DATE 11/8/88

RESOURCE MANAGEMENT PLAN

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Chaco Culture NHP,

APPROVED ON Oct. 31, 1988.

Return to Joe Sovick
NPS
appd
10-31-88

RESOURCE MANAGEMENT PLAN

CHACO CULTURE NATIONAL HISTORICAL PARK

1988

NATIONAL PARK SERVICE

DEPARTMENT OF THE INTERIOR

RESOURCE MANAGEMENT PLAN

CHACO CULTURE NATIONAL HISTORICAL PARK

RECOMMENDED BY: _____ 7/28/88
(SUPERINTENDENT) DATE

APPROVED BY: _____ OCT 31 1988
(REGIONAL DIRECTOR) DATE

ANNUAL REVIEW AND PLAN REVISION

The Resource Management Plan (RMP) will be reviewed annually. At the beginning of each fiscal year, prior to submitting an operating budget, the superintendent and park resource management staff will meet to evaluate progress in accomplishing the previous year's resource management objectives. They will determine necessary revisions in the resources programming sheets, and assess additional resource management needs. Recommended changes in the RMP will be drafted and submitted by the superintendent to the Region for concurrence.

Plan revisions must be approved by the regional director, with the exception of the following:

(1) Grammatical corrections

(2) Pagination corrections

(3) Deletion of completed projects

(4) Deletion or addition of appendices

(5) Correction of the table of contents

(6) Park priorities

(7) Programming sheets

Copies of all changes initiated at either the park or regional office will be promptly forwarded to the other office so that all copies of the RMP are identical. Revised pages will be dated in the lower right-hand corner of the page. Annual revisions will be documented with the regional director's signature and date of approval on the cover sheet of the plan.

_____
Regional RMP Coordinator

_____
Date

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I. INTRODUCTION

A Resource Management Plan is a key factor in good management and preservation of the resources of the park. It is a strategic document that identifies resource management needs, puts them in order of priority, recommends actions, and summarizes the method of implementing the recommendations.

This plan provides a synopsis of the purpose and objectives of Chaco Culture National Historical Park, and of its management zoning and legislative mandates. After an overview of the general problems and needs of the cultural and natural resources, there is a section of individual project statements and programming sheets, separated by type of resource.

The bibliography and appendices give the reader a brief idea of what has been done to date. No attempt will be made to be exhaustive in the bibliography; there is too much material to be a useful reference in this plan. Instead, major items will be listed here, and a separate bibliography will be available for reference at the park.

The plan serves the park staff in two ways: 1) as a reference of management activities that will protect information potential of the natural and cultural resources; and 2) as a prioritized set of research projects designed to obtain additional information from the resources for the enlightenment of the park's staff and visitors.

II. STATEMENT FOR MANAGEMENT

A. PURPOSE OF THE PARK

Chaco Canyon National Monument was proclaimed in 1907 in order to preserve "extensive prehistoric communal or pueblo ruins...of extraordinary interest because of their number and their great size and because of the innumerable and valuable relics of a prehistoric people which they contain."

In 1980, the national monument was enlarged and the name was changed to Chaco Culture National Historical Park, in order to "recognize the unique archeological resources associated with the prehistoric Chacoan culture in the San Juan Basin; and to facilitate research activities associated with these resources."

The park presently includes over 3400 prehistoric and historic sites, including some of the largest ruins in the United States. Intensive study of the Chaco cultural resources has been going on for a century, yet many of the questions about the prehistory of the area remain unanswered and its history has been but little studied. On December 8, 1987, the park was inscribed on the World Heritage List of Cultural Sites, along with Aztec Ruins National Monument and five Chacoan outliers managed by the Bureau of Land Management. This accords world-wide recognition of the potential of Chaco resources to inform future generations.

Human occupancy of the current park lands extends back to about 8000 BC. The prehistoric archeological sites range from simple one room pithouse dwellings and scatterings of lithic chips to examples of monumental public architecture containing more than 400 rooms. In addition to buildings, there are numerous rock art sites, stairways carved into cliff faces, earthen architecture, and remnants of miles of prehistorically engineered roads. Historic sites in the park include Navajo habitations and herding features, inscriptions, early twentieth century homestead and commercial buildings, and public works projects from the 1930s and 1940s.

The study and preservation of the park's cultural resources spans much of the history of archeology in North America. The arrival of the Navajo is little understood, and the nature of their interaction in the Chaco area with other Native American tribes and different Caucasian ethnic groups deserves more study. The story of trading and stock-grazing by Hispanics and Anglos in this part of the San Juan Basin will be told in part from evidence within the park. Finally, the role and impacts of the National Park Service and of the Civilian Conservation Corps are evidenced in the park.

The natural resources of the park today testify to a long sequence of changes in geomorphology, environmental

characteristics, and cultural uses. In the last instance, Chaco has been inhabited successively by hunters and gatherers, village farmers, herders, explorers, and the National Park Service (NPS) and its guests. Today's environment has been scantily inventoried, but is known to harbor some threatened species. There are also natural processes that are inimical to the preservation of the cultural resources.

B. MANAGEMENT OBJECTIVES

Resources Management

Preserve and protect the cultural resources and perpetuate the natural resources of the park by:

monitoring and mitigating external threats to cultural and natural resource integrity

monitoring the effects of visitor activities and backcountry use

supporting the natural evolutionary process of the landscape and ecological communities except where cultural resources and necessary park developments are threatened

encouraging a continuous research program that emphasizes nondestructive methods and is directed toward improved resource knowledge, understanding, appreciation, preservation, and protection

backfilling excavated and exposed ruins not required for interpretive purposes

limiting on-site storage of artifacts to those working collections essential for authentic presentation of the interpretive themes

controlling all mineral activities

Visitor Use

Provide for enjoyment, appreciation, and understanding of the park by the public and control uses that could impair resources or their enjoyment by:

allowing each visitor the opportunity for a safe and enjoyable visit

providing effective visitor information

services

offering a balanced, up-to-date interpretive program focusing especially on the rise, florescence, and decline of the Chacoan civilization

encouraging visitor enjoyment and appreciation of the Chaco backcountry

providing access to primary sites and basic interpretive programs for the handicapped and the aged

Development

Provide minimum facilities necessary for visitor enjoyment, resource protection, and safe and efficient management of the park by:

offering minimum support services to sustain visitors within the park

maintaining development within the optimum social or physical carrying capacity of the resources

providing for sensitive and professional design of facilities that recognizes the need to blend structures with the environment

Cooperation

Achieve harmonious integration of activities inside and outside the park by:

maintaining cooperation with other federal agencies and state and local governments

maintaining cooperation and contact with adjacent landowners, the Navajo Nation, and local and regional organizations

maintaining active involvement in efforts to conserve natural and cultural resources throughout the region

(From: General Management Plan/Development Concept Plan, Chaco Culture NHP. Approved: September 20, 1985)

C. LAND CLASSIFICATION

In the General Management Plan, the entire park is listed as being a Historic Zone. It is further subdivided into four subzones:

Preservation Subzone (20,079 acres): Includes all of the former Chaco Canyon National Monument lands except those zoned for park development. This subzone consists of all of the Canyon within the park, the cliffs bordering the Canyon, and five sections west and south of West Mesa.

Park Development Subzone (217 acres): Consisting of three parcels, this includes the administrative area, the site of the proposed campground on the south-east side of Gallo Wash, and the proposed sanitary landfill site at the east boundary.

Special Grazing Use Subzone (13,523 acres): All of the lands in this subzone were included in the legislative boundaries established in PL 96-550, but were not part of the former National Monument. Nearly all are presently grazed; title to the land is generally non-NPS. Mineral leases administered by Bureau of Land Management (BLM) on some of these lands will expire in 1990 unless drilling and production is undertaken before that time. The long-term aim in this subzone is to eliminate all grazing and other non-conforming uses.

Special Mineral and Grazing Use Subzone (155 acres): This subzone is entirely within the Kin Ya'a unit. In addition to continuing grazing, as in the subzone above, the present leaseholder (Mobil Oil) will be permitted to extract uranium. Mobil is in the process of plugging its water wells and reclaiming the sites in and near the Kin Ya'a unit.

Not presently included in the boundaries is a 25-acre tract BLM has proposed to turn over to NPS on the eastern edge of the Pueblo Pintado unit. When done, this would be included in the Special Grazing Use Subzone until grazing could be eliminated, after which it would be in the Preservation Subzone.

D. LEGISLATIVE DIRECTION

In addition to the direction cited in II-A above, the following legislative guidance is applicable:

NPS Organic Act, August 16, 1916. This act created the National Park Service and defined its purpose as the preservation of historic and natural objects of the park and the wildlife therein "for the use and enjoyment of the people in such ways as to leave them unimpaired." PL 91-383 in 1970 and PL 95-250 in 1978 further strengthened and defined those purposes, insuring that they be applied to all NPS units where no conflict with enabling law exists.

Act of February 17, 1931. This act authorized owners of lands adjacent to the monument to maintain access to their lands and to drive cattle across the monument at locations designated by the superintendent if those owners were separated by acquisition of their land inside the monument.

National Historic Preservation Act of 1966, Section 106. Federal managers are required to consider the effects of proposed undertakings on cultural resources and to allow the Advisory Council on Historic Preservation to comment. 36 CFR 800 contains the regulations governing compliance with this act, much of which is accomplished through a programmatic memorandum of agreement.

American Indian Religious Freedom Act of 1978. This Resolution of Congress requires Federal land managers to recognize the First Amendment rights of Native Americans to the extent consistent with other legal mandates in resource management.

Archeological Resources Protection Act, October 31, 1979. ARPA expands and updates the archeological protection provisions of the Antiquities Act of 1906, providing stronger penalties for convicted violators. This is the key Federal statute available to enforce antiquities protection in the park, along with the provisions of 36 CFR 2.

PL 96-550, December 19, 1980. Title V of this act abolished Chaco Canyon NM and replaced it with an expanded Chaco Culture NHP. Title V also established a system of Congressionally recognized Chaco Culture Archeological Protection Sites. Additionally, the act directs the Secretary of the Interior to search for other Chaco sites for Congress to consider adding to the System, to conduct further research into the Chaco Anasazi, and to develop a computer data-base.

III. OVERVIEW AND NEEDS

A. CULTURAL RESOURCES

SYNOPSIS:

The top five cultural projects the park needs are, in priority:

1. Equalize Fill Levels and Repair Drainage in Ruins (C-1)
2. Accession and Catalog Park Collection (C-2)
3. Continue Wood Preservation Project (C-3)
4. Update Archeological Site Files (C-7)
5. Compile Historic Structures Preservation Guides (C-12)

1. The first project, backfilling and drainage improvement in 9 major structures, is called for in the GMP and will have a major impact on preservation of original fabric and cutting stabilization costs. Money is being spent annually on uninterpreted walls that are being destroyed by moisture seepage. Documentation in the form of archeological testing and preparation of Historic Structures Reports must precede the backfilling. COSTS: $850,000 (32.9 FTE) over FY 89-93.

2. Laws, policies, and guidelines all call for accessioning and cataloging park collections, for purposes of legal accountability and documentation for research needs. The CHCU collection is not in compliance. Active work on this is proceeding. COSTS: $100,000 (5.0 FTE) over FY 89-92; plus $10,000 (.5 FTE) annually from FY 89.

3. The wood preservation project began in FY 86. Its value in preserving an especially fragile resource and providing scientific information has greatly exceeded expectations. COSTS: $10,000 in FY 89 and $40,000 (2 FTE) over FY 90-91.

4. In addition to updating the park site files, a computerized information system will store the site file data enabling the park and researchers to access this information for the purposes of management, preservation, patrol and monitoring, research, interpretation, etc. The computerized site file system can share hardware and software with the Chaco Common Catalog. COSTS: $12,000.00 (.5 FTE) annually from FY89.

5. Historic Structures Preservation Guides will assure systematic documentation of stabilization work, and provide an accurate archive of all work at each structure. COSTS: $25,000.00 (1 FTE) annually from FY89 until completed.

FULL OVERVIEW:

1. Overview: A summary of the park's prehistory and history was prepared for the General Management Plan and is included as Appendix A. It must be regarded as preliminary at best. While Chaco's cultural resources have been the subject of many excavations, studies, and reports over the past century, the number of questions remaining to be answered seems to grow daily.

Certain elements stand out boldly when one considers the research at Chaco to date.

a. Investigation and Protection: Of the Anasazi sites, overwhelming emphasis has been on the great houses. Perhaps 2% of the known sites in the park have been excavated, entirely or in part. Naturally, the sites with exciting above-grade architecture were among the first to be explored. These are also the sites that have been accorded the greatest protection from vandals (and the greatest impact from exposure to visitors and environment), having been acquired during the history of Chaco Canyon National Monument. Most of these sites are being impacted by increased visitation, and protection is complicated by the fact that New Mexico State Highway 57 runs the length of the Canyon, providing access to the best-studied sites at any hour of the day or night.

In contrast, the areas added to the park by the 1980 legislation include over 1400 known Anasazi, Navajo, and historic sites that are virtually unprotected from vandals (but little impacted by visitors or environment). This includes approximately 19 1/2 square miles (12465.29 acres) of land that is within the legislated boundaries but over which the NPS has no management authority. On these lands, including 6 1/3 square miles (4089.18 acres) of land acquired, transferred or leased from other public agencies (all with access problems), grazing continues, adjacent energy and mineral exploration threatens the resources, no preservation treatment is provided to the ruins, and the Service is unable to patrol and protect the sites against antiquities violations. Two major outliers in park care, Kin Ya'a and Kin Klizhin, are not on park land.

b. Accessibility of Research Results: Each period of research has been in tune with the standards of its time. As technical advances (tree-ring dating, pollen analysis, etc.) have allowed archeologists to wring more information out of a site, the research focus has

changed. As a result, the standards governing recognition and selection of materials for retrieval and preservation have changed through the years. Researchers employing recently developed techniques (palynology, for example) may find their efforts thwarted if the material recovered by early excavators cannot be located for reanalysis, or if the documentation has been lost.

At the same time, new techniques of exploiting the information potential of a site have invariably increased the quantity and complexity of the analytical and curatorial workload associated with each site.

At best, remote sensing technology has fostered information-gathering without excavation. When this occurs, the site is saved for future analysis and its contents remain in the ground rather than on curatorial inventories, but the images, tapes, maps, notes, reports, and other analytical products must be analyzed, published, organized and preserved for future investigators. The number and variety of these records have greatly complicated the archival facet of curatorial care, as well as lengthening the time and cost of publishing the results.

When excavation is resorted to, the analytical task is increased still further, and the curatorial responsibility becomes overwhelming. In addition to the work associated with remote sensing activities that may be relevant to the site, there is the requirement to study and report, preserve and catalog, the products of the excavation...artifacts and field records.

c. Future Research: It has become clear in the past two decades of study by the Chaco Center and others that many of the answers to questions about the Chaco Anasazi lie outside the Canyon and the park. At the very least, comparative studies will need to be made between Chacoan materials from the Canyon "heartland" and similar materials from other parts of the Chaco world. Questions of social, economic, and political interactions among outliers, and between outliers and the people of the Canyon, will especially depend on study outside the park. The value of comparative materials and records from sites within the park will increase.

There is also a topical unevenness in the research to date, despite its quantity and quality. With the exception of the activities of Richard Wetherill and his associates, little is known of Euro-American use

and visitation of the Canyon. Chaco's extensive rock art has been partially inventoried, but not analyzed. Recent investigations into Anasazi astronomy have yet to be effectively integrated with the archeological evidence. Gaps in the cultural record occur both before and after the Anasazi, especially as regards any cultural vacuum that may have existed between the departure of the Anasazi and the arrival of the Navajo.

d. Ruins Preservation: Chaco has been a center of ruins stabilization research and practice for at least six decades. This is behind-the-scenes work, often unreported, but it has resulted in a priceless accumulation of written and photographic documentation of the ruins at Chaco. Tomorrow's student of Pueblo Bonito must take into account not only what survived from Anasazi times, and what was excavated by Pepper et al, but also what has happened to the ruin in the course of its stabilization and preservation maintenance. The continued survival of walls currently exposed depends on the experience and knowledge resident in the ruins stabilization staff, technical guidance by knowledgeable archeologists, and preservation recommendations from architectural conservators.

e. Cultural Resource Data Bases: Though much of the park has been surveyed for sites, the quality of the recording varies. The survey needs to be updated and intensive site survey needs to be done prior to any development or other ground-disturbing activity, as well as professional monitoring of excavations as they take place. In a recent review of the List of Classified Structures (LCS) data on record for the park, it was evident that much of the data is inaccurate and unreliable by current standards. The record of cultural material found in the course of park operations or as the result of new erosion is not complete. The museum collection of the park is being accessioned, but remains largely uncataloged.

2. Needs: From these elements of the overview we can discern several cultural resource management needs at Chaco Culture NHP.

a. Protection: Park management currently has insufficient capability to adequately protect the cultural resources known to be contained within the legislated boundaries of the park. On the one hand, the legal authority is not there, in the absence of cooperative agreements with landowners or acquisition of resource management interest through purchase or

exchange. On the other hand, current park staffing levels and visitor access patterns do not even allow adequate monitoring of the cultural resources within the fenced boundary of the former National Monument and the great houses of Kin Klizhin, Kin Bineola, Kin Ya'a, and Pueblo Pintado. The park is well along in implementing a new patrol strategy, providing more coverage of the backcountry and better integration with the site monitoring program. At best; however, it offers the hope of revisiting sites at least every five years rather than at periods of 20 years or more.

Management access to park lands must be gained by 1) speeding up the process of exchanging inholding lands for other public lands, with the aid of BLM and in accordance with PL 96-550; or 2) consummating cooperative agreements with the owners of the inholdings that will allow NPS personnel to provide protection, monitoring, and preservation treatment to the cultural resources thereon. (N -1)

Fencing should be erected around blocks of new addition lands when and where feasible, with top priority being given to the Chacra Mesa addition. On Chacra Mesa, less than three miles of fencing will eliminate grazing and other site-destructive activities from over 3300 acres of park land in an area known to have great site density and diversity. (N -1)

In order to manage all of the resources within the area designated as Chaco Culture NHP at an acceptable standard, the park staff will need to be increased in maintenance (maintenance of fencing and patrol roads), cultural resource management (archeological monitoring, ruins stabilization, and preservation maintenance), and protection (back-country and outlier patrol). Carrying capacity studies are also needed to determine the levels of impact at which management controls will have to be instituted. (C -7, C-12, C-14, N -1, N-3, N-13)

b. Accessibility of Research Results: The evidence of past research is not readily available to the researchers of today and tomorrow. The excavated materials and the related field data of Pepper, Judd, Hewett, and others, including some NPS researchers, are generally not organized, stored for preservation, or accessible to students in published or unpublished form. In many instances, the objects recovered by early archeologists remain in their original shipping boxes, unopened, unanalyzed, and increasingly unable to be found. Notes of a particular researcher may be "stored" in a number of places, seldom organized to

facilitate intellectual access. In essence, much of the work of these early researchers has contributed little to our knowledge of Chaco today. Resources were destroyed without equivalent return in information value.

Publications pending on recent Chaco research need to be finished and released. (C -5)

NPS collections and associated records need to be stored under stable conditions, accessioned, cataloged, and made accessible to researchers. (C -2, C-9)

Collections and records of previous excavations and studies of Chaco resources need to be identified, located, preserved, and inventoried so they can be accessed. A register of research is needed to help managers, interpreters, and researchers identify and locate previous investigations relevant to current questions. (C -6, C-16)

The Service, through the park, should actively foster establishment of a Chacoan repository, archive, and data base as a consolidated resource to foster further research into the Chaco story. To the greatest extent possible, this data base should be computerized and accessible at the park to facilitate management, interpretation, and research at the site. (C -6)

c. Future Research: The research needs of the park are not clear at this time. The park staff is aware that the Chaco Center's work illuminated some questions, posed many others, and did not touch at all on some topics. It <u>is</u> clear, however, that understanding of the Chaco story cannot be advanced solely within the park or solely by the National Park Service. A framework is needed which can coordinate, and hopefully facilitate the funding of, research into a number of topics by a variety of entities.

A research strategy needs to be developed for the foreseeable future (ca. 15 years). (C -4)

Once a strategic framework is established, steps must be taken to foster, finance, and publish the indicated research, as well as to assure the preservation and future accessibility of the documentation. The strategy needs a means of implementation. (C -4, C-20)

d. Ruins Preservation: The stabilization and preservation maintenance programs at Chaco need to be state-of-the-art, the best available. This requires

continual monitoring of effects of work, constructive interaction with preservationists in the region and on other park teams, and ongoing analysis of materials and techniques. The major ruins remain remarkably undocumented after a century of research (many of the rooms in major great houses have never been mapped in detail), and this documentation should precede, and be the foundation for, stabilization and maintenance programs. Specific issues, such as keeping the back wall of Pueblo Bonito erect, require intensive study before any further action. Where possible, the ruins maintenance workload needs to be reduced via backfilling and drainage improvement projects. The resources allocated for this program need to be increased.

Historic Structure Reports need to be prepared on all the major ruins that do not already have them. The HSR must include accurate maps and elevations of the exposed walls and feature, and must also describe in detail the stabilization measures needed and the preservation maintenance requirements. (C -1, C-13)

Where appropriate, and following the preparation of an HSR, backfilling and drainage improvement should be done on each site to reduce the amount of periodic maintenance required. (C-1)

The wood preservation project, begun in FY 86, has great potential for 1) documenting a fragile cultural resource (wood used in the Anasazi ruins); 2) preserving individual elements of that resource that may otherwise be lost through the actions of climate or people; and 3) non-destructively acquiring a data base about the wood that will be valuable to interpreters and researchers. This project has already shed new light on the construction chronology of Pueblo Bonito and needs to be carried through to its conclusion. (C -3)

The back (north) wall of Pueblo Bonito is presently held upright by bracing timbers. Assuming that this technique alters the expansion and contraction dynamics the wall would normally have, it is a temporary solution and the wall should be studied with an eye to identifying and implementing a long-range approach that is consistent with the wall's dynamics. Seismic studies should be continued to assess their value as indicators of wall instability, as well as to evaluate the effects of blasting and other shocks. (C -1, C-10)

Greater interaction and constructive dialogue is needed

with the preservation specialists in the Regional Office, in other parks, and in other agencies. Park staff believe they are doing a good job, but it would be helpful to have that affirmed, to have areas of possible improvement suggested, and to have the opportunity to share the fund of knowledge and experience with others engaged in the same mission. (C -1, C-3, C-11, C-17, C-18)

The documentation of the stabilization work done at Chaco should be included in any central Chacoan archive the NPS participates in. Consideration should also be given to copying the documentation (reports, notes, and photographs) into a space-intensive format, such as optical discs or microform that could be easily accessed by researchers without wear-and-tear on the original copies. (C -6)

e. Cultural Resource Data Bases: Park interpreters, researchers, and managers at all levels need to have access to accurate and current information about the park's resources and the results of past study. With the advent of park computers that can handle large scale data bases, and with the possibility of modern telecommunications finally being possible at Chaco, it is time to put this technology to work to the greatest extent possible in making information accessible.

The site recording form used in the park-wide survey should continue to be the basis for recording all sites, including rock art, sites with above-grade components, and cultural materials encountered in the course of ground-disturbing activity. Key aspects of this form (location, cultural periods represented, etc.) should be in a computer data base. (C -6, C-16)

The data-entry forms for the LCS need to be completely redone. The new forms must be accurate in terms of LCS criteria, consistent in their application, and include updated data as to preservation needs. This data is needed for the information base being developed in the Washington office, and should be useful at the region and park levels as well. The sites in the park will need to be added to the Cultural Sites Inventory. (C -15)

If possible, a computerized register should be started that lists and describes all research done at Chaco. As a minimum, the register should include the name of the researcher, the institution represented, date(s) of research, locations investigated, research goals, citations of reports or publications relating to the

research, and the current location(s) of any field records &/or object collections that resulted. (C - 6)

The park collection must be cataloged into the Automated National Catalog System (ANCS). This must include all park-owned objects and associated records currently in the collection at the Maxwell Museum, UNM. (C - 2)

If possible, the park should have computer-accessible data on the location and nature of all artifacts, specimens, and related records resulting from previous, non-NPS research at Chaco. (C - 6)

It does not appear that PARKMAN can be revived or updated. The data that can be retrieved from it should be incorporated into some other multi-faceted, computerized geographic information system that allows park staff to assess in combination such variables as landforms, site types, vegetation, etc. (C-7, C-8, C-14, C-16, C-19, N-3, N-4, N-12)

B. NATURAL RESOURCES

SYNOPSIS:

The top five natural projects the park needs are, in priority:

1. Acquire Resource Management Authority in New Lands (N-1)

2. Erosion Control Plan (N-2)

3. Wildlife & Vegetation Management Plan (N-3)

4. Air Quality (N-7)

5. Backcountry Management Plan (N-13)

1. PL 96-550 added new lands to the park. The intent of Congress cannot be carried out without the acquisition of effective management authority over these lands. Under present conditions, that will require a land exchange through BLM, with subsequent fencing. COSTS: $720,000 (24 FTE) over FY 88-91; $50,000 (2 FTE) annually thereafter.

2. The erosion control plan is the outgrowth of studies done previously. Some dirt work was done before funding ran out. It needs to be continued to save ruins. COSTS: $300,000 (20 FTE) over FY 88-92; $20,000 (.5 FTE) annually starting in FY 88.

3. The park is without adequate baseline studies on biotic species and communities. After verifying what lives in the park, management goals and plans need to be established and implemented. COSTS: $50,000 (contract) over FY 89-91. (Acquisition of management authority should precede this.)

4. Air quality is a significant natural resource that needs priority attention in order to provide good visibility to park visitors, comply with Clean Air Act standards, and monitor any changes in visibility range and air quality as visitation increases and surrounding energy development projects increase. COSTS: $136,000 (No FTE) over FY 89-93; $15,000 and .5 FTE annually for continued monitoring and equipment.

5. A backcountry management plan is essential to the protection of the park's cultural and natural resources. With the increase in visitation to the backcountry, guidelines for monitoring/controlling use, and establishing written park policies on backcountry management is of utmost importance. COSTS: $10,000 and .5 FTE annually. The cost of sociological and other backcountry use studies is unknown at the present.

FULL OVERVIEW:

1. **Overview:** A summary of the park's natural resources was prepared for the General Management Plan and is included as Appendix B. Like the cultural resources summary in Appendix A, it is somewhat sketchy, but for a different reason. In the instance of natural resources, there has not been a consistent and comprehensive inventory, evaluation, or monitoring program.

On the other hand, there has been considerable attention paid to the mineral and energy resources in and around the park's units, with a view to their possible exploitation. This has been summarized in the Land Protection Plan, attached as Appendix C: Mineral/Energy.

Neither of the above references addresses the topics of cultural modifications of the natural resource through time or the differential cultural impacts within the legislated boundaries at this time.

a. Cultural Modifications Through Time: Evidence from Atlatl Cave indicates human use of the present park area goes back ca. 10,000 years before the present (BP). For many centuries that use was hunting and gathering, a subsistence form that probably affected the botanical and zoological populations of the area but did not involve land-clearing or stock-grazing. The people doing the hunting and gathering were probably seasonally migratory, moving in tune with the changing availability of resources.

During the period the Anasazi inhabited the Chaco area, hunting and gathering continued, augmented by farming of cultigens such as corn, beans, and squash. This new element, agriculture, directly impacted the land by clearing patches of the native, mixed-species vegetation in order to practice monoculture in the cleared spaces. It also led to the institution of water control devices to alter and hold the previously unfettered runoff of precipitation. The Anasazi farmers were more sedentary than their predecessors, building numerous permanent structures, at least some of which were year-round residences. An indirect impact of farming, then, was greater year-round impact on edible plants and animals and on fuel plants in the vicinity of the dwellings. One can reasonably speculate that, at the height of Anasazi impact on the Canyon (ca. 1100 AD), there was neither a burnable bush nor a rabbit within a mile of Pueblo Bonito in any direction.

Following the Anasazi departure from Chaco Canyon, the Navajo occupied the area and, by AD 1800, were beginning to raise corn in the canyon bottoms and later to graze livestock over every area available. In many areas around Chaco the Navajos were gradually supplanted by larger Anglo-owned herding enterprises. The impact of this use was largely to denude the landscape and trample the earth's surface, drastically altering the vegetative patterns and their associated animal populations, hastening erosion by wind and rain.

Following at least a century of over-grazing, the boundaries of the National Monument were fenced and non-conforming uses eliminated in 1948. Since then, the vegetation has been allowed to recover and at the present time there is a striking contrast between opposite sides of the boundary fence. The animal populations are assumed to have changed as the vegetation changed. It should be noted that the natural scene evident on the old Monument lands today is not the scene of the historic period or the Anasazi period or, perhaps, even that of any pre-Anasazi period. Though the Anasazi cultural remains are the primary reason for the park's existence, it is not feasible to attempt to recreate the culturally modified landscape of that period. Therefore, a policy of natural regrowth will be followed to the extent practicable.

b. Differential Cultural Impacts Today: As indicated above, the lands of the former Chaco Canyon National Monument have been fenced for 40 years and show substantial vegetative regrowth. The ecosystem developing in these areas is not that of the pre-agricultural or pre-herding periods; it is an amalgam resulting from the effects of previous cultural influences, the disappearance of some species from the area, altered hydrology, and the impacts of park activities. In some ways, the enclosed area has become an island: animals that would be hunted outside the park find a haven within the fences, and medicine men have said that some of the plant species used in religious and healing activities are easier to find in the old Monument, having been grazed out of existence elsewhere.

By comparison, the new lands included in Chaco Culture National Historical Park by Public Law 96-550 have generally experienced 40 more years of the same grazing activity that affected all of the park before 1948. As noted in section 1a of the Cultural Resource Overview (p. 13), the NPS has no jurisdiction over most of the

new addition lands. Title to the land is vested in other agencies or individuals in a variety of ways. Even in those instances where land owned by BLM or BIA was transferred to the NPS, and where NPS has a lease on the lands owned by the State of New Mexico, there are 1) no fences to prevent livestock trespass; 2) no access from NPS land; and/or 3) subsurface energy or mineral leases that will not expire until 1990 at the earliest.

c. External Threats: In addition to the external threats from mineral and energy exploration and development (described in Appendix C), there are other concerns that need to be considered in the management of the natural resources of the park.

1) Air Pollution: Existing sources in the Los Angeles and Phoenix metropolitan areas, along with the San Juan Generating Station near Farmington, have already affected the air quality within the vistas visible from within the park. Additional coal-fired industries, such as the proposed Dine Power Plant (ca. 20 miles northwest of the park), could further deteriorate the air quality at Chaco.

2) Visitor Impacts: In 1987, the park experienced ca. 58,000 recreational visits, about 8500 more than the previous year. The 1987 increase is higher than usual due to the inclusion of 5000-6000 visits associated with the Harmonic Convergence event in August. Statistics on attendance at programs, visitor center entries, camper nights, garbage pickup, and hiking permits indicate more visitors are camping and staying longer than in previous years. The combination of more people and longer stays puts greater stress on the environment in and around the campground, as well as on the environments of the main visitor use areas and the backcountry trails. No comparative studies have been made in the park to assess these impacts.

Improved access to Chaco Canyon will eventually occur, hopefully accompanied by rerouting of the north entrance from the present location to the Gallo Wash area. The State of New Mexico plans to begin upgrading New Mexico State Highway 57 within the next year, progressing northward from Seven Lakes to Blanco over a ten-year period. It is imperative that the long-planned re-routing of NM 57 from the present north entrance to the east

entrance at Gallo Wash be accomplished as part of this program. Rapid increases in visitation and in camper nights are expected to follow on the heels of road improvements. The proposed new campground will hopefully be in place by that time. There is also a GMP proposal to expand the trail system to cope with the increased visitation, including putting a nature trail in Mockingbird Canyon and expanding the Penasco Blanco, Wijiji, and Tsin Kletsin trails into loop trails on West, Chacra, and South Mesas, respectively. Baseline studies are non-existent for any of these proposed development areas. There also are no carrying capacity studies to advise management as to the level of use at which irreversible deterioration of the soils, biotic communities, water quality and quantity, or air quality will occur.

3) **Native American Uses:** Natural and cultural sites within the park are sacred to some American Indians, particularly the Navajo, Hopi, Zuni, Acoma, Laguna, and some of the Rio Grande Pueblos. Some plants and animals, and perhaps minerals, found within the park are used by practitioners of traditional medico-religious healing practices.

At this time, there is insufficient baseline data to know the extent of rare, threatened, or endangered species habitation of the park. It is also not known whether any of the living materials gathered for use in medicinal practices are rare, threatened, or endangered species. Finally, there has been no assessment of the impact, if any, that Native American access to sacred sites may have on the environment.

The wording of the American Indian Religious Freedom Act and Special Directive 78-1, as well as the NPS Native American Relationships Policy, affirms the right of Native Americans to practice their traditional beliefs and encourages managers to accommodate that practice on public lands. On the other hand, existing regulations explicitly prohibit the taking of plants, animals, or mineral specimens from parks, unless there is a special regulation that authorizes such taking. There is no such special regulation at Chaco.

2. **Needs:** Some of the projects or planning needed for effective natural resource management at Chaco overlap with the projects needed for cultural resources management. In those instances, the natural resource concerns will be listed below, but the relevant individual project statements will be listed under cultural resources.

a. **Inventory and Evaluation:** Basic information is still needed on a number of facets of the park's natural resources. Inventory and evaluation studies need to be conducted on both the old Monument and the new addition lands. To the extent possible, the results of all such studies should be mapped and digitized as overlays for use in a geographic information system.

A natural resource base inventory needs to be conducted on the entire park to determine the occurrence, distribution, and density of vegetative and wildlife species. Particular note should be made of exotic, rare, threatened, and endangered species. Soil and geology studies are not needed, but an analysis of the paleontological resource is. (N -3, N-4)

Detailed baseline studies are needed for the areas destined to be affected by developments proposed in the GMP. These include, but are not limited to, the new campground and the trails in Mockingbird Canyon and on West, South, and Chacra Mesas. (N-3, N-4, C-19)

Infrared aerial photography should be used as an adjunct to baseline vegetative mapping. The initial photography should be replicated every 10 years thereafter, in order to detect and track changes in plant resources through time. (N - 4)

Historical climatological data from selected recording stations in the park and the San Juan Basin should be obtained, maintained, and analyzed for evidence of micro- and macro-climate changes through time and space. Modern changes may indicate effects of development and pollution in the vicinity of the park. The data may also indicate variability around the Basin, which might have implications for understanding economics and subsistence within the Chaco Anasazi culture area. (N - 8)

Baseline evaluation of ambient noise levels should be done at selected sites in the Canyon, on the mesas, and in each of the detached units. Subsequent re-evaluation should be done to assess possible noise increases due to nearby development, increased visitation, etc. (N - 10)

Native American uses of park resources for medical and religious purposes needs to be inventoried. The focus of this study is on the impact to park resources, not on ethnographic description of their uses within the culture. Particularly important is the identification of any impacts affecting cultural resources or rare, threatened, or endangered species. (N - 5)

b. Management Plans: A number of park natural resource management problems require management action to resolve, or the preparation of a plan to guide management action. In some cases, the baseline studies described above must be completed first. In other instances, the action or plan needs no further study. Subsequent follow-up studies may be needed to detect changes through time. These monitoring results should also be adapted to the computerized information system.

The park must acquire management authority sufficient to protect and preserve resources in all of the lands within the boundaries legislated by PL 96-550. The vehicle adopted to attain this goal should either prescribe the timely elimination of grazing and all other adverse uses, or it should give management adequate tools to control the adverse uses within acceptable impact limits. (N - 1)

An erosion control plan based on the study reported by Simons, Li and Associates in 1982 must be carried out in order to save archeological sites. This includes ongoing maintenance of existing erosion control structures as well as creating new control structures and modifying existing watercourses. (N - 2)

The water resources monitoring program should be reinstated to record the quantity and quality of water flowing in Chaco Wash and its tributaries within the park. Periodic evaluation should also be made of the contents of the aquifers tapped by the park's wells. This should be done in concert with the United States Geological Survey (USGS), which put an 1800' deep well in the park maintenance. (N - 11)

Monitoring of airborne visible particulates needs to be continued. Additional air quality studies should include analysis of air-mass transport corridors, monitoring of gas pollutants, determination of impacts of airborne chemicals (SO4, NO3, O3) and acids, examination of visitor perceptions of visual air quality, estimation of current effects of power plant emissions in northwest New Mexico, and communication of

current findings to the visiting public. (N - 7)

Monitoring of rockfall threats needs to be ongoing. Seismic impacts from natural and unnatural sources should be recorded. The system of cliff face monitoring points should be regularly measured, and the network should be expanded as needed to protect facilities and resources. (C- 10, N- 9)

A special regulation should be promulgated permitting Native Americans to collect natural resource materials within the park for use in traditional religious and medical practices. Prohibitions should be retained against collection for resale or when the collecting will adversely affect cultural resources or rare, threatened, or endangered species. (N - 5)

Upon completion of the related baseline studies, a vegetative and wildlife management plan should be formulated. Among other things, the plan should address control or elimination of exotic species; protection and preservation of rare, threatened, or endangered species; and the vegetative and wildlife goals to be attained in the various zones of the park. (N - 3)

A wildland fire management plan should be developed and implemented, correlated with the vegetative and wildlife management plan. (N -12)

Carrying capacity studies of the major visitor impact areas should consider natural resources as well as cultural resources. (N - 3)

An Integrated Pest Management Plan is needed to address those plant and animal species that are to be controlled or eliminated from part or all of the park. Topics to be included are vermin and insect infestation of facilities, plague and its containment, vegetation on ruin walls, etc. (N - 6)

RESOURCE PROGRAMMING SHEET

CHCU PARK | SWR REGION | NM STATE | X CULTURAL | ___ NATURAL | 07/28/88 DATE | PAGE1

Pk Py	RMP #	Project Title	Action Type	FY 89 FTE	FY 89 $k	FY 90 FTE	FY 90 $k	FY 91 FTE	FY 91 $k	FY 92 FTE	FY 92 $k	FY-93 FTE	FY-93 $k
1	C-1	Equalize Fill Drainage	A,C	2	67	4	134	6	201	6	220		
2	C-2	Accession & Catalog	A	1	25	1	35	1	35	1	35		
3	C-3	Wood Preserv.	A,C	1	20	1	20						
4	C-7	Update Arch. Site Files	A,C	.5	12	.5	12	.5	12	.5	12	.5	12
5	C-12	Hist.Str. Prs Guides	A,B,C	1	25	1	25	1	25	1	25	1	25
6	C-6	Chaco Common Catalog	A,C	2	35	1	20	?	?	?	?	?	?
7	C-9	Improve Park Coll. Storage	A,B	0	6	0	200						
8	C-17	Hist.Res.Stdy	A,C					0	75	0	75		
9	C-10	Seismic Study	A,C	.15	13	.15	13	.15	3	.15	3	.15	3
10	C-13	Site Mon.Prg.	A,B,C	1	20	1	20	1	20	1	20	1	20
11	C-5	Chaco Center Publications	A,C	2.5	80	2.5	80	2.5	80	2.5	80	2.5	80
12	C-16	Blw.Grd.Res.	A,C	.15	13	.15	3	.15	3	.15	3	.15	3
13	C-21	Backlog. Stab Rpts.&Archive	A,C	2	50	1	25	1	25	1	25	1	25
14	C-11	Hist.Str. Rpt	A,C			1	20	1	20	1	20	1	20
15	C-18	Nat.Reg.Nomin	A	1	25	1	25						
16	C-15	Update LCS	A			.5	10	1	25	1	25		
17	C-8	Complete CSI Doc. Water Control Feat.	A,C			.5	10	.5	10	.5	10	.5	10
18	C-4	Estab. Rsrch. Goals	A,C	.1	2								
19	C-20	Syn. Rock Art	A,B,C	.5	1	.5	1	.5	1	.5	1	.5	1
20	C-19	Srvy. Select Sites	A,B,C			.5	10						
21	C-14	Eval.Bdry. Sites for Stb	A,B					.5	15	?		?	

CHCU-C-1 Equalize Fill Levels and Repair Drainage in Ruins

1. Statement of Problem:

For the past 20+ years, the walls in all of the excavated ruins in Chaco Culture have been deteriorating at a rate much greater than they can be repaired with the time and money available. Static loading due to unequal fill levels between rooms, and inadequate or damaged drainage systems have caused the greatest amount of deterioration to the prehistoric fabric of the ruins. This damage is cumulative and irreversible, although it can be arrested by improving surface water runoff and equalizing the differential fill levels within each structure.

1.1 Background Information

Nine major structures in Chaco Canyon are suffering from extreme deterioration due to unequal fill levels and insufficient drainage: Pueblo Bonito, Chetro Ketl, Pueblo del Arroyo, Kin Kletso, Casa Rinconada, Bc 50, Bc 51, Bc 59, and Talus Unit. These sites have been partially or entirely excavated, and all are major interpretive features of the park. Backfilling will eliminate the static loading and the sump effect caused by deep rooms surrounded by higher ground surfaces. It will stabilize some of the most fragile portions of the masonry and decrease the total amount of wall surfaces needing annual and cyclic maintenance. Efficient, functioning drainage systems in each site will prevent surface water from soaking into the fill of rooms and plaza areas. The combination of backfilling and drainage improvement is the most effective and realistic means for preserving the resources while assuring that the majority of the structure will remain exposed for interpretation.

1.2 Present Management

Currently each of these sites receives emergency, annual, and/or cyclic maintenance as time and money permits, not necessarily as the resource requires. None are receiving sufficient stabilization and all are deteriorating more quickly than they are being repaired. Each year more and more original fabric is being replaced with stabilized materials, and fewer areas are left intact for future research. An example is the Talus Unit, where over 200 cubic feet of wall fell as the result of a June 28, 1988 storm runoff flowing from an area of unexcavated fill into an excavated room.

1.3 Program Justification

The problems of unequal fill levels and insufficient drainage have been identified and addressed in the 1985 GMP for Chaco Culture, pages 64-65. The need for this project is clearly supported by federal legislation such as PL 96-550, PL 89-665, and others.

2. Alternative Actions and Probable Impacts

2.1 No Action

This action would perpetuate the continuance and increase in loss of prehistoric fabric, deterioration of interpretive and research value, and increase expenses in correcting future problems.

2.2 Continue Current Management

Effects are similar to the above statements, but the deterioration will occur more slowly.

2.3 Equalize Levels and Improve Drainage in Ruins

A portion of the prehistoric fabric will be stabilized and protected, data critical to research and interpretation will be recovered and preserved, and total area of masonry needing annual and cyclic maintenance will be reduced.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above.

3.2 Type of Action: Resource Management Action (A)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Complete Section 106 XXX Clearance Report.

4.2 Planning, Research, Operation, Reporting

1. Design a backfilling plan and incorporate a drainage and installation program for each structure. The 10-238 for this project has been submitted, but no part of it has been funded. <u>It is imperative that the planning stage be funded immediately, so that the rest of the cost estimates can be refined and a comprehensive work plan prepared</u>.

2. Develop a research program with elements that will address the resources affected by the project. These elements should minimally include: a) review of previous excavations, mapping, etc. conducted at the

site, b) preparation of an Historic Structures Report for each building, c) develop and carry out a sampling program for testing rooms to be backfilled, d) analyze collected data, e) publish HSR and a synthesis of data for research purposes and for use in park interpretation program.

3. Complete a thorough stabilization project on the wall surfaces to be covered by backfilling or effected in any other way by the drainage features.

4. Install drainage systems and backfill in each of the structures.

5. Incorporate the planning process, methods and procedures, materials, archeological investigations, and results into a project report.

4.3 Funding A rough estimate for this multi-year project would be $850,000 staged over a span of four years for a total of 32.9 FTE. An itemized accounting of these estimated costs follows

Itemized Account of Estimated Costs

The table is a breakdown of the costs by task, total number of pay periods required, total FTE needed, and the net cost. These figures are only approximated and will be refined when the overall plan has been developed. The factors used to calculate these figures are:

1) Man day costs estimated at $1,000 per pay period.
2) HSR estimates based on size of structures.
3) Archeological testing based on a) 1/3 of total rooms to be backfilled in each structure, and b) an average of 18 m/d needed for each room.
4) Analysis based on possibility of analyzing most sherds, flakes, and ground stone in the field.
5) Curation based on returning most bulk sherds, flakes, and groundstone to the test trenches (artifacts will be permanently marked so they can not be confused with intact deposits).
6) One write up is for archeological testing only, the other is for a project review and documentation of the stabilization/backfilling.
7) Stabilization cost estimates are based on an average of $600 per room.
8) Backfilling costs estimates are based on an average of $800 per room.

Task	Total PP	FTE	Cost
Design Project Plan	5	.2	5,000
Historic Structure Report	110	4.3	110,000
Archeological Testing	110	4.3	110,000
Analysis	75	2.9	75,000
Testing Write-up	75	2.9	75,000
Curation (.05%)	15	.6	15,000
Stabilization and Drainage	165	6.3	165,000
Backfilling	220	8.5	220,000
Project Write-up	75	2.9	75,000
Total	850	32.9	850,000

CHCU-C-2 Accession and Catalog Park Collection

1. Statement of Problem:

Presently the Chaco Collection cannot be accounted for, in that it is not known how many artifacts are in the collection, where they are located, or in what condition they are. Although many of the artifacts have been accessioned and cataloged, most were done before the guidelines described in the Museum Handbook were established, and they must be brought up to standard. There has been minimal record keeping, such as current condition reports, review and renewal of loan agreements, etc. A number of items have been entered into the accession book, but no catalog cards were completed, and the entries were not done properly. There are several thousand items recovered from field collections and donated gifts which have not been cataloged. There are items on loan from and to other institutions which lack proper forms. For any particular item, it is extremely difficult or impossible to determine its condition, where it is located, how it is being stored, or even if it exists. Various reports that are called for by the national and regional curators in response to congressional inquiry cannot be completed accurately and most questions must be estimated. Considerable progress has been made in reconciling the accession records, inventorying the collection storage areas in both places, beginning the cataloging, and improving the storage conditions. Environmental monitoring has been improved in both storage and exhibit areas.

1.1 Background Information

As stated above, there is little or no accountability for the collections, and access for research purposes is difficult in their present state. Support in the form of time or money allotted to the collections is not adequate, and much of the work that has been accomplished was done with volunteer labor. While this has helped some, most of the work does not conform to professional or NPS standards and will have to be redone. The Chaco Collection contains nearly 1,000,000 items, and is curated both at the park and at the Maxwell Museum of Anthropology on the UNM Campus. The Chaco Collection at the Maxwell Museum contains both material belonging to the National Park Service and material belonging to the University of New Mexico. The collection as a whole is jointly managed by both parties under a Memorandum of Understanding signed in 1987. In a general sense, the NPS portion of the collection is on loan from the park to the Maxwell Museum; object-by-object determination of ownership remains to be accomplished via the accessioning and cataloging process. Some natural history materials are at other institutions, and the Smithsonian, American Museum of Natural History, and others have some of the early collections removed from Chaco Canyon. A small fragment of

the Chaco Collections is housed in three locations in the park.

The portion of the collection at Maxwell is being managed by a Museum Curator under the direction of the Regional Curator, and members of the Maxwell staff. They are continuing to upgrade the accession and catalog information, and accession previously undocumented items. Although all of the NPS material at Maxwell should be entered into the CHCU Accession Book, very little of it is, and in some cases, it is accessioned under one number in the park files, and under another number in the NPS Accession Book at Maxwell. Thus, while many items are the property of the park, the park currently has no way of accounting for or accessioning them. Even items that are housed at the park are not properly accessioned or cataloged, and several thousand have no records in the files whatsoever.

1.3 Program Justification

Accessioning and cataloging the Chaco Collection is clearly identified as a priority need in the Chaco Culture GMP, and is supported by PL 96-550, Archeological Resource Protection Act, Management of Museum Properties Act; 36 CFR 800 Protection of Historic and Cultural Properties; Special Directive 80-1; Management Policies, 1978, Chapter V; NPS 28: and the NPS Museum Handbook, among others.

2. Alternative Actions and Probable Impacts

2.1 No Action

Continued lack of accountability for the NPS-owned collection. Increasing cost of accessioning and cataloging because of growing backlog and loss of personnel who were involved with data collection. Loss of cultural resources due to lack of storage and artifact condition monitoring. Irretrievable loss of information accompanying artifacts.

2.2 Continue Current Management

Same comments as above, however a multi-year effort is being made to accession and catalog items both at the Maxwell and in the park.

2.3 Accession and Catalog Park Collections

Accessioning and cataloging the entire park collection will help achieve complete accountability for the artifacts. Accurate, complete records of the artifacts will protect them from being lost or stolen, or if such happens, the records will retain much of the research value of the

missing items. Although the backlog is considerable, completing the accessioning and cataloging immediately will be much less costly than allowing the backlog to grow. The park will be in compliance with professional, agency, and congressional standards for museum management.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of Action: Resource Management (A)

4. Requirements to Accomplish Action

4.1 Planning, Research, Operation, Reporting

It is imperative that both park personnel and curators working with the Maxwell loan are in direct communication, and coordinate all their respective activities. Next, it will be necessary to establish the current status of the records, define errors or omissions, identify what can be salvaged from the existing documents, etc. Park and region personnel can concurrently proceed with accessioning and cataloging the respective portions of the collection in concert with each other. This can most easily be accomplished if a computer link is established between the park and the Maxwell Museum. In doing so, the park and Maxwell will always have identical sets of accession and catalog information, and both can be kept current simultaneously.

Once the collections are properly and completely accessioned and cataloged, all subsequent records will be kept up to date, loans will be reviewed, condition reports completed, etc.

4.2 Funding

A rough estimate for this multi-year project would be $25,000 per year or 1.25 FTE for the first five years, and $10,000 per year or .50 FTE for as long as the Chaco Collections are in existence.

CHCU-C-3 Continue Wood Preservation Project

1. Statement of Problem:

There is a large quantity of Anasazi wood in both the excavated and unexcavated prehistoric ruins of Chaco Culture. Most wood in the unexcavated structures is relatively will protected. However, in the excavated structures an astounding number of wooden elements were uncovered and left exposed to weathering and vandalism. None of this wood had ever received preservative treatment. Without either removing deteriorating elements for storage in a more controlled environment or applying a chemical preservative to the wood, these extremely valuable artifacts will eventually be destroyed.

1.1 Background Information

In June 1986, a wood preservation project was begun at Chaco. The project consisted of inventorying all wood in the ruins, documenting and assigning unique field specimen numbers to each structural element, sampling by coring or cross-sectioning, and applying a chemical preservative to all exposed wood. It was clearly evident after the initial inventory stage that not only is there much more wood in the ruins than had been estimated, but it is in very poor condition and much data has already been lost through deterioration and lack of control over the artifacts.

The project is now in its third year, and over 7000 pieces of wood have been inventoried and documented in Pueblo Bonito, Pueblo del Arroyo, Kin Kletso, Wijiji, New Alto, Tsin Kletzin, Hungo Pavi, Una Vida, and Kin Bineola. Preservative treatment was applied to approximately 3000 pieces of exposed wood in Pueblo Bonito, Pueblo del Arroyo, Kin Kletso, and portions of Chetro Ketl. Sites that remain to be documented include Bc50, Bc51, Bc59, Casa Rinconada, Penasco Blanco, Kin Ya'a, Gallo Cliff Structures, Pueblo Pintado, and several other smaller structures. The analysis of over 350 samples from Pueblo Bonito indicate that construction of this building may have begun 50 to 70 years earlier than was originally thought. In 1988 another 350 samples from Pueblo Bonito were submitted for analysis, and these will help to confirm this hypotheses, and clarify a number of other questions about construction phases. It is expected that sampling and analysis at the remaining 16 plus structures will provide equally significant research and interpretive data.

1.2 Present Management

With the exception of the inventory and treatment during this project, nothing is currently being done with the wood elements. No information on amounts of wood, condition, or other data is known and there is no management of the resources.

1.3 Project Justification

From an archeological perspective, the wood elements are some of the most valuable, critically important artifacts in the sites. The tree-ring dates derived from the wood provide solid information on building evolution, construction stages, span of occupancy, and are used for inter-site comparisons within the canyon as well as in the whole Anasazi region and beyond. In addition to dating information, the wood artifacts provide data on resource procurement and use, trade contacts, construction techniques, etc. NPS 28 and Chapter V, Management Policies, outline the NPS's obligations to manage and preserve its resources. Supporting legislation includes PL 96-550 and PL 89-665.

2. Alternative Actions and Probable Impacts

2.1 No Action

The remaining untreated wood in the ruins will continue to deteriorate or be vandalized until the original fabric has lost all interpretive, structural, and research value. The project begun in 1986 will not be continued or completed and data gathered will remain in a preliminary state. Additionally, several complementary projects would be difficult to complete without this data, such as trace element analysis, wood source studies being carried out at the San Juan National Forest at Chimney Rock, and greathouse alignment and positioning studies.

2.2 Continue Current Management

Same comments as above; the current management does not provide for preservation or protection of most of the wood in the ruins.

2.3 Complete Wood Preservation Project

All prehistoric wood in the ruins will be inventoried, documented, sampled as necessary, preserved, and a project report compiled. This report will describe the methods used, present data recovered, and synthesize the results for research and interpretation. Data derived from the

documentation will be incorporated into a computerized relational data base for ease of access by researchers, interpreters, and park management

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of Action: Resource Management Action (A)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Planning, Research, Operation, Reporting

A Section 106 XXX Clearance form has been submitted and approved for this project. Included in that document is a detailed outline of the project summarized as follows:

1. Inventory and documentation -- all exposed wood will be located. Data recorded for each wood artifact during this stage include: a) previous tree-ring research, b) location, c) function, d) wood attributes and characteristics, e) context, f) condition, g) preservation needs, and h) sampling.

2. Preservation -- brush application of a turpentine/linseed oil/paraffin mix on all pieces of wood exposed and weathering.

3. Sampling -- cores and cross-sections are extracted from wood that is treated and left in the structure as well as wood removed for curation. Samples will be kept for controls, submitted to the Lab of Tree-Ring Research, or sent to the Los Alamos Labs for trace element analysis.

4. Reporting -- methods and procedures used during the above described phases, data recovered during inventory and documentation, results of analyses, synthesis of all recovered information into a report for research and interpretive use.

4.2 Funding

In 1986, $25,000 was expended to inventory approximately 33% of the wood in the ruins, preserve 50% +/- of the exposed wood, document 15%, extract 300 cores and cross section samples, and purchase chemicals, supplies, coring instruments. In 1987, approximately $3,000 was spent on completing the preservation, and on sample extraction and analysis while all documentation was accomplished with volunteer labor and park based funding. In 1988, no

Cultural Cyclic money was directly allocated for the wood project, however a regional archeologist was detailed to the park to continue documentation and his salary was covered for a month. Additionally, $5,000 of the park based fee enhancement funding was earmarked for the project and will be used for sample analysis and labor to continue documentation and sampling. It is estimated that the project can be completed with an additional $50,000 and 2 FTE.

CHCU-C-4 Establish Research Goals

1. Statement of Problem:

It is not possible to organize, coordinate, and manage the research conducted in the park without a set of guidelines, or a research design. The park lacks a current set of such guidelines. The vast amount of data gathered over the past 90 years, ongoing research, and future investigations need to be organized in such a way that will make the greatest use of the information, prevent duplication of work, assure the data is made available to researchers and interpreters, and will be used to answer pertinent questions about the history of Chaco Canyon. Without some form of organization or coordination, the growing amount of data becomes increasingly difficult to manage and use, and considerable effort is duplicated or wasted. The Chaco story cannot be developed solely with park resources nor can the research be conducted by the NPS alone.

1.1 Background Information

Excavations, surveys, and other archeological projects have been conducted in Chaco for over a century. More field work and research have been centered here than probably any other cultural area in the western hemisphere. Yet, there is still a vast amount of work to be accomplished. Each project has had a research design of some sort. Many of the questions asked during the first archeological work in the canyon are still valid (and largely unanswered) and should be included in a current research design. Other areas of inquiry have been satisfactorily explored, and until new techniques are developed or new data from other areas gathered, they may not need further investigation. However, the great majority of research questions have resulted from the growing body of recent data from Chaco and elsewhere, and from new techniques for data recovery and analysis. In order to manage this enormous quantity of information, and coordinate future work, a research design or a set of guidelines is necessary.

1.2 Present Management

Currently there is no adequate set of guidelines to coordinate, organize, and manage the future research goals of the park. For example, recent interest in archeoastronomy has resulted in a plethora of research, field projects, and publications on that subject, creating a somewhat unbalanced view of the prehistory. Much of this work duplicates itself and has not been synthesized or integrated into the larger context of the Chaco or Southwest prehistory. In an attempt to overcome the lack of coordination among researchers, members of the professional

community organized a small conference at Chaco Culture to focus on one temporal phase of the Chaco Anasazi. This conference was a great help, but it is clear that an overall set of goals is needed to make the analysis and synthesis of the Chaco data understandable. An inter-disciplinary and inter-agency gathering of researchers was held at Chaco Canyon over Easter weekend, 1987. The research ideas generated by that group have yet to be organized into a series of topical proposals, circulated for review, and added to the RMP as a Research Plan. Programming for implementation must follow.

1.3 Program Justification

The need for this project is very clearly supported by the archeological profession, and is a fundamental and critical element of cultural resource management. NPS 28, Public Law 96-550, Chaco Culture GMP, the Chaco Archeological Protection Site System, PL 89-665, and other NPS legislation all support the need for development of research guidelines.

2. Alternative Actions and Probable Impacts

2.1 No Action

Continue collecting data and conducting or permitting research projects with outdated or no coordinated or organized objectives for the park. It will become increasingly difficult for the park to provide guidance to independent and staff researchers, or to integrate new and existing information into a dynamic interpretation of the history of Chaco Canyon.

2.2 Continue Current Management

Effects are the same as those stated above in 2.1.

2.3 Establish Research Guidelines

Existing, ongoing, and future research will be organized and coordinated so that the greatest potential from the data can be realized, efforts will not have to be duplicated, and the needs of the park and the profession will be met.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of Action: Resource Management Action (A)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Planning, research, Operation, Reporting

Organize and present the results of the workshop attended by a wide variety of researchers for the purpose of formulating research goals for Chaco. These goals should cover the historic, ethnographic, natural resources as they pertain to cultural research, and prehistoric concerns. It must be clear that the guidelines are dynamic and can be modified to reflect new data, changing interpretive needs, and current professional standards. A summary of the goals identified during the workshop will be drafted and distributed widely for review before being redrafted into final form. This set of goals will be used by resource managers at the park to help organize and set priorities for projects, to aid independent researchers, and to direct interpretation of the resources.

4.2 Funding

The meeting or workshop was at Chaco, with funds that have been donated by the Southwest Parks and Monuments Association to pay for housing, travel, etc. An additional $2,000 will be needed for .1 FTE to synthesize the conclusions of the conference, and produce the guidelines in a management/research document. Eventually, the goals will be translated into project statements in the next revision of the RMP and a strategy for implementation will be developed.

CHCU-C-5 Complete Chaco Center Publication Series

1. Statement of Problem:

A primary mission of the Chaco Center, now known as the Branch of Cultural Research, is to disseminate the results of their research in a publication series. To date, just over half of the reports have been completed. In recent years, funding and staffing for this integral phase of the Chaco Project have been severely reduced, and the obligation to complete the research is not being met. The park must support the completion of research, analysis, writing, editing, and publication of the remaining 15+ reports. This support must be met with a commitment by the regional staff as well.

1.1 Background Information

Since the inception of the Chaco Project in 1970, the following reports have been published in the two publication series:

Chaco Canyon Studies, Publications in Archeology 18

Archeological Surveys of Chaco Canyon, New Mexico
Great Pueblo Architecture of Chaco Canyon
Tsegai: Archeological Ethnohistory of Chaco Canyon
Small Site Architecture of Chaco Canyon
Environment and Subsistence in the Chaco Area
Investigations at the Pueblo Alto Complex, Chaco Canyon, New Mexico, 1975-1979. Volume I. Summary of Tests and Excavations at the Pueblo Alto Community

Reports of the Chaco Center

Remote Sensing Experiments in Cultural Resource Studies: Non-destructive Methods of Archeological Exploration, Survey and Analysis
Aerial Remote Sensing Techniques in Archeology
The Outlier Survey: A Regional View of Settlement in the San Juan Basin
A History of the Chaco Navajos
Stone Circles of Chaco Canyon, Northwestern New Mexico
The Architecture and Dendrochronology of Chetro Ketl, Chaco Canyon, New Mexico
The Architecture and Material Culture of 29SJ1360, Chaco Canyon, New Mexico
Recent Research on Chaco Prehistory
A Bio-cultural Approach to Human Burials from Chaco Canyon, New Mexico

Contributions to the Chaco Center

As of August, 1988, there are 64 papers included in this series which are published in a variety of journals, proceedings of conferences, government reports, and other forms. A complete listing of these papers can be found in the Resource Management Plan bibliography.

In addition to the above reports, there are at least eight volumes for which a manuscript has been prepared, but retyping, editing, graphics preparation, printing, etc., remain to be done. Finally, there are at least four publications on which little or no work has progressed.

1.2 Present Management

While the completed and proposed reports of the Chaco Center directly benefit research and interpretation in the park, the responsibility of producing them has been with the Chaco Center. Dissolution of the Chaco Center has resulted in the responsibility for meeting the publication obligations being placed with the Division of Cultural Research.

1.3 Program Justification

Dissemination of the results of research conducted in the park is clearly supported by the Chaco Culture Enabling Act, Chaco Culture GMP, NPS-28, Chapter V Management Policies, a variety of other Federal legislation and agency policies, as well as standards of the archeological profession.

2. Alternative Actions and Probable Impacts

2.1 No Action

The remaining reports of research conducted in the park will not be completed and the NPS will default on their obligation to disseminate research results.

2.2 Continue Current Management

The remaining manuscript preparation, typing, editing, graphics production, etc., are being completed on a severely curtailed budget, making deadlines and completion dates difficult or impossible to meet.

2.3 Complete Chaco Center Publications

A program will be submitted, and supported with funding and personnel to complete the remaining research reports. The information will be disseminated to the public facilitating research on Chaco Anasazi and the NPS will be complying with professional and NPS standards.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of Action: Resource Management Action (A)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Planning, Research, Operation, Reporting

The Publications Committee, Branch of Cultural Research, produced a reassessment of the Chaco Project Publications in January 1986. In this report, they recommend three actions for resolving some of the publication problems and meeting the reporting obligations. Briefly, these three recommendations are as follows: 1) pursuit of private sector support, 2) sacrificing volumes, and 3) schedule revision. Following these three recommendations, and committing the funds and personnel to the program, it is possible to meet NPS's obligations to disseminate the research data.

4.2 Funding

Based on the estimates provided in the 1986 Publications Committee Reassessment, roughly $400,000 or 12.5 FTE (2.5 FTE for 5 years) will be needed to complete the projects.

CHCU-C-6 Establish Chaco Common Catalog

1. Statement of Problem:

As a result of over 90 years of archeological work in Chaco Canyon, the artifacts, papers, notes, reports, photographs, maps, etc., are scattered throughout the entire United States in at least a dozen institutions. There is no single location in which even a listing of references and repositories can be found. Hence, it is virtually impossible to conduct a thorough, comprehensive research project even on a relatively small aspect of the prehistory. Without an annotated reference listing of data, it is extremely difficult to manage the resources, and omissions and duplications are a constant problem.

1.1 Background Information

Beginning with exploration and punitive expeditions by the Spanish, Mexican, and American governments, the Chaco Canyon area has been referenced in a wide variety of journals, and other publications. In addition, private and state foundations have supported a vast amount of research on the Chaco Anasazi. These expeditions, excavations, surveys, and stabilization projects have generated an enormous number of records and artifacts which are scattered over a continent.

Although some of the early journals and a sampling of excavation and survey projects have been published and/or reprinted, the majority of written documentation from Chaco has never been published. For many documents, such as field notes, excavation maps, photographs, project journals, some stabilization reports, etc., only a single original copy exists. In some cases, notes and photographs are known to have been taken, but their present location is unknown.

Locating all artifacts, samples, etc., recovered from excavations and survey is probably not possible now, but as time goes on, more and more information will be lost. Artifacts have generally been considered the property of the institutions supporting the archeological work, and often inventories were never completed.

The materials collected by the Chaco Center staff during the 1970's and housed in the facilities at UNM, are the most complete compilation of data on Chaco to date. Although the Chaco Collection has remained intact, the dissolution of the Chaco Center resulted in much of the written material being scattered throughout various institutions again. Even more so now, it is extremely difficult, or impossible to conduct a thorough research or management project.

1.2 Present Management

Currently, there is no formalized plan to compile even a listing of all known documents and artifact remains from Chaco. There is an agreement between the Maxwell Museum of Anthropology and the NPS protecting the Chaco Collections, but the ownership of many of the documents and artifacts in that collection is in question. Parts of the former Chaco Center library have been moved to Santa Fe, while others remain in the Maxwell Museum under substandard storage and access conditions. One researcher, Jonathan Reyman, has identified the locations of the original Hyde Exploring Expedition photographs and notes, but no NPS or other funds are available to obtain, copy, or otherwise preserve these resources. There is a minimal research library maintained at the park, and a small fragment of the Chaco Collections are housed here for educational and exhibit purposes. The park receives frequent requests for reference materials or other data from researchers who assume that Chaco Canyon is the logical place to obtain data on Chaco Canyon. They are given what information is available, but most often they are referred elsewhere.

1.3 Program Justification

It is not possible to accurately or efficiently manage the cultural resources at Chaco without the aid of a complete bibliographic reference to the prior archeological work, and either copies or images of the original documents, or knowledge of where these references and collections reside. This is a basic requirement needed to meet professional and NPS standards, and is clearly supported by PL 96-550, NPS 28, 1985 GMP for Chaco Culture, and others.

2. Alternative Actions and Probable Impacts

2.1 No Action

Continued and increasing loss of documents and other references and artifacts relating to Chaco. Increasing difficulty in effectively and efficiently managing the resources without complete references to the previous work. Increasing inability to assist researchers or conduct research. The present situation also impinges on the ability of researchers to compare new evidence found at Chaco outliers with that found at the canyon. A final, and terminal, problem is that surviving resources may be excavated to answer questions that could have been answered by consulting the information residue of past excavations.

2.2 Continue Current Management

Same comments as above, since no action is presently being taken.

2.3 Establish Chaco Common Catalog

An annotated and computerized catalog would contain all known records, publications, artifacts, etc. from or related to Chaco. This catalog can combine images of as many of these documents as possible, electronically duplicated, and a computerized catalog of all the known Chaco collections. With this Common Catalog, cultural resources can be more effectively and efficiently managed; the park can be of more help to researchers who in turn can aid the park's interpretation and management; and the park can meet professional and agency standards expected for a National Historical Park.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of Action: Resource Management Action (A)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Planning, Research, Operation, Reporting

Phase I: Survey institutions for estimates of Chaco holdings. Data to include artifacts, field records, and publication, noting both quantity and format (photographs, slides, maps, field notes, etc.).

Concurrently, assess hardware and software technologies available, and those in use by participating institutions, to determine standards to be used in developing the Chaco Common Catalog.

Produce a phased plan of sequential tasks necessary to locate, preserve, catalog, computerize, and duplicate the data for Chacoan artifacts and related records, including costs.

Phase II: Locate and allocate funding necessary for participating institutions to accomplish the tasks in the plan.

Phase III: Accomplish the tasks, ending with each participating institution having copies of the

computerized catalogs of artifacts and records, plus electronic images of records (notes, maps, photos, etc.) where possible, for all other participating institutions.

Phase IV: Prepare and issue a report analyzing the Chaco Common Catalog project, in order to make the lessons of this pioneering project available to guide other, similar projects.

4.2 Funding

A very rough estimate of NPS costs for this project is:

Phase I:
$35,000
2 years to complete assessment and plan
1 FTE each year

Phase II:
$20,000
1 year to coordinate funding to start plan
1 FTE
Subsequent costs: ?

Phase III:
$ unknown, dependent on Phase I findings
NPS only: cs. $100,000 in equipment (includes both park and Maxwell Museum location of Chaco Collections)
$100,000 (?) in data entry and digitizing costs for NPS artifacts and records at park and Maxwell Museum.
7 years
2 FTE per year
Ongoing costs of maintaining NPS equipment and data base at park and Maxwell Museum: $?

Phase IV:
$20,000
1 year
1 FTE

TOTAL:
$275,000 +
11 years
18 FTE (not more than 2 FTE per year)

CHCU-C-7 Update Archeological Site Files

1. Statement of Problem:

Two sets of Chaco Site Files exist, one is in the Chaco Center Archives housed at the Maxwell Museum and the other is maintained at the park. Both of these site files are part of the Chaco Collection. Several major problems with the files exist. One is that the volume of these site files is so great that they cannot be managed without a computerized information system. Until a workable computerized system is developed, updating and use of the files is extremely difficult. A second problem is that the park Site Files are incomplete. In early 1988 the written and photographic documentation contained in the Chaco Center Archives was copied and incorporated into the park Site Files. Although this helped to complete the park files, there is still a vast quantity of documents ,such as excavation notes, testing records,photographs, dating information, maps, etc. that still need to be copied. Many of these documents are originals with no duplicate in existence. Duplicating them for the park Site Files will not only ensure that invaluable data is preserved, but will enable researchers and park personnel to readily access and use the information. A related problem is that in approximately 25% of the site files, survey data collected in the early 1970's is inadequate, lacking either descriptive written information or site maps.

1.1 Background Information

The site files are the result of the 1971-72 archeological survey of Chaco Canyon conducted by the National Park Service and the University of New Mexico. The sites inventoried in the PL96-550 park additions have been incorporated into the files. These files are the primary cultural resource management tool used by all divisions of the park, and are extensively used for research purposes. There is a file for every recorded site in the park and they are numerically keyed to a base map. Ideally the files contain the following information: 1) site recording form -- 1971/72 version or expanded 1984-85 form, 2) site map, 3) photograph, 4) all excavation, sampling, research, or reference notes and maps in existence on the site, 5) condition reports if any, 6) site monitoring reports, 7) all other materials pertaining to the particular site or a reference that such material is in existence and where it can be located.

1.2 Present Management

The site files are maintained in the cultural resource office, and are added to and updated in a haphazard manner. Although incomplete, they are heavily relied upon for almost

any action taken by the park. Currently it is necessary to contact either the Cultural Resource Management Office in the Regional Offices or the Maxwell Museum at UNM to obtain more complete data, or to be sure the information at the park is the most current. Information, photographs, condition reports, etc., collected by the park and added to the files here are not being incorporated into the other set of files in Albuquerque, thus both sets are incomplete. A computerized information system called PARKMAN was developed in the mid 1970's to manage the site data. However, there were problems with data entry and no new or updated information has been added to the system for over five years. Further, it appears that PARKMAN cannot function as an information system.

1.3 Program Justification

The site files are used extensively for a variety of park operations. The information contained in the files is necessary when compiling Section 106 compliance reports that are required for all park projects that may affect the resources. Backcountry use is increasing and the site files are consulted so this use can be better managed. The site files are routinely consulted before and after patrols in all parts of the park, including the detached units, in order to evaluate changing site conditions and impacts to the sites. The expanded publication series on Chaco archeology and increased notoriety of Chaco through the protection site system, management and interpretation of Chacoan structures by other federal and state agencies, inscription on the World Heritage List of Cultural Sites, and articles in national and international journals has resulted in a dramatic increase in the amount of research conducted at Chaco. While the files are not open for public use, they are frequently used by researchers working at the park. Additionally, interpretation programs rely heavily on data in the site files. PL 96-550, Pl 89-665, and others support and require the upkeep of these active files.

2. Alternative Actions and Probable Impacts

2.1 No Action

Without duplicates of the records housed in the Chaco Archives, any damage or loss of the original document will mean an irretrievable loss of archeological data. The site files will continue to become outdated and incomplete and will eventually lose their usefulness as a cultural resource management tool. Their function as interpretive and research references will continue to diminish if not kept current and complete. It will become increasingly difficult to update and correct the problems if no action is taken.

2.2 Continue Current Management

Since the Chaco Archives are not being housed in NPS facilities, they are more difficult to access and it is more difficult to assure proper storage conditions. Park files are currently being haphazardly updated and augmented. Copies of updated information are not being circulated to all repositories of the files and the sets of files are continuing to become less compatible.

2.3 Update Archeological Site Files

All data pertaining to each site will be duplicated and placed in the Chaco Site Files so that at least one duplicate of the original exists and can be easily accessed and used. The Chaco Site Files will contain the most current, complete data available and they will be accurate references for resource management, interpretation, and research. A computerized information system will facilitate organization, management, updating, synthesizing, etc. of this vast volume of data.

3. Recommended Course of Action

3.1 Implement alternative 2.3 described above

3.2 Type of Action: Resource Management Action (A)
Research Action (C)

4. Requirement to Accomplish Action

4.1 Planning and Operation

A listing of the contents of each site file in the park has been compared with files at the Maxwell Museum, and additions and updates/corrections were made, or will be made where necessary. Portions of the files, such as listings of negatives, field notes, FS sheets, etc., may be reduced to optical disc or microfilm, and the park will have to provide enough space to accommodate the complete hard copy files.

Since the Chaco Archives and Site Files are a part of the Chaco Collections, they can be incorporated into the Common Catalog (see CHCU-C-6). This data management system will need to be developed and put into operation, and the park will need the hardware and software to run the system. The park will need the equipment to read microforms, if used, and to make hard copies

4.2 Funding

The data management system needed for the Site Files can easily be linked to the hardware and software acquired and developed for the Chaco Common Catalog, since the former is a subset of the latter. There will be an annual cost for data entry, file maintenance, etc. of at least .5 FTE and $12,000.00.

CHCU-C-8 Document Historic and Prehistoric Water Control Features

1. Statement of Problem:

For the past 1000 or more years, the inhabitants of Chaco Canyon have been building water control features in the tributaries and main channel of Chaco Wash. In many cases, these Anasazi, Navajo, historic Euro-American, and Government-built structures are quite similar in site location, construction technique and materials used. Although several features have been recorded, none have been thoroughly documented or mapped. In some instances it is difficult or impossible to determine if the features are 440 years old, 100 years old, or 1000 years old. People who either planned or built the modern Government structures are gone or will be soon, and this valuable information is being lost. Similarly, children and grandchildren of the people who constructed the historic and/or Navajo water control systems are passing on and this ethnographic data is not being gathered. Finally, the Anasazi water control features are being lost to increasing soil erosion and are damaged by modern structures.

1.1 Background Information

The primary functions of these prehistoric, historic, and modern water control features are to slow and/or divert run-off water, and prevent down-cutting soil erosion. These features include check dams, canals, head-gates, pour-off basins, and possibly fields. They are an invaluable, continuous record through time of how various cultural groups adapted to a similar environmental situation. Unfortunately, water control features are extremely difficult to locate, record, map, and interpret. Due to the nature of their location and function, they are usually the first features to disappear when not being maintained, either by being swept away in floods or buried by erosional deposits. Prehistoric features exposed on the surface were often modified or expanded by succeeding inhabitants, until the original structure is not discernible. Recently constructed features may further obscure water control structures, or may newly expose ones that have been previously buried.

Several researchers have surveyed, mapped, and tested Anasazi water control features. This work, in addition to isolated segments of canals and head-gates discovered in utilities trenches and toilet pits, have provided at least a sketchy picture of what the prehistoric water control system my have entailed. A handful of features built by the Navajo farmers in the area have been identified in the field and/or described in ethnographic literature. U. S. Government work

projects such as the CCC, WPA, and SCS all funded projects to build erosion structures in the canyon. These features have not been systematically recorded or mapped. Currently, an erosion control study was developed for Chaco Culture which calls for extensive re-channeling and gabion construction in Chaco Wash proper and in the side canyons.

Eventually the documentation of water control features should be extended to the areas added to the park under PL 96-550, including the three detached units of the park.

1.2 Present Management

While the prehistoric and historic water control structures located during the 1971-72 survey have been recorded and are protected, they represent only a fraction of the resources present in the canyon. We lack a comprehensive map of all these features that would help us understand how the entire system may have functioned, and project where buried or otherwise obscured features may be located. Few of the Government-built erosion control features have been recorded, and there is much confusion about the age of some of the structures. Because the extent or exact locations of these structures are not known, and we are not able to predict or even accurately guess where buried deposits may occur, they are often impacted by construction, or by recent erosion control projects.

1.3 Program Justification

The need to adequately and completely record these cultural resources is clearly supported by the Chaco Culture Enabling Law, PL 89-665, the Chaco Culture GMP, NPS 28, and other documents. Documentation of these water control features would provide invaluable research data, needed management information, and a basis for preservation and protection of the resources.

2. Alternative Actions and Probable Impacts

2.1 No Action

Continued and increasing loss of prehistoric fabric, deterioration of interpretive and research value, increased expense in correcting problems in the future or modifying ongoing erosion control plans to avoid unexpected cultural resources.

2.2 Continue Current Management

Effects are similar to the above statements.

2.3 Document Historic and Prehistoric Water Control Features

An invaluable portion of the historic and prehistoric cultural resources in the canyon will be preserved, information will be made available to researchers on water control practices through time, insights into the affect and effectiveness of these structures can aid in planning future erosion control projects, and goals, mandates, and regulations set by the NPS will be met.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of Action: Resource Management Action (A)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Complete Section 106 XXX Clearance Report.

4.2 Planning, Research, Operation, Reporting

1. Compile all known information of prehistoric, historic, and modern water control features in the canyon, including an archival search for records of erosion control work done in the canyon under various Federal programs.

2. Plot the locations of these features and project possible canal routes, locations of possible check dams, etc.

3. Conduct ethnohistory interviews with local inhabitants, former NPS employees, people who worked on the CCC, WPA, and SCS projects.

4. Conduct an intensive survey in areas of known or projected features, accompanied by soil coring, arroyo profiles, etc.

5. Conduct a National Archival search for the CCC/WPA/SCS records of the work done in the canyon to control erosion.

6. Produce a report of the survey, testing, data collection, and results of the project, along with a comprehensive map showing all known water control features in the canyon through time.

5. Funding:

A rough estimate for the cost of this project would be $50,000 or 2 FTE staged over several years.

CHCU-C-9 Improve Park Collection Storage

1. Statement of Problem:

Chaco Culture NHP does not have a Collection Management Plan and consequently no Collection Storage Plan, either in draft or final form. Presently the Chaco Collection cannot be completely accounted for in terms of number, location, and condition of artifacts due to minimal record keeping and substandard storage in a variety of locations in the park at the Maxwell Museum. Recent progress has been made in inventorying,accessioning, and cataloging, but Collection Management and Storage Plans are necessary to proceed in a efficient manner. Although steps have been taken to improve storage facilities and monitor environmental conditions, these are stop-gap measures and desperately need the guidance of a management and storage plan to guide future work.

The portions of the Chaco collections housed in the park are stored under substandard conditions. Collections are in areas that have no environmental controls; fire and theft protection is minimal; space is inadequate; artifacts are improperly stored in containers; shelves, etc., not designed for that use; items are not in designated collection storage areas but share space with plumbing, air conditioning, safety, and interpretive equipment and operations. The storage conditions for the portion of the collection housed at the Maxwell Museum are somewhat better, but the artifacts and archives tend to be more fragile. Few of the storage conditions meet Federal and professional standards.

1.1 Background Information

Even though the Chaco Collection is one of the largest in the National Park Service , no Collection Management or Storage Plans have ever been compiled. The Chaco collection contains over one million artifacts and is housed in two separate locations. The majority of the collection is at the Maxwell Museum of Anthropology on the UNM campus and is stored in several different facilities. The balance of the collection, approximately 10 to 15%, remains in the park in three storage areas. These areas are the visitor center, Rooms 105 and 25 of Pueblo Bonito, and in the CCC explosives bunker. The material at the Maxwell Museum includes artifacts with primarily research and/or exhibit value from excavations and which retain complete or near-complete documentation. The materials housed at the park are those lacking information on provenience, bulk samples, architectural artifacts, miscellaneous donated and field collected items, which are more suited for exhibit or educational purposes than research.

The following is a brief listing of the types of materials housed in the three collection storage areas of the park. Residual float samples, spall samples, large ground stone artifacts, and roof beams are stored in the Pueblo Bonito rooms. Wood beams from Chetro Ketl are the only artifacts in the CCC bunker. The visitor center storage is divided between the exhibit/collection storage areas, and a closet in the archeologist's office. These areas of the visitor center contain an entire range of artifact types including ceramics, lithics, textiles, metal, vegetal, etc., of both prehistoric and historic origin, and with incomplete or no documentation. Present conditions in the VC storage areas are as follows:

Exhibit Area: no functioning fire alarm; no intrusion alarm, artifacts relatively secured in glass cases either screwed or locked shut; no environmental control, although the cases provide considerable humidity and temperature stabilization; UV filtered lights.

Archeologist's Closet: no fire alarm; no intrusion alarm; artifacts behind locked door although key is distributed among staff; no environmental control; artifacts placed on open, uncovered metal shelving that is in unstable condition and not designed for collection storage; items stacked on top of one another; a variety of non-collection materials stored in room and a variety of non-collection tasks performed in room.

Collection Storage/AV Room: This room contains eleven museum storage cabinets, a locker, and a shelving unit in a 186 square foot area, accounting for the extremely crowded condition. The following are a listing of some of the other conditions present in this room:

1) Entrance door is shared with A/V room and is used numerous times daily by all staff and is often not shut when employees are in A/V area.

2) Room contains two water pipes supplying restrooms, ducts for air conditioner, and a built-in film vault for interpretive use.

3) Floor is unsealed concrete, walls are unsealed, painted cinderblock.

4) Location of the room is directly in visitor use area of the VC, and in the opposite end of the building from the resource office.

5) Security is a problem in that all employees have the key to this room and presently there is no functioning intrusion alarm system in the building.

6) The space available in the room for storage is grossly inadequate in that storage cases are stacked three high; there is not enough room to pull out drawers from the cases to view or remove artifacts and drawers must be tipped at an extreme angle to remove them; only one person can be in the storage area at a time; etc.

7) Space is inadequate to store bulk items such as ground stone, boxes of archeological collections, and other items suited for storage on shelving.

8) No adjacent area allotted for cataloging or other record keeping and filing necessary to manage collections.

1.2 Present Management

Currently there is no Collection Management Plan and no Collection Storage Plan and the collections are maintained as best they can be in the available space. Some measures have been taken to correct or at least measure storage and other problems, such as acquiring a hygrothermograph and dehumidifier, establishing a routine for monitoring environmental conditions, re-bagging and re-boxing artifacts, and requesting that locks with fewer keys be installed. Without the Management and Storage Plans that help the program, the larger problems still exist and the collection continues to deteriorate as a result of the inadequate storage facilities.

1.3 Program Justification

The 1907 enabling act for Chaco Canyon National Monument states that the monument would preserve the pueblo ruins and the "innumerable and valuable relics which they contain" (Chaco Culture GMP, 1985). Other legislation and regulations regarding the care and use of the collections are:

Public Law 96-550, 1980, Chaco Culture Enabling Law
Archeological Resources Protection Act, 1979
Archeological and Historic Preservation Act, 1974
National Environmental Policy Act, 1969
National Historic Preservation Act, 1966, amended 1980
Management of Museum Properties Act, 1955
Historic Sites Act, 1935
NPS Organic Act, 1916
Antiquities Act, 1906

36CFR800 Protection of Historic and Cultural Properties
35CFR60 National Register of Historic Places
43CFR7 Protection of Archeological Resources
Special Directive 80-1
Management Policies, 1978, Chapter V
NPS 28, Cultural Resource Management Guidelines
NPS Museum Handbook

2. Alternative Actions and Probable Impacts

2.1 No Action

Continued and increasing deterioration of interpretive, research, and exhibit value of individual artifacts.

2.2 Continue Current Management

Effects are similar to the above statements, but stop-gap measures will be attempted to slow deterioration.

2.3 Improve Park Collection Storage

Secure a Collection Management and Storage Plans. These plans will provide guidance for complete accountability for the Chaco Collection and set standards for use policies, loans, etc. With guidance and recommendations from these plans, improve storage facilities at the Maxwell Museum, and construct an area with sufficient size and features to house the Chaco Culture NHP collections stored in the park. These storage areas must also include space for records work and research on the collection materials and for storing accession and catalog records. The plans will insure that the Chaco Collection is managed in compliance with professional, agency, and congressional standards for museum collections.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of Action: Resource Management Action (A)
Research Action (B)

4. Requirements to Accomplish Action

4.1 Approved Section 106 XXX Clearance

4.2 Planning, Operation

1) Contract for Collection Management and Storage Plans to be completed for the Chaco Collection.

2) Use the Collection Storage Plan to design adequate storage facilities at the park, and to guide the Maxwell Museum in providing adequate storage spaces.

3) Draft blueprints, contract construction for storage facility at the park.

4) Acquire appropriate storage cabinets, shelving, cases, etc., and bring existing equipment up to standard. Move collections into storage area and establish a program of regular maintenance on the facilities.

4.3 Funding

An estimated $6,000.00 is needed for a team of museum professionals to conduct an on-site assessment of the Chaco Collection and facilities at the Maxwell Museum and at the park. Once recommendations are made for storage improvements at the park, a rough estimate for contracting the planning and construction of adequate storage is $200,000.00. No FTE are needed for these phases, however, complying with the recommendations of the Collection Management and Storage Plans will definitely require additional FTE and will be addressed once the plans are completed.

CHCU-C-10 Continue Seismic Studies on Prehistoric Structures

1. Statement of Problem:

The proposed improvement of State Road 57, Gallo Mine east of the park, and construction and mining at the Dine Power Plant pose potential threats to the prehistoric structures in the park. In a 1984 seismic study conducted at the park, industrial blasting and vibration caused by construction and traffic were identified as hazards to the masonry structures. While safe upper limits for induced motions and minimum distances of blasting and traffic from the prehistoric structures have been established, an ongoing seismic monitoring program will augment this baseline data, and assure that the hazards are kept within recommended levels.

Cyclic maintenance of the ruins is based on visible signs of deterioration in the structures; that is, when erosion or failure of elements become visible, the masonry is repaired. This visual inspection is relatively effective, given the time and funds available, but an average of at least two major sections of masonry each year collapse without any significant warning. When such a collapse occurs, essentially all of the original integrity of the masonry is lost. A means for predicting failure would greatly enhance our ability to preserve the resources, and the seismic characteristics of standing walls may provide clues to their relative stability.

1.1 Background Information

In 1984, a study was conducted to identify the potential for damage to prehistoric masonry structures resulting from earthquakes, landslides, industrial blasting, road building and vehicular traffic (Kenneth W. King, S.T. Algermissen, and P.J. McDermott, 1985 -- Seismic and Vibration Hazard Investigations of Chaco Culture National Historical Park, Open-File Report 85-529, D.O.I., U.S.G.S.). An analysis of the collected data is presented in a preliminary report submitted in 1985. In an October 1986 seminar, the principal author recommended that an ongoing monitoring program at Chaco would be extremely valuable to test and/or augment the initial data. The report established that cultural resources can be preserved while allowing industrial blasting and traffic vibration to continue. But in order for this to occur, site and building response to motion must be known, and motion must be kept within safe limits. There is a difference in perspective between standards set for industrial blasting and those set to protect cultural properties. Standards for industrial blasting (Bureau of Mines) allow a certain amount of damage which is measured against how much damage a typical frame structure can withstand, the types of repairs that can be made, and the life span of the structure. Standards set to

protect cultural resources do not allow for any preventable damage since the goal of resource management is to preserve and protect, not repair.

During the 1984 seismic testing, it was noted that statistically, some of the walls fall below a standard curve of periodicity and damping. This may be a predictor of unstable walls and may aid in setting stabilization priorities. A portable seismograph could be used to record measurements, and the data sent to the U.S.G.S. to be synthesized. Any walls that do not fall within a characteristic curve or cluster could be targeted for intensive inspection, and if necessary, stabilization.

1.2 Present Management

Currently no seismic monitoring is being conducted at the park. The preliminary report has been reviewed and a final report with complete graphics is awaited. Low flying aircraft and sonic booms may play a larger role than the report implies. Chaco is in Crownpoint's Military Operations Area Zone, and experiences low overflights from private aircraft. The potential impact on the ruins from aircraft overflights will be addressed in further detail by the Washington Office's Aircraft Management Task Force.

Highway 57 runs within approximately 7 meters of the Kin Kletso structure. Ideally, the road will eventually be diverted from its present route to the Gallo Wash entrance. The King report recommended that the Park could reduce the vibration effecting Kin Kletso by laying a section of base and asphalt over the dirt road bed. This has not been done, and the vibration from traffic is continuing to damage the structure. The author of the preliminary report has provided the park with a proposal to resume seismic studies and re-evaluate the recommendations of the report. The proposal is broken down into three sections with some cost estimates in the $18,000 range. At least two companies are conducting seismic studies just outside the park to test for oil and gas bearing formations. These studies involve induced seismic vibration, and at present the park is not monitoring the effect of these tests on the resources.

Presently, the cyclic and annual maintenance of the ruins is based on identifying visibly deteriorating masonry. Deterioration that is occurring within the wall and not apparent on the exterior is not detected. This results in an annual loss of at least two major sections of prehistoric masonry per year.

1.3 Program Justification

The purpose of the 1984 seismic and vibration hazard investigations conducted by the U.S. Geological Survey was to determine the specific site response (soils, substrata) and building response (periodicity and damping characteristics) of the prehistoric masonry structures in Chaco. Once this information was determined, safe levels could be set for various types of induced ground motion to prevent damage to the structures. However, the study was not an end unto itself. Continued seismic monitoring at the major structures with standing walls is necessary to augment this initial study, assure that motion caused by construction and blasting outside the park remains within safe limits, and to confirm the results of the original tests. Additionally, during the seismic testing it was noted that statistically, some walls fall below a standard curve of periodicity and damping. If these walls that do not statistically cluster with the majority of walls are found to be unstable, and on the verge of failure, the data can be used to predict unstable walls, and will aid in setting stabilization priorities and preventing loss of historic fabric. The project is supported by the Chaco Culture NHP GMP, Land Protection Plan, NPS 28, PL 96-550, and other National Historic Preservation legislation.

2. Alternative Actions and Probable Impacts

2.1 No Action

Without more extensive information on the effects of seismic and vibration hazards, it will be difficult for the park to assess, monitor, and enforce limits to which industry and construction outside the park must adhere. Industry will abide by standards set by the Bureau of Mines which allow for a degree of damage to structures. Without the continued seismic monitoring, the park cannot test the theory that readings from walls that do not fall within a statistical cluster may be a predictor of unstable, failing masonry.

2.2 Continue Current Management

The effects are similar to the above statements.

2.3 Continue Seismic Monitoring

Additional data can be gathered by the park and sent to the U.S.G.S. to be synthesized. The information will augment their initial studies, and will strengthen the park's abilities to assure industrial and construction vibration originating outside the park does not damage resources within the park. Additionally, the collected information

may aid in predicting wall deterioration and thus prevent loss of historic fabric.

3. Recommended course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of Action: Resource Management Action (A)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Section 106 XXX Clearance to comply with PMOA on GMP, and to assure that installation of a portable seismic monitor will not adversely affect the resources.

4.2 Planning, Operation, Reporting

Working in conjunction with the U.S.G.S. in Denver, a program will be developed for the park to monitor the major ruins with a portable continuous recording seismometer. Readings will be sent to U.S.G.S. to be synthesized, and the park will receive this information and recommendations for any necessary action.

4.3 Funding

Continuous Recording Seismograph: $10,000. Transfer of funds or Memorandum of Agreement for a contract between the U.S.G.S. and the park to provide consultation services to the park. Approximately $3,000 or .15 FTE will be needed to fund the monitoring program.

CHCU-C-11 Complete Historic Structure Reports

1. Statement of Problem:

Only two Historic Structure Reports (HSR's) have been prepared for the over 50 sites in Chaco Culture requiring such studies, and both of these reports are in draft form only. Without these documents, the sites lack systematic, accurate records of the historic fabric and stabilization/maintenance history, and guidance for future stabilization and maintenance. The research potential is limited, the sites are difficult to interpret, interpretive use cannot be monitored, and planning an effective management program for the sites is severely hampered. Without an HSR, primary, accurate archeological, architectural, cultural, and interpretive data are not available for designing management goals and accomplishing preservation and protection measures. According to NPS 28 guidelines, a HSR is mandatory prior to any major construction, stabilization, or other projects performed on the sites.

1.1 Present Management

Currently there are draft HSR's on Tsin Kletzin, compiled in 1981, and Kin Nahasbas, compiled just prior to stabilization and backfilling in 1984. A Historic American Building Survey team is currently working on drawings of the south one third of Pueblo del Arroyo, and these drawings are a starting point for a third HSR in the park. There are between 54 sites within the original Monument boundaries that either have undergone stabilization or are scheduled for stabilization, and lack HSR's. Additionally, there are at least 20 sites in the newly acquired park lands that also will need HSR's. Presently, the management of the resources is hampered by a lack of HSR's. Often a relatively straight-forward project is complicated by having to gather and record information that should be readily available in an HSR. Management and maintenance decisions are sometimes based on crisis situations, rather than following a more organized set of priorities. Fee enhancement money is earmarked ($10,000) for HSR's in 1990.

1.2 Program Justification

The need for HSR's is identified in the 1985 GMP for Chaco Culture, and is supported by federal legislation such as PL 96-550, PL 89-665, and others. Additionally, the HSR's are recognized as mandatory baseline management data along with HSPG's, and are called for in NPS-28.

2. Alternative Actions and Probable Impacts

2.1 No Action

Continued and increasing loss of historic fabric, without any way to accurately repair and maintain what has never been recorded. Continued difficulty in accomplishing other projects due to lack of accurate baseline data. Interpretive potential of the sites lacking HSR's is reduced, and the expense of producing an HSR increases as more of the buildings deteriorate.

2.2 Continue Current Management

Same comments as above since no action is presently being taken.

2.3 Complete Historic Structure Reports

Baseline information will be gathered and recorded. Management of the resources can be done in accordance with the specific needs of the structures. Projects can be accomplished within allotted time limits without having to spend time and money gathering basic information that should be in an HSR. The park will be in compliance with NPS 28.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of action: Resource Management Action (A)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Planning, Research, Operation, Reporting

1) All sites requiring an HSR be identified. Note that the "Equalize Fill Levels and Repair Drainage Systems" project (CHCU-C-1) includes a phase for completing HSR's on the sites affected by the project. Those sites must have priority for HSR's. Finalizing the draft HSR's on Tsin Kletzin and Kin Nahasbas should also have priority.

2) The three elements of the HSR's to be completed are: a) an administrative data section, b) a physical history and analysis section, and finally c) an appendix containing a record of all fabric analyses, an assessment of future research potential, records of any documentary data, and an annotated bibliography of sources.

3) Any data obtained during subsequent treatment of the structure will be added to the document as addenda.

4) Publish the HSR's to assure that information is available to the Regional Office Cultural Resource Management Division and Division of Conservation, park interpretive and stabilization programs, and copies are accessioned into the library for researchers.

4.2 Funding:

A rough estimate for this multi-year project would be an average of $10,000 or .50 FTE per report, with some requiring much less time and money, and some requiring more.

CHCU-C-12 Compile Historic Structure Preservation Guides

1. Statement of Problem

Historic Structure Preservation Guides (HSPG) have never been compiled for the sites receiving stabilization or maintenance treatment in Chaco Culture NHP. Without these Guides, work proceeds without benefit of inspection and preservation instructions, material specifications, as-built drawings, reference material, etc.

1.1 Background Information

Although the stabilization program at Chaco Culture has been operating within the parameters of the Historic Structure Preservation guidelines, and documenting these procedures, a formal HSPG has never been prepared for each site. Should the present stabilization foreman and crew leave or retire, the program would be in deep trouble. Preparation of a formal HSPG for each of the ruins being maintained would allow past and existing knowledge about inspection, cyclic preservation maintenance, and reference data to be systematically and permanently documented.

1.2 Present Management

The ruins stabilization maintenance program is presently run by the masonry foreman who is under the supervision of the park archeologist. Biannually the ruins are inspected and their condition is recorded on inspection forms. Projects to be performed during the work year are programmed on the basis of this inspection. A scope of work for the year's projects is prepared and the standards, techniques, materials, etc., are identified in a Section 106 XXX report. Photographic and written records are kept for all work performed, and are compiled in a yearly stabilization report. At present, no single document is available that outlines the standards, methods, materials, etc., used at specific sites, more are continuing or projected needs of specific sites recorded in a single document. The ruins stabilization program is being integrated into the Servicewide Maintenance Management System.

1.3 Program Justification

HSPG's are called for in NPS 28, and will aid the park in complying with GMP statements, agency and professional stabilization standards, and a variety of regulations and legislation regarding cultural resource management.

2. Alternative Actions and Probable Impacts

2.1 No Action

As long as existing personnel remain at the park in the stabilization program, there will be no great impact. However, if one or all of the stabilization crew leaves, the program will suffer from loss of information that has not been documented.

2.2 Continue Current Management

Similar comments as above.

2.3 Prepare Historic Structure Preservation Guides

Information concerning methods, materials, inspection, experience, etc., currently being applied to the individual structures will be combined with professional assessments by historic architects and documented in a systematic form, and will be evaluated, updated, augmented, and preserved regardless of personnel and funding changes.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of Action: Resource Management Action (A)
Monitoring Action (B)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Planning, Research, Operation, Reporting
An HSPG will be compiled for each site presently receiving stabilization maintenance, and for any site added to the list. The HSPG will include the following components in accordance with the NPS 28 Technical Supplement:

a) Instructions -- general data, references, and instructions pertaining to background information and rationale for treatment, explanation of legal/policy constraints and procedures, formulation and use of maintenance and inspection schedules, materials specifications, etc.

b) Schedules -- cyclic preservation maintenance schedules and inspection schedules.

c) Reference Materials -- building data, construction and as-built drawings, specifications, photographs, job order requests, emergency plans and procedures, etc.

4.2 Funding

At present, approximately 54 sites are in need of HSPGs; however when the sites in the new park boundaries are evaluated, the total number of sites will increase. An estimate of $25,000 per HSPG or one FTE will be needed annually for this multi-year project.

CHCU-C-13 Establish A Site Monitoring Program

1. Statement of Problem:

A systematic patrol or monitoring of sites is needed for the entire park including the expanded boundaries. Without this systematic coverage, the park cannot assure that resources are being protected and preserved, there is no baseline information with which to assess potential or recurring damage, and the park cannot meet NPS standards for resource management.

1.1 Background Information

Given the present budget and personnel limits, periodic and systematic patrols are the most important form of protection and resource management the park can provide. A set of baseline data is generated when sites are monitored on a regular schedule, and any type of damage or threat of damage can be identified, investigated and minimized. The monitoring assures that sites are visited periodically, and impacts such as visitor use, grazing, rodent burrowing, erosion, structural deterioration, etc., are recorded and analyzed. Resource management actions will more effectively respond to the needs of a particular site or zone, and areas will be opened or closed as dictated by the condition of the resources. This type of information gathering allows resource managers to set realistic goals nd priorities, and helps assure compliance with the original mandates of the park and of the NPS.

1.2 Present Management

Currently, as of 1988, the park has been divided into zones, and patrols have been made in portions of these zones. During the patrols, site and area conditions are recorded, although the type and value of recording has not been systematic. Additionally, much of the monitoring has been done by volunteers or employees on their own time, and certain areas are more intensively covered than others. At present there is no effective means for assimilating the information gathered during the patrols and analyzing it or comparing it to other areas. While the work accomplished during this past year will be useful baseline information, a more systematic, structured system is needed in order to effectively use the data.

During the past year, missing portions of the site files have been obtained for use at the park, and a prototype standardized site monitoring form has been developed for use by staff. The next step will be to assign a monitoring frequency by zone to each site (varying from 1 to 5 years), and build a schedule that will list the sites to be visited

each year.

1.3 Program Justification

The need for this project is clearly supported by the 1985 GMP for Chaco Culture, legislation such as PL 96-550, Chaco Enabling Law, PL 89-665 National Historic Preservation Act, Archeological Resource Protection Act, and others, and is called for in NPS 28 Cultural Resource Management Guidelines. More frequent monitoring of known sites has also been recommended by House and Senate subcommittees and by the General Accounting Office in their studies of antiquities violations.

2. Alternative Actions and Probable Impacts

2.1 No Action

There will never be a set of baseline data from which the park can evaluate threats, erosion, visitor use, or other impacts to the resources. There will be no way for the park to plan, program, or support protection and preservation measures. No monitoring means no official presence for deterrence and no evidence on which to base prosecutions, spreading the welcome mat for vandals and looters.

2.2 Continue Current Management

Park will continue to gather unsystematic, incomparable information on sites, and will continue to have an imbalance, inadequate data base from which to make resource management decisions. This weak information will continue to be insufficient for use in long-term planning and programming.

2.3 Establish Resource Monitoring Program

A set of systematically gathered, comparable, accurate baseline data will be gathered. Resource management decisions concerning preservation, protection, maintenance, visitor use, etc., can be made, and funding for these programs will be supported by the gathered information.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of Action: Resource Management Action (A)
Monitoring Action (B)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Planning, Research, Operation, Reporting

A. Update Site Files -- Complete site files with duplicate information from the Chaco Center Archives (see CHCU-C-7)

B. Develop a computerized information system into which the collected data can be stored, synthesized, etc.

B. Establish Site Evaluation Ranking Criteria for Scheduling

1. Stable/Unstable: exposed architecture or other fragile features (rock art, midden deposits, etc.)

2. Protected/Unprotected: established trail, road, boundary within 1/4 mile from a site, or evidence of visitation

3. Low profile/High profile: site types such as low density artifact scatters, small camps, or high density scatters, structural mounds and easily identified features

4. Past or recurring impacts (yes/no): vandalism, erosion, livestock, heavy visitor use, etc.

C. Establish Monitoring Schedule

1. Define topographic zones within the park

2. Based on evaluations, establish appropriate scheduling for each site or group of sites

3. Determine appropriate level of documentation

4. Develop appropriate sampling strategy

D. Monitoring and Documentation

1. Monitor sites based on the schedule established for each zone, including the detached zones

2. Document sites based on their complexity, previous documentation, immediate need for expanded data base on an individual site, etc.

3) compile the monitoring information on a monthly basis and produce a report yearly that clearly describes the results of the program, recommends areas that may need further attention, etc., and finally

complete a report at the end of the 5-year period when all areas of the park have been systematically patrolled.

4) design the yearly resource management program to address the findings of the patrols, program and plan projects to correct any problems encountered, and assure that if the project is effective, it is supported in the annual budget.

4.3 Funding

A rough estimate for an annual cost of this on-going project would be $20,000, or 1.0 FTE.

CHCU-C-14 Evaluate New Boundary Sites for Stabilization

1. Statement of Purpose:

Public Law 96-550 provided for the inclusion of additional acreage to the park holdings. Within these new boundaries, a total of 1320 sites have been recorded. The stabilization needs of these sites have not been evaluated and once identified, will be incorporated into the cyclic stabilization program.

1.1 Background Information
During the inventory survey, a brief notation of site condition was recorded. Sites noted as being unstable will require evaluation by the masonry foreman and park archeologist. If it is determined that sites are in need of stabilization or cyclic maintenance, a project design and scope of work will identify the type, amount, urgency, and frequency of treatment needed.

1.2 Present Management
Currently no evaluations have been made to determine the stabilization requirements of the sites in the newly acquired park lands. Although most of these sites are in stable condition, those with exposed masonry are steadily deteriorating. The lands previously administered by the Bureau of Land Management, Bureau of Indian Affairs, and the Archaeological Conservancy have been transferred to the National Park Service. Lands owned by the State of New Mexico are leased by the Service. PL 96-550 provides for land exchanges, through the BLM, to bring the State, tribal trust, Navajo fee, and Navajo allotment lands under NPS management.

2. Alternative Actions and Probable Impacts

2.1 No Action

Continued and increasing loss of prehistoric fabric, deterioration of interpretive and research value, increased expense in correcting problems in the future.

2.2 Continue Current Management

Currently the sites are not being managed, and most have not even been acquired by the National Park Service. Effects are similar to the above statements, and the deterioration will continue to occur.

2.3 Evaluate New Boundary Sites for Stabilization

Each of the sites noted as being unstable by the inventory survey will be evaluated and their stabilization and

maintenance needs identified. Those in critical condition will receive treatment as soon as possible, those with less immediate problems will be incorporated into the cyclic maintenance program, and those that are to be allowed to deteriorate naturally will be allowed to do so.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of Action: Resource Management Action (A)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Section 106 XXX Clearance to comply with PMOA on GMP

4.2 Planning, Research, Operation, Reporting

a) Inspect sites recorded as being in unstable condition.

b) Develop project design and scope of work for each of the sites slated for stabilization.

c) Perform the necessary stabilization on the sites to arrest or slow the deterioration.

d) Incorporate the targeted sites into a cyclic maintenance program that will be administered by the park stabilization crew.

e) Produce a detailed stabilization report on the initial work at each site and standard annual stabilization reports when sites receive cyclic maintenance.

4.3 Funding

To complete the evaluation, $15,000 or .5 FTE are needed. Note that this funding will only cover the costs of compiling the initial inspection of sites requiring stabilization. Until the inspection is completed, an estimate of stabilization and cyclic maintenance costs can not be compiled.

CHCU-C-15 Upgrade LCS Data and Complete CSI

1. Statement of Problem:

Although LCS forms have been completed for a number of sites in Chaco Culture, the information recorded is of varying quality. The standards for determining which sites were to be included on the list were not consistent, data recorded on the forms are out of date and inaccurate, and the listing is its present state is not usable. There is some question whether the LCS as it is presently defined can be used with any purpose at Chaco Culture. Presumably the CSI database will fill the gaps left by the LCS; however, the new CSI data categories are in draft form only, and until they are finalized, work on the CSI can not proceed.

1.1 Background Information

In the early 1980's NPS and contracted personnel completed LCS forms for a portion of the sites in the original Monument boundaries. Apparently, the dominant criterion for determining which sites were included in the listing had to do with the presence of standing walls, although this was not applied consistently. Other inconsistencies were discovered when trying to use the data. Sites containing several different structures were entered as a single entry, while at other times a separate LCS number was assigned to each individual structure. Some rock art components which are associated with structures were assigned LCS numbers while other rock art sites were not included on the list. There are cases where a site was assigned a LCS number while a similar site immediately adjacent was not; the deciding factor being that the listed site had been tested or excavated thus exposing standing architecture, while the other had not been or had been backfilled. The usefulness of the LCS data in its present condition at the park level has been questioned.

In part, the CSI was designed to compensate for the problems encountered with the LCS. At present the CSI data categories are in draft form only, and it is not known when data entry can begin and the inventory used for resource management at the park, region, or national levels.

1.2 Present Management

Although some sites have been entered on the LCS, the data are not being used in the park, nor on the regional or national level. The quality of information is poor and it is not accurate, specific, or systematic enough for use in cultural resource management.

1.3 Project Justification

The LCS and CSI are called for in NPS-28, Chapter V of Management Policies, and in the Chaco Culture GMP. This type of computerized information system will be extremely useful for resource management and research at the park and regional levels.

2. Alternative Actions and Probable Impacts

2.1 No Action

The LCS will continue to be an inaccurate and unusable database, and lack of a computerized information system to manage cultural resource data will continue to hamper resource management.

2.2 Continue Current Management

Effects are similar to the above statements.

2.3 Upgrade LCS and Complete CSI

The LCS data can be standardized, corrected, and updated so information is in a useful, accurate state. The CSI database will provide an effective management tool for park and region cultural resource specialists. Additionally, the CSI will be a useful reference for researchers.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of Action: Resource Management Action (A)

4. Requirements to Accomplish Action

4.1 Planning, Research, Operation, Reporting

a) To continue with the LCS format, a standardized system of site selection, data entry, and field reconnaissance will be necessary to upgrade the existing information and add new data.

b) Upgraded LCS data must be made available to the park and region in the form of software that is compatible with existing computer systems (MS-DOS).

c) Once the data fields for the CSI are finalized, all sites within the new park boundaries will be included on the inventory. Data entry may involve some field reconnaissance and verification.

d) The CSI data must be made available to the park and region in the form of software that is compatible with existing computer systems (MS-DOS).

4.2 Funding

A rough estimate of the cost to upgrade the LCS data would be a one time expense of $10,000, or .5 FTE. The estimated one time cost of adding all sites in Chaco to the CSI would be $50,000, or 2 FTE.

CHCU-C-16 Monitor and Synthesize Below-Grade Resources

1. Statement of Problem:

Cultural resources have been exposed, and continue to be exposed in erosional banks in the major arroyo channels in the park. Although some of these sites have been recorded, a systematic survey is needed annually or biannually to record newly exposed features and monitor the condition of those already recorded. Additionally, as a result of construction projects, cultural resources have been recorded in pits, trenches, etc., at depths up to 10 feet. These scattered pieces of information on below-grade cultural levels need to be synthesized and compared with cultural remains exposed in erosional cuts.

1.1 Background Information

During the inventory survey of the park in 1971-72, a number of sites were recorded in the banks of Chaco Wash and in tributary arroyo cuts. Since that time, some cultural material recorded 15 years ago may be gone, while subsequent floods, bank cave-ins, and other erosion have exposed additional features or new sites. The site files were never intended to be static documents, and they should be updated as new information about the site and its condition are available.

Each year the maintenance division of the park has occasion to dig trenches for utility lines, pits for toilets, foundations, and other projects that require exposing the substrata. All such projects are monitored by the park archeologist, and in almost every instance, cultural material is encountered. Occasionally the cultural material is either not in original context, such as a buried erosional surface, or a light sheet trash scatter. But more often, features are encountered that represent portions of habitation or procurement sites, irrigation systems, prehistoric road surfaces, remains of historic occupation, earlier components of surface expressions, and so on. These below-grade resources vary in depth from being just beneath the surface to three or more meters beneath the present ground level.

While it will not be possible to directly tie all these features together, a synthesis of these below-grade data may yield some important patterns regarding depositional histories, site formation, settlement patterning, evaluation of surface expressions, etc.

1.2 Present Management

Currently, there is no program in place to monitor the condition of cultural resources exposed in erosional cuts, or to check for newly exposed cultural material. The Zorro Bradley and Lizard House sites are being monitored yearly for mortar and masonry deterioration as part of the stabilization testing program. However no systematic recording of what is happening to the cultural data in these or other sites is occurring. All construction activities that require ground disturbance are monitored by an archeologist, but monitoring reports are not systematic, and almost always remain in field note form filed with an individual project report. Presently there is no means for comparing or combining all this below-grade cultural data.

1.3 Program Justification

This project is an integral part of cultural resource inventory and management as described in NPS-28. It is supported by PL 96-550, National Historic Preservation Act, the GMP for Chaco Culture, and others.

2. Alternative Actions and Probable Impacts

2.1 No Action

Continued and increasing loss of historic fabric and accompanying archeological data, loss of interpretive and research values at sites, lack of information necessary for resource management.

2.2 Continue Current Management

Effects will be similar to the above statements.

2.3 Monitor and Synthesize Below-Grade Resources

Site data will be updated, previously unrecorded resources will be added to the files, information on how to manage the resources will be gained, interpretive and research data will be acquired, information recovered as a result of destructive activities will be used to further our understanding of the resources.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of Action: Resource Management Action (A)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Planning, Research, Operation, Reporting

a) Using the existing survey data, design a systematic annual or biannual monitoring survey to record changes in resources or previously unrecorded resources exposed in arroyo banks.

b) Compile all existing information previously gathered on below-grade resources encountered during construction or other activities and create a master chart to three-dimensionally plot these occurrences. This will be most easily accomplished by using a geographic or other computerized information system. Include the data recovered from the monitor survey of erosional faces. Compare all these data with respect to horizontal location, relative and absolute vertical elevation, associated or nearby surface expressions, terrain, vegetation, erosional patterns, artifact data, etc.

c) Produce a working report on these studies that synthesizes available information with yearly appendices adding to the body of data. This can be easily facilitated by using a geographic or other type of computerized information system.

d) All artifacts recovered during this project, along with field-generated records of the project, will be accessioned and cataloged into the Chaco Collection and preserved.

4.2 Funding

A rough estimate for this annual project would be $15,000 or .75 FTE for the first phase, and $4,000 or .20 FTE for continuation of the project.

CHCU-C-1 Prepare a Historic Resource Study and an Administrative History

1. Statement of Problem:

Neither an Historic Resource Study (HRS) nor an Administrative History for Chaco Culture NHP have been prepared. Without these studies, the coordination of research and other uses of the historic cultural resources is difficult and sometimes needlessly duplicated. The park is woefully ignorant of the post-Anasazi eras that have effected its history and shaped its boundaries and attitudes. Lacking this historical information, management decisions and actions effecting the historical resources are often poorly designed and at times have been devastating to this important part of Chaco's history. In concert with these two studies, an ethnographic overview should be developed. Without such an overview the park has had difficulty determining which Native American groups should be consulted on various park actions, it is difficult complying with A.I.R.F.A., and our interpretation of both historic and prehistoric resources suffers. Finally, the most critical and valuable references for such studies are individuals who directly participated in the history of Chaco Canyon (early custodians, superintendents, archeologists, stabilization or maintenance crew members, traders, ranchers, etc.) or their direct descendants. These people are dying before the information and insights they have can be recorded.

1.1 Background Information

Although some components of the HRS and Administrative History are being planned, or have been completed, a comprehensive outline such as these documents can provide is needed to coordinate the research. The synthesis of the Chaco Project, proposed to be completed in 5+ years, will provide a detailed review and analysis of Chaco archeology and represents the culmination of the Chaco Center's work. The inventory surveys conducted on the original Monument and in the new park boundaries provide base maps for the resources. The proposed project to establish research goals for Chaco (CHCU-C-4) also addresses some of the elements of the HRS and Administrative History as well. Funding to begin the Historic Resource Study has been programmed from Fee Enhancement money in FY 89 and 90.

1.2 Project Justification

Both the HRS and the Administrative History are called for in NPS-28, in NPS-6, and Chapter V of the Management Policies.

2. Alternative Actions and Probable Impacts

2.1 No Action

No HRS, Administrative History, or ethnographic overview will be compiled for the park and cultural resources may suffer from lack of a coordinated plan for management. Interpretation will suffer by not having access to the information that can be from the lack of the information to be gained from the study.

2.2 Continue Current Management

Similar comments as stated above.

2.3 Prepare an Historic Resource Study

An inventory and evaluation of all historic resources, collections,archives, research data, etc., will be compiled. This document can be consulted for both management issues and for research purposes. It will enable the park to more readily and responsibly adhere to AIRFA and other legislation pertaining to Native American issues. Most importantly, the park can intelligently preserve and protect these historic resources.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of Action: Resource Management Action (A)
Research (C)

4. Requirements to Accomplish Action

4.1 Planning, Research, Operation, Reporting

This project will result in a single volume or a series of volumes containing the HRS, the Administrative History, and the Ethnographic Overview. While it may be prudent to follow the outlines provided in NPS-28 Technical Supplement Chapter 4, it may also be valuable to combine aspects of all of these studies to create a comprehensive study of the historic resources. This comprehensive document should minimally contain the following sections:

A. Trading/Commercial Era -- pre NPS commercial endeavors including the Trading Posts and their operators, Hyde Exploring Expedition, homesteads, Post Office, stock raising operations,etc.

B. Government Institution Era -- Bureau of Indian Affairs operations, General Land Office surveys, Civilian Conservation Corps camps and work, and other government agency actions on Chaco.

C. Educational Institution Era -- Hyde Exploring Expedition, American Museum of Natural History, National Geographic Society, School of American Research, University of New Mexico, Museum of New Mexico, National Park Service, etc.

D Ethnographic Overview -- summary of Brugge's and other's Navajo studies, as well as other Native American groups with ancestral or other ties to Chaco (Zuni, Acoma, Laguna, Hopi, Jemez, Zia, Santa Ana, Northern and Southern Rio Grande Pueblos, and others)

E. NPS Administration of the Monument -- the administrative history of Chaco Canyon National Monument and Chaco Culture NHP

4.2 Funding

A rough estimate of the cost of preparing this document or series of documents is $150,000, and all of the work would be contracted rather than performed by park personnel.

CHCU-C-18 Complete National Register Nominations

1. Statement of Problem:

National Register nomination forms have never been completed for Chaco Culture NHP. All sites within the park are provisionally included on the register under the initial park nomination, however, an assessment of the contribution of individual sites to the park's historical significance is required. The original nomination does not include objects and collections associated with and contributing to the significance of the nomination as specified in the 1980 National Historic Preservation Act amendment.

1.1 Background Information

The National Register nomination for Chaco included all sites within the park, and did not assess the significance of individual sites as they relate to the overall park nomination. Only features or properties described on the nomination form as contributing to the historic significance merit protection under Section 106 of the National Historic Preservation Act (amended 1980). The nomination must establish and define National Register boundaries of the park and features defined within the boundaries that contribute to the park's historical significance. The characteristics that qualify the area for inclusion in the Register must be included in the 'significance' section of the nomination. Similarly, the characteristics of associated objects and collections should be described, as in a Scope of Collection Statement. The significance of this collection must be assessed in terms of the Register criteria. Once the nomination is completed, it must be reviewed and approved by the superintendent, submitted for regional and national review and final submission to the Keeper of the National Register.

1.2 Present Management

Currently, the National Register Nomination forms have not been completed properly. The process of identifying and assigning significance to features or sites has not been accomplished, nor has a thorough definition of the National Register boundaries been made. Previously, both the Chaco Center and the Division of Cultural Resource Management took charge of the National Register Nomination for Chaco Culture NHP.

1.3 Program Justification

Completing the National Register Nomination forms is clearly called for in the Chaco Culture 1985 GMP, PL 89-665, PL 96-

550, National Historic Preservation Act, NPS 28, and others.

2. Alternative Actions and Probable Impacts

2.1 No Action

Continuance of the lack of compliance with national agency regulations, resources will not be afforded the protection and status provided by being listed on the National Register.

2.2 Continue Current Management

Effects are same as the above statement.

2.3 Complete National Register Nomination

The resources within Chaco Culture will be assessed for their National Register significance, boundaries for the nomination will be defined, the nomination will be reviewed and approved on park, regional, and national levels. Ultimately, inclusion of Chaco Culture on the National Register of Historic Places will give Chaco Culture the protection and status provided by being listed on the Register, and will assure that Chaco is in compliance with agency and federal regulations. It will also support the World Heritage listing.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of Action: Resource Management Action (A)

4. Requirements to Accomplish Action

4.1 Planning, Research, Operation, Reporting

a) compile all existing documents on the provisional nomination
b) gather and assess all data needed to complete the National Register Nomination form
c) submit the nomination to the park, region, and national authorities for review and approval

4.2 Funding

This project can be completed by the park or regional personnel, or it can be contracted on bid to an independent individual or company. A rough estimate of the cost would be $50,000 or 2 FTE.

CHCU-C-19 Intensive Survey of Selected Areas of the Park

1. Statement of Problem:

Several areas of the park will require intensive inventory surveys. Fajada Butte has received considerable attention as a result of the findings of the Solstice Project, and a more thorough survey is needed to effectively manage the heavily impacted area on and surrounding the butte. As proposed in the Chaco Culture GMP, the existing camping area will be replaced by a newly designated campground. The area within and adjacent to the proposed campground will require an intensive inventory survey as part of the planning phase, to augment the initial archeological survey. Other areas of the park may require more intensive survey, either as a result of proposed development or of research and intensified use by visitors.

1.1 Background Information

In 1971 through 1973, and inventory survey was conducted on the land within the monument boundaries. When Public Law 96-550 was passed, creating the park and expanding the boundaries, an inventory survey was conducted on this newly acquired land. While these surveys are comprehensive and complete, a more intensive inventory is needed in areas that are heavily impacted by construction, visitor use, research, and other intrusions. While Fajada Butte is presently closed to the public, the research conducted by the Solstice Project has brought considerable attention to the area. There have been subsequent research projects yearly on the butte, and there is tremendous public pressure to open the area to visitor tours. Additionally, an intensive survey may yield information on the temporal affiliation of the resources on the butte. The proposed campground will be located in an eastern rincon off Gallo Canyon. A Section 106 XXX clearance will be required as a part of the planning phase for the camping facilities, utilities, roads, and other construction. An intensive survey will need to be performed, and mitigation efforts completed before construction can begin.

1.2 Present Management

Currently, the only inventory of these two areas is the survey conducted in the early 1970's. While it is comprehensive, subsequent intensive ground checking for other Section 106 XXX clearance inspections has revealed a moderate percentage of unrecorded cultural resources. In areas that are proposed to be heavily impacted by visitor use, construction, or other disturbances, a more intensive survey is necessary. Presently, a number of unrecorded resources are known on and around Fajada Butte.

1.3 Program Justification

The inventory of all cultural resources within NPS boundaries is mandated in NPS 28, and is supported by Public Law 96-550, Chaco Culture GMP, Chaco Culture Land Protection Plan, Chaco Archeological Protection Site System, PL 89-665, National Historic Preservation Act, and other NPS legislation. The inventory of resources is the primary, and most basic step in cultural resource management, without which any type of management is difficult to effect, inadequate, and misguided. Additionally, without baseline data, it is difficult to provide accurate interpretation of the resources, and equally difficult to conduct research on the sites.

2. Alternative Actions and Probable Impacts

2.1 No Action

Planning of the proposed campground area can not proceed until specific information about the resources is obtained, and construction may be needlessly delayed without this information. At Fajada Butte, resources may be damaged or destroyed due to a lack of information.

2.2 Continue Current Management

Effects are similar to the above statements. In the case of Fajada, present management may be inappropriate.

2.3 Conduct an intensive inventory survey of the proposed campground area, Fajada Butte, and other sections of the park slated for more intensive use. The results of the surveys will be used in NHPA Section 106 XXX Clearances for the various projects, such as campground construction, research on the resources of Fajada Butte, and others..

3. Recommended course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of Action: Resource Management Action (A)
Monitoring Action (B)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Planning, Research, Operation, Reporting

Proposed campground: The proposed development area and a sizable buffer zone (a minimum of a mile radius) surrounding it will be intensively surveyed. Site forms will be

completed for all newly recorded sites, and previously recorded sites will be updated as necessary.

Fajada Butte: A large scale aerial photograph has been provided by Koogle and Pools, and a topographic map drafted from the aerial may be supplied by the Solstice Project. This map will be used to plot any unrecorded cultural resources. Site forms will be completed for these newly discovered sites, and previously recorded site forms will be updated if necessary. Several surface artifact transects will be sampled to characterize the ceramic assemblage in an attempt to define the temporal context of the prehistoric use of the butte.

5. Funding

A rough estimate for this project which can be accomplished within a single year would be $10,000 or a total of .5 FTE.

CHCU-C-20 Synthesize Rock Art Studies

1. Statement of Problem:

There has never been a comprehensive synthesis of rock art in Chaco Culture. Although there have been at least 10 surveys/studies of the various forms of rock art, none have combined all existing information and produced a comprehensive summary. A computerized synthesis of the data is needed for both research and management purposes.

1.1 Background Information

In 1982, F. Joan Mathien compiled a history of rock art studies in Chaco Canyon, which includes a review of at least nine separate studies, an attempt to correlate the recorded illustrations in each study with the NPS inventory survey site numbering system, and a table of historic petroglyphs. The Chaco Center surveys of 1972 and 1984 provide the most extensive record of rock art in Chaco. Based on the 1972 survey, the Archaeological Society of New Mexico, under the direction of Col. James Bain, photographically recorded sites with known rock art. A portion of the negatives generated from this survey are missing, although the majority are on file in the Chaco Center Photo Archives. Clarion Cochrane, in 1974 through 1976, compiled a series of line drawings of some of the sites recorded, and these are also on file at the Chaco Center Archives and in the park library. No overall summary of the NMAS work has been produced to date. Other rock art studies conducted in the old Monument boundaries include Ted C. Sowers' work in the early 1940's, Polly Schaafsma in the early 1970's, Anna Sofaer and others in the late 1970's-early 1980's, and more specific studies by Dave Brugge, Jonathan Reyman, Ray Williamson, Florence Ellis, and Michael Zeilik.

1.2 Present Management

Currently there is no operative automated information system for managing the rock art data. Much of the information is stored in the site files, which are organized by site number only. It is extremely difficult to conduct any research or even manage the rock art resources. In order to look up information on a particular panel, the location and/or site number of the panel must be known. No cross referencing system is currently available that allows researchers to study certain elements, temporal components, styles, etc.
In early 1988, the park received a proposal from the University of Tennessee and Chattanooga to conduct a computerized glyph recording project. Some preliminary field work on this research project, COGI (Chaco On-line Glyph Information System), was completed this year. The

project will take several years to complete and the park will be providing what support it can.

1.3 Program Justification

Facilitating research and management of the resources is called for in NPS-28, Chaco Culture Enabling Act, Chaco Culture GMP, and other agency guidelines and policies.

2. Alternative Actions and Probable Impacts

2.1 No Action

The rock art data will not be synthesized, or otherwise organized in a manner that facilitates research or management needs. Future research cannot be coordinated and duplications and redundancy may occur.

2.2 Continue Current Management

Effects are similar to the above statements

2.3 Synthesize Rock Art Data

All previous rock art records, surveys, studies, etc., will be compiled in a computerized form that will allow cross-referencing and other data manipulation. References to the original documents will be provided as well.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above

3.2 Type of Action: Resource Management Action (A)
Monitoring Action (B)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Planning, Research, Operation, Reporting

The park will actively support the rock art studies proposed by the University of Tennessee at Chattanooga. Their project, COGi includes the following sequential goals (description of these phases taken from the Project Proposal, 4 May 1988):

A. An archival search of previous rock art studies will be used to design and implement a database.

B. Systematically correction of the first version of the COGI Catalog produced in 'A.', with refinement and

completion through extensive field work.

C. Design and production of an extended series of analytical studies on the data produced in 'A. and B.'

D. Study implications to theory and interpretation of Chaco rock are and of glyphic material in general .

Thus, by using previous records, documents, reports, etc., gathered within the present park boundaries, and incorporating additional, more intensive field work, this database will be computerized in such a format that future studies can be added, analysis of spatial, temporal, stylistic, and other variables can be compared and contrasted, and it can function as a complete reference for Chaco rock art. The resultant research report will synthesize the existing data, provide references for the original documentation, identify deficiencies in existing data, and suggest future research needs.

4.2 Funding

Because the University of Tennessee at Chattanooga is sponsoring the research project through grants and other funding sources, the cost to the NPS is limited. However, some support must be provided, and would include providing systematic review of field work and written products, working with data base to assure that it is developed as a usable management and research tool, etc. Costs to the NPS are estimated at $5,000, or .25 FTE spread over the next 8 years.

CHCU-C-21 Complete Backlogged Stabilization Reports and Compile Stabilization Archives

1. Statement of Problem:

During the past 15 years, stabilization reports that document annual work on the ruins have not been completed. Because the stabilization program at the park has been severely underfunded for some years, the reporting phase of the program is continually short-changed. Reports are in various stages of completion; some have been typed with photographs affixed to pages and captioned, but need proof reading, pagination, indexing, and binding; some need to be typed and all the preliminary steps to ready them for binding; and some are in a completely preliminary state with only the photographs developed but not organized or affixed on pages. These reports are a critical part of the stabilization program and an invaluable research and management tool.

Many of the reports on previous stabilization projects which have been documented are not available for baseline and research use at the park. Although copies or originals of these reports exist, either at the Southwest Regional Offices or at Western Archeological Conservation Center, they are not accessible by the stabilization crew and other researchers. Without these baseline data on hand to refer to when stabilizing badly eroded or fallen walls, it is difficult or impossible to accurately preserve original Anasazi architectural features. Hence, these features are being lost at an alarming rate.

1.1 Background Information

Although the first stabilization work on the ruins in Chaco, performed by Richard Wetherill around the turn of the century, were not specifically documented, most subsequent stabilization projects were. With the exception of the excavation reports, there is probably no other body of data more critical to the archeology and interpretation of the Anasazi buildings than these reports. They are a photographic record of how the walls, masonry, features, wood, etc. appeared in their original state. No amount of written description can compare to a single 'before' photograph. Equally important are the 'after' photographs which document what was added or changed or modified, in order to stabilize the fabric. The early stabilization reports were quite basic, with minimal 'before' and 'after' photographs along with a very brief narrative of methods, materials, and labor. As with other aspects of archeology, recording has been refined and more information collection is required. More accuracy and detail are necessary to meet even minimal documentation standards. However, along with increasing severe damage to the ruins, increased funding has not been commensurate with these upgraded documentation

standards. The results of this inadequate funding are about 15 years of ruins stabilization documentation in an incomplete and unusable state.

1.2 Present Management

Currently, field documentation of the ruins stabilization work is an integral part of the program. This documentation includes:

- condition evaluations
- scopes of work and Section 106 reports
documentation of original Anasazi fabric
- pre-stabilization assessments and photograph
methods, techniques, materials, labor, etc.
- progress of work during projects
- results and final written and photographic records

While the detail of this documentation has increased over the years, the 'before' and 'after' condition reporting has been complete and consistent. Once the field season is completed, the photographs are processed and captioned and field notes are written up for typing. Every year there are insufficient personnel to complete any further work, such as the typing, editing, writing introductions, pagination, indexing, or sometimes even finishing the basic write up. This backlog grows every year as more detailed information is being documented.

During the field season, the previous stabilization reports accessioned in the park library are used extensively. However, because we are lacking several major works, we constantly lack adequate baseline data to properly perform the stabilization and archeological work. Funding is being sought through Southwest Parks and Monuments Association to enable us to hire personnel to help us complete the backlogged stabilization reports. Additionally, we have requested funding to have the missing stabilization reports photographically reproduced for accessioning into the Chaco library.

1.3 Program Justification

Lacking Historic Structures Preservation Guides (see CHCU-C-11), the stabilization reports are our only baseline data on which to rely. The need for a stabilization report archives is obvious in light of the vast amount of work that has been performed on the ruins. Federal legislation such as PL 96-550, PL 89-665 and others clearly support this project, as do the National Historic Preservation Act, NPS 28, and other professional and agency guidelines.

2. Alternative Actions and Probable Impacts

2.1 No Action

Unfinished stabilization reports will continue to stack up, with photographs and other records deteriorating due to improper storage. The information contained in these incomplete reports will not be accessible for research and management purposes, and can not be used as baseline data. Lack of a complete and indexed stabilization archives will continue to hamper stabilization efforts.

2.2 Continue Current Management

Effects are the same at the above statements

2.3 Complete Backlogged Stabilization Reports and Compile Stabilization Archives

All previous stabilization documentation will be completed and bound in a form that can be used for research, management, and as baseline data. The stabilization archives will provide the stabilization program with a complete and easily referenced history of all work performed on the structures, an accurate picture of pre-stabilization conditions, and baseline data on original Anasazi fabric. Additionally the archives will be an invaluable resource for archeologists and other researchers.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 described above.

3.2 Type of Action: Resource Management Action (A)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Planning, Research, OPeration, Reporting

A. Inventory all stabilization documents in the Chaco library, and those in stages of completing in the stabilization office.

B. Determine which reports are missing and where copies can be located for duplication. Determine how many reports are incomplete and what will be needed to complete them and send them for binding

C. Perform the necessary work to complete the stabilization reports and send for binding. Contract to have the missing reports duplicated.

D. Create an annotated bibliography of all stabilization reports and cross-index them by site, room, and wall. It will be necessary for this stage of the project to be computerized so the data can be easily accessed and manipulated.

4.2 Funding

An estimate of the one-time cost of this project to complete the backlogged reports and create the stabilization archives is #25,000.00 and 1 FTE. An annual cost of $25,000.00 and 1 FTE will be required for personnel to assist in producing a stabilization report each year.

RESOURCE PROGRAMMING SHEET

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Pk Py	RMP #	Project Title	Action Type	FY 89 FTE	FY 89 $k	FY 90 FTE	FY 90 $k	FY 91 FTE	FY 91 $k	FY 92 FTE	FY 92 $k	FY-93 FTE	FY-93 $k
1	N-1	Acqr.Mgt.Auth	A,B	6	725	2.5	62	2.5	62	2.5	62	2.5	62
2	N-2	Erosion Ctrl.	A,B	4	60	4	60	4	60	4	60		
3	N-3	Wldlf.& Veg. Mgt. Plan	A,B,C	0	20	0	20	0	10				
4	N-7	Air Quality	B,C		135	.5	15	.5	15	.5	15	.5	15
5	N-13	Backcountry Mgt. Plan	A,B,C	.5	12	.5	10	.5	10	.5	10	.5	10
6	N-6	IPM Plan	A,B,C	.25	3		?		?		?		?
7	N-4	Aerial Photo.	A,B,C	0	15	0	20	0	20	0	20	0	20
8	N-9	Cliff Face Monitoring	A,B	.1	1	.1	1	.1	1	.1	1	.1	1
9	N-12	Wldfr.Mgt.Pln	A,B,C	0	10	?	?	?	?	?	?	?	?
10	N-8	Climat. dBase	A	.1	1	.1	1	.1	1	.1	1	.1	1
11	N-5	Native Amer. Uses of Park	A,C	0	3	0	15	0	3	0	3	0	3
12	N-11	Hydrol. Monit	A,B	.25	10	.25	10	.25	10	.25	10	.25	10
13	N-10	Ambient Noise Level Study	C	0		0	10	0		0		0	

CHCU-N-1 Acquire Resource Management Authority in New Lands

1. Statement of Problem:

1.1 Background Information

The 12,465 acres of land added by PL 96-550 consist of lines drawn on a map, soon to be more accurate as the result of cadastral survey just completed, with no NPS management authority beyond that accorded in 36 CFR 9, dealing with access for mineral and energy exploration and development. Title remains in the hands of other agencies or individuals. In the instances where an interest has been acquired (BLM and BIA lands transferred to NPS; Archeological Conservancy land purchased by NPS), grazing and other resource-disturbing uses continue because the land has not been fenced and, in several instances, there is no direct access without crossing property in which NPS has no interest.

Subsurface ownership is privately held on some parcels, and on others there are 23 extant mineral &/or energy leases issued by BLM, which will not expire until 1990. Two such leases exist on BIA land. PL 96-550, Section 505, required the Secretary of the Interior to seek to enter into cooperative agreements with owners of land within the park in order to be able to protect the resources and conduct research. Native American religious uses could continue under such agreements, as could livestock grazing (Section 506[d]).

1.2 Present Management

All of the land suitable and accessible is currently being grazed beyond its carrying capacity. In most instances, the stockmen are Navajo ranchers leasing lands owned by the Navajo Tribe, having been purchased in fee when the former Anglo ranchers sold out. In some parcels, the land is tribal trust land and individual allotment land, with BIA having a trust responsibility. The absence of fencing permits stock from legitimately leased lands to trespass on allotments, privately-owned parcels, and on parcels now owned or leased by NPS. By the same token, uncontrolled access from lands outside the legislated boundary, or from non-NPS interest lands to those where an interest has been acquired, allow individuals to hunt, camp, pot-hunt, cut vegetation, and otherwise impact the natural and cultural resources without park control. Lacking jurisdiction, the park is also unable to exercise measures for the safety and protection of persons in those areas. No right of access exists to conduct research into the resources of these areas, or to stabilize or maintain sites.

1.3 Program Justification

The stated purpose of PL 96-550 was "to recognize the unique archeological resources associated with the prehistoric Chacoan culture in the San Juan Basin; to provide for the preservation and interpretation of these resources; and to facilitate research activities associated with these resources" (Section 501[b]). The present management status prevents NPS from carrying out this purpose.

2. Alternative Actions and Probable Impacts:

2.1 No Action

No management activities would be performed on the new addition lands, including research, resource condition monitoring, contact with users of the new addition lands, etc. Impacts of continued grazing and other adverse uses would continue unabated, unknown, and inconsistent with Congressional intent.

2.2 Continue Current Management

Limited visual inspection and contact with users is done infrequently now. Under this option, the impacts would be the same as under "No Action," but the park would be more aware of it. Congressional intent would be subverted.

2.3 Acquire Management Authority Via Cooperative Agreement

Although specified as the preferred option by Congress, the principal party to such an agreement, the Navajo Nation, has indicated that this is not acceptable to them. The cooperative agreement, if possible even as an interim management tool until exchanges could be made, would have to incorporate a grazing plan that allowed grazing to continue but at levels and in areas that did not damage significant resources. In the absence of fencing, frequent patrol would be necessary to monitor the agreement and to enforce park regulations.

2.4 Acquire Management Authority Via Land Exchange

The Navajo Tribe has indicated that this is their preferred option. A mechanism for accomplishing such an exchange is set forth in PL 96-550. If the exchange could not all be accomplished at once, the park's top priority would be the Chacra Mesa addition. Staff would be able to enforce park regulations immediately upon completion of the exchange, with the exception of any arrangements made for the gradual removal of livestock. Fencing would be necessary to complete the transition. Subsequent impact would be to

reduce the rate of deterioration of cultural resources to that caused by the natural elements and to allow the natural resources to regenerate. This is the preferred option stated in the park's Land Protection Plan.

2.5 Acquire Management Authority Via Purchase

This was not the preferred option of the Tribe, and money is not likely to be available. If possible, the schedule of events and probable impacts would be the same as in 2.4 above.

3. Recommended Course of Action:

3.1 Implement Alternative 2.4 described above, as the most practical option for all parties involved and as the preferred option as stated by the Navajo Nation and the Land Protection Plan.

3.2 Type of Action: Resource Management Action (A)
Monitoring Action (B)

4. Requirements to Accomplish Action:

4.1 Management Action

In accordance with Section 504(d) of PL 96-550, BLM would have to establish a pool of land from which present owners could select lands for exchange. In the event that owners selected land for purposes other than the uses of the current lands in the new addition to the park, collateral agreements would have to be made covering the eventual removal of livestock and other adverse uses. Negotiations proceeding under the current Tri-Party Agreement among the Navajo Nation, BIA, and BLM may provide the background of understandings and procedures for land transfers necessary for the park's exchanges to take place.

4.2 Planning, Studies & Development Needs

If grazing were to persist for a significant time after the completion of the land exchange, a grazing management plan would need to be prepared and implemented.

In conjunction with the termination of grazing on the lands acquired, the boundaries would need to be surveyed, fenced, and posted. This is addressed in Park Development Package 193.

Acquisition must precede inclusion of the subject lands in the evaluations and management plans called for in other project statements.

4.3 Ongoing Needs

Increasing the area actively managed by the park staff by ca. 30% will necessitate adding to the park base 1 FTE for a GS-5 ranger for patrol, .5 FTE of a Natural Resource Management Specialist (GS-9), and 1.0 FTE of a Maintenance Worker (WG-8) to maintain roads, fences, and signs. Needs for cultural resource preservation are addressed in project statement C-14.

5. Funding:

Package 193 (survey, fence, & post boundary) would require $720,000 & 6 FTE over 4 years upon completion of the land exchange.

A grazing management plan, if needed to cover a transition period, would cost $5,000 and .25 FTE.

Park base increases would total 2.5 FTE and $62,000.

Total cost to completion: $725,000 and 6.25 FTE in project funds and $62,000 and 2.5 FTE in annual costs thereafter, exclusive of costs included in other project statements and administrative costs incurred by the NPS in completing the exchange.

CHCU-N-2 Erosion Control Plan

1. Statement of Problem:

Chaco Culture NHP was established for the primary purpose of protecting and preserving cultural remains of the Chaco Anasazi. Arroyo cutting and other erosional processes seriously threaten these resources.

1.1 Background Information

The park is located in high desert and mesa lands in the San Juan Basin. It contains over 3400 known archeological sites spanning 10,000 years of human occupation.

The most pressing natural resource threat to the preservation of these resources is erosion. The Chaco Wash and its tributaries drain ca. 400,000 acres of over-grazed, sparsely vegetated land. Gullies and soil pipes have already destroyed several small sites and, in the past, have caused roads to collapse.

Numerous erosion control projects have been undertaken from the mid-1930's through 1988 to minimize erosion damage to ruins and to control overall erosion in the park. Many types of erosion control devices were installed. A hiatus in these projects between 1968 and 1980 caused structures to collapse and fall into disrepair.

In 1980, the park completed 17 projects through grants and YCC funding. In 1981, two projects were completed. Simons, Li and Associates were awarded a contract to undertake a comprehensive erosion control study and develop an erosion control action plan. The study was completed in May, 1982. It found that Chaco Wash and its tributaries are in a cyclic state of aggradation, a condition which has been little affected by the erosion control efforts of the past 50 years.

1.2 Current Management Action

Implementation of the Erosion Control Plan began in the summer of 1982 with work at Wijiji and Pueblo del Arroyo. Work was completed at Wijiji, Chetro Ketl and Pueblo del Arroyo in 1984. Funding in 1985 was only adequate to do channelizing of the streambed near Kin Kletso. Small amounts of funding for maintenance of erosion control structures are programmed in the cyclic maintenance program. A series of culverts will be installed in FY 88 to control runoff in the Kin Kletso area and along the north entrance road in Clys Canyon. Erosion control work on the road bank opposite Kin Kletso was completed in 1988, small amounts of

money are earmarked from 1989-90 fee enhancement funds to deter erosion in the group campground.

1.3 Results of Current Action

Erosional effects on the primary cultural features have been mitigated, except for completing the work in the Pueblo del Arroyo/Kin Kletso area. Erosion adjacent to Kin Kletso is now beginning to eat away at New Mexico State Highway 57. Funding for maintenance of erosion control structures is erratic and inadequate, external to the park's operating program. A long-range program to assure erosion control is not in place. There is no complete inventory and map of erosion control structures.

1.4 Program Justification

Erosion control is recognized in the GMP as a critical natural resource management problem, the solution of which is essential if the Service is to carry out its mission of preserving the values for which the park was created.

2. Alternative Actions & Probable Impacts:

2.1 No Action

Lack of any further erosion control effort will abandon all of the effort and money expended to date and will surely consign Pueblo del Arroyo, Kin Kletso, NM 57, and other ruins to destruction.

2.2 Continue Current Management Action

Currently, the erosion control program is at a standstill. A small amount of money is available periodically through the cyclic maintenance program, and there is a package in the multi-year program that needs further definition. Current response to the situation tends toward fighting brush-fires, not getting ahead of the problem. Costs will be greater with this approach, and resources will be at risk.

2.3 Develop and Implement Long-Range Erosion Control Plan

This alternative would require programming to complete the project-type work remaining to be done as an outgrowth of the recommendations by Simons, Li and associates. It would include ensuring regular funding for maintenance of the erosion control structures within the park. The result would be to deter loss of large sites or facilities, but would not preclude loss of some of the smallest sites.

2.4 Expand Efforts to Manage Erosion in the Entire Wash

Completely control erosional processes in the Chaco Wash via extensive manipulation and construction. Extend control measures beyond park boundaries in cooperation with the Soil Conservation Service and neighboring landholders. The objective would be to eliminate all loss of cultural resources due to erosion.

3. Recommended Course of Action:

3.1 Implement Alternative 2.3. This is the most practical and cost-effective approach to reducing the loss of resources due to erosion.

3.2 Type of Action: Resource Management Action (A)
Monitoring Action (B)

4. Requirements to Accomplish Action

4.1 Planning, Studies & Development Needs

Use and expand as needed the Erosion Control Plan of May, 1982.

Extend and implement Park Development Package 180, to perform projects necessary to bring condition to a maintenance level.

4.2 Ongoing Needs

Instead of relying on cyclic maintenance to periodically cover portions of what is an ongoing annual problem of maintaining erosion control structures, increase the park base by an amount sufficient to handle the job.

5. Funding:

Package 180 would require $60,000 and 4 FTE annually over 5 years to establish control over the erosion in Chaco Wash.

Annual maintenance could be covered by an increase to the park base of $20,000 and .5 FTE (Maintenance Worker WG-8). This would replace and update present Cyclic Maintenance packages A23 (Soil Erosion Control: Flood Fences & Dikes; $50,000/five years) and A62 (Erosion Control Structures Repair: Drop Structures; $10,000/3 years).

CHCU-N-3 Wildlife & Vegetation Management Plan

1. Statement of Problem:

Current wildlife and vegetative populations of Chaco are unknown. Exotic, extirpated, threatened, rare, or endangered species have not been adequately identified for effective management purposes. Occurrence and distribution need to be known for the whole park and, for some species of special interest, density as well. A vegetative map must be developed for the park and digitized for use in a Geographic Information System. Impacts of proposed park developments on natural resources cannot currently be assessed.

1.1 Background Information

Between 1890 and the late 1940's heavy grazing severely altered the vegetative cover of the park and its watershed. Grazing was eliminated from the old Monument in 1948 and vegetation has since shown marked regrowth within the fenced Monument boundaries. The fencing also protected resident wildlife populations from hunting and trapping. Even so, the sightings of antelope, elk, mountain lion, spotted skunk, and striped skunk have been rare in the last 20 years. Observations of grey fox, porcupine, and white-tailed prairie dogs appear to be much reduced compared with the 1960's and earlier. Coyotes, rodents and rabbits are abundant; mule deer and bobcat populations may be stable.

The 1980 addition of lands completed mesa ecosystems for West and South Mesas and included the rincon watersheds on Chacra Mesa. Grazing is heavy on the level lands, with the rugged north-facing slopes more nearly approximating natural conditions. Wildlife populations are virtually unknown for these lands, but the inclusion of complete physiographic habitats may benefit larger mammals, if authority can be acquired to manage the lands appropriately. The new additions may also enhance the presence of golden eagles, prairie falcon, and peregrine falcons in the park.

The 1977 Resource Management Plan contained a project on natural vegetation, but lack of complete physiographic provinces precluded any serious management of the situation. Kirk Jones, UNM, under the direction of the Chaco Center, completed a preliminary study of plant communities and set up transect markers. Unfortunately, the transects have not been followed up and probably cannot be found now. Other studies have identified avian and other wildlife species found in the park, but they are usually limited to short-term transect observations and do not cover the whole of the present park.

The park now contains isolated areas of pristine (or nearly so as the result of regrowth) vegetation. Benches have large patches of cryptogamic soil (especially Chacra Mesa). Rincon heads contain riparian and semi-riparian growth, while middle reaches and mesa tips now have subclimax mixes of forbs and grasses. Woody plants are slowly filling their ecological niches.

As part of the erosion control efforts, exotics (particularly tamarisk) were planted in the arroyo to help with inner bank stabilization. These are not widespread in the Chaco drainage outside the park, nor are seedlings prevalent, but the population within the park is large and should be monitored. Russian thistle grows in profusion alongside roads and in other disturbed areas. An introduced cottonwood population is progressively declining due to alluvial fill in the canyon from the natural erosion/sedimentation processes of the Chaco Wash and its tributaries.

Effects of mineral and energy exploration and development in the areas adjacent to park units cannot be adequately evaluated without better baseline information for wildlife and vegetation on all of the lands within the legislated boundaries. Inadequate baseline data also makes it impossible to assess the impact of park developments, such as the new campground, new or expanded trails, a new sanitary landfill, and increased visitation resulting from area road improvements.

1.2 Current Management Action

None. Natural history observation cards are filled out and kept, but have not been analyzed for management purposes. Other than 36 CFR regulations on visitor impacts on vegetation and wildlife, no active management programs are underway.

1.3 Results of Current Management Action

No detailed knowledge of current vegetative geography. Exotics dominate certain habitats. A general lack of knowledge will continue making informed management impossible. Without management access to the new addition lands, and without a strategy upon gaining access, those lands will continue to diverge from their natural potential. Park developments will occur without real regard for their impacts on the environment.

1.4 Program Justification

The management of the wildlife and vegetation is consistent with the intent of PL 96-550, the Organic Act of the National Park Service, and all policies and guidelines derived therefrom.

2. Alternative Actions & Probable Impacts:

2.1 No Action

This is the current management action and the results will be as stated in 1.3 above.

2.2 Establish a Baseline of Vegetation and Wildlife Data

Survey the park for occurrence, distribution, and density of plant and animal species, both modern and fossilized. Produce vegetative pattern maps compatible with a Geographic Information System, as well as similar maps for wildlife, fossil resources, nesting and den sites, etc. Identify type and distribution of exotic species and rare, threatened, or endangered species. This will at least alert management to the current distribution and identify significant species for special attention. Extend this inventory to the new addition lands as soon as feasible. Intensively inventory the vicinities of anticipated park developments, establishing transects for follow-up studies.

2.3 Prepare & Implement Biotic Management Plan

Following a comprehensive inventory, identify the management goals for the vegetation and wildlife of the park. Specifically address possible elimination of exotic species and protection of rare, threatened, or endangered species. This would allow management of ecosystems in a manner consistent with the GMP and NPS policies. Address impacts of proposed developments on sensitive species.

2.4 Implement Biotic Management Plan, Including Reintroduction of Extirpated Species

This would include all of 2.2 & 2.3 above, plus reintroducing such species as antelope, ringtail, skunk, and other species that may be found to have existed here in historic times, but cannot be found now. This would entail assuring that adequate environmental niches were protected to allow a breeding population of the reintroduced species to survive, after determining that a breeding population ever did exist within the park.

3. Recommended Course of Action

3.1 Implement alternatives 2.2 (Establish a Baseline of Vegetation & Wildlife Data) and 2.3 (Prepare & Implement Biotic Management Plan) successively. This will allow an orderly identification of present occurrence, distribution and density of species, followed by management planning and action to attain and maintain the desired environment.

3.2 Type of action: Resource Management Action (A)
Monitoring Action (B)
Research Action (C)

4. Requirements to Accomplish Action:

4.1 Management Action

Any meaningful and useful approach to biotic management of the park must include the lands added to the park in 1980. At present, access to those lands for the purpose of conducting baseline studies requires permission of the landowners, who may be difficult to locate in some instances and may not agree in others. No follow-up monitoring or management action would be possible on the new additions until sufficient management authority was acquired. This authority must be acquired before the recommended alternatives can usefully be implemented.

4.2 Planning, Studies & Development Needs

A 10-238 will need to be prepared for funding of a park-wide vegetative analysis that includes a report and the establishment of transects for future study, especially in the areas of proposed park development and greatest impacts from increased visitation. The project should also result in a vegetative map that can be used with a geographic information system.

Similar 10-238's will be needed to fund park-wide analyses of wildlife and of fossil resources. Reports, transects, and digitized mapping should be produced.

Upon completion of the above studies, a project should be funded to prepare a vegetation and wildlife management plan for the park. This should identify periodic monitoring programs to be conducted, as well as the management goals for specific areas and/or species and the actions necessary to reach those goals.

4.3 Ongoing Needs

By the time the management plan is prepared, if not sooner, the park will need to increase its base funding and FTE allocation by an amount sufficient to provide the annual monitoring and management actions required to achieve the plan.

Funding for periodic (long than annual) monitoring studies will need to be programmed into the Cyclic program.

5. Funding:

Vegetative baseline studies (contract): $20,000; no FTE.

Wildlife baseline studies (contract): $20,000; no FTE.

Fossil resources inventory (contract): $10,000; no FTE.

Base and Cyclic funding increases: not predictable at this time; requires completion of the biotic management plan.

CHCU-N-4 Aerial Photography

1. Statement of Problem:

The park needs complete multi-spectrum aerial photography coverage at a scale that can be digitized as an overlay in a geographic information system. The value would be exact location of sites, facilities, vegetative patterns, landforms, etc. The photography should be duplicated at least every 10 years, in order to detect changes and document them.

1.1 Background Information

The Chaco area was photographed by the Soil Conservation Service back in the 1930's and again in the late 1960's and early 1970's. Chaco was also photographed by various agencies and individuals in the mid and late 1970's and early 1980's. Those, and other images by planes and satellites, have been used as references by researchers, and maps have been constructed by using them, though not by digitizing the photos. Also, the previous work is not consistent in terms of coverage of the present boundaries of the park.

1.2 Present Management

At present, the results of previous aerial photography are only available as single frame prints and stereo pairs. The overlays prepared for as GIS system, including soil types, vegetation zones, etc., are not presently runnable. Also, the park does not have a plotter to draw them if they were accessible. No ongoing program exists to do follow-up photography to detect and record changes.

1.3 Program Justification

Aerial photography and the creation of overlays for use with other theme maps is the most efficient way to monitor and track changes to the visible surface of the park and its immediate environs. The alternative would be ground surveys and the creation of hand-drawn maps. For the time being, the latter is impossible anyway, due to the lack of management authority in the lands added in 1980. Monitoring of this type is essential if park management is to document what is happening to the park's resources.

2. Alternative Actions & Probable Impacts

2.1 No Action

This would be an acceptance of "flying blind" as a management style. Changes could not be noted and mapped.

Development planning would be hampered by weak data.

2.2 Continue Current Management

This option is much like 2.1: No Action. The work that has been done is not in readily usable condition at the park and there is no mechanism in place for updating the coverage. Changes cannot be detected except visually, and access is not available for 1/3 of the park.

2.3 Acquire Comprehensive Aerial Photographic Coverage, with Periodic Repeat Flights

After there is certainty as to the geographic information system to be used, a rectangle including all of the park would be flown at the appropriate scale. Coverage would include black-and-white and other imagery as well. Results would be digitized into computer overlays. The park would acquire a plotter capable of producing the maps. Flights would be repeated at least every 10 years.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 as a way of getting parkwide coverage without having management access to new addition lands.

3.2 Type of Action: Resource Management Action (A)
Monitoring Action (B)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Management Action

Determine the geographic information system to be used for the park. Determine the scale and types of films to be used in the photography.

4.2 Startup Costs

The park would need to acquire a plotter.

A geographic information system, would have to be readied for use at Chaco.

4.3 Ongoing Costs

The funding of the initial and successive aerial photography needs to be programmed into a cyclic fund source, so that it comes around every 10 years at least.

5. Funding:

Plotter with supplies: $5,000.

Prepare geographic information system to integrate aerial photography results: $10,000 ?

Take photos & digitize for use: $20,000/repetition ?

CHCU-N-5 Native American Uses of Park Resources

1. Statement of Problem:

While it is known that Navajos and other Native Americans have used the resources of the present park lands for physical and spiritual strength for 10,000 years, the extent of current use for medical and religious purposes is not known. Impacts on irreplaceable resources (or on rare, threatened, or endangered species) may be occurring without the knowledge of park management.

Uses that do not tax the environment may include pilgrimages to shrine or ceremonial sites, taking of common plants and animals, etc. Some of these uses are in conflict with existing NPS regulations and policies, though management is encouraged to permit the continuance of Native American traditional medical and religious practices. The inherent conflict between the general regulation prohibiting taking of natural resources and the Federal policy of allowing American Indian religious freedom needs to be resolved. A special regulation is proposed.

1.1 Background Information

Among Chaco's cultural resources are Anasazi sites considered to have been ceremonial in nature. Rock art in various places shows modern Pueblo religious symbols. Navajo healing ceremonies are depicted in other panels. Prehistoric and historic prayer sticks have been found.
A Hopi religious leader, Paul Saufkie, visited the park with Michael Kabotie in the autumn of 1986, on a pilgrimage to sites associated with Hopi legends. Acoma potter Lucy Lewis and her daughters asked to conduct their pottery class at Chaco at about the same time, because they believe they are descended from Chacoans.

Navajo medicine men in the Chaco area are known to visit the park to collect plants for use in medico-religious ceremonies. Because the old Monument lands have been fenced for 40 years, while grazing continues outside the fence, it has been said that the park is now a reservoir for medically useful plants that are scarce in the surrounding area. Chaco sites figure in Navajo legends.

The draft GMP suggested that medicine men could get a permit from the superintendent after a XXX assessment had been done on their request to gather materials. The Navajo Nation, in their review of the draft, objected to this intrusion on the privacy and independence of Navajo ceremonial life. Without a special regulation, the issuance of such permits would have been in violation of 36 CFR anyway.
The resultant language follows:

"...the superintendent will maintain communications with native American groups whose religious activities may be affected by park management actions or programs. Nondestructive ceremonial use of sites within the park will be allowed, subject to NPS policies and regulations regarding religious activities and public assemblies ('Management Policies,' chapter 7). Park management will work cooperatively to permit continuation of religious and ceremonial practices by individuals and groups who have traditionally used the park for such purposes." GMP, p. 70.

1.2 Present Management

Present management is consistent with the statement in the GMP. Native American groups and individuals have been permitted to conduct ceremonies at sites within the park, including at Fajada Butte after the necessary review required by the area's closure. On several mornings within the past two years, rangers have found feathers, corn meal or kernels, and other ritual materials in various ruins after a ceremony had been conducted earlier by unknown persons (who may or may not have been Native American).

Several Navajo medicine men are known to occasionally enter the fenced part of the park to collect plants for medicinal purposes. The species they collect, and the locations, are not known. Nothing at all is known about current medico-religious practices affecting the lands legislatively added to the park in 1980. On several occasions, a person who was to be involved in a healing ceremony requested permission by the superintendent to collect portions of a common bush for use in the ceremony. Verbal permission was given, and would be given again under similar circumstances, or, as in one instance, a short-term special use permit would be issued.

Development of a consultative relationship with religious leaders of the relevant Native American groups is in the superintendent's work plan. Contacts have already been established with several Navajo medicine men and with an Acoma religious leader, less successfully with Hopi leaders. This resource management plan, when approved, will be the basis for initiating consultations

1.3 Program Justification

Consultation is required by the GMP and the Native American Relationships Policy, published in November of 1987. Both documents require that American Indians be allowed to continue traditional practices on Federal lands where they were formerly practiced, as does the American Indian

Religious Freedom Act.
326 CFR Part 2, on the other hand, prohibits collecting of park resources and contains no provision excepting Native Americans from the prohibition. The Endangered Species Act and the Archeological Resources Protection Act also prohibit the taking, disturbing, or damaging of specific park resources.

2. Alternative Actions & Probable Impacts

2.1 No Action

This alternative would be non-complying with the park's GMP and with current NPS policy. Ignorance of impact on park resources would continue. The basic conflicts of the policy encouragements and the regulatory prohibitions will go on unresolved. The situation cannot simply be ignored.

2.2 Continue Current Management Action

Current action complies with policy, conflicts with the regulations, and does not provide much information as to the real impact of Native American traditional practices on park resources.

2.3 Develop Consultative Relationships, Prohibit Collecting

Developing the consultation process would be consistent with NPS policy. Non-consumptive traditional uses would be permitted; regulatory prohibitions against collecting of plants, animals or minerals would be enforced. Cost of effective enforcement would be high. Citation of a medicine man for gathering common plants in the back-country would be embarrassing to the NPS and would probably be destructive to the consultative process.

2.4 Consultative Process, Study of Uses, Special Regulation

The consultative relationships would be developed, per policy. With the assistance and cooperation of the consulting religious leaders, a study would be made of park resources used by Native Americans, especially identifying the amount and type of collecting going on. The study would identify any cultural or fossil resources or rare, threatened, or endangered species being collected.

A special regulation would be issued allowing Native Americans to collect natural resource materials for their use in traditional practices. Prohibition would continue on collection of materials for resale and on the collection of fossils, cultural resources, and rare, threatened, or endangered species. Assistance of the tribal consultants would be necessary to achieve and effectively implement this

solution.

3. Recommended Course of Action

3.1 Implement Alternative 2.4 above. This is the only alternative that resolves the potential conflict between policy and regulation and provides management with improved information on the impacts of traditional uses on park resources.

3.2 Type of Action: Resource Management Action (A)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Management Action

The superintendent will contact Navajo, Zuni, Acoma, other Pueblo, and Hopi religious leaders to establish the consultative relationship required by policy. Other Native American groups will be included as appropriate.

After input from the religious leaders, a special regulation will be drafted and submitted for issuance, as in 2.4 above.

4.2 Planning, Studies & Development Needs

A study of Native American uses of park resources will be funded, as described in 2.4 above. This should include all of the lands within the legislated boundaries of the present park, and may need to wait until management jurisdiction has been acquired.

5. Funding:

Extra travel to meet with religious leaders at their locations and to bring them to Chaco would cost $3,000 yearly, no FTE.

The special regulation would require some administrative overhead costs, which should be absorbable.

The special study would be contracted, for about $15,000. Completion of the study would require a report and map(s).

CHCU-N-6 Integrated Pest Management Plan

1. Statement of Problem:

Some species of plants and animals found in the park represent a hazard, or at least an irritation, to people and/or resources. To control their impact in a safe, rational manner requires an Integrated Pest Management Plan (IPMP).

1.1 Background Information

The park is the home of rattlesnakes, prairie dogs with fleas that may host the plague bacillus, plants that obscure or deteriorate masonry in ruins, and vermin that get into residences and park buildings. Each of these, and others at times, presents a special control problem.

Rattlesnakes occasionally establish their territory athwart a trail. Their persistent presence on a footpath endangers pedestrians.

If an outbreak of bubonic plague occurs in a prairie dog colony, the prairie dogs die off and their disease-carrying fleas look for new hosts. This may be a human or a pet, and can result in death for both.

Plants growing in rooms and kivas of ruins detract from the appearance of the structures. Those that grow where their roots can infiltrate the masonry or clog drainage structures cause faster deterioration of the resource.

Bugs, critters, and molds may infest the museum exhibits, offices, storage areas, residences, and other workspaces. When they do, they are destructive of resources, supplies, and facilities, and may carry disease.

1.2 Present Management

No IPMP exists for the park. Pesky rattlesnakes are removed and released at a distance from likely visitor contact. Park staff works with Public Health Service personnel in Crownpoint to monitor prairie dog colonies in the park. If there was a die-off, the burrows would be immediately dusted with Savin or malathion to kill the fleas. Encroaching vegetation is removed by hand, or not at all. Rodents are trapped, but nothing is being done to combat insect infestation, except small quantities of PDB in museum storage cases.

1.3 Program Justification

Resources, people, and facilities have to be protected from damage, death, or destruction by pests. However, the NPS policy is to prepare an IPMP for each instance, assessing alternatives in order to arrive at the solution that is feasible without extensive reliance on biocides.

2. Alternative Actions & Probable Impacts

2.1 No Action

This alternative could result in injury or death to visitors or staff, as well as loss of resources, supplies and facilities.

2.2 Continue Current Management

None of the current actions are covered by an IPMP. There is controversy over whether rattlesnakes should be removed or destroyed. The park is not allowed to keep a biocide on hand in case of a plague outbreak; its emergency use is not covered, either. Manual vegetative removal is expensive; absence of action is costly in terms of resource loss. Nothing is being done about insect infestation in the exhibits, except taking greater care to keep doors closed.

2.3 Prepare and Implement IPMP For Each Pest

This would assess the pros and cons of the alternatives for controlling each pest, and guide park management in the actions that can be taken within NPS policy. The result should be less exposure by people to hazard or disease, as well as deterrence of loss of resources.

3. Recommended Course of Action

3.1 Implement Alternative 2.3 above, the only one that is consistent with NPS policy.

3.2 Type of Action: Resource Management Action (A)
Monitoring Action (B)
Research Action (C)

4. Requirements to Accomplish Action

4.1 Management Action

Natural Resource Management/Interpretation Ranger will prepare IPMP's as time permits.

4.2 Ongoing Costs

When IPMP's are prepared and approved, this would include supplies, equipment & personnel necessary to carry them out.

5. Funding

Unknown until the IPMP's are completed.

CHCU-N-7 Air Quality Monitoring

1. Statement of Problem:

Existing and planned energy development, including coal-burning power plants, strip mining, uranium mining, heavy truck transportation, and a railroad spur line, will impair visibility and the quality of air in Chaco Culture NHP to an unknown extent. Normally Chaco enjoys some of the best visibility in the contiguous 48 states. The park is classified as a Class II clean air area under the 1977 Clean Air Act Amendments. This means some development may be permitted near the park as long as resultant TSP and SO2 do not exceed the maximum allowable concentrations (increments) established for Class II areas. As a Class II area, baseline ambient concentrations of SO2 and fine particulates must be determined so that established increment levels will not be exceeded. These studies must also consider air flow patterns in and around the San Juan Basin.

1.1 Background Information

Air quality and its relationship to both the natural and cultural features are of primary importance to the resources and interpretive story of the park. Visibility and air quality are now "good" to "excellent."

Prehistorically, visibility over long distances was probably essential for navigating while walking across the San Juan Basin. Clear visibility up to 75 miles from the park is essential to interpreting this story. Middle distant views are also important as they contain 50 or more Chaco Outliers plus miles of Chacoan roads.

Deposition of chemical particulates is a second concern. The ruins are built of sandstone bonded by calcium carbonate, which dissolves readily in an acidic environment. Water concentrated in Chaco's thick masonry walls contains potentially destructive particulates and acids. The ruins are built on alkaline soils, which may buffer any acid deposition effects. Future changes in chemistry could affect the soil permeability and/or stability. Chemical changes may also adversely affect native vegetation.

The Four-Corners Power Plant is one of the largest single point-source emitters of pollutants in the country and is located approximately 50 miles north of Chaco. Within the area of this power plant and the nearby San Juan Generating Station are non-attainment areas for SO2 and areas of high concentrations of NOx. The proposed Dine Power Plant, nearly as large as the Four-Corners Plant, would be less than 20 miles from the park.
Chaco is one of the only permanent monitoring stations in

the San Juan Basin. As a Class II area, the legal protection for the park's air quality rests entirely upon the Prevention of Significant Deterioration (PSD) permit program of the Clean Air Act. This requires knowledge of baseline concentrations of SO2 and fine particulates as well as measurement of any increases. The Southwest Regional Park Service Office has been in contact with the State of New Mexico concerning Chaco's reclassification as a Class I area. With the energy development at a lull around Chaco and the Government Accounting Office encouraging reclassification, there exists a greater potential for Chaco to become a Class I site. Efforts for reclassification will continue to be made by park and regional staff.

1.2 Current Management Action

Parameters required under the PSD program are not being monitored. Since mid-1978 Chaco has been monitoring visibility from the Pueblo Alto area with the contrast teleradiometer (replaced by an automated camera in 1986). Up to six targets were in use, in every direction except north. A total suspended particulate (TSP) sampler was installed in 1978, discontinued in 1986.

1.3 Results of Current Management Action

Monitoring equipment has established concentrations of particulates and current visibility ranges. Studies conducted by Dr. Michael Treshov in 1980 detected no noticeable damage to vegetation due to pollution. Dr. Tom Nash came up with similar findings in his study of lichens in the same year. Dr. Roger Ferenbaugh of Los Alamos Labs was contracted to do baseline assessment of sulfur compounds in pine needles and cones in 1985 and 1986.

1.4 Program Justification

Maintaining an acceptable level of visibility and air quality is a commitment Chaco has to its visitors and is a requirement of the Clean Air Act.

2. Alternative Actions and Probable Impacts

2.1 No Action

Without monitoring, the NPS would have no data to present in cases of:

(1) Hearings when/if the increments are exceeded for the Class II floor areas;

(2) Hearings on changes in status for Chaco's air quality protection;

(3) Substantial changes in the air quality as a result of increased mineral and/or energy activity in the San Juan Basin.

Additionally, Chaco's station serves to supplement data for three Class I areas: Mesa Verde NP and two USFS Wilderness Areas.

2.2 Continue Present Monitoring

This will continue to provide valuable data on visibility at Chaco as part of a regional net. However, data in support of Class II increment assessment are not being gathered.

2.3 Increase Present Monitoring

Begin monitoring SO2 concentrations because this is one of the two pollutants for which increments have been established. This will aid determination if emitting facilities will be permitted. Minor sources nearby may also contribute to this increment. Studies also are needed to determine air flow characteristics that may influence Chaco's air quality.

3. Recommended Course of Action

3.1 Implement Alternative 2.3, as the best defense against illegal deterioration of Chaco air quality.

3.2 Type of Action: Monitoring Action (B)
Research Action (C)

4. Requirements to Accomplish Action

4.2 Planning, Studies & Development Needs

Park Package 189 (Study/Monitor Energy Development Impacts) would provide for SO2 studies when needed.

Park Packages 163, 164, 165, 166, 170, 174, 181, 182, and 198, all submitted through the NPS Air Quality Division in Denver, would add to our understanding of the airborne environment at Chaco.

4.3 Ongoing Needs

The present system only requires attention every 10 days by park staff. The addition of an SO2 monitor would involve start-up costs and operational funding.

5. Funding

Package 189 would require $75,000 at the point at which SO2 studies should begin, and would be external to the park's operating program.

Package 163 (Model Trajectories of Air Masses for VIEW Parks) will cost $35,000 for the CHCU portion, and would be external to the park program.

Package 164 (Analyze/Report Visibility Data for All VIEW Sites) will cost $5,000 for CHCU, no park FTE.

Package 165 (Conduct Criteria Pollutant Monitoring) will cost $3,000 to start at CHCU, no park FTE.

(**Park does not have the 10-238's for packages 166, 170, 174, 181, or 182 and so cannot provide the cost data for them.**)

Package 198 (Assist NM Air Quality Bureau for NO2 at Four Corners Power Plant) will cost $18,000, no park FTE.

Park base increases include $15,000 and .5 FTE (GS025-5) for continued monitoring of equipment in Package 165.

CHCU-N-8 Acquire Climatological Data Base

1. Statement of Problem:

The park has a good base of climatological data, 50 years of temperature and precipitation records. However, there is little or no data on hand from around the San Juan Basin to compare with the Chaco data. Such comparisons would be useful both in terms of detecting modern trends and for hypothesizing ancient climate variations. Historical data is available in computer format from NOAA.

1.1 Background Information

One hypothesis for interpreting the Anasazi existence at Chaco is based on redistribution of resources from areas of surplus to areas of need. This theory assumes significant variations in temperature and precipitation among locations in the San Juan Basin in a given year, and between years in a given location.

Historically, records have been kept from a time when the air was tainted only by smoke from occasional fires and dust from storms, to a time when large volumes of pollutants are poured into the air daily by auto exhausts and smokestacks. We have insufficient comparative records to determine whether any changes in temperatures and/or precipitation can be correlated with the increasing thickness of the air.

1.2 Present Management

The park has a weather station that provides minimum/maximum temperatures and precipitation data. Summary reports from NOAA for all New Mexico stations are received and filed monthly. No analysis is currently done.

1.3 Program Justification

Consistent with the park's air quality monitoring program and with environmental protection legislation, the park should explore all indicators of environmental impacts affecting the park, including climate changes caused by activities external to the park. Ongoing research into the Chaco Anasazi was one of the intents of PL 96-550.

2. Alternative Actions & Probable Impacts:

2.1 No Action
Taken strictly, this alternative would mean ceasing the weather monitoring done now. This would truncate a 50 year old record at the present, providing no further data for Chaco researchers.

2.2 Continue Current Management

Current operations contribute data to NOAA for someone to examine at some point in the future, but it does nothing for present management or research.

2.3 Park Purchase & Maintain Data From NOAA

For about $1500, the park could purchase all of the data for selected stations around the Basin. Present hardware is probably inadequate to handle the volume of data; upgraded equipment would have to be purchased. Analysis of the data would depend on staff time available, or on outside researchers.

2.4 Park Coordinate with Institution to Obtain NOAA Data

San Juan College has opened a computer center, and the staff there is interested in developing a variety of data bases for the San Juan Basin. They have informally requested Chaco's participation. By working with SJC, the park would not need to buy larger equipment, more researchers would be likely to use the data, and the park could probably get access to the results or data as needed. It may also be feasible for the park to use the facilities BLM is developing at its Farmington Resource Area Office.

3. Recommended Course of Action

3.1 Implement Alternative 2.4 as described above. This is the most cost-effective method to use, and it does not preclude the park from acquiring the data at a later time when it has hardware with more capacity.

3.2 Type of Action: Resource Management Action (A)

4. Requirements to Accomplish Action
4.1 Management Action

Park staff will consult with BLM San Juan College staff to see what data bases they are interested in obtaining. NPS can offer testimonial support of the value of this data, perhaps listing purchase of the computerized NOAA data in its gift catalog.

5. Funding

The selected alternative should result in minor costs to the park, including purchase of computerized data. Indirect costs may include some staff time spent in consultation with SJC, not exceeding $1,000 annually. A small amount of funding has been earmarked from fee enhancement money.

CHCU-N-9 Cliff Face Monitoring

1. Statement of Problem:

Rockfalls have damaged and partially destroyed ruins at Chaco in the past. The same geological process that has caused them is continuing today. There is reason to believe that further rockfalls may endanger residences as well as other sites and facilities.

1.1 Background Information

Chaco Canyon's creation is continuing. Many huge boulders at the sides of the canyon have Anasazi petroglyphs on them, indicating the pieces of cliff had fallen before the Anasazi were here. One huge cliff fragment, known historically as Threatening Rock, had masonry under and prayer sticks behind it when it fell in 1941, smashing part of Pueblo Bonito. A smaller boulder fell in the same area in 1984, barely grazing the back wall of Pueblo Bonito. In the winter of 1984-85, a 10-12 ton boulder slid down the talus slope in the maintenance area, coming to rest on top of the water line. On March 23, 1988, several thousand cubic feet of rock fell from the cliff behind Casa Chiquita.

In order to assess the immediacy of the threat, SWRO contracted with Dr. Bruce Wachter, a consulting geologist, to study the known problem areas. He was shown the suspected problem areas on the cliff faces behind Pueblo Bonito and the Talus Unit, near Chetro Ketl. Staff also asked him to look at the cliffs behind the park residences.

Wachter's report raised enough concern for the park to contract for his services again to look more closely at the areas behind the residences and make recommendations. He established a number of monitoring points near the residences and ruins. Direct measurement of the distances between pins set in the cliff and pins set in fragments that are detaching themselves from the cliff will provide data on the movement of the fragments, if any.

1.2 Present Management

In 1987,with SWRO assistance, it was possible to relocate the trailers to an area free from rockfall hazard. There has been discussion, but no specific plans, about purposely and carefully bringing down some of the threatening rocks behind ruins. Lack of personnel has prevented maintaining the monitoring records, but this will be changed, now that the interpretation/natural resource management position is filled.

1.3 Program Justification

The Service has an obligation to protect the lives and property of residents and visitors from destruction by preventable or predictable causes. It also has the responsibility by law and policy to take all reasonable measures to protect the resources of the park. The monitoring program, and possibly careful removal of endangering rocks, will enable management to assess the danger and take steps to prevent death or damage.

2. Alternative Actions & Probable Impacts:

2.1 No Action

Absence of action will leave the Service open to claims and suits by people who have had their property and/or their loved ones destroyed by rockfalls. Now that the danger has been identified, this alternative is indefensible.

2.2 Monitor, Use Rock Management Techniques

This option would eliminate the most likely lethal hazard, provide data on the direction and rate of movement of suspect cliff faces, and offer the possibility of preventing some resource damage by carefully removing some rocks before they fall.

2.3 Move All Residences, Expand Monitoring, Manage Rocks

This option would remove all of the residences, including the houses, to locations safe from rockfalls. It would also call for extending the monitoring program to many more areas, and would include bringing down rocks as in 2.2.

3. Recommended Course of Action:

3.1 Implement Alternative 2.2 as described above. There is not sufficient evidence at present to warrant abandonment of the houses, nor to greatly expand the monitoring system. This option remains open if future data warrant.

3.2 Type of Action: Resource Management Action (A)
Monitoring Action (B)

4. Requirements to Accomplish Action:

4.1 Management Action

Resume the rockfall monitoring program.

4.2 Planning, Studies & Development Needs

Plan preparation of the new sites for housing, including provision of utilities, access, pads, etc.

Plan for the safe removal of hazardous rocks, without endangering resources in the process.

5. Funding

The park has funding sufficient to resume the rockfall monitoring program. Some fee enhancement funds have been budgeted for the program.

SWRO technical assistance will be necessary in planning the new sites and helping fund their preparation. A 10-238 was submitted 7/23/86 to accomplish this, including the replacement of all seven trailers with four single family houses, plus a 4-unit apartment complex. [The cost of site preparation was estimated at $15,000 for each site. Houses were estimated at $50,000 each and the four-apartment unit at $250,000, which would total $525,000 (including site preparation)].

CHCU-N-10 Determine Ambient Noise Levels

1. Statement of Problem:

For people without hearing impairment, sound is one of the most omnipresent and potentially distracting facets of the environment. One can look away from an unpleasant sight, but one must leave the vicinity of an unpleasant sound if the source cannot be stopped. The park faces the possibility of an increase in ambient sound levels both as a constant resulting from increased visitation and adjacent development and as a sporadic intrusion stemming from coal mining and other mineral and energy activities near the park.

1.1 Background Information

In terms of the modern world, the park is isolated. The sound of honking horns, rumbling of giant engines, or the roar of landing planes and passing trains are never heard in most of Chaco. That fact is often mentioned by visitors as an enhancement of their visit, an aid to their contemplation and study of the cultural and natural resources of the park. They also mention that it relaxes them and fosters the restorative value of their vacation, weekend, or holiday visit to the park. The quiet is already broken by low overflights of civilian and military aircraft.

Changes in this condition may well result due to increased visitation to and travel through Chaco. Energy and mineral development on the virtual boundaries of the park could lead to:

Oil drilling and pumping noises.
Uranium milling noises.
Blasting in open-pit coal mines.
Noise of trucks & trains serving mines.
Construction noise as facilities are set up.
Generally increased traffic noise around the park.
Low overflights related to adjacent operations.

At this time, management has no hard data on any noise levels anywhere in any of the park units. There is no baseline.

1.2 Present Management

None. Limiting factors are present in the form of bad roads, size of campground, size of parking lots, 10:00 pm "quiet time" rule in the campground, and economic conditions which have slowed the energy developments planned outside the park.

1.3 Program Justification

Baseline studies are needed to provide a standard with which to compare the anticipated impacts of developments proposed in and around the park. Sound levels were passed over in the EIS for the coal leases north of the park, but will need to be addressed when Section 106 compliance issues are considered in connection with BLM review of mine operating plans. Similar 106 considerations will be necessary for proposed park developments, the coal-haul railroad, road improvements, etc. Audible sounds (and associated seismic impacts) must be part of the review.

2. Alternative Actions and Probable Impacts:

2.1 No Action

The restful and contemplative aspects of a park visit at Chaco will be steadily eroded. Background noise of traffic, trains, heavy trucks, and equipment motors will become constant and may increase in intensity at exposed points in the park (especially Pueblo Alto, Penasco Blanco, Tsin Kletzin, Pueblo Pintado, and Kin Ya'a). The sound (and vibration) of large dynamite explosions may punctuate the day (and possibly the night) at nearly every point in the main park.

2.2 Continue Current Management

Current management is voicing concerns but has no data, therefore impact of this alternative is identical to the "No Action" option.

2.3 Conduct Ambient Noise Studies to Establish Baseline, with Subsequent Monitoring As Needed

Sound studies would be made at the major ruins in and around the canyon, the back country, visitor center, campground, and at the outliers. Sound levels should stress current maximums during heavy visitation and should include weekday/weekend and daytime/nighttime variations. Follow-up studies would record the same conditions when there is reason to believe that the hearing environment has changed.

2.4 Conduct Ambient Noise Studies to Establish Baseline, with Regular Subsequent Monitoring

Same as 2.3 to establish baseline, but follow-up monitoring would be on a regular annual or biennial basis to document trends in the hearing environment.

3. Recommended Course of Action:

3.1 Implement Alternative 2.3 above, as the most cost-effective option to establish a baseline for use later to defend the park against sound-encroaching activities.

3.2 Type of Action: Research Action (C)

4. Requirements to Accomplish Action:

4.1 Planning, Studies & Development Needs

A 10-238 will be submitted to provide funding to perform the baseline study described in 2.3 above. The park will also look into the possibility of getting a donation to pay for the cost of the study.

5. Funding:

It should be possible to contract the field recording necessary for the baseline study and get a report for $10,000, with no FTE required.

1. Statement of Problem:

Water utilization, groundwater exploitation, and surface runoff in the park and surrounding area are critical to the ecological well-being of the park and to the continued health of the visitors and employees. Nearby grazing and development of mineral and energy resources could seriously threaten the quality & quantity of surface and subsurface water.

1.1 Background Information

A multitude of mineral or energy developments are planned in the watersheds of the Chaco, Fajada, and Gallo Washes between now and 1995. Oil extraction started in 1978 one mile north of the park in the Gallo drainage. Intensive exploration for oil and natural gas has taken place since 1979 in the Fajada drainage with one 12-pump field being developed near Upper Kin Klizhin ruin (Chaco archeological protection site), five miles south of the park. Intensive uranium exploration has taken place all around the park with potentially economic minerals being found in the upper Chaco drainage (Chacra Mesa) and one location was incorporated into the park in 1980, in the Clys Canyon drainage. Dewatering from Nose Rock Uranium Mine, southwest of the park, created a perennial stream in the Kim-me-ni-oli Wash, which flows for three miles through the Kin Bineola detached unit (shutdown of mine operations has changed this).

The State of New Mexico has the following permit applications pending or active:

a. 40,000 gallon/hour dewatering from the Gallup aquifer. Location: 17 miles south of the park on the Fajada Wash. Permit granted 1978; not active.

b. 200 acre feet/year dewatering from subsurface aquifers. Locations: 25 miles south of the park. Application protest by NPS; still pending.

c. Reinjection of mineralized waters into Gallup aquifer. Location: 14 miles south of the park. Protested by NPS; protest withdrawn.

d. 1,000 acre feet/year dewatering from subsurface aquifers. Location: 15 miles northwest of the park. Protested by the NPS; protest withdrawn.

Further dewatering permit applications are expected due to the long-range emphasis on energy production in the San Juan Basin. Most, if not all, subsurface aquifer activity is in

the Gallup aquifer which is the aquifer that supplies the park's domestic water. Dewatering is a triple threat: 1) Lowering of the aquifer, causing the park well to dry up or necessitating deeper drilling (presently 3200' deep); 2) Increased turbidity of the underground waters; 3) Surface flows from dewatering causing perennial streams in arroyos.

In 1975, the USGS began stream-gauging operations on the Chaco Wash (at the concrete bridge) under a cooperative agreement. In 1977 this was expanded to include a gauging station on the Gallo Wash (near the campground). In 1979, with special funding through the Regional Chief Scientist, three more stations were installed by the NPS. These were at the Bonito bridge, on the upper Chaco near the east boundary, and on the Fajada Wash at the south boundary. Funding cuts in 1980 required the removal of the Gallo Wash station, and further cuts in 1982 necessitated cutting back to taking samples from only the concrete bridge. That has been damaged and is in disuse, but USGS may repair it in 1988.

A water resource management profile was developed for the park by SWRO in 1982.

1.2 Current Management Action

None. Measurements were made at the gauge sites in the past, but none are now. Subsurface water quality and quantity were monitored by the Regional Hydrologist at the headquarters well and others, but that has also ceased. The only studies currently done are the State-run water quality tests required by the Public Health Service. A new gauge may be installed by USGS at the concrete bridge over the Chaco Wash in 1988.

Chaco's water rights have not been legally determined. The position charged with handling stream-gauging, etc., has only recently been filled.

1.3 Results of Current Action

With the data from the stream-gauging stations, the park has a limited data base established prior to the developments anticipated outside the park. Continued monitoring will be needed to expand the data base. Monitoring must continue after developments occur in order to document changes. The program is currently moribund. Subsurface data support the concerns outlined in 1.1 above. Further research and monitoring are necessary to have defensible data for potential litigation based on allegations of damage to park resources.

1.4 Program Justification

The park has the responsibility to provide adequate, clean water to its staff and visitors. It also is required to be watchful of any streamflow changes that would hasten erosion (thus endangering cultural resources) or would affect the vegetative growth associated with the streams (due to altered chemical content).

2. Alternative Actions & Probable Impacts:

2.1 No Action

The baseline data on surface and subsurface water will be what it is now. Changes due to activities outside the park will be impossible to verify, and the existing baseline may not be adequate to support a protest against polluters.

2.2 Continue Current Management Action.

There is no current management action; impact is the same as in 2.1.

2.3 Resume Monitoring of Streamflow & Monitoring of Water Well.

USGS will shortly re-establish the gauge at the concrete bridge on Chaco Wash. A new test water well has been drilled (1987) near the one currently in use. Data from that will be useful. Resume testing of the well in use and other locations.

3. Recommended Course of Action:

3.1 Implement Alternative 2.3: This appears to be feasible and will allow the park to detect significant changes in water quality or quantity caused by activities in the watershed outside the park.

3.2 Type of Action: Resource Management Action (A)
Monitoring Action (B)

4. Requirements to Implement Action:

4.1 Ongoing Costs
Monitoring will require .25 FTE (NRM Specialist, GS-9) and $6,000 annually added to the park base. If the quality testing can no longer be done in SWRO, it will have to be contracted at an estimated cost of $4,000 annually.

5. Funding
Base increase needs would be .25 FTE and $10,000 annually.

CHCU-N-12 Wildland Fire Management Plan

1. Statement of Problem:

A park fire management plan does not exist to specify when and where potential prescribed or natural fires should occur, or be suppressed. Natural resource role of maintenance and safety uses of fire have not been outlined.

1.1 Background Information

An adequate history of natural fire occurrence in Chaco is lacking, yet the possibility of both natural or man-caused fire exists. Effects of such fire on cultural resources must be considered. Prescribed fire may be needed to accomplish safety or maintenance goals, e.g.: reducing unnatural vegetation buildup in the former sewage spray field.

1.2 Current Management Action

Currently, all fires would be suppressed. No fire management plan exists. Safety/maintenance fire applications have been attempted in an unsystematic way.

1.3 Results of Current Action

A haphazard fire management program with no guidance as to fire's natural role in the ecosystem, nor any attempt to determine if that role has been disrupted by human activities.

1.4 Program Justification

Though the amount of fuel for a wildland fire is usually low, there are occasions when a windblown fire could cover some territory. The park must be prepared to carry out its mission to protect lives and cultural resources, but must also be cognizant of its agency mission to preserve the natural environment as well. Without an understanding of historic ecology and without a plan of action, this cannot be carried out.

2. Alternative Actions & Probable Impacts:

2.1 No Action

This is the same as current management action, 1.2 above.

2.2 Develop & Implement a Fire Management Plan

In order to properly manage fire, it is necessary to determine its role, occurrence and history, and, if appropriate, to adopt a plan and policy which allows fire to be treated as an integral part of the ecosystem. Fire effects on cultural resources should be assessed.

3. Recommended Course of Action:

3.1 Implement Alternative 2.2, which will provide the chance of knowledgeable management of fires.

3.2 Type of Action: Resource Management Action (A)
Monitoring Action (B)
Research Action (C)

4. Requirements to Implement Action:

4.1 Planning, Studies, & Development Needs

A package needs to be prepared to fund a study of the fire ecology in the San Juan Basin and the specific fire history of the lands now in the park's legislated boundaries. The report should consist of the findings of the study and a draft recommended fire management plan for the park.

4.2 Ongoing Costs

It is possible that the eventual plan could call for fire-fighting equipment beyond the park's current inventory.

5. Funding:

The package to contract for a study and produce a draft plan would cost $10,000.

No estimate can be made at this time for additional equipment needs.

CHCU-N-13 Backcountry Management Plan

1. Statement of Problem:

A backcountry management plan for Chaco Culture NHP does not exist at the present time. Observed backcountry impacts reveal visitors hiking off trails, visiting remote sites, and creating mazes of trails. Vandalism of backcountry archeological sites continues to be a problem as well. With the increased demand in backcountry use (1985-9,600 users; 1986-10,841 users; 1987-12,282 users), and the high potential for road access improvements within the next five to ten years, the park will need a backcountry management plan to manage this increase in use, and to preserve the park's resources.

1.1 Background Information:

Historically, backcountry use at Chaco has been limited to day use on short trails. The park's GMP has outlined an expansion of the current backcountry trails. Backpacking in Chaco has been and is prohibited, and wilderness has not been addressed since 1969.

In April 1969, a wilderness study suitability report was completed for the park. In 1969 the park was Chaco Canyon National Monument, consisting of 21,509.40 acres. The 1969 study concluded that Chaco Canyon National Monument was not suitable for wilderness designation; therefore, recommending that no wilderness area be designated. The basis for this decision was that, "the wilderness area in consideration had a continuing need for archeological preservation and research studies involving investigations and excavations, which would include the use of motorized vehicles and the development of structures." The 1978 NPS Management Policies Chapter VI-3 states that "An area will not be excluded from a wilderness recommendation solely because established or proposed management practices require the use of tools, equipment, or structures if those practices are necessary for the health and safety of wilderness travelers or protection of the wilderness area."

The park was expanded in 1980 by P.L. 96-550 to include a total of 33,974.29 acres (10,965.26 acres which remain to be protected by NPS authority). At Chaco Culture NHP, the value of the backcountry/ wilderness resource is of cultural and natural significance, which must be protected through various approved management practices.

In 1984, a draft backcountry management plan was developed, but was not finalized or implemented. Visitor use attitudes and perceptions of the backcountry have not been studied, nor has recreational carrying capacity been researched and

applied to the backcountry.

1.2 Present Management:

The park presently manages the backcountry according to the February 13, 1987 Park Compendium, and as outlined in the GMP. All of the park's backcountry is closed to public use (36 CFR 1.5), except four designated trails. These four trails require a backcountry use permit as described in 36 CFR 1.6. The procedures are standard federal regulations, which do not address backcountry management issues specific to the park. The GMP proposes to expand the trail system on South, West and Chacra Mesas. This will take hikers into areas of the park not currently accessible, increasing the need for a backcountry management plan.

1.3 Program Justification:

The general public is becoming more aware and interested in the Chacoan phenomenon; consequently, Chaco is experiencing more visitation from laymen, as well as professionals. The remoteness of the park setting offers these varied visitors opportunities for solitude, freedom, challenge, and other wilderness associated values within an NPS backcountry area. Preservation of the fragile cultural resources, including their surrounding natural resources, is of utmost importance. In order to allow visitor access to backcountry areas without resource damage, a plan which includes monitoring of visitor use and the impacts on cultural and natural resources is essential. A backcountry management plan also needs to be prepared and implemented to meet the mandate in NPS Management Policies Chapter VII-10a. A backcountry management plan at Chaco Culture NHP will set the standards for future management of the backcountry.

2. Alternative Actions and Probable Impacts:

2.1 No Action

This alternative would continue NPS administration of the backcountry without a written policy or plan. Visitor use attitudes and perceptions of the backcountry would continue to be unknown factors. The park's potential for wilderness would not be researched or known. The park would lack a monitoring program for visitor impacts.

2.2 Continue Current Management

This is, in effect, the same as the No Action Alternative.

2.3 Develop and Implement a Backcountry Management Plan

To properly manage the backcountry, the park must have a plan to follow. This plan should include regulations, an environmental awareness program, and recommendations for future research and study. Research and study should include, inventorying and monitoring visitor use impacts on the natural and cultural resources to set limits of acceptable change for recreation carrying capacity [RCC=f(social cc, biological cc, and physical cc)], a backcountry user attitudes and perceptions study, and a wilderness feasibility study. The backcountry use inventorying and monitoring program should work in conjunction with the site monitoring program.

3. Recommended Course of Action

3.1 Implement alternative 2.3, which will give park management an administrative policy for the backcountry, an expanded public awareness program, and recommendations for future research and study.

3.2 Type of Action: Resource Management Action (A)
Monitoring Action (B)
Research Action (C)

4. Requirements to Implement Action:

4.1 Planning, Study and Development Needs

The park's natural resources management employee will be the primary individual, with aid from the regional office, for upgrading and finalizing the Draft 1984 Backcountry Management Plan. The recommended research and study projects will be conducted by outside park sources, such as CPSU's, DSC, SWRO, or environmental groups.

5. Funding:

Approximately .50 FTE and 10,000 annually should be used for implementation and monitoring of the proposed alternative in the plan. Printing of the plan are other costs, but no definite figures are known. The cost of the studies will depend on the organization performing the services.

Cultural Resources

Overview of Prehistory. Like other massive prehistoric ruins of the American Southwest, those at Chaco caught the fancy of early archeologists, dilettantes, and the Victorian public. Later investigations dealt with progressively more ancient cultures and with less obvious archeological remains. Archeologists now know that the prehistory of the San Juan Basin is extraordinarily complex and that Chaco Canyon represents one of the most organized and far-reaching cultures of its time on this continent north of Mexico.

Humans probably first entered the Chaco region about 8500 B.C. These Paleo-Indian hunters were replaced by more sedentary gatherers and small game hunters during the subsequent Archaic stage (6000 to 1000 B.C.), perhaps because the large Pleistocene mammals were becoming extinct and the climate was fluctuating.

While still without pottery, the Basketmaker II people (1000 B.C. to A.D. 500) began using domesticated plants such as corn and squash. Thus began the emergence of the Anasazi tradition that came to dominate the Four Corners region of the American Southwest.

Chaco Canyon witnessed its first significant exploitation by farmers in Basketmaker III time (A.D. 500 to 750). The canyon was permanently occupied by A.D. 500, and villages of up to 20 pithouse dwellings were established. Pottery was first manufactured during this period.

During the Pueblo I period (A.D. 750 to 900), above-ground storage rooms occurred in conjunction with pithouses. Crescentric villages composed of small storage rooms, larger habitation rooms, and pithouses (in front of the room block) became more formalized and rectangular in Pueblo II time (A.D 900 to 1050), with the kiva replacing the pithouse by the end of the period.

Up to A.D. 900 the Anasazi farmers of Chaco were little different from their neighbors throughout the Colorado Plateau. The small pueblos in Chaco were similar in construction to those on Mesa Verde or along the Little Colorado River. Then in the 10th century came a turning point in Chaco prehistory, an unparalleled transition that set the Chacoans apart from all other Anasazi.

Between A.D. 900 and 1140 numerous large masonry pueblos were constructed. New architectural techniques such as rubble core/banded veneer masonry appeared. Pueblo Bonito, Chetro Ketl, Una Vida, Penasco Blanco, Hungo Pavi, and Kin Bineola are examples of these carefully planned multistoried houses of up to several hundred rooms. The great kiva--reaching immense dimensions (up to 25 meters in diameter)--became a predominant feature.

Similar construction spread far beyond the immediate Chaco Canyon area, apparently representing a regional sphere of influence. The canyon became established as the population, cultural, and trading nucleus for

what has become recognized as a cohesive economic and possibly ceremonial system linking dozens of Chacoan communities and resource areas throughout the San Juan Basin.

Yet the small (3-20 rooms) communities with simple masonry rooms and kivas--typical of earlier Anasazi--continued to be built in the canyon and around the huge communal structures (average 288 rooms) of both the canyon and the outlying communities. Scores of the irregular, old-fashioned pueblos continued to be occupied and added to. The material culture of the small villages was similar to that found at the large structures. The settlements appear to have been comprised of small village domiciles clustered around a multistory communal structure and great kiva(s). These population centers were often connected by a formal network of straight, wide roads. Possible signaling stations and public works such as reservoirs, dams, and irrigation canals were also common.

By A.D. 1050 there was a large regional economic system operating, especially to the south and west. The canyon's population increased. Around A.D. 1100 outlying communities appeared in the north, reflecting interaction with populations in the San Juan River Valley or Mesa Verde region. No major new construction occurred in the following Late Pueblo III period (A.D. 1130-1200), and by the end of the period most of Chaco was abandoned.

Some small Mesa Verde-style sites were inhabited in the Chaco area during the Late Pueblo III/Mesa Verde phase (A.D. 1200-1300); then they too were abandoned. The area was not reinhabited until the Navajo migrated into the region from the northeast in the 1600s.

Overview of History. Vague historical references to what seems to be Chaco Canyon came from the mid-1600 Spanish outposts, and Vizcarra named Penasco Blanco and Fajada Butte in 1822. The first detailed reports of Chaco date to the early American era, beginning in 1849. The earliest archeological evidence of European-American presence consists of inscriptions left by American troops in 1858. By the 1880s the American public had seen published photographs of many Chaco features. Still, sheepherders remained the most frequent visitors until 1895, when Richard Wetherill (formerly of Mesa Verde) came to Chaco Canyon.

From 1896 to 1901 Wetherill and archeologist George Pepper, funded as the Hyde Exploring Expedition, excavated portions of Pueblo Bonito and adjacent Chacoan ruins. Like most excavators of this era, they sought relics as well as information. Railroad carloads of artifacts were shipped to the American Museum of Natural History in New York--50,000 pieces of turquoise, 10,000 pieces of pottery, 5,000 stone tools, and 1,000 bone and wooden objects.

As word got out, other collectors came to dig in Chaco, and Wetherill, who had already started a trading post in the canyon, sought to protect his interest in the relic sources by filing for a homestead that included Pueblo Bonito, Chetro Ketl, and Pueblo del Arroyo. This resulted in a

General Land Office investigation that contributed detailed descriptions of many ruins.

But around the turn of the century there was increasing public concern about the rapid destruction of Southwestern antiquities, and in 1906 the Antiquities Act was passed. Under the provisions of that act, in 1907 Theodore Roosevelt proclaimed Chaco Canyon a national monument. In the midst of protests and controversy, the General Land Office ordered the Hyde expedition to cease its excavations. Wetherill's homestead entry was denied.

In 1921 Neil Judd set up field operations for the National Geographic Society expedition's 5-year excavations of Pueblos Bonito and del Arroyo. In 1927 Frank H.H. Roberts, Jr., of the Smithsonian excavated Shabik'eshchee, a pithouse village on Chacra Mesa that became the type site for Basketmaker III.

In the 1930s New Mexico institutions took the lead in Chaco archeology. The School of American Research/University of New Mexico field schools, under Edgar Hewett, excavated portions of Chetro Ketl, the Casa Rinconada and Kin Nahasbas great kivas, and the talus unit behind Chetro Ketl. Between 1939 and 1942 and in 1947 university students built a research center and excavated small village sites on the south side of the canyon, especially near Casa Rinconada. The Chacoan suburbs had been discovered, and the dichotomy between them and the large communal sites became the topic of the day.

The university, through Hewett's efforts, had acquired parcels of land within the national monument, and after tedious negotiations these holdings were deeded to the Department of the Interior in 1949. As part of that agreement, the University of New Mexico obtained preferential research rights.

In the early 1930s the National Park Service had built upon Judd's initial efforts and instituted a modest stabilization program. In 1937 a Civilian Conservation Corps camp was established in the canyon, which operated through 1941. Salvage archeology projects included the excavation of sites at the CCC camp, park headquarters, and campground sites. Efforts were also directed to salvaging and protecting remains threatened by erosion, most notably the Pueblo del Arroyo triwall structure (1950).

In 1971 the Chaco Center--a multi-disciplinary research unit of the National Park Service--began a program to inventory all the visible archeological resources of the monument (see USDI, NPS, SWRO, Hayes, Brugge, and Judge 1981; USDI, NPS, WO, Maruca 1982). As a more comprehensive view of the Chacoan resources emerged, a remote sensing (for example, aerial photography, radar and thermal scans) program was instituted. Remote sensing data revealed the elaborate road network.

Water control devices, paleoecology, improved dating, and Archaic sites have also received the center's attention. Village sites from all periods have been excavated. The Chaco Center's efforts--and those of other

archeologists in the San Juan Basin--have revealed complexities undreamed of a decade ago. Although much has been learned about the Chacoans, advances in anthropological theory continue to stimulate questions that remain to be answered.

Archeological Resources. Chaco Culture National Historic Park was established because of its prehistoric archeological resources. The park is listed on the National Register of Historic Places and has been nominated to the World Heritage List.

Over 3,600 archeological sites have been recorded within the authorized boundaries. Hayes, Brugge, and Judge (USDI, NPS, SWRO 1981) have summarized the results of archeological surveys in and adjacent to the former national monument. Almost 2,400 sites have been recorded within and adjacent to the old monument boundaries; average site density is 47 per square mile. The sites that could be assigned to specific times, and the approximate percentage attributed to each is as follows:

Navajo	22
Late Pueblo III	8
Early Pueblo III	14
Late Pueblo II	15
Early Pueblo II	17
Pueblo I	16
Basketmaker III	6
Archaic-Basketmaker II	2

A reconnaissance of the lands added to the park by PL 96-550 was completed by Powers (1982) as part of the general management plan data-gathering process. Lands previously surveyed were not reinvestigated. Powers recorded over 800 sites (see the "Land Management" section and appendix E).

A number of ruins in the park have been excavated and stabilized. In fact, Chaco has many more square feet of exposed wall fabric than other NPS units in New Mexico and Arizona. Chaco Culture National Historical Park contains 350,000 square feet (32,516 sq m) of exposed wall, as compared to 85,550 square feet (7,948 sq m) at Aztec Ruins National Monument and 75,150 square feet (6,982 sq m) at Canyon de Chelly National Monument. Ruin stabilization is by its nature continuous, so maintenance of prehistoric structures in the park constitutes a monumental task.

Compared to the massive structural remains of later Anasazi periods, the Paleo-Indian, Archaic, and Basketmaker II sites--typically scatters of lithic debris--have very low visibility and have only recently been looked for. Moreover, windblown sands on the mesas and alluvial deposits in the canyon have concealed numerous pre-Pueblo remains. Even Pueblo I period sites are known to be deeply buried, having been revealed in the cutbanks of Chaco Wash. Hayes (USDI, NPS, SWRO 1981, 24) suggests

that probably more than half the pre-Pueblo sites are buried and are therefore not recorded by surface surveys. On the other hand Navajo sites, spanning 200 years of utilization under an economy that required a scattered population, are quite visible and numerous. It is assumed that a larger proportion of the Navajo sites were recorded, as compared to earlier Anasazi sites.

Brugge (USDI, NPS, SWRO 1981, 69) indicates that about a third of the sites surveyed in or adjacent to the former monument had evidence of use during the historic perod. Sites could be assigned in roughly equal numbers to either the late Spanish colonial period, 1750-1820, or the "recent" historical period, 1880-1945, the gap between the periods representing a period of intense warfare. The most common archeological feature of the historic period is the Navajo hogan, followed by corrals and other animal husbandry structures, hornos (ovens), trails and roads, cairns, storage rooms, and rock art. Although remains relating to early archeological efforts have received little attention, the archeological record of Wetherill's trading post, Judd's field camps, the field school's research center and hogans, and the CCC camp are becoming increasingly valuable as part of the history of American archeology.

Navajo Sacred Sites. The last Navajo family residing in the former national monument left in May 1948 (Pierson 1956), but most had been moved out in 1936 or 1937 (Brugge in USDI, NPS, SWRO 1981, 95; see also USDI, NPS, SWRO, Brugge 1980, 486). "In the decades since the fencing of the monument, many of the local white ranchers, or in some cases their heirs, have sold their lands to the Navajo Tribe. As tribal ownership has grown, the country has once again become largely Navajo in population. . . ." (USDI, NPS, SWRO, Brugge 1980, 487).

Although most of the Navajo residing adjacent to the park have adopted elements of industrial American culture, many elements of traditional Navajo culture continue to be practiced. Hence, a review of traditional religious beliefs is pertinent in light of constitutional guarantees of freedom of religion, as reinforced by the American Indian Religious Freedom Act of 1978.

The role models for proper behavior among traditional Navajos come from culture heroes in their mythology (Reichard 1950, 13). Navajos believe that sickness and other maladies result if these models are not followed. Ceremonies to counteract or prevent such supernatural retribution, modeled after mythological examples, constitute a major element of traditional religious practice (USDI, BIA, WRO, Holt n.d.).

Navajo myths and ceremonies are closely tied to the actual physical localities described (Van Valkenburgh 1974). Such mythical places have been utilized for certain ceremonies--as shrines where offerings are left and prayers are made and as gathering areas for ingredients critical to certain ceremonies (Van Valkenburgh 1974; Kluckhorn and Leighton 1948; Franciscan Fathers 1910).

As Holt (USDI, BIA, WRO n.d.) has pointed out, "Particular Anasazi ruins are viewed as major shrines, others as minor shrines, and all retain some aspect of supernatural forces." The origin myths of the Navajo mention many Anasazi ruins (Matthews 1897). For example, mythical wanderers are described passing Kin Ya'a, Kin Bineola, Kin Klizhin, Pueblo Bonito, and Wijiji (Kluckhorn 1967, 159, 166). Pueblo Pintado and Wijiji are important locations in an origin story and in "Pueblo War" stories (Matthews 1897, 195-208). The origin myth of the Kinya'ani clan unfolds at Kin Ya'a, while Pueblo Pintado has similar relevance to the clan Tse'n'ji'kini' (Van Valkenburgh 1974, 38).

Moreover, because Anasazi ruins are places of the dead, they are usually avoided or treated reverently by traditional Navajo. Disturbance of an Anasazi ruin antagonizes the ghosts of those who died there, and Navajo believe that retribution against the violator or an innocent bystander results (Matthews 1897; Reichard 1950; Fransted 1979).

Clay used in certain ceremonies was gathered near Pueblo Bonito (Franciscan Fathers 1910, 410), and chipped-stone projectile points--a revered ritual ingredient--have been gathered from numerous Anasazi sites (USDI, BIA, WRO, Holt n.d.). Prominent topographic features such as Fajada Butte also play a role in Navajo mythology.

Although little research has been devoted to understanding sacred sites in the park area, it is clear that there may be numerous locales within that continue to be sacred to some of the Navajo who live adjacent to the park.

APPENDIX B (from GMP)

Natural Resources

Climate. The semiarid climate of the area is generally dry and sunny, with warm summers and cold winters. Average annual precipitation is only 8 inches, with considerable variation from year to year. Most of the precipitation occurs in locally heavy thundershowers during the summer months. The potential evapotranspiration is greater than the average precipitation. Sunshine occurs about 70 percent of the time, making the area suitable for solar energy uses. Temperatures vary considerably according to season and time of day. Daytime summer temperatures often exceed 90 degrees and winter lows are commonly below freezing. Intense summer sun and heat and winter cold and snow can pose harsh conditions for visitors.

Air Quality. Air quality in the vicinity of the park is generally excellent. Concentrations of sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) are well below state and federal air quality standards (BLM 1982c). Total suspended particulate (TSP) levels are also normally low. Occasional high concentrations of TSP are probably the result of windblown dust. Normally Chaco has the best visibility of any of the 28 NPS monitoring stations in the West. In fact, the San Juan Basin has the best visibility of any area in the contiguous 48 states (USDI, NPS, Yarborough 1982). The region is listed as a class II "attainment" area

Soils. The soils of the canyon bottom consist of textured clay loams and silty clay loams (USDA, SCS 1980). They are deep, slowly permeable soils formed in alluvium derived dominately from sandstone and shale, which are highly susceptible to erosion and piping. The soil cover on the canyon slopes is thin and also easily eroded when vegetation is disturbed. Gentle slopes above the canyon are covered with deep, well-drained loams and silty clay loams. The soils at lower elevations south of the canyon consist of deep loamy fine sands that are somewhat excessively drained. The hazard of soil blowing is severe in and near the park. There are no prime or unique farmlands within the boundary.

Hydrology. Chaco Canyon is drained by Chaco Wash, an intermittent stream, and its intermittent tributary washes. There are a few small, naturally occurring seeps within the park, but Kin Bineola Wash now runs consistently because of uranium mine dewatering 10 miles (16 km) to the south. Flooding happens irregularly in the park, usually as a result of intense upstream thunderstorms, when waters can rapidly rise. When these ephemeral streams flow, suspended sediment concentrations are very high. The floodplains of Chaco Wash are primarily in the incised channels. The floodplain in Gallo Canyon is broader, covering much of the canyon floor and including the existing campground. No other developed area is within the 100-year floodplain (1 percent chance of happening any given year). The visitor center is on the fringe of the 500-year floodplain. There are no wetlands within the park. There is groundwater in the alluvial fill of the canyon bottom at an average depth of about 40 feet below ground level; however, the quality is not suitable for park use. The park water supply is derived from a 3,100-foot (945-m) well drawing from the Gallup sandstone. This artesian water must be cooled and demineralized prior to use for drinking purposes.

Vegetation. Vegetation in the area is sparse because of the dry climate and past overgrazing. The canyon floor is dominated by saltbush and greasewood. Scattered pinyon and juniper are found on mesa slopes, and grasslands occur on the relatively level uplands outside the canyon proper. There are no known federally listed endangered or threatened plant species inhabiting the park. There is a likelihood that Mesa Verde cactus occurs in the area, and there may be some "review" species, which could be listed after studies are completed by the U.S. Fish and Wildlife Service; no official legal status is afforded them until that time. The park has not had a thorough plant survey to discover whether one or more of these species exist.

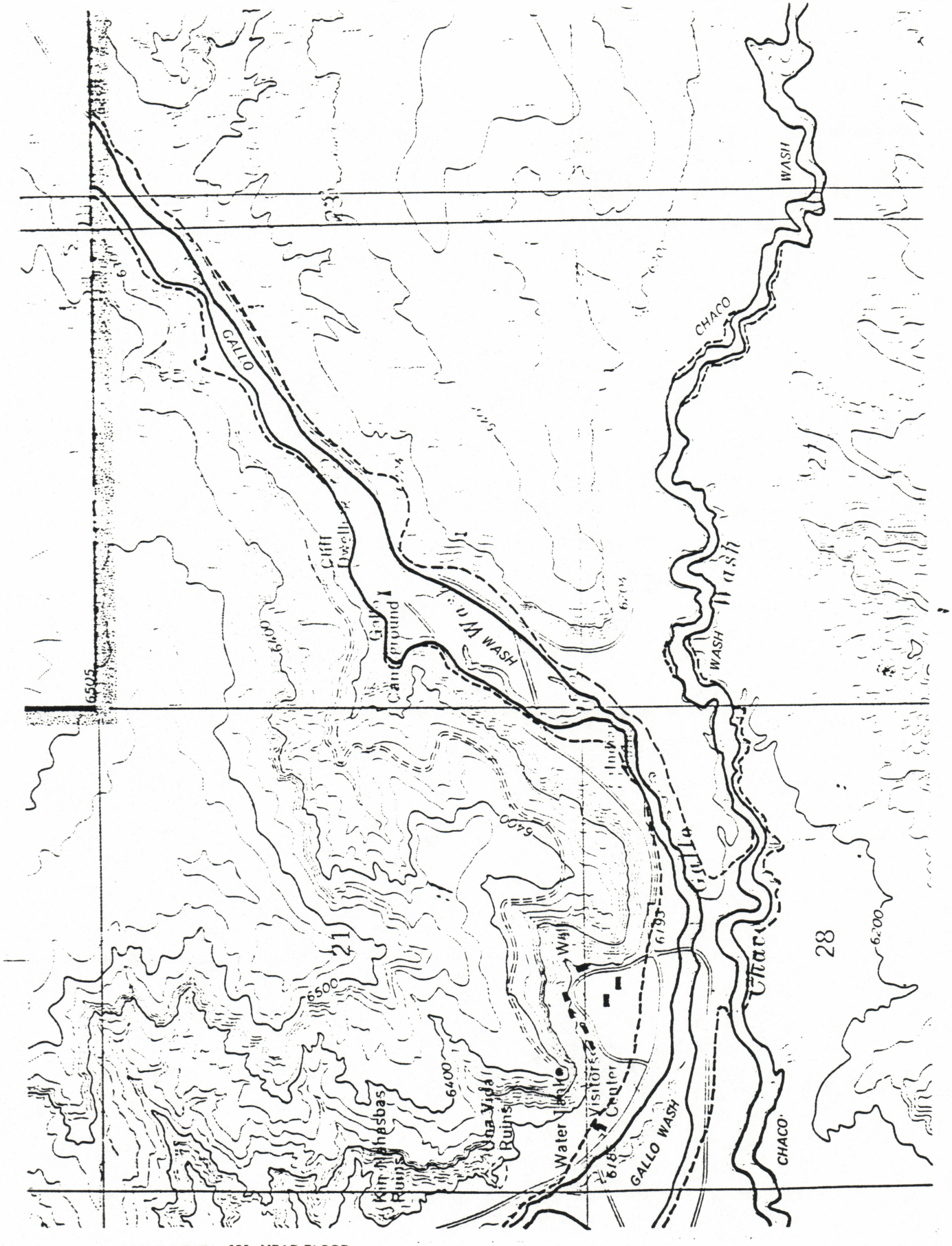
Wildlife. Wildlife species are typical of the habitats described above. Rabbits, mice, and coyotes are common, mule deer are fairly common, and bobcats inhabit the park. Numerous bird species can be found at Chaco, including golden eagles and prairie falcons; peregrine falcons have been sighted in the area on rare occasions. No nesting sites have been documented for any of the raptor species within the park; however, it is suspected that golden eagle and prairie falcon nesting does occur based on the frequency of pair sightings during the nesting season. There are no known federally listed threatened or endangered animal species inhabiting the park. There are two known prairie dog towns in the for air quality by the Environmental Protection Agency. This means that degradation is allowed up to the national ambient air quality standards.

Geology/Minerals. The walls of Chaco Canyon are composed primarily of the Cliff House sandstone, a massive formation that is about 360 feet (110 m) thick in the area. It is underlain by the Menefee formation, which crops out at the base of the canyon walls. The Menefee is a coal-bearing formation. However, the coal beds are highly lenticular, are relatively thin, are generally of low quality, and usually grade rapidly into sandstone (USDI, GS, Dane 1936; New Mexico BMMR 1971). A small abandoned coal mine is within the former monument boundaries southwest of Pueblo del Arroyo. The coal was probably used for local domestic purposes. The excessive overburden and limited thickness make these coal beds in the park uneconomic for strip mining (New Mexico BMMR 1971). The limited deposits and relatively low quality of the also make underground mining unlikely. The potentially more valuable Fruitland formation coal is north of the park boundaries. These conclusions are based on surface evidence and some very limited drilling data. There may be unknown coal resources of greater value in the park, although it appears unlikely. While the Kin Ya'a unit is underlain by the Dilco coal member, it is deeply buried in the area and is also of limited potential (New Mexico BMMR 1971). There is no evidence of coal in the Kin Bineola unit.

The entire park is classified as prospectively valuable for oil and gas by the Bureau of Land Management, meaning that there are geologic formations in the area that have potential for oil and gas deposits. There are no known geologic structures (KGSs) within park boundaries. (A KGS is a subsurface geologic structure identified as having significant potential for oil and gas production.) There are three KGSs within 10 miles (16 km) of the park to the northeast, east, and southeast. There are no oil or gas wells within the park boundaries. There has only been one exploratory drilling operation in the park, in the Chacra Mesa addition, which produced a dry hole.

The U.S. Department of Energy has identified the park area as having potential for uranium resources (USDE, MAD, GJO 1982). The park is estimated to have possible and probable resources but only at a forward cost of $50/lb. U_3O_8 or more. This is above the current depressed market rates. Favorable environments for uranium deposits exist in the Morrison formation but at a depth of 4,000-5,000 feet (1,200-1,524 m) in the area of the park (Bendix 1980). The marginal nature of the resource is reflected by the fact that all 1872 mining law claims within the park boundary (presumed to be for uranium) have been relinquished or abandoned. The exception is the Kin Ya'a unit, which is 25 miles (40 km) south of the main portion of the park and currently under lease for uranium extraction. Mineralization in that area occurs at a depth closer to 1,000 feet (305 m). Other than at Kin Ya'a, no uranium development has occurred within the park.

More detailed information on geology and minerals can be found in the Chaco Land Protection Plan.



100 - YEAR FLOOD

500 - YEAR FLOOD

0 1000 2000 FEET

0 300 600 METERS

N

SOURCE: SIMONS, LI And ASSOCIATES., 1982

FLOODPLAINS

CAMPGROUND - VISITOR CENTER

CHACO CULTURE NATIONAL HISTORICAL PARK

UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

310	20022B
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APPENDIX C (from LPP)

MINERAL/ENERGY RELATIONSHIPS

Background

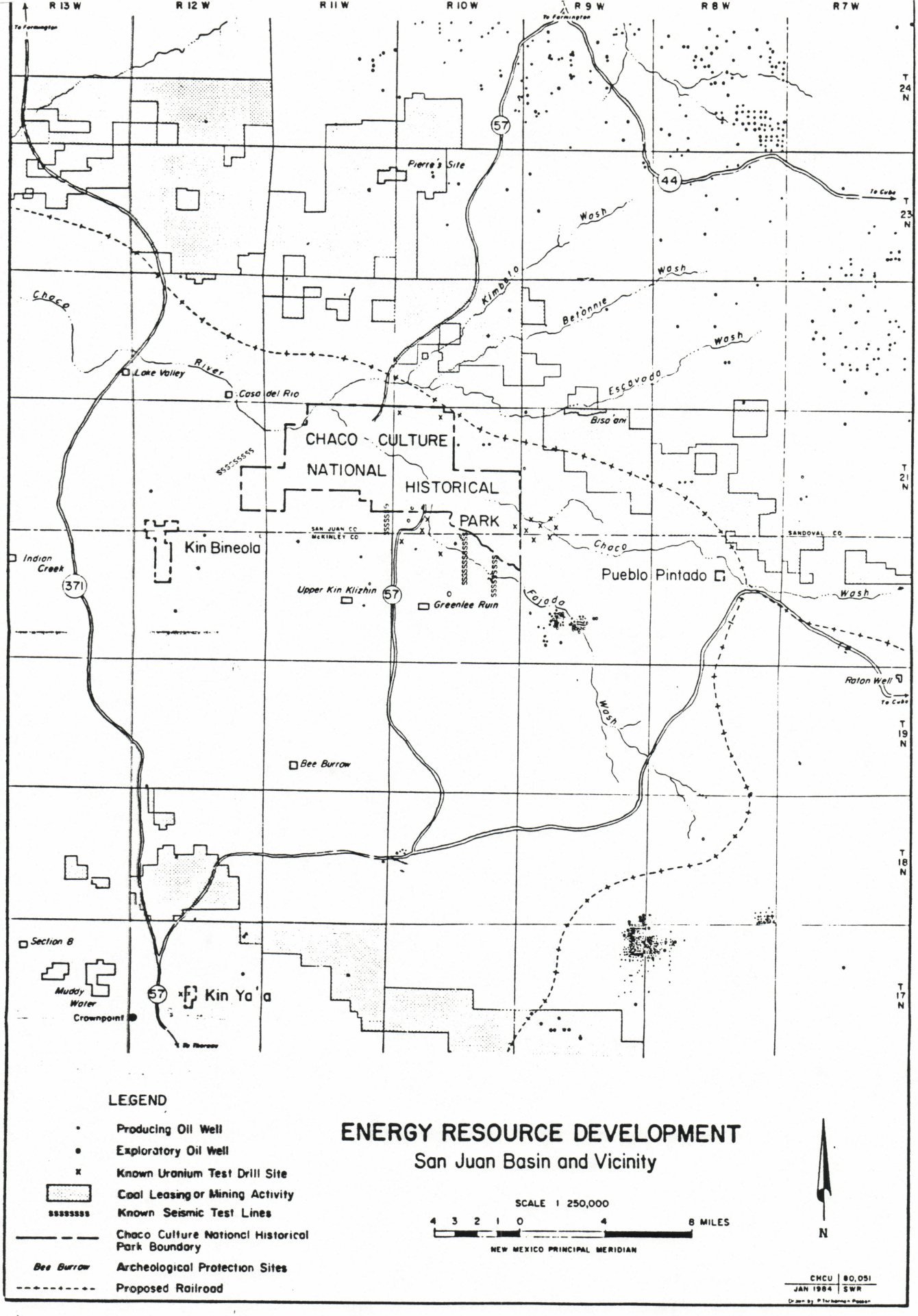
All 1980 addition lands, including those transferred to the Park Service from other federal agencies, have outstanding subsurface interests. Most lands are split estates, that is, the surface owner does not own the subsurface. Additionally, 1,437 acres of the former monument have outstanding subsurface interests. The federal subsurface tracts are closed to any new entry effective December 1980. However, these tracts are subject to existing leases that may not expire if the lessee develops his interest before the expiration date. This applies on approximately 3,738 acres, primarily in the Chacra Mesa and northern additions. The other federal subsurface interests are administered by the Bureau of Indian Affairs under legal provisions (including Allottee Mining Act of 1909) that require that interests be managed to the economic benefit of individual Indians or the tribe for whom title is held by the federal government. This includes approxiately 1,120 acres, of which approximately 800 acres are not currently leased. The state of New Mexico has similar requirements for economic benefit on its 1,769 acres. Besides the Bureau of Land Management, Bureau of Indian Affairs, and state, private individuals have subsurface tracts that are leased or are open to leasing.

Potential Mineral/Energy Resources

Although no deposits having current economic value have been located under authorized lands, the potential exists under all authorized lands, as indicated by widespread leasing.

Coal. In 1980 the Bureau of Land Management published a coal resource map that includes all lands within the park as "areas of potential coal occurrence." In the category of "areas of high coal development potential" are lands near the north boundary of the main unit and the Pueblo Pintado unit and north and south of the Kin Ya'a unit. In 1978, the U.S. Geological Survey identified lands now in the Kin Bineola unit as within a known recoverable coal resource area. The Kin Klizhin addition is on the margin of this formally designated area. Small, low-grade coal seams occur throughout the unit; in August 1979 BLM geologists inventoried a coal seam in the southern addition.

Plans have been approved for coal leasing under BLM's preference right lease applications and competitive leasing system within 3 miles of the park's north boundary. The state of New Mexico's Mining and Minerals Division has mapped Chaco as part of a coal field and has issued 10 permits for coal strip mines within 20 miles of the park (as of August 1983). Three more mines are listed as being in planning stages. All this activity is occurring at a time when the market is depressed. It is expected that activity in the area will substantially increase if the market improves.


R 13 W
R 12 W
R 11 W
R 10 W
R 9 W
R 8 W
R 7 W
T 24 N
T 23 N
T 21 N
T 19 N
T 18 N
T 17 N
To Farmington
To Cuba
57
44
371
Pierre's Site
Wash
Kimbeto
Betonnie
Escavada
Bisa'ani
Chaco
River
Lake Valley
Casa del Rio
CHACO CULTURE
NATIONAL
HISTORICAL
PARK
SAN JUAN CO
MCKINLEY CO
SANDOVAL CO
Kin Bineola
Indian
Creek
Upper Kin Klizhin
Greenlee Ruin
Pueblo Pintado
Falodo
Raton Well
Bee Burrow
Section 8
Muddy
Water
Crownpoint
Kin Ya'a
LEGEND
Producing Oil Well
Exploratory Oil Well
Known Uranium Test Drill Site
Coal Leasing or Mining Activity
Known Seismic Test Lines
Chaco Culture National Historical Park Boundary
Archeological Protection Sites
Proposed Railroad
ENERGY RESOURCE DEVELOPMENT
San Juan Basin and Vicinity
SCALE 1 250,000
4 3 2 1 0 4 8 MILES
NEW MEXICO PRINCIPAL MERIDIAN
N
CHCU | 80,051
JAN 1984 | SWR

Uranium. During 1978-79 the Department of Energy undertook a project to locate and evaluate uranium resources along the margins of the Grants mineral belt, which extends into the Chaco Canyon area. Although the official report is not available, contacts with the field geologists during the drilling revealed that uranium is present under Chacra Mesa and the southeastern corner of the park. With current technologies it is uneconomical to extract these localized, relatively low-grade ores from depths of 4,000+ feet. Since 1979, the uranium market has been severely depressed. If market conditions improve, research into newer extraction technologies could occur. Coupled with better area access, some of the ore bodies may become economical. Within the Kin Ya'a unit, a company is extracting uranium ores that were not economical even five years ago, using a solution mining process that is still in the experimental stage.

A private company drilled two uranium exploration holes in the northern addition in 1979. Onsite geologists told park staff that uranium was present, but it was not economically feasible to extract the resource in the foreseeable future. The company subsequently abandoned their claims within the northern addition, after destroying three segments of prehistoric road and one archeological site that are now within the park. Approximately 12 to 14 acres within the northern addition were disturbed without adequate reclamation or additional knowledge of the park's cultural resources.

As mentioned, uranium exploration occurred in the Kin Ya'a area before 1980, and resource extraction is occurring within that unit. So far, all inventoried sites have been avoided by both exploration and extraction activities. The possibility exists that there are cultural resources in this unit for which no present methods of detection are available. Some of these as yet undetected resources have probably been affected (see discussion of cultural resources under "Resource Significance" section).

Oil and Natural Gas. Within 20 miles of the park are four oil-producing areas and one well that is capped, pending improved access, market, and/or technology. Most of the fields in the immediate area must use secondary production techniques. One such operation is 1½ miles from the park boundary, and three pumps are in operation. Production is expensive because of maintenance of fluid injection pumps, heaters on the pipes and storage tanks, isolation on dirt roads, and rights-of-way for access.

Since the well operations near the park boundary began in 1978, there have been difficulties in obtaining compliance with state and/or tribal permits. The collection pits have never been in compliance with safety or engineering requirements and have broken on at least three occasions. During one event, in April 1979, the sludge fluids flowed into the park, causing destruction of vegetation and animal habitat.

The park's records document 11 wildcat wells being drilled within 3 miles of the boundaries since 1978. Some of these are known to have been dry holes from onsite contacts; others may simply be capped pending access and market improvements. During October-November 1983, a seismic exploration company used heavy machinery including bulldozers to put in four seismic lines adjacent to the park's boundaries (see Energy Resource Development map). One line trespassed approximately ¼ mile into the

southern addition despite the National Park Service's efforts to work with the company to avoid trespass. One archeological site within the unit was damaged. The Navajo tribe, as the permitting agency, was unable to effectively control operations as required by the permit: Operations proceeded without the required presence of an archeologist; the seismic lines were moved from locations indicated on maps attached to the permit; and reclamation was not undertaken until after penalities were imposed. On the well exploration sites near the park, the only reclamation that has been accomplished is some landscaping. Drill pads may be visible years later as changes in vegetation occur or areas become eroded.

The Chaco area is open and has little vegetation to muffle sound. Exploration activity within 3 miles of the park has resulted in some impacts on the visitor experience. Noise from drilling activities has been heard in the campground and in the backcountry from as far away as 4 miles. Derricks are visible for many miles. If exploration or development activities occurred within the park, the disruption of visitor experiences would be much more pronounced.

Of the 44 outstanding subsurface tracts depicted in appendix A, 16 are owned in fee or by allottees. All the remaining oil, gas, and mineral leases may be encumbered for a significant period of time if the leases go into production. BLM federal oil and gas leases define the rights of a lessee as follows:

> The lessee is granted the exclusive right . . . to drill for, mine, extract, remove and dispose of all oil and gas deposits . . . in the lands leased, together with the right to construct and maintain thereupon, all works, buildings, plants . . . roads . . . pipelines, reservoirs, tanks, pumping stations, or other structures necessary to the full enjoyment thereof, for a period of 10 years, and so long thereafter as oil or gas is produced in paying quantities. [Underline added.]

Many BIA leases have similar provisions.

Effects of Mineral Entry on Park Resources

Effects of resource extraction entry on park resources can roughly be divided into three categories: exploration--short-term impacts; exploration--long-term impacts; and development impacts.

Exploration--Short-Term Impacts. Most exploration sites involve 3 to 7 acres of land for the drill pad and 2.4 acres per mile for road access. Some activities require more land for the drill pads, depending on type of drilling activity and the need for collection pits. During the exploration activity, there is loss of topsoil (which is very shallow in this type of desert) and potential for erosion. Because of the open terrain, visual intrusions could only be mitigated in a few areas of the park, and it might not be possible to mitigate noise intrusions except in the extreme west end of the park.

If the Park Service was unable to enforce its oil and gas development regulations (because of lack of control of access or lack of surface ownership), the reclamation practices common in the San Juan Basin would be employed--scarifying compacted pads and access roads to promote the reestablishment of native plants. Often, Russian thistle (an exotic) takes over for one to three years, with a very slow reinvasion of other exotics and some native species. Even where the Park Service could require relandscaping and planting, the plant species that would dominate for many years would not approximate natural conditions (see discussion of long-term impacts below). Current revegetation practices are designed to provide good range cover to retain topsoil and to provide for grazing rather than to reestablish native conditions.

Exploration--Long-Term Impacts. Archeological resources might be irretrievably lost as a result of exploration. Any resulting mitigation or salvage requirements would be designed to quickly gain a basic understanding of a site; however, this information would not be as comprehensive as that obtained through research designed by the National Park Service. Such research typically takes much longer to perform than mitigation or salvage. Although it might be possible to mitigate any impacts of exploration in a month, it might take a year or longer to properly research the same site to gain maximum knowledge. Comprehensive research was clearly the intent of Congress in establishing this unit of the national park system. The congressional hearings on PL 96-550 indicated an expressed interest in establishing a scientific laboratory where the mitigation of impacts would not be the basis for collecting information.

Perhaps even more important to the purposes of the park would be the long-term impacts that the entry would have on site identification. Many of Chaco's archeological sites are initially identified by observing vegetation anomalies, either from the ground or in aerial photos. Even small features such as canals (less than two feet wide) can be identified, and large features such as prehistoric roads (average 30 feet wide) are readily identifiable. Since new techniques for identifying sites are still being developed (see the "Purpose" section), and new sites are still being sought and found, it is critical that no masking of these features be allowed to occur. Archeologists are successfully identifying man-made scars or disturbances that are close to 1,000 years old. Man-caused disturbances occurring today could obliterate clues to prehistoric sites or create confusion and misdirect research.

Development Impacts. All impacts discussed above would be present but intensified. Any development would be a long-term intrusion on the cultural/natural scene of the park. The extraction of resources requires much more area than exploration does: Tank batteries, pipelines, collection pits, power sources, maintenance facilities, and transportation facilities can require 15 or more acres, depending on the nature of the resource and production methods employed. Even with ideal situations, such activities could directly disturb or destroy up to three sites and indirectly affect other sites by opening new areas of the park to vehicle/public traffic.

Summary of Impacts. Mineral exploration and development activities involve practices that impact natural resources in direct and indirect ways. Seismic lines, roads, drill pads, shafts, and pits all affect the terrain and the natural system it supports. First, saltbush and associated shrubs and grasses are removed and replaced by bare patches of ground. If this ground is permitted to return to a vegetated state, exotic plant species, notably Russian thistle, dominate. Roads unused in the park for over 30 years are still visible because they have become dominated by thick stands of thistle, and it is probable that disturbed mineral sites would also be revegetated with species that are undesirable from a National Park Service management perspective. Revegetation and restoration of disturbed lands require continuous and active exotic eradication efforts and plantings.

Because of the magnitude of the problem and tenacity displayed by exotics, no work has been done to replace exotics in this area with native plant communities. However, based on observations of previously disturbed sites, it is assumed that, in general, any new mineral exploration and development would result in the loss of native plant cover and its replacement by exotics, with little chance of community restoration without extensive work. Even efforts to mechanically remove the scars on the terrain would probably exacerbate the problem of exotics.

Second, impacts of these activities on soils cause denudation, exposure to wind and water erosion, and compaction. Efforts can be made to partially mitigate these effects with the use of the best engineering practices. Before these destructive activities could be permitted, determination of the best engineering practices and compliance with them would have to be required.

Third, exploration and development would have impacts on air quality. Chaco is a class II area, with certain limits for allowable pollutant increases established by law. Generation of fugitive particulate emissions would result from the operation of heavy equipment, vehicles, and blasting. These emissions could be reduced in part by such practices as road watering. However, even under the best control, there would still be an increase in fugitive particulate emissions.

Fourth, the presence of mineral-related activities would impact wildlife. Direct impacts on raptors and large ungulates would be matched by similar impacts on small rodents or vegetation on which the whole community depends.

In summary, terrain disturbance associated with mineral activity would inevitably impact cultural and natural features in this park. There is no way terrain disturbance could avoid such impacts. The effects could be minimized, but that minimum would still be severe and would degrade park values. Mitigation could reduce the level of damage but not restore the natural community in the short run. Given the aridity of this climate and the thin soils, recovery would be slow at best.

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