

Department of Botany
First Progress Report

April 1, 1974

INITIATION OF THE WORK OF THE UNIT

This report is issued for the information of the National Park Service and its cooperating institutions and personnel in fulfillment of the requirements of the related contract no. 8092-0005-100 between the University of Hawaii and the Western Regional Office of the National Park Service. The transmission of the information in this report is the responsibility of Maxwell S. Doty, Botany Department, University of Hawaii, Honolulu, Hawaii, who is Director of the Unit. It has been compiled from field and conference notes principally by the administrative assistant with the help of others as mentioned in the text. Completed 29-III-74.

This progress report of the National Park Service Resources Studies Unit at the University of Hawaii represents the activities of two months toward the accomplishment of this Unit's 01-year objectives. Much of our initial effort has, of necessity, been expended in "gearing up", making contacts and laying the groundwork for imminent research.

A Unit office has been established in the Plant Sciences Building at the University of Hawaii, Manoa Campus, near the office of the Unit Director, Dr. Maxwell S. Doty. Immediately necessary supplies have been purchased and additional supplies as well as major office equipment (e.g., typewriter, desk, chair) are on order. Letterhead paper for the Unit has been designed and is now being printed.

The initial steps of hiring an administrative assistant and a clerk/typist for the Unit have been taken. Since this involves advertising and interviewing for a specified period of time, a combination position was established and filled on a temporary basis in the person of Marlyn Miller. This has been a most successful appointment; her responsibility has been to make the Unit operative. In this capacity, she has attended the Hawaii Volcanoes National Park Master Plan public meetings and the Wilderness Area public hearings in Hilo and in Honolulu, meeting NPS representatives and other attendants directly or indirectly associated with NPS affairs (e.g., Bishop Estate, Conservation Council, Audubon Society, Big Island Fish and Game Association, and the Congress of Hawaiian People). She has also travelled to Hawaii Volcanoes National Park, Haleakala

and City of Refuge for the purpose of gathering the management's views and research priorities as well as better acquainting herself with the particular areas of research interest in each of the parks.

The pre-contract Resource Group has been strengthened by additional professional people. They have been notified of our operative status and their continued support solicited (see attached letter, February 28). A meeting has been arranged for the purposes of bringing together the members of this Resource Group and the National Park Service managerial level people, including the State and Regional Directors and the Chief Scientist of the NPS Science Center, Miss. (see attached letter, March 19)--primarily to become acquainted, but also to exchange ideas regarding research and traineeships.

In order of their appearance in the General Work Plan, the "Project priorities for the 01-year effort" are discussed below in terms of their progress to date. Design of a 5-year work program for their achievement with the inclusion of others has been begun.

AREA A. TRAINING FOR SCIENTIFIC PARK RESOURCE EVALUATION, DEVELOPMENT
AND MANAGEMENT

- a. Recommend course work for certificate training after investigation of content of courses prospectively to be required.
- b. Develop a set of on-the-job training opportunities for the certificate training.
- c. Propose and seek University implementation of the certificate program.

These objectives, comprising the educational aspect of the Unit's responsibilities, are being sought by Dr. C. H. Lamoureux of the University of Hawaii Botany Department. His efforts to date in the

elucidation and implementation of the above objectives are presented below in his "Proposal for a Certificate Program in Resource Management" which will go to the Graduate Council for approval. We are optimistic that approval will come relatively quickly and that the program may be operative by Fall, 1974.

I. Introduction

This is a proposal for a program which would lead to a certificate in Resource Management that would be granted as an addition to a graduate degree in various graduate fields of study in natural sciences such as Botanical Sciences, Zoology and Geology/Geophysics. Award of the certificate would indicate that the student had, in addition to meeting the degree requirements in his field of study, also completed certain courses and participated in an internship program.

The optimal management of natural resources is a major field of interest at this time and is likely to become even more significant over the next few decades as demands on available resources increase. Managers of national, state and local parks, natural areas, wilderness areas, wildlife refuges, forest reserves and similar public facilities frequently require the results from basic research in the natural sciences in order to make wise management decisions. All too often such information is unavailable to the manager, either because the scientific work has not been done or because, although the information has been obtained, the lack of communication between scientists and

resource managers makes it difficult for the manager to obtain the needed information. Furthermore, the scientist is frequently unaware of the needs of the resource manager and so makes little or no effort to convey the results of his work to the resource manager.

The U. S. National Park Service (NPS) has recognized this problem and is making some efforts to overcome it. Recently the NPS has provided the funds for the establishment of a Cooperative National Park Resources Studies Unit in the Department of Botany at the University of Hawaii. It is anticipated that funding of this Unit will continue indefinitely, subject of course to adequate performance.

The NPS has indicated a need for staff members who have had advanced training in natural sciences as well as a familiarity with the problems peculiar to managing national parks or other natural resource facilities. It is likely that, in the future, the NPS as well as state and local park systems and other agencies concerned with natural resource management will be employing people who have had such training. The certificate program proposed here is designed, therefore, both to meet perceived needs of natural resource management agencies and to offer students somewhat broader training which might enhance their opportunities for employment.

The proposed program would not require the expenditure of additional State funds; any costs over and above the usual costs of existing graduate education would come from the NPS contract.

II. Description of the Program

The Resource Management Certificate Program will be open only to graduate students who are intended candidates for a graduate degree in one of the participating graduate fields of study: Botanical Sciences, Zoology, Geology and Geophysics. It is possible that additional graduate fields of study may be affiliated in the future.

Upon successful completion of the program, in addition to the completion of the disciplinary graduate degree, a certificate in Resource Management will be awarded. The certificate program would not have its "own" students.

The program will consist of three courses plus a period of internship.

a. Courses

1. Botany/Zoology 450. (3 credits). Natural History of the Hawaiian Islands. This is an existing course offered jointly by both Botany and Zoology. It provides a basic scientific background in the unique natural features of the Hawaiian Islands, both terrestrial and marine, and includes information on geology, climates, ecology, endemism and evolution in the Hawaiian biota, and the effects of man on the Hawaiian biota.
2. Botany 6xx. (3 credits). Problems in Resource Management. This is a new course which will be developed. The course will be organized by the Program Coordinator and will utilize NPS resource managers as well as University faculty as lecturers. The objectives of the course will be to present the types of problems faced by resource managers and to try to bring to bear on these problems the roles of various types of scientific research.
3. Botany 6xx. (3 credits). Seminar in Resource Management. This is a new course which will be developed. It will be taught by various members of the Committee of Cooperating Faculty. The seminar will focus on current research in resource management and case history studies.

b. Internship

Each student in the program will be required to complete an internship program which will involve working in a national park or some other appropriate resource facility for a certain period, usually either a summer or a semester. This will provide the student with an opportunity to work with the kinds of problems faced by resource managers. Initially it is expected that most students would complete their internships in national parks in Hawaii. Eventually, we hope to work out similar arrangements with state and county park departments. While the emphasis in the programs, because of the location and interests of the University of Hawaii, will be on resource management in Hawaii and other Pacific island areas, it would also be possible for students to complete the internship requirements by working in mainland parks. It is anticipated that interns would be employed as short-term (e.g., summer) employees by the participating parks during their periods of internship.

III. Staff

- a. The program will need a Coordinator, who will work closely with the Director of the Cooperative National Park Resources Studies Unit. The Coordinator will be a University of Hawaii faculty member (initially Dr. C. H. Lamoureux, Professor of Botany). Since the program size is expected to be small (perhaps 5 to 10 students at any one time) and

since supporting services will be provided by the NPS contract, there should be no need for the Coordinator to have formal released time for the performance of the necessary duties of the position.

- b. There should be a Committee of Cooperating Faculty, composed of members of the graduate faculty selected from cooperating fields of study. The members of the Committee would be appointed by the Dean of the Graduate School, after consultation with the program Coordinator. The duties of the Committee would be to advise the Coordinator, to assist in advising students, and to participate in the teaching of the proposed seminar course. This Committee should also include a representative of the National Park Service.
- c. Secretarial support will be needed; funds are available in the NPS contract to provide such support.

IV. Budgetary Implication for the University of Hawaii.

Implementation of the program should not require any additional expenditure of State funds. Secretarial and supporting services are provided by the NPS contract. One of the three courses required in the program already exists. The second course is a graduate seminar which will be team taught by the Committee of Cooperating Faculty. The third course will be organized by the Coordinator and will draw on various guest lecturers. Both new courses are expected to have small enrollments and will not require laboratory facilities. As mentioned earlier, the Coordinator should not require formal released time from teaching duties to fulfill his administrative demands.

AREA B. DESCRIPTIVE INVENTORY OF NATURAL RESOURCES

- a. Plan and, as feasible, initiate a study of Kipahulu Valley.

Although this is of first order priority in the views of the Unit and the Haleakala management, caution takes greater priority. The current status of the Valley is "no entry" by declaration of the Haleakala superintendent. Although it would seem desirable to study this relatively untouched valley for scientific purposes (in more detail than that reported in the 1967 "Scientific Report of the Kipahulu Valley Expedition"¹), the very entry of the researchers may cause changes in the flora and fauna.

Research techniques as well as human impact might be developed elsewhere, e.g., in neighboring Waihoi Valley and Upper Hana Forest Reserve, and applied to Kipahulu since those areas have already been cursorily studied by a group of NSF grantees directed by J. I. Kjargaard. Because the Upper Hana Forest Reserve is an anticipated addition to HNP anyway, any research done there would not be "wasted" in the view of the NPS. Although the areas are geographically adjacent and probably have similar overall elevations and rainfall, the 1972 report² of Kjargaard's group indicates Kipahulu has about 50% more native species than Waihoi and about 50% fewer introduced species. Personal communication with one of the Waihoi/Upper Hana investigators

¹ Warner, R. E. (ed.). 1967. Scientific Report of the Kipahulu Valley Expedition. Sponsored by The Nature Conservancy. v + 184 pp.

² Kjargaard, J. I. (ed.). 1972. Scientific Report of the Waihoi Valley Project. Sponsored by National Science Foundation. iii + 252 pp.

indicates this comparison is probably unrealistic, because Waihoi is only about half the size of Kipahulu and because the proportions of the two valleys at upper and lower elevations differ. Therefore, their comparability must be considered before major action is taken.

There are conflicting reports regarding the extent of the damage by the 28 people participating in varying degrees in the August, 1967, expedition into Kipahulu. Again, personal communication with one of the Waihoi/Upper Hana investigators indicates that not only are the trails made by the group in Waihoi/Upper Hana being revegetated, but the new growth is almost all native vegetation. Indeed, some trails are already obliterated or recognizable only by persons familiar with floral landmarks of the area. If it can be established that the impact on Kipahulu is no more severe or lasting than it apparently was in Waihoi, the preferred approach might be to study Kipahulu directly.

Assuming a decision is imperative regarding Kipahulu, the immediate task would seem to be one of assembling and evaluating all information (printed and by personal communication) available on the Valley--possibly by someone with first-hand experience in the Valley. Study of this body of information could then form the basis for recommending a direction to be taken after being weighed and decided upon by the superintendent of Haleakala. If he concurred in the decision, the instrumentation of the recommendation could be carried out by this Unit with appropriate additional funding, by the National Park Service, or by some other group with the necessary qualifications.

It would seem possible that whatever ecological techniques (quadrats, line transects, etc.) are used, markers could be left so that later monitoring of changes could be carried out if desired.

- b. Prepare in quantitative terms descriptions of the Hawaiian ecosystems. Historic changes will be included.

No progress to date. See under Area D-c, -d and -e below.

- c. List the rare, endangered and interesting plant and bird species of Hawaii through cooperative programs to be sought with the State Division of Fish and Game and the Bureau of Sport Fisheries and Wildlife. The same will be done in time for other groups of organisms and phenomena.

Regarding plants falling into the "rare and endangered" category, no published list is currently available but one is in progress.

Dr. F. R. Fosberg at the Smithsonian is preparing the list and expects to send it to the Tropical Pacific Gardens on Kauai this month (April) for publication. Dr. W. Stewart, Director of the Gardens, expects the publication to be available by mid-July, 1974. Although a preliminary list is currently available, we prefer to wait and either include or reference the published list in a later report.

The cryptogamic plants, the algae, fungi and soil microorganisms are not included in Fosberg's list and are so poorly known taxonomically, geographically and ecologically that they are almost certainly beyond the scope of investigation by this Unit at present.

A copy of the "USDI Bureau of Sport Fisheries and Wildlife List of Endangered Native Fish and Wildlife" was obtained from the Bureau's Office of Endangered Species in Kailua. Those species on the list

native to Hawaii are:

BIRDS

Akepa, Hawaii (akepa)	<u>Loxops coccinea coccinea</u>
Akepa, Maui (akepuie)	<u>Loxops coccinea ochraceu</u>
Akialoa, Kauai	<u>Hemignathus procerus</u>
Akiapolaau	<u>Hemignathus wilsoni</u>
Coot, Hawaiian	<u>Fulica americana alai</u>
Crow, Hawaiian (alala)	<u>Corvus tropicus</u>
Creeper, Molokai (kakawahie)	<u>Loxops maculata flammea</u>
Creeper, Oahu (alauwahio)	<u>Loxops maculata maculata</u>
Duck, Hawaiian (koloa)	<u>Anas wyvilliana</u>
Duck, Laysan	<u>Anas laysanensis</u>
Finches, Laysan and Nihoa	<u>Psittirostra cantans</u>
Gallinule, Hawaiian	<u>Gallinula chloropus sandvicensis</u>
Goose, Hawaiian (nene)	<u>Branta sandvicensis</u>
Hawk, Hawaiian (io)	<u>Buteo solitarius</u>
Honeycreeper, crested (akohekohe)	<u>Palmeria dolei</u>
Millerbird, Nihoa	<u>Acrocephalus kingi</u>
Nukupuus, Kauai and Maui	<u>Hemignathus lucidus</u>
Oo, Kauai (oo aa)	<u>Moho braccatus</u>
Ou	<u>Psittirostra psittacea</u>
Palila	<u>Psittirostra bailleui</u>
Parrotbill, Maui	<u>Pseudonestor xanthorphrys</u>
Petrel, Hawaiian dark-rumped	<u>Pterodroma phaeopygia sandwichensis</u>
Stilt, Hawaiian	<u>Himantopus himantopus knudseni</u>
Thrush, large Kauai	<u>Phaeornis obscurus myadestina</u>
Thrush, Molokai (olomau)	<u>Phaeornis obscurus rutha</u>
Thrush, small Kauai (puaiohi)	<u>Phaeornis palmeri</u>

MAMMALS

Bat, Hawaiian hoary	<u>Lasiurus cinereus semotus</u>
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ARTHROPODS

The national list is limited to birds and mammals, so Wayne Gagné and Frank Howarth of Bishop Museum were contacted regarding arthropods. Hawaii is a great repository of examples of insular evolution of arthropods, but because of destruction of habitat, introduction of predators (especially ants), parasites, etc., many

of these highly specialized endemics are becoming rare and endangered if not already extinct. The dynamic list of Gagné and Howarth currently contains well over 300 species considered "rare and endangered". Because of the inherent disorder of such a dynamic list, it could not be adequately organized in time for inclusion in this report.

MOLLUSCS

Rare and endangered terrestrial molluscs have shared an obscurity similar to the insects, but their numbers and taxonomy are also beginning to be publicized. Dr. Yoshio Kondo at Bishop Museum has been working on this group of organisms for many years, and the task is a laborious one. He estimates that 50% of the 1061 species of nine families of terrestrial snails that once inhabited Hawaii are now extinct. Reasons cited for these extinctions and for endangering still living species are: destruction of native habitats, invasion of exotics, predation by Englandina (a carnivorous snail from Florida) and over-collecting. Although his list of rare and endangered species would be large if molluscan taxonomy were a simple matter, Dr. Kondo has chosen to list the species in only the following two genera for which the status of the species is well-known:

Achatinella vulpina
phaeozona
fulgens
stewartii
bellula
juddii
livida
curta

list continued --

Achatinella dimorpha
pulcherrima
decipiens
viridans
taeniolata
bulimoides
elegans
pupukanioe
fuscobasis
sowerbyana
lorata
cestus
vittata
leucorraphe
swiftii
apexfulva
valida

Carelia bicolor

Marine molluscs cannot yet be ascribed as "rare and endangered" due to inadequate knowledge. However, Dr. Alison Kay suggests that certain of the species may be indirectly assigned this designation, because their habitats are subject to such classification. An example she would include in this "rare and endangered by association" list is Arca tenella, a bivalve collected heavily in the early 1900's in Kaneohe Bay, but rarely seen now--most likely due to deterioration in the Bay substrate. A more complete "list" (with the above qualifications) may be completed by the July report.

- d. Complete revision of plant check lists and herbarium updating for Hawaii Volcanoes and Haleakala National Parks.

This objective is being met under the direction of Dr. W. Theobald who is supervising the work of J. Krahulik of the University of Hawaii Botany Department. Dr. Theobald is a well-known taxonomist engaged in producing a manual of Hawaii's flowering plants. Krahulik

is a graduate student in taxonomy and well-acquainted with the Hawaiian flora.

Permission was obtained from the National Park superintendents to transport the Park herbarium specimens (with utmost care) to the University where Kraulik has access to reference collections, books and professional advice for completion and revision of the classification of the specimens. He has begun work on the HVNP herbarium; when that is completed, he will work on HNP's specimens.

Revision of the check lists and collecting of species not represented in the current herbaria will require field work which will also be carried out by Kraulik. Tentative plans are for this phase to begin during Easter vacation and continue this summer. This phase may well involve requesting National Park people to watch for particular species, either because Kraulik did not find them or because they were not in the flowering condition required for herbarium specimens at the time of his collecting.

- e. Describe the City of Refuge fish populations and sketch a plan for their presentation to the public.

The State Division of Fish and Game quantified the populations along transects in Honaunau Bay in 1969, -70 and -71, but fiscal considerations have prevented their continuing beyond May, 1971. The Marine Options Program, sponsored by the Sea Grant Program, carried out some investigations in the Bay on a cruise in the summer of 1972³ but their information is more descriptive than quantitative

³Marine Options Program. 1972. Honaunau Bay Survey. 26 pp. Unpub.

and population estimates are not possible from them. From snorkeling line-transects and from making use of grids, they reported 12 families of fish, 7 phyla of invertebrates, made estimates of per cent cover by different types of coral and estimated percentages of different substrate types. From their brief studies, they tentatively concluded that the Honaunau plant and animal populations exhibit less diversity than those of Hanauma Bay, a refuge on Oahu. However, they acknowledge that their sampling was inadequate, non-quantitative and perhaps associated with seasonality. They highly recommend making Honaunau a marine park and indicate elaboration of this plan might follow that suggested by the Governor's Task Force on Oceanography⁴. This would include a snorkeling trail with markers, identification plaques, shore displays, etc. Dr. Doty has also talked to J. Rougerie, a French architect interested in underwater construction, about the possibility of transparent underwater tubes for visitor viewing of the Bay; but this is a no-doubt costly and revolutionary innovation for which the Park Service may not be ready for some time.

AREA C. BIOLOGICAL CONTROL AND CARRYING CAPACITIES

- a. Recommend carrying capacity for visitors in some key areas.

Human carrying capacity is governed by environmental factors related to the physical and biological impact of visitors on natural resources. It is governed as well by anthropocentric factors related

⁴ Governor's Task Force on Oceanography. 1969. Hawaii and the Sea. 112 pp. Unpub.

to the quality of experience and safety for park visitors. All of these factors have been discussed with personnel in the three parks in an attempt to identify key areas meriting special attention by this Cooperative Park Resource Studies Unit. It was decided to split the objective into two segments: 1) identification of existing or potential carrying capacity problems and 2) implementation of the appropriate research needed in the problems chosen for research. Ruth Gay, an ecologist on the University of Hawaii Botany Department staff, who has done similar work on the tundra ecosystem, undertook the first segment and submitted the following report.

Carrying capacity problems governed primarily by visitor safety, such as in volcanic eruption areas, or by physical impact, such as those operating on historic features, are seemingly adequately controlled by present park management procedures and will probably be within the management capabilities of the foreseeable future. There are few dangerous organisms in Hawaii; thus, it is anticipated visitor safety will be outside this Studies Unit's scope of activities.

The biological impact of visitors is an indirect factor operating on endangered birds such as the nene and the dark-rumped petrel on Mauna Loa and Haleakala. It appears, however, that more study is needed on the direct role of predators and on the biology of these birds before carrying capacity investigations are begun.

The impact on the biological communities around camping and picnic areas deserves attention and seemingly should be investigated in coordination with the development of native-plant planting programs

and exotic plant control. Of the various overnight facilities presently available, the study of the impact of visitors on vegetation around the cabins and campsites within Haleakala Crater should be given priority. In these areas, a relatively high visitor use rate and a lack of alternate sites may result in significant carrying capacity problems. An on-site reconnaissance would be needed to determine the feasibility of a study project in these areas. If a study were feasible, related information should be sought from Diane Driggot, a University of Michigan student who has collected data on the quality-of-experience factor by interviewing Crater visitors. The establishment of a registration system at each area could provide information on the size of parties, the age of members, equipment and duration of visits. Data on soil texture, soil compaction at various depths and per cent ground cover by plant species could be collected quarterly from specifically marked sites and from adjacent control areas to provide seasonal information. The interrelating of these two lines of empirical study should provide management guidance on visitor impact.

Information on the biological impact of human disturbance on intact native plant communities may be useful to management decisions at Haleakala in areas such as Kipahulu Valley. Data on trail use by student investigators in a field study in nearby Waihoi Valley and the Upper Hana Forest Reserve are available and could provide a foundation for a study on the recovery rates of native vegetation. Although an on-site reconnaissance would be desirable for the design

of an investigation, it would appear that data on per cent ground cover by species in permanent plots supplemented by permanent photographic points would provide valuable baseline information. This information could be used in the development of a controlled experiment comparing different frequencies and intensities of trail use within one or more sensitive native plant communities.

The area of the palace grounds at the City of Refuge offers another opportunity for an investigation of possible merit. Currently this area is covered with a matrix of mixed exotic grasses, dissected by two sandy trails. If visitor traffic were directed from a turnstile or a beam counter at the entrance to the grounds into different pathways marked on the grass matrix, these intensities of use could be compared to a control area. Cultural treatments, e.g., water and water plus fertilizer, could be set up along part of the length of each trail. Statistical analysis of ground cover and visitor use data could lead to a prediction of site durability.

Although several other current or potential carrying capacity problems were identified, many do not lend themselves to concise studies with foreseeable solutions consistent with the objectives of this Studies Unit. Examples of key areas that appear to be more suitable for longer term experimental carrying capacity projects include: 1) the vegetated summit area adjacent to parking, access paths and comfort facilities on Haleakala and the O'laa Forest in Hawaii Volcanoes and 2) visitor impact on silversword populations in Haleakala.

There seemed to be a nearly unanimous opinion among the Service

personnel in Hawaii that biocentric carrying capacity is not a major problem in Hawaii's National Parks, except as carrying capacity relates to the problems of endangered species and the spread of exotic plants and feral animals.

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References for Carrying Capacity Problems:

- Beardsley, W. G., and J. A. Wagar. 1971. Vegetation management on a forested recreation site. *J. For.* 69: 728-731.
- Frissell, S. S., and D. P. Duncan. 1965. Campground preference and deterioration in the Quetico-Superior Canoe Country. *J. For.* 63: 256-260.
- Kjargaard, J. I. (ed.) 1972. Scientific Report of the Waihoi Valley Project. 252 pp. Unpub.
- Vogl, R. J. 1971. General Ecology of Northeast Outer Slopes of Haleakala Crater, East Maui, Hawaii. Contributions for the Nature Conservancy No. 6. 8 pp.
- Warner, R. E. (ed.) 1967. Scientific Report of the Kipahulu Valley Expedition. 184 pp. Unpub.

- b. Investigate the rare tree area of Kaupo Pali, Haleakala, to determine why the trees are not reproducing.

Dr. N. P. Kefford, plant physiologist, has looked at this problem on Maui and suggested it needs redefinition. At present, he feels the native forest trees are not reproducing because the seedlings are shaded by exotic species. Reversing the competition at this late date, he believes, is probably an impossibly massive task--even around one tree for experimental purposes. His alternative course of action would be to chemically treat (to eliminate exotics) an enclosed area of suitable substrate near the Paliku Cabin (since one of the purposes of preserving natives is for visitor enjoyment), then plant it with native stock of optimal transportable size. The enclosure would be periodically monitored for growth rate and general

condition as well as to eliminate exotics that encroach on the experimental area.

Native trees currently grow around the Paliku Cabin, but they are old and will not last forever. The experimental plot, hopefully, would provide a long-range appreciation of these native species and might contribute some expertise to the propagation of such native species.

- c. Complete the Hiiaka fire burn study in Hawaii Volcanoes as a continuation of the work reported in the 1969 Office of Natural Science Studies annual report, AND
- d. Update and extend the vegetative dynamics of the 1959 Kilauea Iki eruption, recording trends since 1968 of a successional nature.

We have written confirmation and, more recently, assurance by telephone from Dr. G. A. Smathers, Chief Scientist of the NPS Science Center, Miss., that he plans to collaborate with Dr. D. Mueller-Dombois, University of Hawaii Botany Department, in working on both these vegetation projects (c and d) in June, 1974. They will also collaborate on the subsequent report, which will probably be of a publishable nature.

- e. Other projects as opportune to available personnel and time restraints.

- 1) Restore old Hawaiian fish ponds at City of Refuge.

The superintendent of City of Refuge, J. Shimoda, would like the royal fish ponds restored and stocked with the kinds of fish that were kept in them by the early Hawaiians. These ponds have been defunct for several years, but the Youth Conservation Corps has been renovating them in recent summers and will continue to

work on them until they are physically restored (e.g., by removing bottom sediments and rebuilding walls).

The ponds are currently contaminated with Tilapia of less than 6" total length. This fish is particularly tenacious in situations like this and very difficult to eradicate. Shimoda has asked our help in getting rid of these undesirable fish and restocking with the appropriate species. Several scientists at the University as well as the State Division of Fish and Game have been contacted regarding the problem. Two possibilities for eradication are fish poison and electrofishing. The former could prove detrimental to Honaunau Bay as tidal fluctuations in the ponds indicate there is some connection with the Bay. Salinities were measured with a refractometer at various depths at low and high tides in the ponds to determine whether or not Dr. J. Maciolek's (Unit Leader, Cooperative Fishery Unit) electrofishing gear could be used. Results showed that salinities in the pond were 8 to 14 ‰, indicating a freshwater head that does not allow seawater to enter the ponds freely at high tide. Nevertheless, these salinities are at the upper limit of or above the effective electrofishing capacity. Dr. Maciolek visited the ponds personally to evaluate the possibilities; unfortunately, a storm bringing 30-foot waves had just inundated the ponds with seawater, so not even preliminary results are available at this time. If, in fact, the salinity is too high after the ponds stabilize for even Maciolek's largest equipment,

we will have to resort to poison--probably rotenone. Twenty parts per million should be adequate, and pumps would probably have to be used to force the poison under the dividing strip between the two major ponds (see attached aerial photo) as well as into the water in the marsh-like area mauka of these ponds to reach the fish there. Even then, with so many crevices in which to hide, all of the fish will not be reached the first time; therefore, more than one application will have to be made. If applied just before lowest tide on a sunny day, dilution with rising tide and degradation by light should be maximal following maximal effect on the fish and should result in a minimal or no effect on the Bay. If applied in the morning, the balance of the day could be utilized for collecting the fish.

Dr. Maciolek thinks these ponds could serve as a useful "pilot" project as there are several other similar ponds in the State with similar problems and current lack of solutions.

In a search for knowledge of the original species kept in the ponds, Dr. K. Emory of Bishop Museum was contacted. A search of records and studies of the area produced the name of the pond--Heleipalala--but no record of the species kept there. Dr. Emory is sure turtles were kept in the ponds, but suggests we contact an elderly Kona Hawaiian to supply the fish population information. John Tyler of City of Refuge has been asked to make this contact through some of the other Park employees.

- 2) Set up a microfilmed library of pertinent documents, reports, and articles for the Hawaiian National Parks with accompanying indices.

We have been communicating with Dean Robert Stevens of the University of Hawaii Graduate School of Library Studies about the possibility of some of their students' working on this project in fulfillment of their requirements for the course, LS 696 Directed Study. The work would involve a detailed search of libraries on all islands and at the Parks, Fish and Game, etc. They would take the microfilm camera with them and a set of cards for reference collecting. The cards would later be compiled and arranged by some competent cataloger and the microfilm spliced into agreeing order with the card information at the beginning and end of each manuscript on the film.

On the other hand, students may not have the necessary time to spend nor the dedication and qualifications required to do a really thorough job. In this event, we would hope to acquire the services of one of two retired people willing to do specific library jobs, such as this one. If a really thorough job is to be done, including checking all the bibliographies of pertinent works and following through on them, this project could be a rather extensive one in terms of material and time.

- 3) Monitoring of vegetation recovery in goat exclosures in HVNP and on Puu Hualalai.

Vegetation in the large goat exclosure areas in HVNP is clearly showing changes already. The course of these changes should be

followed. Goat enclosures have been set up in the Puu Hualalai area by Bishop Estate's naturalist (Carlson), but he has neither the time nor the expertise to analyze the recovery of the vegetation and has offered access to the enclosures to Park-affiliated investigators. Since HVNP hopes to acquire this land in the near future, this provides a good opportunity for the Unit.

Both projects need to be started immediately, however, or the initial data collecting phase will be unrealistic in a time sequence. An investigator with the necessary interest and qualifications should be contacted without delay.

AREA D. BASIC DATA INFORMATION AND ADVISORY SYSTEMS

- a. Map the zones of high botanical values in the Kalapana Extension of Hawaii Volcanoes National Park.

This objective is pressing. Information is badly needed to determine whether or not a significant loss will occur if homesites are allowed on this land--a provision written into the 1938 acquisition law and currently being tested by a few qualified applicants. A preliminary study⁵ has been made by R. Warshauer and J. Jacobi with a second study by the same authors being in a draft stage. The results are more descriptive than quantitative, and although this is useful initially, the issue is of such interest and magnitude that more stringent data requirements will, no doubt, be made in the near future.

⁵ Warshauer, F. R., and J. D. Jacobi. 1973. A Biological Survey of the Lower Kamoamo and Pulama Sections of Hawaii Volcanoes National Park. 18 pp. + vegetation maps.

This work could be begun with aerial photographing of the Extension followed by ground confirmation and this, in turn, followed by an intensive quantitative study utilizing modern ecological techniques such as those of Curtis or Grieg-Smith. The time and effort involved would, no doubt, require additional funding, but the value to the Service would not even be measurable in monetary terms.

It has been established that rare and endangered animal and at least one plant species also live in the Kalapana Extension, and the further elucidation of their obligate interactions with the specific flora and present conditions of this terrain would be extremely useful.

- b. Advance toward completion the geological mapping of Haleakala Crater National Park.

Dr. G. MacDonald of the Geology Department, University of Hawaii, has been working on this problem for some time. He neither wishes nor requires assistance, only time; so the Unit prefers to merely encourage him on toward the desired end.

- c. Begin preparation of atlases of bioecological information for the City of Refuge and Haleakala.

No progress to date as this is relatively routine and will take some time. See next item.

- d. Begin integration of present IBP study data into an ecosystems computer modeling system.

A preliminary telephone conversation has been held with Dr. Garrett Smathers, Chief Scientist of the NPS Science Center, Miss., and it

appears his Center's capabilities and this project of the Unit may form a happy coincidence. Some discussions have been held with Service personnel on establishment of a grid system for data reference in the parks that would facilitate this work. Dr. Dieter Mueller-Dombois and his staff are being encouraged to continue their current I.B.P. work toward these ends.

- e. Plan further stocktaking and initiate in-depth analyses of presently mapped ecosystems for in-depth modeling and predictive purposes, especially in respect to the Kipahulu Reserve as the initial step toward determining its optimal role in the Park system based on and assembling the presently available information.

No progress to date; however, this is a normal direction for extension of the current I.B.P. under Dr. D. Mueller-Dombois, Coordinator.

- f. Develop descriptions and map the intertidal zone and other marine organisms on Hawaii Volcanoes National Park coast.

This is an area where Hawaii could make a unique contribution to the NPS, and eventually it may be possible for visitors to enjoy this intertidal zone via an overlook or some similar device. Dr. J. Randall of Bishop Museum has expressed an interest in the project, and Dr. R. W. Grigg, Hawaii Institute of Marine Biology, has already done some work in this general area, but with the specific purposes of looking at the effects of the ocean entry of molten lava on marine organisms and the subsequent recolonization and recovery of these locations.

UNIVERSITY OF HAWAII

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College of Arts and Sciences
Department of Botany

28 February 1974

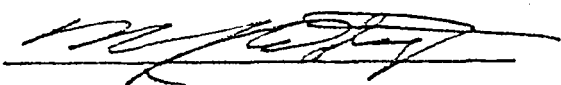
MEMORANDUM

To: Resource Committee
From: M. S. Doty
Re: Cooperative National Park Resources Studies Unit

The contract for the Cooperative National Park Resources Studies Unit is now through all channels, and we are beginning to "gear up". We would hope that you, as members of the "Resource Committee" (the NPS had some legal aversion to "Advisory Committee"), are still interested in being "attached" to the Unit. We would like to be able to call on you for advice and/or possible assistance on a particular project in which your interest lies.

The only currently foreseeable occasion on which I would like to meet with you as a committee is sometime in mid-April. This would be a meeting with the park superintendents (before Russ Cahill leaves), and we would like to kick around the ideas of research priorities (as well as methods of accomplishment) and traineeship possibilities. Please give this some thought, and feel free to contact us in regard to anything which is pertinent to the Unit.

I am enclosing a copy of the General Work Plan which may be slightly different from the one you received some time earlier. The meat of the plan lies in the "Priorities" in the last 4 pages.



M. S. Doty, Director
Coop. NP Res. Studies Unit

UNIVERSITY OF HAWAII

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College of Arts and Sciences
Department of Botany

19 March 1974

MEMORANDUM

TO: Resource Group members

FROM: Maxwell S. Doty, Director, Cooperative Nat'l Park Resources
Studies Unit

SUBJECT: Meeting with National Park Service personnel

We have scheduled a meeting of the Resource Group, the National Park superintendents, the State Director, the Regional Director, and some related personnel for April 15, 1974. It will take place in room D-205 of the Biomedical Building on the University of Hawaii's Manoa campus and will begin at 10:00 a.m. We hope everyone can be present at 10:00 and will be able to stay for lunch (which we will have brought in at our expense).

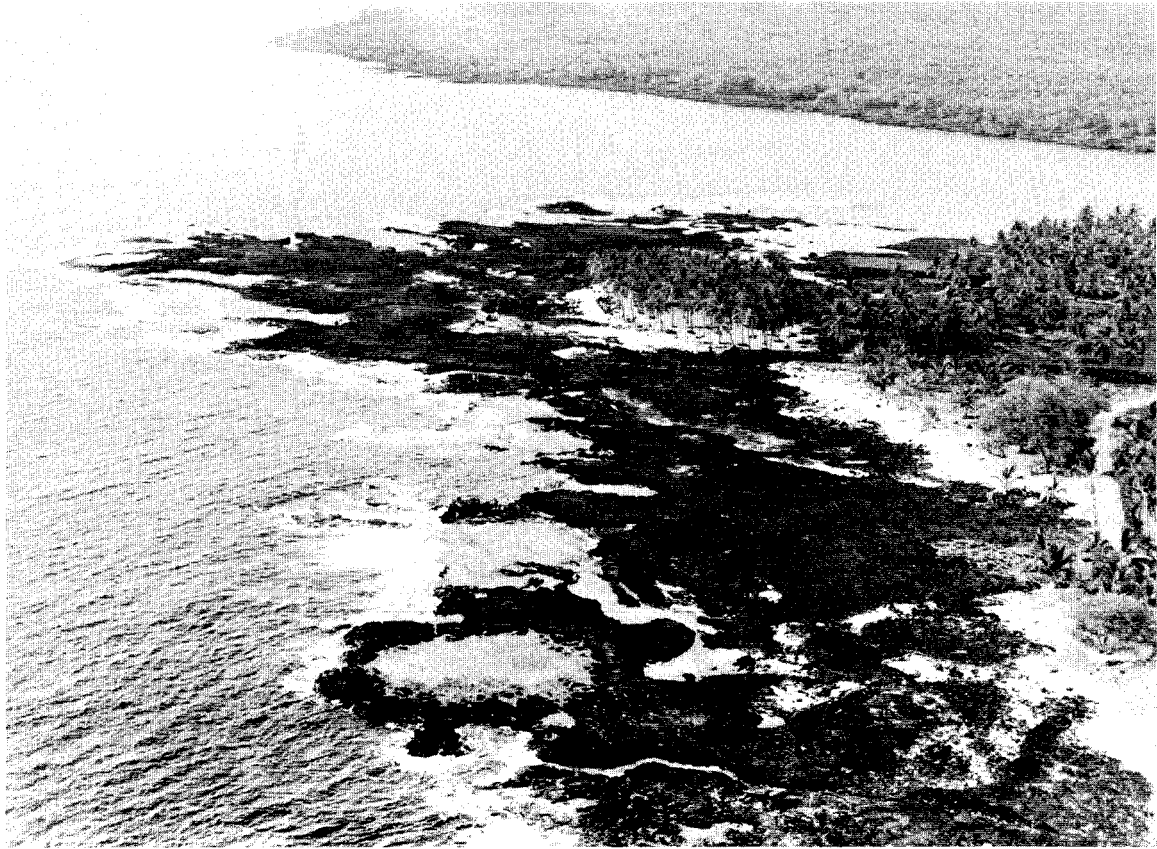
Some of the topics we plan to discuss and which you will, hopefully, start thinking about right away, are: research priorities (see General Work Plan accompanying the 28 February 74 memorandum to you), means of accomplishing them, traineeship possibilities, projects for next year, projects for a 5-year plan, and anything else you or the Park personnel feel should be aired. We will provide each of you with a copy of our April 1 report to the Regional Office, which will acquaint you with our progress to date.

If you wish to discuss anything relating to the Unit before April 15, please feel free to call us.



Maxwell S. Doty, Director
Coop. NP Res. Studies Unit

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Outer Honaunau Bay above. Inner Honaunau Bay below with two of the fishponds showing under the coconut trees in the middle distance.