

SURVEY OF NATIONAL PARK BIOSPHERE RESERVES

August, 1980

Alison Mack

For the purpose of determining the amount and extent of baseline resource inventory, long-term environmental monitoring, and long-term ecological research in the fourteen National Park biosphere reserves*, I conducted a detailed telephone survey. I present the results of this survey, without interpretation, but with a consideration of factors which might affect interpretation, namely: its design; the method by which it was conducted; the way in which results were tabulated; and any problems I encountered in each of these areas. A report and recommendations based on the results themselves is forthcoming.

SURVEY DESIGN

The thirteen-page survey form included general reference information on the parks, tables for baseline and long-range monitoring information, and short-answer questions on long-term environmental research. The form was organized so as to spend as little time as possible gathering the rather broad body of information it demanded; even after several revisions, average completion time was approximately ninety minutes. Despite this lengthy survey time, a high percentage of completion was obtained over the two-week period allowed for contacting the parks.

A brief outline of the topics covered in the survey :

A. General Park Information (usually completed from reference materials like the MAB-8 booklet and the National Park Service Red Book)

1. Natural features and unique ecosystems.

*including Hawaii Volcanoes/Haleakala and Isle Royale, pending designation

2. Incidence of disturbance
3. Management policies on fire and zoning

B. Aquatics

1. Baseline-Long-Range Monitoring Checklist
2. Long-Term Research Questions

C. Macroclimate

1. Baseline-Long Range Monitoring Checklist
2. Long-Term Research Questions

D. Disturbances: Natural, Anthropogenic, and Exotics

1. Baseline Checklist
2. Long-Range Checklist
 - a. for magnitude and frequency
 - b. for vegetation recovery

E. Geological References

F. Vegetation

1. Checklist for vegetation keys, collection, etc.
2. Vegetation reverences
3. Long-Range Research Questions.

G. Fauna

1. Checklist for faunal keys, collections, etc.
2. Long-Term Research Questions

The entire questionnaire, annotated to approximate the way in which it was actually administered, is included with the results.

CONDUCTING THE SURVEY

The head of the biological staff, resource manager, or superintendent of each park was contacted, using an FTS line. The survey and its purpose were briefly described, and the contact was given an opportunity to ask questions. If other people than the contact were better suited to answer sections of the survey, I took their names and phone numbers, and proceeded to call them. Those who actually answered the survey were generally prompt, helpful, and attentive to detail, despite the difficulties presented by the survey itself and the method by which it was administered.

Most prominent among these problems was the fact that the information required was, in some cases, quite specific or detailed. Such questions would have been best suited to a written survey format; because the contact often had to consult files, references, or an expert on a particular matter, such information, although necessary, was obtained inefficiently. Another drawback had to do with the timing of the survey: it was conducted during the height of field season for most National Park biologists. This made them difficult to reach, beyond the fact that at least ninety minutes spent on the telephone was, in many cases, a genuine imposition during an already busy time period. Of course, there is a justification for such problems: the survey was administered quickly, delays in response were minimal, and results are available for efficient use, even if they were obtained by inefficient means.

RESULTS OF THE SURVEY

The results of the survey are summarized in the tables which follow this letter of introduction. They are listed, first by research category: baseline, long-range monitoring and long-term research; and secondly by

topic: aquatics, macroclimate, etc. The baseline and monitoring data are summarized by a series of symbols: C indicates a "comprehensive program being implemented;" I and "incomplete program, in progress;" O, a program on which "work was done in the past, no work currently in progress;" N, "no program;" a diagonal line indicates "does not apply." A comprehensive program was defined as one which was more or less representative of the entire biosphere reserve, beyond furnishing accurate and useful data. An incomplete program did not represent the biosphere reserve, or perhaps was not as sophisticated as it might have been; an example of this would be a park measuring snow depth at a single elevation, or taking macroclimatic measurements only during fire weather season. The "old work" category is self-explanatory. Occasionally, such work was indicated as having been comprehensive or incomplete at the time it was finished; thus, O-I or O-C sometimes appear in the tables.

The distinction between "baseline resource inventory" and "long-range environmental monitoring" was determined, in questionable cases, by the length of time measurements had been taken: a program which had been conducted for at least five years or planned to continue for at least five years was considered "long-range" for the purposes of the survey. Consulting with biologists at Uplands, I found five years to be the minimum required measurement time for monitoring trends in the inventoried data of most systems.

Although the C/I/N/O symbol system was adequate for categorizing much of the survey data, this system did not describe reference materials, collections, or management plans well. An attempt, for the sake of consistency with other baseline data, was made to use these symbols in such cases; however, raw data for each park is also included for those areas which I consider to be poorly represented in the symbol-coded tables.

With these cautions, I defer to the tables of results, which follow the

final section of my introduction.

CONCLUSIONS

I leave the interpretation of these results to my subsequent report, as well as to anyone who wishes to use them, particularly in connection with Man and the Biosphere. The data is, however, unrefined; before it can be used responsibly, the results of the survey must be retuned to the parks involved for verification. This should be done through the mail; perhaps all the data could be sent to each participating park, since many contacts were interested in the results of the survey as a whole. A form for correction might be designed as well, by is probably not necessary.

When sending material for correction and perusal to the parks, I recommend, if possible, addressing it directly to the following individuals, who were my contacts in the parks:

<u>park</u>	<u>name</u>	<u>position</u>
Big Bend	Jay Gries (sp?)	Resource manager
Channel Islands	Nicholas Whelan	Research biologist
Everglades	Gary Hendrix Lloyd Loope Paul Rose Peter Rosendahl James Kushlan	Director, biology program Research biologist " " " " " " " " "
Glacier	Clyde Folley(sp?) Clifford Martinka	Resource manager Research biologist
Great Smoky Mtns.	Gary Larson Susan Bratton Peter White	Director, biology program Research biologist " " "
Mt. McKinley	John Dolle-Malle	Resource manager
Olympic	Bruce Moorhead	Research biologist
Organ Pipe Cactus	Terry Peters	Resource manager
Rocky Mtns.	David Stevens	Research biologist

Sequoia-Kings Canyon	✓ David Parsons	Research biologist
Virgin Islands	✓ Jim Riddle	?
Yellowstone	✓ Mary Meagher	Research biologist
Hawaii	✓ Cliff Smith	Resource administrator
Isle Royale	✓ Craig Axtell	Resource manager

A final, corrected data set for all parks surveyed should be sent to each of the above contacts.

Beyond this survey, which is essentially ground-breaking work and is not, as I told one nervous participant, "engraved in stone," more detailed information should be gained before new programs are actually proposed. If a survey format is to be used to obtain such information, I recommend that a written form, directed toward a specific topic (for example, baseline inventory in aquatic systems) be sent to a single individual best suited to answering such questions. This person could be located by using the telephone, and informed that a survey was being sent. The written response does seem to be the most efficient method for retrieving accurate, detailed information. I would stress that it be used, at least in conjunction with the telephone, for future surveys. At any rate, until my telephone-collected data are verified by written response, I would caution anyone against using them in any by the most general, trend-determining manner. They are not to be used to cite specific parks or programs until corrected and returned by my contacts; even then, I would hesitate to use them as such without more detailed survey work. The symbol system, while supplying a "common denominator" for all parks, obscures the detail and work special to individual parks and their programs. My work is, to use my own criteria, an "incomplete program, in progress." It is hardly comprehensive, but it is a step, I hope, toward understanding and improving science programs in National Park biosphere reserves, if properly interpreted and expanded.

Baseline Resource Inventory

7

C = Comprehensive Program

I = Incomplete Program

O = old work only

$\delta = \text{idle time}$
 $w = \text{no work}$

$N = No$ work
as the factor.

Subject as the factor

Biosphere Reserve

Baseline Resource Inventory

Kiosphere Reserve

(8)

Subject

Water Chemistry	N	O	N	I	I	I	N
phosphate		C		C	N	C	O
nitrate		C		C	I	C	O
conductivity		C		C	N	C	O
anions and cations		C		O	N	C	O
others:							H
dissolved organic carbon			N			N	N
heavy metals		C		N		N	N
Aquatic Organisms:				N		N	N
bacteria	N	N	C	N	N	I	O
periphyton	N	N	C	H	N	I	H
phytoplankton	N	N	C	H	N	O	H
zooplankton	N	N	C	N	O	H	N
benthic invertebrates	N	O	C	I	N	O	I
vertebrates:				I	C	C	O
fish	I	I	C	N	N	N	H
salamanders	N	N	N	N	N	N	N
other:	O			I			

Baseline Resource Inventory

Biosphere Reserve

9

Subject

MACROCLIMATE

air temp.

	Big Bend	Channel Islands	Everglades	Glacier	Great Smoky Mtns.	Mt. McKinley	Olympic	Organ Pipe Cactus	Roxby Mtns.	Saf.-King's Canyon	Virgin Islands	Yellowstone	Hawaii Volcanoes	Isle Royale
air temp.	C	C	C	C	C	C	I	C	C	C	C	C	I	C
relative humidity	C	C	C	C	C	I	I	C	C	I	N	C	I	C
total, sensible or longwave radiation	N	N	N	N	C	N	N	N	N	Z	N	N	N	N
precipitation	C	C	C	C	C	C	I	C	C	C	C	C	I	C
dew point	C	N	N	N	C	N	D	I	N	N	N	N	I	C
wind speed	C	C	I	I	C	I	O	O	O	O	O	C	I	C
wind direction	C	C	I	H	C	I	O	C	O	O	O	C	I	C
soil temp.	C	Z	C	N	H	I	I	O	N	O	N	N	I/N	N
soil moisture (water content)	N	N	C	N	I	I	I	O	N	N	N	N	I/N	N
depth to water table	N	N	C	N	I	N	N	O	C	N	O	N	N	N
shortwave insolation	N	N	N	N	N	N	N	O	N	N	N	N	O	N
runoff/erosion	N	C	N	I	H	N	N	I	O	N	N	N	N	N
soil (composite sampling)	C	C	C	O	H	I	N	O	I	N	N	N	N	N
lysimetry	N	N	N	Z	I	N	Z	N	N	C	N	C	I	N
snow depth	N	/	/	C	H	C	C	C	C	C	C	I	H	H
air quality:														
ozone	Z	N	N	N	N	H	N	C	O	N	N	N	N	N
total suspended particulate	C	N	N	N	C	H	N	C	C	C	N	N	N	N
fine suspended particulate	C	N	N	N	N	H	N	C	C	C	C	N	N	N
NOx	N	N	N	Z	C	C	H	N	C	O	N	N	N	N
SO ₂	N	C	C	C	C	H	H	C	C	C	C	N	C	N
CO	N	N	N	N	C	H	H	N	C	O	N	N	N	N
visibility	C	N	N	C	F	N	C	C	N	C	N	N	C	N

Baseline Resource Inventory

Biosphere Reserve

10

Subject

Baseline Resource Inventory

Kipahulu Reserve

11

Subject

DISTURBANCES

Natural:

- fire
- windstorm
- droughts
- landslides; earth mnts.
- freeze-thaw dynamics
- dune movements
- coastal erosion
- alluvial processes
- insect outbreak
- non-insect pathogen outbreak

	Eis Bend	Channel Islands	Endangered Species	Wai'anae	Great Smoky Mtns.	Mt. McKinley	Symonds	Iron Pipe Cactus	Hawaiian Islands	Leopard's Tail	Yellowstone	Waimea Islands	Haleakala	Isla Rovale
fire	H	N	C O C C C C	C	C N C	C	C	C N C C C	C	C N C C C	C	C	C	C
windstorm	N	N	C C I	N	N	N	I	I	N	N	N	N	N	N
droughts	N	N	C N N C	N	N	N	N	N	N	N	N	N	H	N
landslides; earth mnts.	N	H	N	T	T	T	N	C	N	N	N	N	C	N
freeze-thaw dynamics	N	N	N	H	N	N	I	N	N	N	N	N	N	N
dune movements	H	N	N	N	N	N	N	Z	Z	Z	Z	Z	H*	N
coastal erosion	N	N	N	H	N	N	N	N	O	Z	O	N	H	I
alluvial processes	N	N	N	H	N	N	N	N	N	N	N	N	N	N
insect outbreak	C	I	N C C C	H	N	N	I	C	N	H	N	H	O	N
non-insect pathogen outbreak	N	O	N O C	N	O	O	I	H	H	Z	Z	H	N	N

Anthropogenic:

- fire
- logging
- agriculture
- visitor impact
- park developments

H	N	C I C C O N C C N C C C	C	C	C	C	C	C	C	C	C	C	C	C
N	N	N N C N O N I N N C N O N	C	C	C	C	C	C	C	C	C	C	C	C
N	I	C N C N O N I N N C N O N	C	C	C	C	C	C	C	C	C	C	C	C
C	N	N H C C C C N I C O C O N	N	N	N	N	N	N	N	N	N	N	N	N
N	N	H C C C C N I C O C O N	N	N	N	N	N	N	N	N	N	N	N	N

Exotic Species

- mammals
- fish
- plants
- insects
- diseases

N	N	C C C C C C	C	C	C	C	C	C	C	C	C	C	C	C
N	N	C C C C C C	C	C	C	C	C	C	C	C	C	C	C	C
I	I	C C C C C C	N	N	N	N	N	N	N	N	N	N	N	N
N	I	N N C C C C	N	N	N	N	N	N	N	N	N	N	N	N
N	N	C C C C C C	N	N	N	N	N	N	N	N	N	N	N	N

* represents ash dune movement. lava flow is also monitored.

Baseline Resource Inventory

Biosphere Reserve

12

Subject

Big Bend
Channel Islands
Everglades
Glacier
Great Smoky Mts.
Mt. McKinley
Olympic
Organ Pipe Cactus
Rocky Mts.
Sag.-King's Canyon
Virgin Islands
Yellowstone
Hawaii Volcanoes
Isle Royale

Other:

birds	N	N	N	N	N	N	N	N	N	N	N	I	N
earthworms	N	N	N	N	N	N	N	N	N	N	N	I	N

Seismographic or Mass-movement

C	C	O-I	O-I	I	C	C	N	N	N	C	C	C	N
---	---	-----	-----	---	---	---	---	---	---	---	---	---	---

ct

Baseline Resource Inventory

Biosphere Reserve

13

Subject

FAUNA

Faunal checklists

	Big Bend	Channel Islands	Everglades	Glacier	Great Smoky Mtns.	Mt. McKinley	Olympic	Organ Pipe Cactus	Rocky Mtns.	Salt-Kings Canyon	Virgin Islands	Yellowstone	Hawaii Volcanoes	Isle Royale	
Faunal checklists	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Specimen collection	H	N	I	C	T	I	I	I	I	N	O	I	I	H	H
Abundance indicator	N	H	I	I	I	I	I	I	I	I	O	I	I	H	H
Site-specific keys	N	N	N	N	I	N	I	N	N	N	N	N	N	H	N

Specimen collection

Abundance indicator

Site-specific keys

Baseline Resource Inventory

14

Biosphere Reserve

Subject

	Big Bend	Channel Islands	Everglades	Glacier	Great Smoky Mtns.	Mt. McKinley	Olympic	Organ Pipe Cactus	Roxby Mtns.	Saguaro-Canyon	Virgin Islands	Yellowstone	Hawaii Volcanoes	Isle Royale
--	----------	-----------------	------------	---------	-------------------	--------------	---------	-------------------	-------------	----------------	----------------	-------------	------------------	-------------

GEOLOGICAL FEATURES

Topographic maps	C C C C C C C C C C C C C C C
Surficial geology maps	C C C C C I N C I I C C C I
Air photography:	
black and white	I C C C C C I C N C C C C C C
color	N C C N C C I C C C I C C C
satellite or high-altitude	N C C C I C C C C C C C C C C
Sediment maps	N N N N N C N N N C N C N C

VEGETATION

Vegetation maps	C C I O O-I C I C C C C C C I
Quantitative description	N C I I I N I N C T N I I I
Floristic checklists	N I I I I I I I I I O-I I I I
Floristic collection	I N I I I I I I I I I I I I I
Permanent plots	I C I I I C N C I I I N I I I
Aquatic community maps	N I I I N N N N I N O N N N
Site-specific floral key	N I N I N N I N N I N I N I N
Ground truth or survey	N C I O I C C C C N C I N
Management Zoning Plan	C C C N C C N C C N C N C C
number of zones	3 ≤ 4* 2 / 2 2 / 2? 4 / 2 / 3 2
Bibliography of published work	N I C I-O C I C I C C I I I C
Archiving	I I C I C I I I I C O-I C C I

*depending on the island

Big Bend National Park

	checklist	collection	faunal keys	abundance indicators - population monitoring	Comments
mammals	C	C	N	N	
birds	C	C	N	N	
herpetiles	C	C	N	N	
fish	I	N	N	N	
butterflies, moths	I	I	N	N	
other terrestrial insects	N	N	N	N	
aquatic insects	N	N	N	N	
molluscs	N-I	N	N	N	
marine inverts.					
other inverts.					

Big Bend National Park

	% coverage	scale	most recent year	source	comments
Topographic map	100	1:24,000	1971	A.S.G.S.	
Surficial geology map	100		1966		scale & date unknown
Sediment map					not known if map exists
Air photography					
black and white	<.5%		1975	Internat'l Water's boundary Commission	
color	none				
satellite or high alt.	none				
Vegetation map	100		1970		scale & source unknown
Ground truth or survey	none				
Quantitative description	none				
Aquatic community map	none				
Permanent plots	approx 1% of park area		1978	NPS	plan to monitor

	checklist	collection	floral keys	abundance indicators	population monitoring of rare species	comments
Vascular Plants	C	C	N	N	N	
Bryophytes	N	N	N	N	N	
lichens	C	C	N	N	N	
Algae	N	N	N	N	N	
Fungi	N	N	N	N	N	

Channel Islands National Park

	checklist	collection	faunal keys	abundance indicators - population monitoring	Comments
mammals	C	all at Santa Barbara Mus. of Nat. Hist.	(I) for pinnipeds whales	only for marine mammals (I)	
birds	I at Mus. of Nat. History - S.B.	(interp. " Collections)	not specif. to park	only for gulls and pelicans - baseline data (I)	
herpetiles	C	"	"	only for night lizard (I)	not many herpetiles
fish	not specific to park: I	N	"	gamefish only - Calif. Fish & Game (I)	
butterflies/moths	I	N	"	N	
other terrestrial insects	I	N	I for crickets/grasshoppers	beginning a study; considered for endangered species. I-N	
aquatic insects	N	N	N	N	
molluscs	C aquatic	N	N	only those of commercial value - Calif. Fish and Game	
marine inerts.	C	N	N	" "	
Other inerts.					

Channel Islands National Park

	% coverage	Scale	most recent year	source	Comments
Topographic map	100	7½ min.	1973	U.S.G.S.	
Surficial geology map	100			"old information"	scale unknown
Sediment map	none				
Air photography					
black and white	100		≈ 1978	private contractor; NPS	Scale unknown
color	100		1980	U.S. Forest Service	I.R.; "
satellite or high alt.	100			LANDSAT	not for Santa Rosa or S. Cruz scale & year unknown
Vegetation map	100	1" = 3/10 mile for S. Santa, Anacapa	1979	Santa Barbara Mus. of Nat. Hist.	published under NPS contract; plan to update.
Ground truth or survey	"	"	"	"	in conjunction w/ veg. map; also detailed work in some areas.
Quantitative description	"	"	"	"	"
Aquatic community map	100		1979	Bureau of Land Mgt. OES 4B	intertidal mapping for all 5 islands; scale unknown
Permanent plots	transect - S. Miguel 12 plots 75. sq. mi. each 3 Anacapa plots 3 S. Barbara		1972 / 1978	Botanical Garden/ Museum Nat. Hist. S. Barbara	

	Checklist	collection	floral keys	abundance indicators	population monitoring of rare species	comment
Vascular Plants	I	N*	N	baseline for habitats, exotics (?)	C	
Bryophytes	N	N	N	N	N	
Lichens	I	N	I	N	N	
Algae	I - marine only	N	N	N	N	
Fungi	N	N	N	N	N	

* They use the Santa Barbara Botanical Garden's collection.

Everglades National Park

	checklist	collection	faunal keys	abundance indicators - population monitoring	Comments
mammals	C	I	not specif to park	selective pop. mon. I	
birds	C	I	"	for sparrows, pelicans, cormorants I	
herpetiles	C	I	"	alligators, crocodiles, indigo snake I	
fish	C	I	"	C	
butterflies, moths	C	I	"	N	
other terrestrial insects	N	I	"	N	
aquatic insects	N	I	"	N	
mollusks	N	I	"	N	
marine inerts.	N	I	"	N	
other inerts.					

Everglades National Park

	% coverage	scale	most recent year	source	comments
Topographic map	100	1966	1966	U.S.G.S.	since may 5' elevation
Surficial geology map	100				scale, year & source unknown
Sediment map	none				
Air photography					
black and white	100		1965	U.S.G.S.	scale unknown
color	100	1: 130,000	1973	U.S.G.S.	
satellite or high alt.	100	1:1,000,000	1972-80	LANDSAT	
Vegetation map	5-10	1: 20,000	1979	NPS	Crude monitoring program
Ground truth or survey	"	"	"	"	
Quantitative description	projected 100	—	1978-present	NPS	
Aquatic community map	20		1978	NPS	scale unknown
Permanent plots	100 5x20m plots 50 prairie plots some 1x5m plots		varies	NPS	

	checklist	collection	floral keys	abundance indicators	population monitoring of rare species	comments
Vascular Plants	C	C	not specific to park	I	I	
Bryophytes	N	N	"	N	N	
Lichens	N	O	"	N	N	
Algae	N	O	"	N	N	
Fungi	N	N	"	N	N	

Glacier National Park

	checklist	collection	faunal keys	abundance indicators- population monitoring	Comments
mammals	C	C	not park specific,	I	
birds	C	C	state key	I, eagles.	
herpetiles	C	C	used	N	
fish	C	C	"	N	
butterflies/moths	C	C	"	N	
other terrestrial insects	I	C	"	N	
aquatic insects	I	C	"	I	
molluscs	I	C	"	N	
marine inverts.					
other inverts.					

Glacier National Park

	% coverage	scale	most recent year	source	comments
Topographic map	100	1:100,000 1:24,000	1968	U.S.G.S.	
Surficial geology map	100	—	done in 5 yrs.	U.S.G.S.	scale unknown
Sediment map	none	—			
Air photography					
black and white	100	1:60,000	1968-9	contract NPS	
color	none	—			
satellite or high alt.	100	1:500,000	1979	LANDSAT	
Vegetation map	100	≈ 1:30,000	1936	C.C.C	
Ground truth or survey	"	"	"	"	
Quantitative description	≤ 15-20	—	≈ 1975	contract, NPS	
Aquatic Community map			current	U.S. fish & wildlife	% coverage, scale unknown; depth, current maps
Permanent plots	numerous m ² plots		≈ 1965	NPS ranger	

	checklist	collection	floral keys	abundance indicators	population monitoring of rare species	comment
Vascular Plants	C	C	C	O	N	
Bryophytes	N	I	N	N	N	
Lichens	N	O	N	N	N	
Algae	N	O	N	N	N	
Fungi	N	I	N	N	N	

Great Smoky Mountains National Park

	checklist	collection	faunal keys	abundance indicators- population monitoring	Comments
mammals	C	I	C	I	
birds	O-C	I	C	I	
herpetiles	C	C	C	I-O	
fish	I	I	I	I	
butterflies/moths	O	O	O	O	
other terrestrial insects	O				
equatic insects	I	I	I	I-O	
molluscs	I	I	I	N.	
marine inverts.					
other inverts.					

Great Smoky Mountains National Park

	% coverage	scale	most recent year	source	comments
Topographic map	100	1: 24,000	1979	U.S.G.S.	most from 1960
Surficial geology map	100	1: 12,000	1978	U.S.G.S.	
Sediment map	none				
Air photography					
black and white	100		19?	S.C.S.	
color	95	1: 2400	1980	NPS	
satellite or high alt.	60	1: 200,000	1972		(C AND SAT??)
Vegetation map	80	1: 60,000	1936	C C	
Ground truth or survey	25	.1 ha	1975-80	Uplands	being monitored
Quantitative description	50	.1 ha	1975-80	Uplands	" "
Aquatic community map	none				
Permanent plots	representative	50%	1975-80	Uplands	being monitored

	checklist	collection	floral keys	abundance indicators	population monitoring of rare species	comments
Vascular Plants	C	C	N	C	C	
Bryophytes	I	I	N	N	N	
Lichens	N	N	N	N	N	
Algae	I	I	I	I	N	
Fungi	C	I	N	N	I	

Mt. McKinley National Park

	checklist	collection	faunal keys	abundance indicators - population monitoring	Comments
mammals	C	O	not specif. for park	yes; for most larger mammals (I)	
birds	C	I	"	only for some spp. recent work (I)	
herpetiles	None				no herpetiles in park
fish	C	N	"	N	
butterflies, moths	N	work in progress	not in park	"	N
other terrestrial insects	N	N	"	N	
aquatic insects	N	N	"	N	
molluscs	N	N	"	N	
marine inerts.					
Other inerts.					

Mt. McKinley National Park

	% coverage	scale	most recent year	source	comments
Topographic map	100	<u>1: 63,360</u> 1: 250,000	~1972	U.S.G.S.	
Surficial geology map	75	1: 250,000	~1978	Nat. History	
Sediment map	None	—			
Air photography					
black and white	100	(taken at 20,000')	1952	military	
color	90	1: 250,000 and 1: 63,000	in progress	Univ. of Alaska	
satellite or high alt.	"	"	"	"	
Vegetation map	90	<u>1: 63,000</u> 1: 250,000	in progress	park contract	
Ground truth or survey	"	"	"	"	
Quantitative description	none	—			
Aquatic community map	none	—			
Permanent plots	none	—			

	checklist	collection	floral keys	abundance indicators	population monitoring of rare species	comments
Vascular Plants	C	I	not park specific	N	N	only 2 rare spp
Bryophytes	N	N	"	N	N	
Lichens	C	I	"	N	N	
Algae	N	N	"	N	N	
Fungi	N	N	"	N	N	

Olympic National Park

	checklist	collection	faunal keys	abundance indicators- population monitoring	Comments
mammals	C	C	not specif. for park	on elk, goats, old data on marmots (I)	
birds	C	O	"	fire studies	I
herpetiles	C	N	"	N	
fish	C	O	"	I	
butterflies, moths	N	I	I	I	
other terrestrial insects	N	I	N	I	
aquatic insects	N	I	N	N	
molluscs	N	N	N	N	
marine inverts.	N	N	N	N	
Other inverts.					

Olympic National Park

	% coverage	scale	most recent year	source	comments
Topographic map	100	1:12,000 1:62,500	1954	U.S.G.S.	
Surficial geology map	none	—			
Sediment map	100	1:125,000	1978	U.S.G.S.	hard rock geo.
Air photography					
black and white	75	1:125,000	1968-72	contract/ state	
color	85	1:24,000	1976	contract	
satellite or high alt.	100	variable x 1:62,500	In progress	LANDSAT-NASA	
Vegetation map	~85	x 1:24,000	1940	NPS contract	
Ground truth or survey	100	1:62,500	1980	NASA	not a community map
Quantitative description	80	—	1970	L.C. Bliss & students	
Aquatic community map	none	—			
Permanent plots	many. spruce, Elk/Goat exclosures, etc.		1978 (spruce)	varies.	mostly for qualitative analysis

	checklist	collection	floral keys	abundance indicators	population monitoring of rare species	comments
Vascular Plants	C	C	C	N	T	
Bryophytes	N	N	O	N	N	
Lichens	N	N	N	N	N	
Algae	N	N	N	N	N	
Fungi	N	N	N	N	N	

Organ Pipe Cactus National Park

	checklist	collection	faunal keys	abundance indicators - population monitoring	Comments
mammals	I	I	not park specific	N	
birds	C	I	"	I	
herpetiles	C	C	"	N	
fish	N	C	"	C	
butterflies, moths	I	I	"	N	
other terrestrial insects	I	I	"	N	
aquatic insects	I	I	"	N	
molluscs	O	N	N	N	
marine inerts.					
Other inerts.					

Organ Pipe Cactus National Park

	% coverage	Scale	most recent year	source	comments
Topographic map	100	1:62,500	≈ 1978	U.S.G.S.	
Surficial geology map	100	1:62,500	1980	U.S.G.S.	
Sediment map	none				
Air photography					
black and white*	100	variable	≈ 1979	remote sensing; SW Air.	
color	100	variable	1978	Office of Arid Lands	I.R.
satellite or high alt.	100	1:30,000	≈ 1979	U.S. Air Force	
Vegetation map	100	1:24,000	1979	Office of Arid Lands	} done together
Ground truth or survey	"	"	"	"	
Quantitative description	none				
Aquatic community map	none				
Permanent plots	4 ha. fenced exclosures & scattered cacti plots		1974-6	W.S. Steenbagh; Survey	

* A black and white series was taken in 1973 with a scale of 1:24,000 by U.S.G.S.

	checklist	collection	floral keys	abundance indicators	population monitoring of rare species	comments
Vascular Plants	C	C	N	N	I - for <i>Acuña cactus</i>	
Bryophytes	I	N	N	N	N	
Lichens	N	N	N	N	N	
Algae	N	N	N	N	N	
Fungi	N	N	N	N	N	

Rocky Mountains National Park

	checklist	collection	faunal keys	abundance indicators - population monitoring	Comments
mammals	C	I	not specific to park	some surveys of large mammals (I)	
birds	C	C	"	Christmas counts; some spp. (I)	
herpetiles	C	I	"	N	
fish	C	O	"	most comprehensive of faunal monitoring for some spp. (I)	
butterflies, moths	I	N	"	N	
other terrestrial insects	N	N	"	(I) some spp. - plots.	
aquatic insects	I	I	"	(I) as part of water quality studies	
molluscs	N	N	N	N	
marine inverts.					
other inverts.					

Rocky Mountains National Park

	% coverage	scale	most recent year	source	comments
Topographic map	100	1:62,000	1961	U.S. G.S.	some quad. update since 1961
Surficial geology map	~60		current	U.S. G.S.	
Sediment map	none				
Air photography					
black and white	none				
color	100	1:15,400	1969	Contract	
satellite or high alt.	100	varies	current	LANDSAT, EROS	haven't been very good.
Vegetation map	100	7 min.	in progress	NPS	
Ground truth or survey				U.S. G.S.	doesn't know scale, year, etc.
Quantitative description	1/2 % or less	—	1978	NPS	done every 5 yrs.
Aquatic community map	scattered	varies	over last 20 yrs.	NPS, fish & wildlife, etc.	monitored for upkeep
Permanent plots	established	1968	→	NPS	monitored every 5 years

	checklist	collection	floral key:	abundance indicators	population monitoring of rare species	comments
Vascular plants	C	I	C	I	I	
Bryophytes	I	I	not spec. to park	I	N	
lichens	N	N	"	N	N	
Algae	N	N	N	N	N	
Fungi	I	N	N	N	N	

Sequoia - Kings Canyon National Parks

	checklist	collection	faunal keys	abundance indicators - population monitoring	Comments
mammals	C	N	N	I	
birds	C	N	N	N	
herpetiles	N	N	N	I	one or two spp.
fish	N	N	N	C	
butterflies, moths	N	N	N	N	
other terrestrial insects	N	N	N	N	
aquatic insects	N	N	N	N	
molluscs	N	N	N	N	
marine inerts.					
Other inerts.					

Sequoia - Kings Canyon National Parks

	% coverage	scale	most recent year	source	comments
Topographic map	100	1:62,500	1957	U.S.G.S.	
Surficial geology map	~10	1:62,500	1965	U.S.G.S.	
Sediment map	none	—			
Air photography					
black and white	100	1:15,840	1973	contract	
color	5	"	1973	"	
satellite or high alt.	100		1979	U-2 jet propulsion lab Dept. Nat Res. contract	scale unknown → Menlo Park, Cal.
Vegetation map	100	1:15,840	1971-3		
Ground truth or survey	"	"	"	"	
Quantitative description	~25	—	from 1925 through present	researchers	
Aquatic community map	none	—			
Permanent plots	~40 1/4 ha.		varies.	Independent researchers	

	checklist	collection	floral keys	abundance indicators	population monitoring of rare species	comments
Vascular Plants	C	C	O-I	N	C	
Bryophytes	N	N	N	N	N	
Lichens	N	N	N	N	N	
Algae	N	N	N	N	N	
Fungi	N	N	N	N	N	

Virgin Islands National Park

	checklist	collection	faunal keys	abundance indicators - population monitoring	Comments
mammals	C from St. Croix	N	N	N	
birds	C	N	N	I - for pelicans only	
herpetiles	C	N	N	I/O - studies on sea turtle, lizards	
fish	O	O	N	N	
butterflies/moths	O	O	N	N	
other terrestrial insects	O	O	N	N	
aquatic insects	O	O	N	N	
molluscs	N	O	N	N	
marine inverts.	N	O Coral only	N	O - some on coral reefs	
Other inverts.	N	N	N	N	

Virgin Islands National Park

	% coverage	scale	most recent year	source	comments
Topographic map	100	1:24,000	1958	U.S.G.S.	
Surficial geology map	100	$\approx 1:24,000$	1966	researcher, Ph.D. dissertation	
Sediment map	100	$\approx 1:24,000$	1972	U.S.D.A.	soil map
Air photography					
black and white	100		1968	NASA	
color	100		1970	NASA	
satellite or high alt.					not sure if it has been done.
Vegetation map	≈ 100		1955	NPS	very rough; not useful
Ground truth or survey	none				
Quantitative description	none				
Aquatic community map	100	"smaller than 1:24,000"	1959	private researcher	rather general
Permanent plots	none				

	checklist	collection	floral keys	abundance indicators	population monitoring of rare species	comments
Vascular Plants	O	I	not specific for park; use U.S.D.A. keys	N	N	
Bryophytes	N	N		N	N	
Lichens	N	N	N	N	N	
Algae	N	N	N	N	N	
Fungi	N	N	N	N	N	

Yellowstone National Park

	checklist	collection	faunal keys	abundance indicators - population monitoring	Comments
mammals	O	I (skins)	not park-specific;	some intensive work on certain species, mostly ungulates. (I)	
birds	C	I	local keys used	some work on impacted species (I)	
herpetiles	O	N	"	one study: O	<u>very few</u> in park
fish	O	C	"	C - fisheries work	
butterflies/moths	N	I	"	N	
other terrestrial insects	N	I	"	N	
aquatic insects	N	C	"	N	
molluses	N	N	"	N	
marine inverts.					
Other inverts. (fresh water)	N	C	"	N	

Yellowstone National Park

	% coverage	scale	most recent year	source	comments
Topographic map	100	1:126,720	1962	U.S.G.S.	also complete 15 min. quad series
Surficial geology map	100	1:125,000	1972	U.S.G.S.	
Sediment map *	none				(projected for future)
Air photography					
black and white	100	1:76,000	1978	U.S.G.S.	
color	100	1:15,300	1969-72	Forest Service	
	100	1:100,000	1969	NASA	I.R. transparencies
satellite or high alt.	100	1:500,000	1978	LANDSAT	
Vegetation map	100	1:125,000	1980 ^a	NPS	
Ground truth or survey	"	"	"	"	over last 5-yr period; in conjunction w/ veg. map
Quantitative description	"	"	"	"	not comprehensive; as part of veg. map digitizing.
Aquatic community map	none				
Permanent plots	2 sets Parker transects, other scattered plots			varies.	most established as parts of different research projects.

* Bedrock map : 100% coverage; 1:62,500; 1971-77; complete 15 min quad series; USGS

^a not yet published

	checklist	collection	floral keys	abundance indicators	population monitoring of rare species	comments
Vascular plants	C	C	C	N	I	
Bryophytes	N	I	non-specific key	N	N	
Lichens	N	I	"	N	N	
Algae	N	I	"	N	N	
Fungi	IV	I	"	N	N	

Hawaii Volcanoes-Haleakala National Parks

	checklist	collection	faunal keys	abundance indicators-population monitoring	Comments
mammals	C *	not in park	not specif. to park	I	
birds	C *	"	"	C.	
herpetiles	C *	N	"	N	
fish	N	N	"	N	
butterflies, moths	N	I	N	N	
other terrestrial insects	N	I	"	N	
aquatic insects	N	I	"	N	
molluscs	N	N	I marine only	N	
marine inerts.	N	N	I	N	
other inerts.					

* informal/unpublished

Hawaii Volcanoes-Haleakala National Parks

	% coverage	scale	most recent year	source	comments
Topographic map	100	1:24,000	1980	U.S.G.S.	
Surficial geology map	~ 40	1:24,000	1979	U.S.G.S.	
Sediment map	100	1:24,000	~1966	U.S.D.A.	soil map
Air photography					
black and white	100	1:52,000 1:24,000	1979	U.S.G.S.	
color	100	1:12,000	1976	NASA (u-2)	I.R.
satellite or high alt.	100	1:100,000	periodically	LANDSAT	prefers U-2 series to this one.
Vegetation map	90	1:24,000	~1975	C.P.S.U. contract	
Ground truth or survey	50	"	"	"	
Quantitative description	60	—	In progress	mostly by C.P.S.U.	
Aquatic Community map	none				
Permanent plots		x 25 100 m ² plots so variable sized	1965 x 1975	researchers "	

	checklist	collection	floral keys	abundance indicators	population monitoring of rare species	comments
Vascular Plants	C	C	N (not specific)	C	I	
Bryophytes	C	C	N "	N	N	
michens	I	C	N "	N	N	
Algae	O	N	N "	N	N	
Fungi	N	N	N "	N	N	

Isle Royale National Park

	checklist	collection	faunal keys	abundance indicators - population monitoring	Comments
mammals	C	I	not specif. to park	detailed studies for wolf & moose (I)	
birds	C	I	"	for 3 spp. (I)	
herpetiles	C	N	"	N	
fish	I	N	"	N	
butterflies, moths	I	N	"	N	
other terrestrial insects	I	N	"	N	
aquatic insects	to genus: I	C	"	N	
molluses	N	N	"	N	
marine inerts.					
Other inerts.					

Isle Royale National Park

	% coverage	scale	most recent year	source	comments
Topographic map *	100	1:62,500	1970	U.S.G.S.	
Surficial geology map					not sure if one exists
Sediment map	none	—			
Air photography					not sure if any exist.
black and white					
color					
satellite or high alt.					
Vegetation map	80-85	1:62,500	1978	LANDSAT	Check for monitor on an outdated map.
Ground truth or survey	none	—			
Quantitative description	25	—	in progress	Michigan Tech: B. Janke	
Aquatic community map	none	—			
Permanent plots	10-100 circular plots		1950's over last 20 yrs	researchers B. Janke	

* Also have a nautical chart.

	checklist	collection	floral keys	abundance indicators	population monitoring of rare species	comments
Vascular Plants	C	C	N	I	I	
Bryophytes	C	C	N	N	N	
lichens	C	C	N	N	N	
Algae	I	I	N	N	N	
Fungi	I	I	N	N	N	

C = Comprehensive Program
I = Incomplete Program
O = Old work only
N = No work on
the factor.

Subject ~~No. 1~~ the factor.

Long-Term Environmental Monitoring

Biosphere Reserve

44

Subject

Long-Term Environmental Monitoring

45

Biosphere Reserve

Subject

Long-Term Environmental Monitoring

Kiowah Reserve

46

Subject

Subject

DISTURBANCES

Natural:

- fire
- windstorm
- droughts
- landslides; earth mts.
- freeze-thaw dynamics
- dune movements
- Coastal erosion
- alluvial processes
- insect out break
- non-insect pathogen outb

Anthropogenic:

- fire
- logging
- agriculture
- visitor impact
- park developments

I	N	C	N	C	C	N	N	N	C	N	C	C	C
N		N	N	I	N	O	N	N	N	N	N	N	N
N	N	C	N	C	N	N	N	N	N	N	N	N	N
C	N	N	N	C	C	C	N	I	C	N	N	N	N
N	N	N	C	I	I	N	N	I	N	N	N	N	N

Exotic Species

mammals
fish
plants
insects
diseases

Long-Term Environmental Monitoring frequency and magnitude

Biosphere Reserve

48

Subject

Other:

Seismographic or Mass-movement

N C N N? I C N N N N C C C N

Long-Term Environmental Monitoring
of Vegetation Recovery

Cinquefoil Reserve

49

Subject

DISTURBANCES

Natural:

fire
windstorm
droughts
landslides; earth mnts.
freeze-thaw dynamics
dune movements
coastal erosion
alluvial processes
insect out break
non-insect pathogen outbreak

Big Bend	Channel Islands	Glacier	Great Smoky Mtns.	Mt. McKinley	Olympic	Organ Pipe Cactus	Rocky Mtns.	Saguaro Canyon	Yellowstone	Yosemite	Hawaii Volcanoes	Isle Royale
N	N	C	N	C	N	C	N	I	C	N	C	C
N	N	N	N	I	N	N	N	N	N	N	N	N
N	N	N	N	N	N	N	N	N	N	N	N	N
N	N	N	N	I	N	N	N	N	N	N	N	N
N	/	N	N	N	N	N	N	N	N	N	N	N
I	/	N	N	N	N	N	N	N	N	N	N	N
N	N	N	N	N	N	N	N	N	N	N	N	N
N	N	N	N	I	I	N	N	N	N	N	N	N
N	N	N	C	C	C	I	N	N	C	N	N	N
N	N	N	C	N	N	N	N	N	N	N	N	N
N	N	N	I	I	N	N	N	N	N	N	N	N

Anthropogenic:

fire
logging
agriculture
visitor impact
park developments

N	N	C	N	C	C	N	N	N	C	N	I	C
N	/	N	N	I	N	O	N	N	N	N	N	N
N	N	C	N	C	N	O	N	N	N	N	N	N
N	N	N	N	O	C	C	N	I	C	N	N	N
N	N	N	N	I	I	N	N	I	N	N	N	N

Exotic Species

mammals
fish*
plants
insects
diseases

N	C	N	O	I	N	N	N	N	C	N	I	N
N	/	N	I	N	N	N	C	C	N	I	N	N
N	I	C	N	O	N	I	N	I	N	I	I	N
N	N	N	N	C	N	N	N	I	N	N	N	N
N	/	N	N	C	N	N	N	N	N	N	N	N

* also species recovery of native populations

Long-term environmental monitoring vegetation recovery

Biosphere Reserve

50

Subject

Long-Term Ecological Research at Big Bend

51

Subject	status
Primary productivity-aquatics	none
Population dynamics: of fish	"
of water birds	"
of aquatic mammals	"
of aquatic reptiles	"
of aquatic amphibians	"
of aquatic invertebrates	"
of aquatic vascular plants	"
of aquatic nonvascular plants	"
Carbon Cycle-aquatic systems	"
Inorganic nutrient cycling-aquatics	"
Aquatic Succession	"
Ecosystem modelling-aquatics	"
Primary productivity-vegetation	"
Population dynamics: vascular plants	"
of non-vascular plants	"
Carbon cycle- vegetation systems	"
Inorganic nutrient cycling-vegetation	"
Vegetational Succession	"
Ecosystem Modelling-vegetation	"
Population dynamics: invertebrates	"
of amphibians	"
of reptiles	"
of birds	"
of mammals	some studies; baseline research on mule deer
Faunal Succession	none
Ecosystem Modelling-systems	"
Archiving	for weather data, herbarium and fauna specimens only

Long-Term Ecological Research at Channel Islands

52

Subject	status
Primary productivity-aquatics	none
Population dynamics: of fish of water birds	" (perhaps some work on fished species) for gulls, pelicans and some others
of aquatic mammals	some monitoring in progress
of aquatic reptiles	study of Night lizard in progress
of aquatic amphibians	none
of aquatic invertebrates	Threatened Santa Barbara mussel; Cal. Fish Game on ^{edible} livers.
of aquatic vascular plants	none (plans to monitor)
of aquatic nonvascular plants	"
Carbon Cycle-aquatic systems	"
Inorganic nutrient cycling-aquatics	Baseline O.C.S. '48 work; 1975-8
Aquatic Succession	none
Ecosystem modelling-aquatics	" (plans to do it in a few years)
Primary productivity-vegetation	"
Population dynamics: vascular plants	"
of non-vascular plants	"
Carbon cycle- vegetation systems	"
Inorganic nutrient cycling-vegetation	"
Vegetational Succession	monitoring only
Ecosystem Modelling-vegetation	none
Population dynamics: invertebrates	on molluscs on Santa Barbara
of amphibians	none
of reptiles	Night lizard only
of birds	(all are water birds - see above)
of mammals	all San Miguel marine mammals.
Faunal Succession	none
Ecosystem Modelling-systems	"
Archiving	only for interpretive use in park; Santa Barbara Mus. of Nat. History stores specimens, has botanical collection.

Long-Term Ecological Research at Everglades

53

Subject

status

Primary productivity-aquatics	just beginning.
Population dynamics: of fish	in progress; freshwater fishes, fishing pressure, water.
of water birds	in progress; water management of colonial waterbirds
of aquatic mammals	" "
of aquatic reptiles	" "
of aquatic amphibians	" "
of aquatic invertebrates	" "
of aquatic vascular plants	" "
of aquatic nonvascular plants	" "
Carbon Cycle-aquatic systems	none.
Inorganic nutrient cycling-aquatics	none.
Aquatic Succession	no information available
Ecosystem modelling-aquatics	yes; transport modelling
Primary productivity-vegetation	some preliminary studies; nothing really long-term
Population dynamics: vascular plants	community-oriented studies
of non-vascular plants	baseline information on wetland periphyton
Carbon cycle-vegetation systems	none
Inorganic nutrient cycling-vegetation	none
Vegetational Succession	extensive work
Ecosystem Modelling-vegetation	none
Population dynamics: invertebrates	none
of amphibians	none
of reptiles	alligator and crocodile studies
of birds	fire effects on Cape Sable sparrows
of mammals	none
Faunal Succession	none (succession not a major factor in S. Florida)
Ecosystem Modelling-systems	animal none (model exists, never used)
Archiving	comprehensive, includes herbarium and collections

Long-Term Ecological Research at Glacier

54

Subject

status

Primary productivity-aquatics	none
Population dynamics: of fish	"
of water birds	"
of aquatic mammals	"
of aquatic reptiles	"
of aquatic amphibians	"
of aquatic invertebrates	"
of aquatic vascular plants	"
of aquatic nonvascular plants	"
Carbon Cycle-aquatic systems	"
Inorganic nutrient cycling-aquatics	"
Aquatic Succession	"
Ecosystem modelling-aquatics	nothing comprehensive
Primary productivity-vegetation	some small, short-term projects
Population dynamics: vascular plants	none
of non-vascular plants	"
Carbon cycle-vegetation systems	"
Inorganic nutrient cycling-vegetation	"
Vegetational Succession	ongoing work w/ mountain pine beetle infestation, fire history
Ecosystem Modelling-vegetation	none
Population dynamics: invertebrates	"
of amphibians	"
of reptiles	"
of birds	"
of mammals	for elk, deer, bear
Faunal Succession	as part of elk and deer studies
Ecosystem Modelling-systems	not as much
Archiving	complete for aquatics, vegetation; incomplete in fauna

Subject	status
Primary productivity-aquatics	none
Population dynamics: of fish	work in progress
of water birds	none
of aquatic mammals	impacts of hogs on aquatic systems
of aquatic reptiles	none
of aquatic amphibians	salamander studies
of aquatic invertebrates	none
of aquatic vascular plants	none
of aquatic nonvascular plants	none
Carbon Cycle-aquatic systems	parts of it: d.o.c.; suspended particulate carbon
Inorganic nutrient cycling-aquatics	phosphates and nitrates; also work in conjunction w/ hog studies
Aquatic Succession	none
Ecosystem modelling-aquatics	in conjunction with Hog studies
Primary productivity-vegetation	old work: done in 1960's
Population dynamics: vascular plants	work done
of non-vascular plants	none
Carbon cycle- vegetation systems	for campsites and in fire study
Inorganic nutrient cycling-vegetation	some at high elevations
Vegetational Succession	extensive work done
Ecosystem Modelling-vegetation	yes - has been used
Population dynamics: invertebrates	(work on benthic macroinvertebrates), (periphyton)
of amphibians	salamander work
of reptiles	none
of birds	none
of mammals	Nats., extensive bear studies
Faunal Succession	none
Ecosystem Modelling-systems	none
Archiving	library, U. of TN computer data banks, amphibian-reptile collection

Long-Term Ecological Research at Mt. McKinley

56

Subject	status
Primary productivity-aquatics	none
Population dynamics: of fish	"
of water birds	"
of aquatic mammals	"
of aquatic reptiles	"
of aquatic amphibians	"
of aquatic invertebrates	"
of aquatic vascular plants	"
of aquatic nonvascular plants	"
Carbon Cycle-aquatic systems	"
Inorganic nutrient cycling-aquatics	"
Aquatic Succession	"
Ecosystem modelling-aquatics	"
Primary productivity-vegetation	none
Population dynamics: vascular plants	study in progress for one species
of non-vascular plants	none
Carbon cycle- vegetation systems	"
Inorganic nutrient cycling-vegetation	"
Vegetational Succession	one study done
Ecosystem Modelling-vegetation	none.
Population dynamics: invertebrates	"
of amphibians	"
of reptiles	"
of birds	"
of mammals	in progress
Faunal Succession	none
Ecosystem Modelling-systems	current project on large mammals in progress
Archiving	telemetry, weather records, collection of all research done in past

Long-Term Ecological Research at Olympic

57

Subject

status

Primary productivity-aquatics	none
Population dynamics: of fish	none (just beginning on a few species)
of water birds	none
of aquatic mammals	none
of aquatic reptiles	"
of aquatic amphibians	"
of aquatic invertebrates	"
of aquatic vascular plants	"
of aquatic nonvascular plants	"
Carbon Cycle-aquatic systems	" (NSF plans to start)
Inorganic nutrient cycling-aquatics	" " " " "
Aquatic Succession	"
Ecosystem modelling-aquatics	"
Primary productivity-vegetation	beginning - goat impact studies
Population dynamics: vascular plants	Sitka spruce demography work
of non-vascular plants	none
Carbon cycle- vegetation systems	"
Inorganic nutrient cycling-vegetation	"
Vegetational Succession	Sitka spruce study and backcountry tramping studies
Ecosystem Modelling-vegetation	underway in conjunction with Sitka spruce work.
Population dynamics: invertebrates	none
of amphibians	"
of reptiles	"
of birds	some fire studies
of mammals	elk; incomplete work on goats
Faunal Succession	none
Ecosystem Modelling-systems	animal none
archiving	herbarium, minor collections, no integral storage systems

subject	status
Primary productivity-aquatics	none
Population dynamics: of fish	for pupfish - mark-recapture program planned
of water birds	none
of aquatic mammals	"
of aquatic reptiles	"
of aquatic amphibians	"
of aquatic invertebrates	"
of aquatic vascular plants	"
of aquatic nonvascular plants	"
Carbon Cycle-aquatic systems	"
Inorganic nutrient cycling-aquatics	"
Aquatic Succession	"
Ecosystem modelling-aquatics	"
Primary productivity-vegetation	work done on N. American deserts by independent researcher
Population dynamics: vascular plants	N. Am. deserts work plus <u>Agave deserti</u> study
of non-vascular plants	N. Am. deserts work
Carbon cycle- vegetation systems	none
Inorganic nutrient cycling-vegetation	"
Vegetational Succession	" (succession not important in desert)
Ecosystem Modelling-vegetation	"
Population dynamics: invertebrates	"
of amphibians	"
of reptiles	M.A. Ornes on shovelnosed snake
of birds	none
of mammals	studies of select white-tail deer
Faunal Succession	competition studies of bighorn sheep and mule deer
Ecosystem Modelling-systems	animal none
Archives	herbarium, some animal specimens. Incomplete / primitive date archiving

Long-Term Ecological Research at Rocky Mountains⁵⁹

Subject	status
Primary productivity-aquatics	none
Population dynamics: of fish	work done
of water birds	little, if any
of aquatic mammals	" " "
of aquatic reptiles	none
of aquatic amphibians	"
of aquatic invertebrates	"
of aquatic vascular plants	work done
of aquatic nonvascular plants	(some bacterial population studies)
Carbon Cycle-aquatic systems	none
Inorganic nutrient cycling-aquatics	"
Aquatic Succession	some sediment studies done
Ecosystem modelling-aquatics	not as much - perhaps as parts of other projects
Primary productivity-vegetation	some work in alpine plots
Population dynamics: vascular plants	for some plants
of non-vascular plants	none
Carbon cycle- vegetation systems	"
Inorganic nutrient cycling-vegetation	"
Vegetational Succession	work done
Ecosystem Modelling-vegetation	none
Population dynamics: invertebrates	"
of amphibians	"
of reptiles	"
of birds	some work on particular species
of mammals	" " " " "
Faunal Succession	none
Ecosystem Modelling-systems	"
Archives	some specimen collections; no data archives

Long-Term Ecological Research at Sequoia-Kings Canyon '60

Subject	status
Primary productivity-aquatics	lake community studies
Population dynamics: of fish	as part of lake studies
of water birds	none
of aquatic mammals	"
of aquatic reptiles	"
of aquatic amphibians	some frog studies
of aquatic invertebrates	none
of aquatic vascular plants	Vaseline research in lakes
of aquatic nonvascular plants	" " " "
Carbon Cycle-aquatic systems	none
Inorganic nutrient cycling-aquatics	"
Aquatic Succession	"
Ecosystem modelling-aquatics	"
Primary productivity-vegetation	"
Population dynamics: vascular plants	"
of non-vascular plants	"
Carbon cycle-vegetation systems	"
Inorganic nutrient cycling-vegetation	"
Vegetational Succession	"
Ecosystem Modelling-vegetation	one small-scale study
Population dynamics: invertebrates	none
of amphibians	"
of reptiles	"
of birds	"
of mammals	on some specific mammals
Faunal Succession	none
Ecosystem Modelling-systems	"
Archives	herbarium, some animal skeletons & collections; Comprehensive bio. data storage

Subject	status
Primary productivity-aquatics	none — no real long-term work at all.
Population dynamics: of fish	"
of water birds	"
of aquatic mammals	"
of aquatic reptiles	"
of aquatic amphibians	"
of aquatic invertebrates	"
of aquatic vascular plants	"
of aquatic nonvascular plants	"
Carbon Cycle-aquatic systems	"
Inorganic nutrient cycling-aquatics	"
Aquatic Succession	"
Ecosystem modelling-aquatics	"
Primary productivity-vegetation	"
Population dynamics: vascular plants	"
of non-vascular plants	"
Carbon cycle- vegetation systems	"
Inorganic nutrient cycling-vegetation	"
Vegetational Succession	"
Ecosystem Modelling-vegetation	"
Population dynamics: invertebrates	"
of amphibians	"
of reptiles	"
of birds	"
of mammals	"
Faunal Succession	"
Ecosystem Modelling-systems	"
Archives	some work done; not up to date

Long-Term Ecological Research at Yellowstone

62

Subject

Status

Primary productivity-aquatics	autoxanthin-oligotrophism studies on Yellowstone Lake
Population dynamics: of fish	much work done
of water birds	white pelicans, California gull, cormorants, among other recent survey, old work on beavers; not much
of aquatic mammals	lizard M.A. study, Turner inventory.
of aquatic reptiles	perhaps some salamanders work in Turner inventory
of aquatic amphibians	none
of aquatic invertebrates	some work in conjunction w/ a Swan study
of aquatic vascular plants	" " " " " " ; also fisheries studies
of aquatic nonvascular plants	none
Carbon Cycle-aquatic systems	perhaps some work in water quality or fire studies
Inorganic nutrient cycling-aquatics	
Aquatic Succession	none
Ecosystem modelling-aquatics	"
Primary productivity-vegetation	"
Population dynamics: vascular plants	"
of non-vascular plants	"
Carbon cycle- vegetation systems	"
Inorganic nutrient cycling-vegetation	"
Vegetational Succession	limited projects in progress; range transects
Ecosystem Modelling-vegetation	none
Population dynamics: invertebrates	"
of amphibians	"
of reptiles	"
of birds	some specific work
of mammals	mostly ungulate work
Faunal Succession	limited: working from old records; studies of moose, etc
animal	
System Modelling-systems	some w/ Grizzly bear
Archives	complete for history of One park in park library

Long-Term Ecological Research at Hawaii Volcanoes - Haleakala⁶³

Subject	status
Primary productivity-aquatics	none
Population dynamics: of fish	some work - cursory
of water birds	none
of aquatic mammals	none
of aquatic reptiles	none
of aquatic amphibians	none
of aquatic invertebrates	marginal work
of aquatic vascular plants	none
of aquatic nonvascular plants	none
Carbon Cycle-aquatic systems	none
Inorganic nutrient cycling-aquatics	none
Aquatic Succession	none
Ecosystem modelling-aquatics	none
Primary productivity-vegetation	none
Population dynamics: vascular plants	none
of non-vascular plants	none
Carbon cycle- vegetation systems	none
Inorganic nutrient cycling-vegetation	none
Vegetational Succession	yes - work in progress.
Ecosystem Modelling-vegetation	none
Population dynamics: invertebrates	none
of amphibians	none
of reptiles	none
of birds	species work in progress
of mammals	" " " " ; particularly for exotics
Faunal Succession	none
Ecosystem Modelling-systems	animal none
Archives	for all data; Not within the park, however

Long-Term Ecological Research at Isle Royale

64

Subject

status

Primary productivity-aquatics	none
Population dynamics: of fish	"
of water birds	"
of aquatic mammals	"
of aquatic reptiles	"
of aquatic amphibians	"
of aquatic invertebrates	"
of aquatic vascular plants	"
of aquatic nonvascular plants	"
Carbon Cycle-aquatic systems	"
Inorganic nutrient cycling-aquatics	not comprehensive at moment - plan for long-term work has been done for some sections for invertebrates
Aquatic Succession	
Ecosystem modelling-aquatics	none
Primary productivity-vegetation	"
Population dynamics: vascular plants	some work
of non-vascular plants	none
Carbon cycle- vegetation systems	"
Inorganic nutrient cycling-vegetation	first begun
Vegetational Succession	work done
Ecosystem Modelling-vegetation	none
Population dynamics: invertebrates	none
of amphibians	"
of reptiles	"
of birds	for three species
of mammals	detailed wolf-moose work; limited for fox, snowshoe hare yes ; " " " " " " "
Faunal Succession	
Ecosystem Modelling-systems	has been done for wolf, moose, beaver
Archives	herbarium, animals; no data in park, some at Mich. Tech.

Questionnaire form

- 1 -

Park General Information

Name _____ State _____

Total Area _____ (acres) _____ (hectares)

(LAND - if significantly different than total area) _____ (acres) _____ (ha)

Elevation range _____

General physical features:

Completed from
reference materials

Unique physical features:

General Climate:

NATURAL FEATURES:

Forested _____ (% if available) Treeline _____

Virgin systems _____ (area if avail.)

Unique systems (list):

Importance (area, etc.) of streams:

for purposes of
report

Importance of natural lakes:

Impoundments :

Importance of marine systems:

Type of coastline:

Importance of glaciers:



MAJOR DISTURBANCES:

Anthropogenic

mining:



logging:

for purposes
of report

grazing:
exotic species:

fire:

Natural: fire:



Other:



MANAGEMENT

1) Are you currently employing, or have you ever employed, fire management in the park?

-if yes, for how long?

2) Are you currently employing, or have you ever employed, management zoning (historical, natural, etc) in the park?

-if yes, what zones?

AQUATICS

What is the status of a) baseline resource inventory and b) long-term environmental monitoring in the following areas; concerning aquatic sites:

C = ~~current and actively pursued~~ comprehensive program being implemented

I = incomplete, but in progress

N = none

O = work has been done in the past, but none is currently in progress

	baseline	long-term	comments (# of stations v / long)
water temp.			
air temp.			
sediment temp.			
salinity			
pH			
particulate			
dissolved O ₂			
transparency			
water (lake H ₂ O levels)			
numbers of streams & lakes			
morphology of aquatic features			
(stream) discharge			
ice cover			
snow depth on lakes			
precipitation			
dew point			
wind speed			
wind direction			
water levels			
solar radiation			
water hardness			

	baseline	long-term	comments: (lakes, streams, etc.)
Water chemistry:			
phosphate			
nitrate			
conductivity			
anions & cations			
Others			
Aquatic organisms :			
bacteria			
periphyton			
phytoplankton			
zooplankton			
benthic inverts.			
Vertebrates:			
Salamanders			
fish			
other			

Have you been conducting long-term ecological research to determine natural trends and responses to natural and anthropogenic stress in the following areas:

Primary productivity:

Population dynamics:

of fish:

birds:

mammals:

reptiles:

amphibians:

invertebrates:

vascular plants:

non-vascular plants:

Carbon cycle:

Cycling of inorganic nutrients:

Succession:

Have you done any ecosystem modelling?

Are you recording or storing data or specimens in archives?

~~Do you publish~~ Have you ~~ever~~ compiled a bibliography
of ~~your~~ ^{published} work?

→ These two questions were asked of every contact; only asked once if only one person was contacted.

MACROCLIMATE

What is the status of a) baseline resource inventory and b) long-term environmental monitoring in the following areas:

C = ~~comprehensive program being implemented~~

I = incomplete but in progress

N = none

O = work has been done in the past but none is currently in progress.

	Baseline	Long-term	Comments
air temp.			
% humidity (relative)			
total radiation, sensible or longwave			
precipitation			
dew point			
wind velocity			
wind direction			
soil temp.			
soil moisture (water content)			
depth to water table			
shortwave insolation			
groundwater level			
runoff/erosion			
soil (composite sampling)			
lysimetry			
snow depth			
air quality monitoring:			[elevation(s)]
ozone			
total suspended particulate			
fine "			
NOX			
SO ₂			
CO			
visibility			
trace elements			

Pesticide

Wet-fall chemistry
dry-fall "

base
line

long-
range

Comments

Have you been conducting long-term ecological research to determine natural trends and responses to natural and anthropogenic stress in the following areas:

Carbon cycle

Cycling of inorganic materials

not
asked

Have you done any ecosystem modelling?

Have you assembled your data in ~~the~~ archives?

Have you compiled a bibliography of your published work?

DISTURBANCES

What is the status of a) baseline resource inventory and b) long term environmental monitoring in the following types of disturbances in the park:
comprehensive program being implemented

C = comprehensive program being implemented
~~current, and actively pursued~~

I = incomplete, but in progress

I = incomplete, but in progress

$N = \text{none}$

O = work has been done in the past, but none is currently in progress. ^{long-term}

	frequency, magnitude	infiltration velocity	Comments
NATURAL			
Fire			
windstorm			
droughts			
landslides; earth mts.			
freeze-thaw "			
dune "			
Coastal erosion			
alluvial processes			
insect outbreak			
pathogen outbreak			
ANTHROPOGENIC			
fire			
logging			
agriculture			
visitor impact			
park developments			
historic zone mgmt.			

baseline	freq., mag., veg. recovery	comments
Exotic species		
mammals		
fish		
plants		
insects		
diseases		
other		

GEOLGICAL FEATURES

Do you have the following references to the geological features of the area? If yes, what is the most recent year (or a decade) in which they were made, and what is their scale? What is the source of these materials?

	To coverage	most recent year	scale	source	comments
Topographic maps					
Surficial geology maps					
Sediment maps					
Air photography					
black & white					
color					
satellite or high altitude					

Is there any geologic monitoring going on in the park (for example, seismographic or mass-movement monitoring)? Is it a baseline (short-term) evaluation or a long-term monitoring project?

VEGETATION

Do you have the following and are they

C = ~~comprehensive program being implemented~~

I = incomplete, ^{program} in progress

N = have none

O = work was ~~done~~ on them in the past, but there is no work current or in progress.

	checklist	collection	floral keys	abundance indicators	p.o.p. monitoring of rare species	Comments
Vascular						
Bryophytes						
Lichens						
Algae						
Fungi						

If you have the following resources, indicate their % coverage, year established, scale, time, and if they are being monitored as a long-range project:

	% cov.	year	scale	time	monitoring?	Comments
Vegetation map						
ground truth or survey						
quantitative description						
permanent plots						
aquatic community maps						



Have you been conducting long-term ecological research to determine natural trends and responses to natural and ~~anthropogenic~~ anthropogenic stress in the following areas:

Primary productivity:

Population dynamics

vascular plants:

nonvascular plants:

Carbon cycle:

Cycling of inorganic materials

Succession:

Have you done any ecosystem modelling?

Have you assembled your data and/or specimens in ~~the~~ archives?

~~Have you compiled~~ ~~together~~ a bibliography of your published work?

FAUNA

Do you have the following and are they
comprehensive program being implemented

C = ~~available, past or active program~~

I = incomplete, program in progress

N = have none

O = work was done on item in the past, but there is
no work current or in progress.

	checklist	collection	fauna keys	abundance indicators	population monitoring	concepts
mammals						
birds						
herpetiles (rept. & amph.)						
fish						
butterflies/moths						
other terrestrial insects						
aquatic insects						
moles						
marine invert.						
other inverts.						



Have you been conducting long-term ecological research to determine natural trends and responses to natural and anthropogenic stress in the following areas:

Population dynamics

invertebrates:

amphibians:

reptiles:

fish:

birds:

mammals:

Succession:

Do you do any ecosystem modelling?

Have you assembled your data and/or specimens in archives?

Have you compiled a bibliography of your published work?