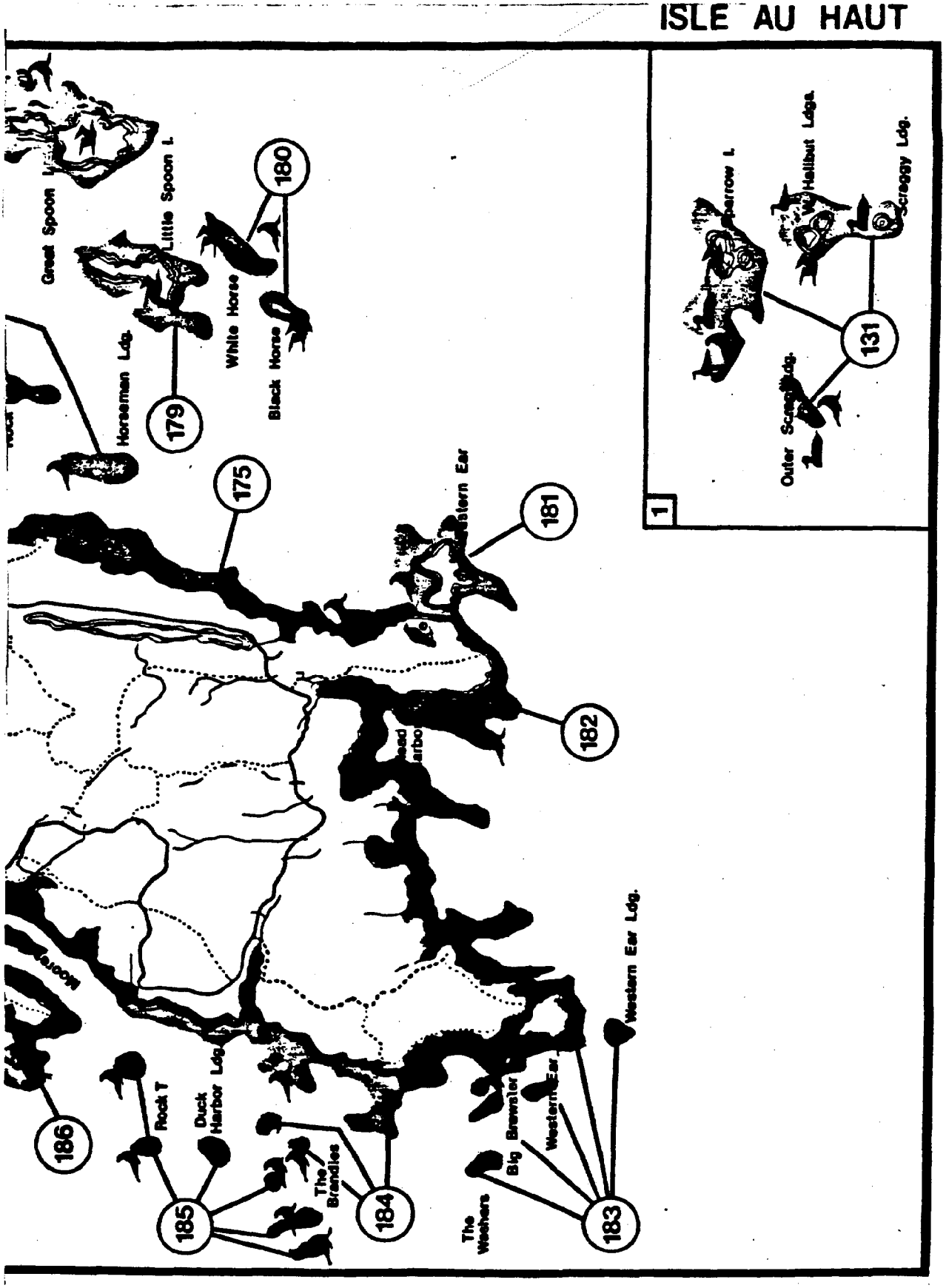
* If space for more species is needed, use additional sheets and fill in the following information: Sheet 3 of 3.

MASS. COOP. WILD. RES. UNIT
UNIV. OF MASS., AMHERST MASS. 01002

ONLY COMPLETE BOXES WITHOUT DIAGONAL LINES

B - 487

Areas of Concentration of Species Occurrence
(from map in Penobscot Bay Coastal Habitat Inventory)



HABITAT OF COLONY (Circle one of A and one of B)

A: 1. Suburban
2. Urban
3. Rural
4. Undeveloped
5. Other

B: 1. Mainland sandy beach
2. Marsh - salt
3. Marsh - brackish
4. Marsh - fresh
5. Inland island
6. Spoil bank
7. Marsh island
8. Barrier island
9. Non-barrier island, coastal
10. Bog
11. Swamp
12. Lake or pond
13. Woodland
14. Tundra
15. Field
16. Other: _____

A: [ ]
B: [ ]

COLONY HISTORY (Circle one or more)

1. Forms filed for previous years (see note*).
2. Colony present previously, but no exact data available.
3. Colony considered to have moved from another site:
Previous locality: _____.
4. Colony absent previous year.
5. Area not visited previously.
6. Other: _____.

[ ][ ][ ][ ][ ][ ]

PRECIP. TYPE		PHOTOG. FILED	
NONE	✓	NO	✓
TIDE		SEA CONDITIONS	
FLOOD	✓	CALM	✓

REMARKS: Include comments on outcome of colony. See Instructions

(1) Individual count from boat = 156 · 4 = 744 birds.
(2) 720 B. Pel. Birds observed.

*Please complete forms for earlier years if exact data available. If forms have been completed for earlier years, list years under Remarks

CENSUS TECHNIQUE (Circle one)

1. Visual estimate - air (fixed wing).
2. Visual estimate - air (rotary).
3. Visual estimate - (boat) car, foot (circle which)
4. Aerial photographic count.
5. Total ground count - individuals.
6. Total ground count - nests.
7. Quadrat census. (Sketch below)
8. Line strip census. (Sketch below)
9. Other: _____

NOTE: YES Check if more than one census technique has been used for this colony on the current visit. File separate reports for each technique. [ ]

HUMAN ACTIVITY (Check appropriate level of immediate activity of each type. If the potential for activity exists, check where appropriate.)

Type	Immediate None	Lt.	Med.	Hvy.	Potential
Human Technology	☒	☐	☐	☐	☐
Human Habitation	☒	☐	☐	☐	☐
Human Recreation	☐	☒	☐	☐	☐
Vehicular Use	☒	☐	☐	☐	☐
Scientific Invest.	☐	☒	☐	☐	☐

(Indicate exact type of activity in "remarks" area.)

[ ]

GENERAL COLONY SKETCH in relation to some prominent topographic feature. Include approx. compass coordinates, directions to colony, and scale of distance.

See sheet # 2 of 3

Sketch details of sample plots within colony boundary.

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3 6668 14102 9340