NR files

FORT UNION NATIONAL MONUMENT

RESOURCE MANAGEMENT PLAN

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INTRODUCTION

This Resource Management Plan is intended as the strategic planning document for management and preservation of the natural and cultural resources of Fort Union National Monument.

The Overviews rank resource management problems in priority order and state the significance of each. Problem statements, analysis of alternative actions, and recommendations are presented in the Natural and Cultural Resources Program sections. This plan serves the Superintendent and Unit Manager as a manual for management activities.

Statement for Management

Fort Union National Monument was authorized by Public Law 429, 83rd Congress, approved June 28, 1954, and established on April 5, 1956, to preserve, protect and provide public access to the site and remaining structures of "Historic Old Fort Union".

The National Park Service Organic Act (1916) further defines the monument's purpose as "...to conserve the scenery and the natural and historic objects and the wildlife therein, and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

Significance of Fort Union

The significant resources of Fort Union National Monument include the site locations of three successive forts used from 1851 to 1891, adobe and stone remains of the Third Fort Union and Arsenal, earthworks of the Second Fort, some foundation remains of the First Fort, a collection of over 9,000 museum specimens, and ruts of the Santa Fe Trail.

Fort Union was established along the Mountain Branch of the Santa Fe Trail 100 miles northeast of Santa Fe. Local inhabitants, as well as Santa Fe Trail travellers, looked to the soldiers of Fort Union for protection from the warring factions of the Jicarilla Apache, Ute, Navajo, Kiowa, and Commanche tribes. Besides being a point of defense and protection, Fort Union served as a supply depot. Army contract freight wagons carried the massive amounts of foodstuffs, equipment, weapons, and ammunition down the Santa Fe Trail to supply the farflung American outposts in the Southwest.

In 1880, the Santa Fe Railroad arrived in Santa Fe, and a major reason for Fort Union's operation was gone. Fort Union was abandoned in 1891, after 40 years of military operation.

Sixty-three years of neglect ended in 1954 with the establishment of Fort Union National Monument. The main 640 acre section includes the site of the Second Fort (Star Fort), with perimeter ditches still visible, and sixty-three adobe buildings of the Third Fort. An 80-acre detached section a mile to the west encompasses the historic grounds of the First Fort and includes fragmentary foundations of that fort as well as the adobe ruins of the Arsenal affiliated with the Third Fort. Santa Fe Trail ruts also remain within monument boundaries.

RESOURCE MANAGEMENT PLAN PROGRAM OVERVIEW

NATURAL RESOURCES PROGRAM OVERVIEW

As a historic area, Fort Union National Monument in the past concentrated its research on studies of a purely historic nature. A minimal amount of information is available on climate, common vegetation, animal sightings, surrounding landforms, ecosystems, and/or influences of any of these factors (past or present) on the area.

It is becoming increasingly obvious that natural features and influences play a significant role in the management of Fort Union National Monument's historic resources, and that basic information is necessary for sound management, preservation of historic features, and interpretation of the historic scene.

The studies are essential for the development of realistic plans for preservation of historic ruins and remnants of the Santa Fe Trail. Without information on animal activity, composition of plant populations, weather, etc., there is danger of losing both natural and historic resources.

Five-year Natural Resource Programming Sheets are included in Appendix F of the document.

Prioritization of Natural Resource Plans

Although very basic observation data is now being compiled by park staff, more detailed, systematic study is necessary. The Natural Resources Plans are prioritized as follows:

1. FOUN-N-1: Natural Resources Base Inventory
2. FOUN-N-6: Integrated Pest Management Plan
3. FOUN-N-7: Historic Scene Management Plan
4. FOUN-N-5: Flood Hazard Study

The following projects have been deleted:

FOUN-N-2: Climatological Data Collection
FOUN-N-3: Historic Vegetation Baseline Data (completed)
FOUN-N-4: Wildland Fire Management Plan
FOUN-N-8: Construct Windbreak in Residential Area

Overview of Prioritized Plans

FOUN-N-1: Natural Resources Base Inventory -- The absence of a basic natural resources inventory makes sound management planning and decision making difficult. This project would initiate research to provide a natural resources inventory and data base for the following parameters: Area flora, area fauna, hydrological features, climatalogical data (historic and current), and soils. Projected Work Years = 1.0; Cost = $20,000.

FOUN-N-6: Integrated Pest Management Plan -- Past pest management has been approached on a case-by-case basis, and there is no park specific data from which managers can anticipate problems and make informed decisions. This project would develop an Integrated Pest Management Plan addressing current and potential pest problems. It will serve as a management tool for monitoring, problem evaluation, treatment selection, and recordkeeping. Projected Work Years = 0.1; Cost = $1,000.

FOUN-N-7: Historic Scene Management Plan -- The General Management Plan identifies preservation of the historic scene as a key management objective. Several natural and anthropogenic features comprise the 'historic scene' at Fort Union National Monument. These include vegetative cover, historic roadways, features of the three forts (the Star Fort, adobe ruins, post corrals, beef corrals, etc.), and the rural landscape. Research conducted under project FOUN-N-3 (Schackel, 1983) determined that the grassland ecosystem may be threatened should pinon pine, juniper and other shrub species encroach. This study recommends prescribed fire as a management tool for maintaining the present grassland ecosystem. This project recommends that additional research be conducted in order to develop a Historic Scene Management Plan which will define actions and guidelines needed to maintain all aspects of the historic scene. Projected Work Years = 0.3; Cost = $12,000.

FOUN-N-4: Flood Hazard Study -- This project would identify areas subject to potential flooding and recommend mitigating actions to reduce damage to property and prevent loss of life. The plan is needed to comply with Executive Order 11988, Floodplain Management. Projected Work Years = 0.3; Cost = $10,000.

CULTURAL RESOURCES PROGRAM OVERVIEW

A variety of management techniques have been implemented since the establishment of Fort Union National Monument in an attempt to preserve the historic resources. Much of the past preservation work involved the use of artificial stabilization agents (cement, chemicals, silicone treatments), most of which have proved incompatible with the original materials and methods of construction.

Limited excavation was performed in the 1960s primarily in the vicinity of the privies, dumps, and Officers' Quarters. Extensive stabilization was also performed at this time. Company Quarters, Star Fort, First Fort foundations, etc., remain unexcavated.

The ruts of the Santa Fe Trail, recognized only in recent years as a significant resource, remain a prominent feature within and near the monument.

Primary needs are for research, both into unexplored aspects of the construction and operation of the fort at various periods, and into practical techniques of adobe ruins preservation. Data is needed to support future preservation work as well as interpretation and curatorial work.

In addition, there is a need to protect the historic scene from encroachment by incompatible developments on adjacent lands. An effort should be made to negotiate a cooperative agreement with the adjacent landowner to achieve this end, as per the recommendations of the General Management Plan.

Five-year Cultural Resource Programming Sheets are included in Appendix F.

Prioritization of Cultural Resource Plans

In order to assure that management objectives are met, it is necessary to identify all historic and archeologic resources, and provide for adequate treatment and protection for ruins and cultural artifacts. Eight plans are hereby indentified by the Cultural Resources Program, and are placed in priority below. In addition, the top five plans are summarized in this overview.

1. FOUN-C-2: Ruins Preservation Research
2. FOUN-C-1: Stabilization of Historic Adobe Walls and Stone Foundations of the Third Fort and Arsenal
3. FOUN-C-6: Historic Resources Study and Historical Base Map
4. FOUN-C-11: Historic Structure Reports
5. FOUN-C-7: Meet Curatorial Storage Requirements
6. FOUN-C-4: Historical Research
7. FOUN-C-12: Collections Condition Survey
8. FOUN-C-13: Archaeological Overview and Assessment

The following projects have been deleted:

FOUN-C-3: Santa Fe Trail Ruts
FOUN-C-5: Preparation of Collections Management Plan
FOUN-C-8: Star Fort Management Program
FOUN-C-9: Oral History Project
FOUN-C-10: Tracking and Monitoring Project, Third Fort Adobe Walls

The following projects have not been included in the Resource Management Plan at this time, but may be considered in future revisions. The reasons for exclusion are stated below:

--Ethnographic Overview and Assessment
This plan will not be developed unless FOUN-C-13 finds positive evidence of ethnographic use and suggests the value of additional research.

--Ethnographic Field Study
This plan will not be developed unless an Archaeological Overview and Assessment finds that it is needed.

--Recording of Cultural Objects
At present FOUN has only a minimal backlog of items to be entered into the National Catalog. When the monument acquires IBM compatible hardware and DBaseIII software, a great deal of work will be needed to enter all 9,000+ catalog numbers into the National Automated Catalog System. Such an acquisition will warrant inclusion of this project into the RMP.

--Administrative History of Fort Union National Monument
Two administrative histories have been completed. These include "Fort Union National Monument: Its Origin, Development and Administration" by Donald D. Mawson (1961), and "Fort Union National Monument, New Mexico: The First Twenty-Five Years" by Douglas Croy (1984). The need for an aditional Administrative History has not been demonstrated.

Overview of the Top Five Prioritized Plans

FOUN-C-2: Ruins Preservation Research -- Ruins include only remnants of adobe walls and stone foundations, all of which are constantly exposed to the effects of weathering. There is currently no known technique capable of meeting management preservation objectives under these conditions. This plan calls for conducting research on adobe composition and weathering characteristics, as well as analysis of various treatment technologies. In addition, the plan calls for a comprehensive Preservation Guide which will ensure appropriate evaluation and treatment of the ruins for long-term preservation. Projected Work Years = 0.7; Cost = $20,000.

FOUN-C-1: Stabilization of Historic Adobe Walls and Stone Foundations of the Third Fort and Arsenal -- Historic adobe walls and stone foundations, which together constitute the primary resource, are exposed to the elements and are deteriorating rapidly. A long term preservation plan is needed to establish guidelines and priorities for stabilization. The plan should also identify emergency preservation work needed on all structures, and establish a schedule of annual maintenance necessary to keep the walls and foundations at acceptable standards of appearance and safety. Projected Work Years = 1.9; Cost = $60,000.

FOUN-C-6: Historic Resources Study and Historical Base Map -- While active, Fort Union encompassed a military reservation of some 41,000 acres. The historic data base is still sketchy on some sites within the monument, and on most sites outside the present boundaries. This plan recommends that an archaeologic survey be conducted and a historical base map prepared. The project should include information on the significance and location of sites, historic and prehistoric, as well as documentation. Projected Work Years = 2.6; Cost = $100,000.

FOUN-C-11: Historic Structure Reports -- The ruins of the First Fort lie buried beneath and among the ruins of the Third Fort Arsenal. Although maps exist diagramming each component, the exact location and use of many structures are not known. No maps exist showing the location of First Fort sites in relation to still standing Arsenal ruins. Another component, the Star Fort, was constructed in 1861. Very little is known about its construction, day-to-day operations, and final outcome. Management planning and interpretation concerning these areas are sorely lacking. As time progresses this information will be increasingly difficult to obtain. FOUN-C-9 calls for a surface survey and preparation of historic structure reports for the Arsenal, Star Fort and First Fort. The need for a map showing the geographic relationships of the structures involved is also identified. Projected Work Years = 0.9; Cost = $30,000.

FOUN-C-7: Meet Curatorial Storage Requirements -- The FOUN curatorial collection is now stored in a converted maintenance storeroom not meeting NPS guidelines for collections storage. Some specimens have been damaged in the past due to inadequate environmental controls. Curatorial work space is virtually non-existent. The plan calls for the construction of a curatorial storeroom as identified in the approved Fort Union General Management Plan. Projected Work Years = 1.6; Cost = $211,000.

NATURAL RESOURCE MANAGEMENT PLANS

FOUN-N-1
Natural Resources Base Inventory

Project Statement

No base inventory of natural resources exists for Fort Union National Monument. The absence of basic population data constitutes a void in the information needed for sound management plans and decisions.

Alternative Actions and Probable Impacts

1. No action. Management decisions will continue to be based on incomplete data and assumptions.

2. Collect data relevant to northeast and north central New Mexico, and rely on general ranges of plant and animal populations in management of Fort Union National Monument. This method fails to account for specific habitats, and possible presence of threatened and/or endangered species.

3. Survey the most obvious plant and animal inhabitants, sufficient to answer visitor inquiries and provide for visitor and employee safety. This method ignores ecological relationships and the possible presence of threatened or endangered species.

4. Conduct detailed research and establish a computer-based natural resources inventory from which management decisions can be made.

Recommended Course of Action

Alternative 4 most closely meets the needs of the area. This alternative also conforms to the requirements of the approved General Management Plan. Initiate research projects to establish a natural resources inventory and data base. Prepare a map series to integrate this data and allow for analysis of resource parameters and relationships. Studies necessary to provide such an inventory include:

> Area Flora -- All vascular and significant non-vascular plants. Special note should be made of plants with unusual visitor, scientific, or economic interest, and of any threatened or endangered species. An effort should be made to identify plant species within the boundaries which could be indicators of environmental change.

Area Fauna -- All vertebrates and significant invertebrates. Special note should be made of species of unusual visitor, scientific, or economic interest, and of any threatened or endangered species. A special study of the snakes should be done to determine the impact of the current Snake Management Plan. Potential pests such as rodents and insects should be identified and potential treatments suggested for incorporation in a park Integrated Pest Management Plan.

Hydrological Study -- All hydrological features in the monument, i.e. perennial and intermittent streams, and groundwater. Investigate also the past activity of these features.

Climatological Study -- Gather and analyse historic and current weather data to determine past and present trends. Determine what additional data will be useful for future analysis, especially climatic parameters which could have an effect on ruins preservation. This should include monitoring of acid rain levels and identification of air pollutants.

Soil Analysis -- Soil structure and moisture holding capacity, for application to management of both natural and cultural resources. Field sheets of the existing soil to the level of association and series, which are scheduled to be published by the Soil Conservation Service in 1986, should be used in studying soils in the monument.

FOUN-N-2
Climatological Data Collection

FOUN-N-2 has been deleted as a separate project. Components of this project have been incorporated in FOUN-N-1 and FOUN-C-2.

FOUN-N-3
Historic Vegetation Baseline Data

This project, undertaken by Sandra Schackel, was completed in October 1983. The resulting report, Historic Vegetation at Fort Union National Monument, has become a useful reference document.

FOUN-N-4
Wildland Fire Management Plan

FOUN-N-4 is currently under preparation. As it is anticipated that the plan will be completed during FY88, it is hereby deleted from this document.

FOUN-N-5
Flood Hazard Study

Project Statement

Executive Order 11988, Floodplain Management, requires that federal agencies take appropriate measures to mitigate flood threats to critical facilities. No flood hazard study exists for lands within Fort Union National Monument. Historic structures (adobe and stone remains of the Third Fort) as well as modern facilities (employee quarters, maintenance shop, utility systems, and sewer lagoons) appear to be subject to flood damage. A series of flood hazard boundary maps prepared in 1977 by the U.S. Dept. of Housing and Urban Development shows 100-year flood areas for Mora County. However, Fort Union National Monument was excluded from the maps. Several potentially hazardous areas are shown at or near the boundaries of the monument. Flooding could result from Wolf Creek, located adjacent to the monument entrance, or from arroyos originating outside but continuing inside the monument.

Alternative Actions and Probable Impacts

1. No action. If no study is conducted, facilities will continue in use in their present locations, without proper precautions. Sudden flooding could result in loss of cultural resources and government facilities, visitor and employee injuries or fatalities, and pollution of surface and groundwaters.

2. Conduct flood hazard study to identify actual hazards so that mitigating measures can be implemented.

Recommended Course of Action

Alternative 2 is the only alternative to meet the requirements of Executive Order 11988. A flood hazard study will be conducted to define 100 and 500-year floodplains and determine threats to monument resources and facilities. The study should also recommend mitigating measures to be implemented.

FOUN-N-6
Integrated Pest Management Plan

Problem Statement

The current approach to pest control at Fort Union National Monument involves addressing problems as they occur, or anticipating problems and implementing mitigating actions on a case-by-case basis. The IPM coordinator consults with other specialists in seeking solutions to problems. However, there is no park-based data from which managers can anticipate pest problems and make informed decisions.

Alternative Actions and Probable Impacts

1. No action. Pest problems will continue to be approached on a case-by-case basis. Recurring problems will continue to be anticipated and thus some mitigating actions may be implemented in advance. The overall effect of treatments on pest populations and other ecosystem elements will not be documented. Some pest problems will not be recognized until after considerable damage has occurred to park resources.

2. An Integrated Pest Management Plan will be developed for Fort Union National Monument. The plan will include pests likely to be encountered, elements of habitat, related species, known biotic controls, alternative controls, and chemical controls. Known monitoring techniques and recommendations for each identified pest will also be included. Information regarding chemical treatment will include possible effects on other populations, health concerns, application techniques, etc. The plan will include recordkeeping requirements. It will provide information necessary for decision making while maintaining a holistic approach to ecosystem management.

3. Contract pest control service for periodic inspections and control. Traditionally, these companies utilize chemical controls as a 'first line of defense.' Service would not be provided on a frequent enough basis to note subtle changes in pest populations. According to current management guidelines, the use of contracted service out of the context of an integrated pest management plan is not acceptable.

Recommended Course of Action

Develop an Integrated Pest Management Plan specifically addressing current and potential pest problems at FOUN. This is the only course of action that fully meets park needs and management requirements.

FOUN-N-7
Historic Scene Management Plan

Problem Statement

The General Management Plan identifies preservation of the historic scene as a key management objective. Several natural and anthropogenic features comprise the 'historic scene' at Fort Union National Monument. These include vegetative cover, historic roadways, features of the three forts (the Star Fort, adobe ruins, post corrals, beef corrals, etc.), and the rural landscape. Research conducted under project FOUN-N-3 (Schackel, 1983) determined that the grassland ecosystem may be threatened should pinon pine, juniper and other shrub species encroach. This study recommends prescribed fire as a management tool for maintaining the present grassland ecosystem. Additional research is needed in order to develop a Historic Scene Management Plan which will define actions and guidelines needed to maintain all aspects of the historic scene.

Alternative Actions and Probable Impacts

1. No action. The historic scene may gradually alter its character over the years. Vegegation will contine to encroach on historic features, making them more difficult to discern and interpret. Other changes may occur which adversely affect the Star Fort, historic roadways, etc. The historic scene will gradually be altered, and therefore GMP recommendations not met.

2. Prepare a Historic Scene Management Plan which will identify management techniques to be used in order to preserve the historic scene. Utilize the recommendations already made within the Historic Vegetation Study. Incorporate new recommendations needed to preserve the Star Fort, historic roadways, etc. Begin implementation of the Plan upon approval.

Recommended Course of Action

Alternative 2 is the only course of action which stays within the guidelines established by the General Management Plan. Prepare and implement a Historic Scene Management Plan. Utilize recommendations already identified within the Historic Vegetation Study, including the use of prescribed fire. Establish controlled areas to determine rate and extent of change. Monitor treated areas and historic features to assure that objectives are achieved. Incorporate a plan for management and use of the Star Fort. Maintain ongoing files and prepare bi-annual reports to document implementation.

FOUN-N-8
Construct Windbreak in Residential Area

FOUN-N-8 is hereby deleted. Further study is needed to determine the appropriateness of the General Management Plan recommendations regarding the introduction of such a windbreak.

CULTURAL RESOURCE MANAGEMENT PLANS

FOUN-C-2
Ruins Preservation Research

Problem Statement

The ruins of Fort Union include remnants of adobe walls and stone foundations. None are complete structures, and none are protected in any way from the effects of weathering. At this time there are no effective means of preserving adobe under such conditions, while maintaining any semblance of historic appearance.

Past preservation efforts have included the following techniques and results:

-stabilization of adobe walls with metal frames and braces -- loss of historic appearance; in some cases, accelerated twisting of walls; possible seismic/vibration effects.

-use of cement-stabilized adobe bricks in rebuilding of wall segments -- loss of uniform appearance, and poor bonding between original and stabilized material.

-rebuilding and capping of foundations -- use of non-historic materials (cement mortar) resulting in differential weathering and fracture of foundations, loss of historic fabric.

-Pointing of foundations and brickwork -- loss of original workmanship and techniques.

-Capping and plastering (with protective cement plaster) of adobe wall remains -- loss of original appearance, due to non-historic wall treatment and change in color of adobe walls; deterioration of adobe, due to trapping of moisture beneath protective plaster, eventual loss of underlying adobe, which flakes off with the protective plaster layer. The plaster also appears to inhibit drainage of moisture from base of walls, resulting in coving and weakening at the base.

-silicone treatment of adobe ruins -- moisture trapped inside walls in the form of water vapor cannot escape and hastens deterioration from within.

-installation of drain systems within buildings -- potentially effective but extremely expensive and time-consuming.

An additional problem stems from the lack of systematic record keeping monitoring changes in condition and the actual work performed. The Rehabilitation of Historic Structures, prepared in 1960 by Archeologist Wilson, does provide base data for condition and status of walls as of that date. Compilation of work done since then, as well as a method to monitor changes, are needed to support the stabilization and preservation efforts.

Alternative Actions and Probable Impacts

1. No action. In the absence of site-specific research into adobe manufacture and preservation, each season will incorporate different materials and techniques with no overall plan. Significant resources may be lost in the process. In addition, valuable time will be lost in determining valid preservation techniques.

2. Continue present action. The ruins themselves will be used as experimental test plots. Impacts much as above. Staff expertise is not sufficient to monitor and evaluate effectiveness of preservation methods, or to keep current on other research.

3. Return to chemical stabilization techniques. Impacts on appearance and resource as listed in problem statement.

4. Conduct research only on causes of deterioration, weathering, etc. This approach addresses the problem, without consideration of treatment.

5. Conduct research into original materials and techniques, the causes of deterioration and weathering, and the success rates of various treatments. Compile records of previous work accomplished on specific walls and/or sections of the Third Fort. Develop a system for monitoring changes and recording ongoing stabilization projects. Resulting data will provide information needed for preparation of a Preservation Guide for Fort Union National Monument.

Recommended Course of Action

Alternative 5 is the only course of action which will yield significant long-term progress in the area of ruins preservation. Obtain research data on 1) place of origin of adobe mix used in Third Fort buildings, 2) chemical and organic content, 3) methods of mixing and construction, 4) differences in construction materials, 5) environmental causes (effects of moisture penetration, frost heaving, temperature extremes, winds, lightning strikes, and other external forces), and 6) longevity of walls resulting from the various treatment techniques.

Develop a reference system and basemap for tracking and monitoring the adobe ruins of the Third Fort. Research and identify past projects for inclusion into the system. Use measurements and photographic records to begin monitoring primary walls in order to detect changes. Experiment with new field techniques (e.g., seismic monitoring) for detection of changes too subtle to be otherwise noticed.

All obtainable data should be used to prepare a comprehensive Preservation Guide to ensure appropriate evaluation and preservation/stabilization treatment of all structures at Fort Union National Monument. See GMP, approved 2/14/86.

FOUN-C-1
Stabilization of Historic Adobe Walls and Stone Foundations of Third Fort and Arsenal

Problem Statement

Historic adobe walls and stone foundations, which together constitute the monument's primary resource, are exposed to the elements and are deteriorating rapidly. Preservation and stabilization work has been underway since 1956. Due to lack of adequate funding in the ONPS base, preservation work has been performed on a piecemeal basis, concentrating on the obvious structures and on emergency needs, rather than long-term priorities.

Alternative Actions and Probable Impacts

1. No action. Continue present preservation efforts. Planning and scope of each season's work depend upon available funding, rather than condition of the historic resource. Guidelines and goals will continue to be formulated on an annual basis, or in response to emergency needs. Risk is great that important structures will be lost before a long-term preservation plan can be established.

2. Cover walls or protect with overhead structures. This approach would detract from the historic scene. Such structures are not compatible with approved resource management components of the General Management Plan.

3. Establish long-term preservation program sufficient to apply stabilization efforts on all significant walls and foundations on an annual basis.

4. Selected preservation of certain structures. Walls and foundations of all other structures will continue to deteriorate until identity is lost.

5. Preserve only foundations. A great deal of significant information and original material will be lost before research or even documentation can be carried out.

6. Discontinue all preservation efforts. Walls and foundations will continue to deteriorate and collapse. The primary resource of the national monument will be lost. This alternative fails to comply with the area's establishing legislation, NPS policies, NPS-28, the National Historic Act, and other mandates.

Recommended Course of Action

Alternative 3 most closely meets the requirements outlined in the approved General Management Plan. A long-term preservation plan will be prepared to 1) establish guidelines and priorities for stabilization, 2) complete emergency preservation work on all structures, and 3) establish annual preservation maintenance necessary to maintain walls and foundations at acceptable standards of appearance and safety. The plan will conform to the guidelines in the approved General Management Plan (pgs. 41-42 of the GMP), and any action will receive Section 106 compliance before work is begun. An approved interim preservation plan prepared for FY 1981 appears in the Appendix.

Preservation and stabilization of both adobe walls and stone foundations should be carried out according to the best available technology. This will require secure funding, ongoing monitoring, frequent consultations with experts, and continuing research on preservation techniques.

FOUN-C-3
Santa Fe Trail Ruts

FOUN-C-3 is hereby deleted as a separate project. In 1986 a two-year arroyo stabilization project was completed to reduce the threat of erosion on trail ruts. It is expected that the Santa Fe Trail will gain status as a National Historic Trail during this session of Congress. Such an action will result in a two or three year NPS study on a variety of aspects including the history and significance of the Santa Fe Trail and the preservation of trail ruts. Upon completion and analysis of this study, project requirements will be reevaluated and restated according to needs and study recommendations.

FOUN-C-4
Historical Research

Problem Statement

Information is only sparsely available on specific phases or aspects of Fort Union's history. Specific studies needed for preservation and management purposes include: Quartermaster Depot, the roles played by the hospital and arsenal, Sutler operations, Loma Parda, timber preserve, intercultural relationships, the railroad, and Fort Union after abandonment.

Quartermaster Depot -- The most intact structures at Fort Union are located in the Quartermaster Depot. Early preservation work altered details of these structures' original appearance. To accurately preserve this area its construction and history needs further study.

Hospital and Arsenal -- The roles played by these two units should be investigated to provide greater detail, and to clarify the relationships between these units and the military post.

Post Sutler Operations -- The post sutler's building was one of the first Third Fort buildings constructed. Merchandise in the store was valued at $350,000 to $500,000. Also in the sutler's complex were a restaurant, saloon and hotel. Little is known about day-to-day operations, relationship to the military reservation, and use by Indians, civilians, and military people.

Loma Parda -- This settlement located some 5 miles from Fort Union was frequented by soldiers for the entertainment available there. At times special orders were issued prohibiting personnel from visiting the town. Some of the ruins still stand, and visitor inquiries are often made as it is officially listed as a ghost town. More detailed information is needed to provide a better perspective of the role played by Loma Parda and her residents.

Timber Preserve -- A timber preserve for Fort Union was located in the Turkey Mountains 12 miles east of the fort. Soldiers were detailed there to cut wood for construction and heating purposes. Although some information on sites in the timber preserve has been gathered, additional research and a map should be developed. An impending timber harvest is threatening to damage historic and archaeologic sites in this area. This study should be completed prior to commencement of the timber operations.

Intercultural Relationships -- Fort Union was a meeting place for people from varied cultures (officers from West Point, local Hispanics, Indians, Irish and German immigrants, and many other cultural groups). Visitors to Fort Union are interested in the interaction and the varied roles of these people in day-to-day life at the post.

The Railroad -- The arrival of the railroad was an extremely important factor leading to a change in the military's operations in the Southwest. This impact should be explored in greater depth to determine the effects the railroad played on all aspects of Fort Union's operations.

Fort Union After Abandonment -- Although two Administrative Histories deal with the subject of Fort Union prior to establishment as a National Monument, little detail is available on the period between 1891 and 1929. More research is needed to fill in this gap.

Oral History -- An oral history project started at Fort Union in the 1950s resulted in approximately 30 reel-to-reel tapes containing information useful in resource management, historic research, and interpretation. However, the information has never been transcribed, and there is a danger that the tapes may deteriorate and the information lost. Work should begin immediately to transcribe the information already recorded. Evaluation should be made of present tape condition and tapes rerecorded in order to preserve the original interviews. Additional individuals with personal information and/or experiences worthy of historical recording should be located and interviewed.

Alternative Actions and Probable Impacts

1. No action. Continue to use previous limited historical studies. Lack of detailed information will result in continued destruction of the historic fabric. Important aspects of area history will not be interpreted to area visitors.

2. Conduct only in-house historical studies. Studies will be done by personnel piecemeal on a time available basis.

3. Conduct a comprehensive study by professional historians. The results of the research should be published for use by the park staff, researchers, management, etc.

Recommended Course of Action

The information obtained by utilizing Alternative 3 would be the most complete and accurate due to the ability of professional historians to use successful and thorough research techniques. Research should be initiated on the elements identified above. The results of this research should be published as a comprehensive study in a format useable by researchers, management, maintenance and interpretive personnel.

FOUN-C-5
Preparation of Collections Management Plan

Project FOUN-C-5 is nearing completion. A second draft of the Collections Management Plan is currently being reviewed, and it is expected that the document will be approved soon.

FOUN-C-6
Historic Resources Study and Historical Base Map

Problem Statement

The boundaries of Fort Union Military Reservation extended for miles in each direction. Only 720 acres of the reserve's approximately 41,000 acres lie within the monument boudaries. Although emphasis in recent years has been on features located inside the monument, information on some of these features is still sketchy. In addition, very little information is available on the following features located outside the monument: Commanding Officer's Quarters for the First Fort, Quartermaster corral and shops of the First Fort, cemetery, lime kilns, depot dumps, quarry, brickmaking area, Los Pozos waterholes, race track, target pits, middens, timber preserve, Loma Parda, and Santa Fe Trail ruts within a 25 mile radius. No complete base map exists for features within or outside of the monument boundaries.

Alternative Actions and Probable Impacts

1. No action. Continue to refer only to features already well documented. Other features will continue to be ignored. Structures on private land will continue to deteriorate.

2. Conduct on-site research to locate historic resources within and outside present boundaries. Synthesize this research in a narrative report discussing the social, cultural, and political history of the area. An archaeologic survey will be conducted, and a historical basemap prepared, showing all significant resources (historic and prehistoric) both within and outside the monument boundaries.

Recommended Course of Action

Alternative 2 is necessary to meet the requirements of the approved General Management Plan. A historic resources study should be conducted as the first phase of this project. Then, an archaeological survey should be made to identify historic and prehistoric resources, and from this information a historical base map prepared. The map should include locations and significance of features located both within and beyond the boundaries of the monument, with an emphasis on those sites within the monument. Supporting documentation (structure reports, measurements and photographs) should be developed as a component of the mapping project.

FOUN-C-7
Meet Curatorial Storage Requirements

Problem Statement

Essentially all of the 9000 museum specimens not on exhibit are now stored in a maintenance building with inadequate temperature or humidity control, and are subjected to temperatures ranging from 40 to 80 degrees Farenheit. Numerous specimens have been damaged by insects and rodents in the past due to inadequate storage. Space is limited with little or no room for expansion of the collection. Curatorial work space is minimal and does not comply with NPS standards.

Alternative Actions and Probable Impacts

1. No action. Museum specimens will continue to be damaged by storage conditions. New acquisitions, particularly those containing paper, leather, or fabric, will receive inadequate curatorial care.

2. Provide curatorial training for park staff. Training will alleviate only a small part of curatorial problems, as storage space itself makes routine care difficult.

3. Arrange for transfer of affected specimens to a conservation center warehouse (e.g., WACC). Consider long term loans to appropriate museums or other exhibitors. This approach will reduce the research value of the collection as a large percentage of museum specimens are specific to Fort Union, and constitute a significant part of the area's history.

4. Construct new museum storage and work space to provide protection commensurate with NPS standards.

Recommended Course of Action

Alternative 4 is the only course of action which also meets the requirements of the approved General Management Plan. New museum storage and work space should be constructed as outlined in the GMP. This will provide needed work and storage space, and allow adequate curatorial treatment of all museum specimens. Damaged specimens can then be treated and maintained under controlled conditions.

FOUN-C-8
Star Fort Management Program

FOUN-C-8 is hereby deleted. Portions of this project have been incorporated into FOUN-N-7 and FOUN-C-11.

FOUN-C-9
Oral History Project

FOUN-C-9 is hereby deleted as a separate project. Components of the project have been incorporated into FOUN-C-5, Historical Research.

FOUN-C-10
Tracking and Monitoring Project
Third Fort Adobe Walls

FOUN-C-10 is hereby deleted. Portions of this project are now incorporated into FOUN-C-2.

FOUN-C-11
Historic Structure Reports

Project Statement

The First Fort lies buried beneath and among the ruins of the Third Fort Arsenal. Although maps exist diagramming both components, the exact location and use of several structures are not known. The Historic Structure Report, Third Fort Union stresses the need for additional information on the First Fort and Arsenal structures. Another component, the Star Fort, was constructed in 1861. Very little is known about its construction, day-to-day operations, and final outcome. Without more data on these three units management planning and interpretive operations will suffer. As time progresses it will become more difficult to map these areas and identify their structures and uses.

Alternative Actions and Probable Impacts

1. No action. Information regarding the Arsenal, Star Fort, and First Fort will continue to be sketchy. The exact location and use of structures will not be known. Resource management and interpretive programs concerning these sites will continue to suffer due to incomplete and inaccurate information.

2. Conduct research, complete a site survey (surface only), and prepare map overlays detailing the location and use of various structures involved. Perform archaeological testing when necessary for confirmation of data. Prepare and publish a separate historic structure report for each site which will provide accurate resource information for informed decision making and site interpretation.

3. Perform an archaeological excavation of the sites. Such an excavation would expose foundations, providing extremely detailed and accurate information on the location of structures. The historic scene would suffer a degree of disruption from such a dig, as there would be no plans to restore walls once identified. Due to curatorial storage limitations, excavated specimens would need to be stored off-site. The cost of such an excavation will greatly exceed the cost of a surface survey (Alternative 2).

Recommended Course of Action

Alternative 2 meets the needs of management without incurring the problems discussed in Alternative 3. Conduct a surface survey of each of the three sites (with archaeological testing as necessary). Develop a separate historic structure report on each site detailing findings. Produce map overlays showing the relationship of Third Fort Arsenal structures to facilities of the First Fort. The priority for research and report preparation will be as follows: 1) Third Fort Arsenal, 2) Star Fort, and 3) First Fort.

FOUN-C-12
Collections Condition Survey

Project Statement

In 1983 a collections reorganization and analysis was conducted by VIP Deborah Boll. Boll's findings included an estimate that 80% of the FOUN collection "could use some sort of conservation or preservation treatment..." FOUN management has attempted to address the problem through training of on-site individuals. Several individuals with responsibility for the 9,000 item collection have been nominated for the Curatorial Skills course over the years, but to date none have been selected. Time and inaction will lead to the deterioration of specimens whereas stabilization or repair is impossible. The FOUN collection is a national trust deserving the care and protection defined in NPS-28. To assure that these guidelines are met, FOUN-C-12 calls for an evaluation of the collections and prioritization of treatments needed to achieve conservation and preservation needs.

Alternative Actions and Probable Impacts

1. No action. The condition of specimens will not be established. Prioritization of needed treatment will not be made, and the condition of items will deteriorate. Requirements identified in NPS-28 will not be achieved.

2. On-site personnel will attend the Curatorial Skills course to obtain some of the basic skills needed for identifying problems and providing treatment. It should be noted that most conservation work requires expertise beyond the abilities that can be acquired as such a course. Because of other duties detailed to on-site personnel, evaluation and treatment will be a part-time assignment. Although collections work will be on-going, some problems will not be identified because of time constraints and lack of expertise.

3. A NPS or outside consultant will be assigned the task of surveying the condition of all items, recommending treatment to achieve stabilization and preservation requirements, and prioritizing these recommendations. Items will be treated on-site if expertise and treatment materials are available. A new museum technician position should be established to provide ongoing care to the collection.

Recommended Course of Action

Alternative 3 is recommended. A curatorial consultant should evaluate all items within the collection, determine condition, and make recommendations needed to meet long-term conservation needs. The survey should be summarized in report format for guidance and reference by the monument staff. A museum technician position should be established to provide the continuous care and recordkeeping duties the collection requires.

FOUN-C-13
Archaeological Overview and Assessment

Problem Statement

To date, most research at FOUN has dealt with historic aspects of the three forts, its personnel, and its relationship with the Santa Fe Trail. No archaeological or ethnographic survey has ever been conducted, as required by NPS-28. Such a survey is needed for inclusion in the Cultural Sites Inventory (CSI), which documents location and significance of sites, identifies threats, and defines management concerns. Possible ethnographic users of the area include tribes of the Western Plains (Kiowas, Comanches, and Utes), Apaches (Mescalero and Jicarilla), Navajos, and Pueblos, as well as Paleolithic groups.

Alternative Actions and Probable Impacts

1. No action. No information will be available on prehistoric sites within the monument. The minimum data required for the CSI will not be available. Information for management decisions and interpretive utilization will be scant or non-existent.

2. Conduct a survey to identify archaeologic sites and ethnographic use within the monument. Minimum data will be collected for inclusion into the CSI, and recommendations will be formulated for any sites identified. Minimum information will become available for use within the interpretive program. The basic inventory requirement identified in NPS-28 will be met.

3. The survey will be conducted as in Alternative 2, but will include excavation of identified sites. A complete data base will be established dependent on unearthed cultural remains and site analysis. Possible damage to historic sites could occur as archaeological sites are excavated. More data would be accumulated than required by the approved GMP, Statement for Management, enabling legislation, and other management documents.

Recommended Course of Action

Alternative 2 is the only course of action which meets the requirements of NPS-28 while still conforming to other approved management documents. An area survey will be conducted to identify sites and provide enough basic data for completion of the CSI. Recommendations made as a result of the survey will be evaluated by FOUN management in light of approved management documents. Survey information will be incorporated into the park interpretive program to the extent applicable.

APPENDIX A

(INTERIM) PRESERVATION PLAN (1990)

Preservation Plan 1981

The work we expect to accomplish this summer is shown on the attached pages. These projects were chosen on the assumption that funds may not be available next year, or in sufficient quantity in future years, to preserve large sections of FOUN's historic resources. This summer's work, therefore, includes emergency stabilization of walls and foundations that might not survive the additional year or years without treatment. The projects were chosen according to the following priorities:

1. Structures which in their present state constitute major safety hazards, such as leaning walls, sagging and crumbling adobe, loose brick cornices and falling chimney bricks.

2. Walls and foundations where failure to do repairs now would result in significant loss of original fabric.

3. Foundations with loose stones, or stones which have fallen out but are still lying adjacent to the walls and can be restored to their original locations.

4. Adobe walls that are especially susceptible to moisture absorption from the ground.

5. Previously treated adobe walls, where large sections of original adobe are now exposed and eroding.

Our approach to completion of these projects will be guided by the following policies:

a. Transportation of materials and workers will be in accordance with the designated road network as shown in the draft Resources Management Plan, to prevent damage to the historic landscape.

b. Record photographs will be taken of each project before, during, and after work is done.

c. Where possible, the use of new adobe, veneer, or bracing material will be limited to the back side of structures, i.e. the side most hidden from regular visitor view. The maximum amount of original fabric will be preserved in all cases.

d. Except in unusual circumstances, walls which fall suddenly or which melt away due to the elements will not be rebuilt.

e. If it is necessary to remove a hazardous wall, it will be rebuilt only if considered a major wall segment of an important building, or if it is in a highly significant location.

f. Walls will be rebuilt only to the extent that they existed at the time of removal.

APPENDIX B

WATER RESOURCES MANAGEMENT PROFILE (10/82)

Water Resources Management Profile

for

Fort Union National Monument

Recommended by: _____ 9/30/82
Area Manager, Fort Union National Monument — Date

Concurred by: _____ 9/30/82
Superintendent, Capulin Mountain/Fort Union NM — Date

Approved by: Robert I. Kerr OCT 12 1982
Regional Director, Southwest Region — Date

I. Authorization:

Fort Union National Monument was authorized by Public Law 429, 83rd Congress, approved June 28, 1954; and established on April 5, 1956; to preserve, protect and provide public access to the site and remaining structures of "historic old Fort Union."

The purpose of the area is further delineated in the National Park Service Organic Act of 1916 as ". . . to conserve the scenery and the natural and historic objects and the wildlife therein, and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

II. Physical Description of the Water Resource

A. Watershed: The monument is located in Arkansas-White-Red Drainage System (Region 11, ASA 05). More specifically it is in the Arkansas-Canadian Rivers, Mora River, and Wolf Creek sub-drainage basins. All groundwaters are assigned to the Great Plains physiographic province.

B. Climate: Fort Union climate is characterized as semi-arid. The long term average precipitation at the monument is 18.01 inches (1915-1971). More than 80% of the annual precipitation occurs during the months of May through October.[1]

Yearly average temperature for the monument is about 49.2 F (Las Vegas, NM, FAA, AP 1940-1979). The maximum average monthly temperature occurs in July (69.7 F) and the minimum average monthly temperature occurs in December (33.1 F).

C. Geology:[3] Fort Union is located on the east side of a southward trending valley of Wolf Creek, a tributary to the Mora River. This valley is bounded on the west by a prominent sandstone mesa, which rises 150 to 200 feet above the valley, and on the east and northeast by the Turkey Mountains.

The rock strata exposed at the monument has been classified as that belonging to the Graneros Shale of Early Cretaceous Age.

D. Water: Surface drainage near the monument is confined within Wolf Creek, a spring fed creek with a perennial flow that may be continually resupplied because of vertical leakage from the Dakota and Purgatorie sandstone aquifers. Recharge to all underground waters is probably from precipitation on the Turkey Mountains.

a. A flowing spring (estimated 3/4 gpm) is located south of residence No. 2. It was discovered

accidently during installation of sewer lines in the 1960's and was for a number of years piped into the sewer lagoon in order to maintain adequate water level. This use was discontinued in 1981. A slight surface seepage now exists adjacent to the residential road.

E. Soils: Soil scientists have identified all soils at the monument as belonging to the Loma-Camero-Trican Association. These soils are moderately deep, well drained and underlain by sandstone or indurated caliche. This association supports a good cover of grass with blue-gramma, western wheat grass, mesa dropseed, ring muhly, and three-awns being the most important species.

F. Floodplain Identification and Management: A flood hazard map, produced by the U.S. Department of Housing and Urban Development identifies special flood hazard areas in the immediate vicinity, including Wolf Creek, and several drainages associated with eroded remnants of the Santa Fe Trail outside the monument. Unfortunately, land within the boundaries of Fort Union National Monument were excluded from the project. A flood study for monument lands is necessary for the safety of visitors and park employees, as required by Executive Order 11988 (Floodplain Management) and implementing guidelines.

III. Management of Water Resources and Legal Aspects:

A. The historic use of water while Fort Union was an active military post was from several hand dug wells and from Wolf Creek. Current water needs are satisfied from a 325-foot well which was drilled in August 1957.

Water use based on park operational procedures was estimated to be 0.7 million gallons in 1975. Considering increases in visitation, future water needs will be 1.7 and 2.2 million gallons for the years 1985 and 2000 respectively.[5]

B. Water Quality: Chemical quality of groundwater at Fort Union within the recommended limits set by 1962 Public Health Service Drinking Water Standards as adopted by EPA. Analyses are made every three years by a state-approved laboratory. The Park Staff collects water samples twice a month for bacteriological analyses by a state-approved laboratory. Results are consistently in compliance with health standards.

C. Water Rights: All claims by the National Park Service to surface and groundwaters are made in accordance with Federal Reserved Water Rights Policy or in accordance with the appropriate water rights statutes of the State of New Mexico.

Federal reserved water rights claims are not applicable.

A. 10-238 (pkg 129) has been submitted for quantification of federal water rights.

Surface water - not applicable as there is no surface water within the monument.

Groundwater - not applicable as the monument is located within an undeclared underground water basin. The National Park Service has, however, filed a "Declaration of Owner of Underground Water Right" on January 8, 1960 (Declaration No. Misc. 1-MA-5) for 50,000 g.p.d. for domestic and irrigation uses. Priority date claimed August 21, 1957.

IV. Water Resources Problem Identification:

1) Effect of increased ground water withdrawal at Fort Union on existing springs and riparian vegetation it husbands, all of which are located on adjacent private property.

2) Change in surrounding land use from ranching to residential or to agricultural would adversely affect the monument's water supply runoff characteristics.

3) Remaining ruts of the Santa Fe Trail are eroding and forming arroyos.

4) Floodplain has not been determined for monument property.

5) Existing water well needs rehabilitation.

V. Recommended Strategies for Water Resources Protection:

FOUN-W-1 Geohydrology Study at Fort Union

Recommend: Determine if existing well and its associated case of depression will adversely affect existing springs and riparian vegetation.

FOUN-W-2 Land Use Study

Recommend: Monitor, through personal contacts and from newspapers etc., intended use of existing ranching land. Initiate appropriate study to forecast and provide alternatives to mitigate effect of future use(s) on the monument's water supply.

FOUN-W-3 Erosion Control of Santa Fe Trail Ruts

This is discussed in the monument's Resource Management Plan.

FOUN-W-4 Floodplain Determination

Recommend: Determine flood level profile across the monument's only access road at the point it crosses Wolf Creek. It is also necessary to detect flood hazards associated with arroyos and other drainages within the monument. This project is needed to comply with Executive Order 11988 (Floodplain Management) and its implementing guidelines.

FOUN-W-5 Rehabilitate Existing Water Well

Recommend: Well has been in continuous production for 25 years. Well needs to be checked for casing corrosion and incrustation of perforated zone, and cleaned if necessary.

VI. References Cited:

1. Soil Association and Land Classification for Irrigation, Mora County, New Mexico State University Agricultural Experiment Station Research Report 205, September 1971.

2. Climatological Data - Annual 1979, NOAA Weather Bureau, U.S. Department of Commerce.

3. Occurrence and Quality of Ground Water in the Fort Union Area, Mora County, New Mexico, by I. J. Winograd, Geologist, U.S. Geological Survey, 1956.

4. Soil Association and Land Classification for Irrigation, Mora County, New Mexico State University, Agricultural Experiment Station Research Report 205, September 1971.

5. 1975 Assessment of Water and Land Resources, Southwest Region, National Park Service.

6. HUD Flood hazard boundary map, Mora County, New Mexico, revised 8/9/77, Community-Panel No. 350043 - 0016A.

Determination

It is determined that none of the actions outlined above significantly affect the natural environment or cause controversy.

NO ENVIRONMENTAL ASSESSMENT WILL BE PREPARED.

Recommended by: Garland C Moore 9/27/82
Hydraulic Engineer, Southwest Region — Date

Concurred by: Mark A Cisne 9/30/82
Superintendent, Capulin Mountain/Fort Union NM — Date

Concurred by: /s/ Roger J. Siglin OCT 12 1982
Acting Associate Regional Director, Park Operations, SWR — Date

Approved by: Robert L. Kerr OCT 12 1982
Regional Director, Southwest Region

APPENDIX C

RATTLESNAKE POLICY (6/84)

DRAFT

FORT UNION NATIONAL MONUMENT

RATTLESNAKE POLICY

Submitted by: Carl Kuse 5/30/84
Unit Manager — Date
Fort Union National Monument

Recommended by: Clark A. Crane 6/1/84
Superintendent — Date
Capulin Mountain-
Fort Union National Monuments

Approved by: Donald A. Dodd 6/19/84
Acting Regional Director — Date
Southwest Region

RATTLESNAKE POLICY - FORT UNION NATIONAL MONUMENT

I. Introduction

Rattlesnakes are historically a natural part of the ecological system of Fort Union National Monument. Soldiers and their families who lived at the fort probably feared rattlesnakes, and some evidence exists rattlesnakes were considered dangerous and killed. The habitat which existed at the fort during its occupation would have been less optimal for rattlesnakes than it is today because of the lack of cover for snakes and their prey. Heavy grazing by livestock, soldier drilling activities, adobe brick construction and gardening all contributed to s available cover (Historic Vegetation at Fort Union National Monument 1951-1983, by S. Schackel).

One species of rattlesnake is known at the monument, the prairie rattlesnake, (Crotalus viridis). Another, darker and more aggressive variety is also found in the locality, but has not yet been positively identified. Fort Union National Monument is located within the general range of the prairie rattlesnake (Crotalus viridis), western diamondback (Crotalus atrox), and massasauga (Sistrurus catenatus). (Audubon Society Field Guide to North American Reptiles and Amphibians, by Behler and King).

The presence of rattlesnakes at Fort Union National Monument poses blic safety and management problems when they are found in areas

normally used by visitors or park personnel. These problems would intensify if the density of rattlesnakes were to increase or if visitor or park personnel use increased. The purpose of this policy statement is to confront this issue and to define appropriate management actions.

The rattlesnake policy for Fort Union National Monument must be consistent with management policies of the National Park Service which state in part:

> *The Service will perpetuate the native animal life of the parks for their essential role in the natural ecosystems. Such management, conformable with general and specific provisions, will strive to maintain the natural abundance, behavior, diversity, and ecological integrity of native animals in natural portions of parks as part of the park ecosystem.*
>
> *. . . Native animal life in the National Park System shall be given protection against harvest, removal, destruction, harassment, or harm through human action, except where:*
>
> *. . . . - - removal or control of animals is necessary for human safety and health.*

Natural processes shall be relied upon to regulate populations of native species to the greatest extent possible. Unnatural concentrations of native species, caused by human activities, may be regulated if those activities causing the concentrations cannot be controlled . . . The need for, and results of, regulating animal populations, either native or non-native, shall be documented and evaluated by research studies. (Management Policies IV-6 through IV-7).

The Service, in the operation and management of the parks, will provide for the safety of park visitors in their use of park facilities and services.

It is also the policy of the Service to insure a safe and healthful environment for park, concessioner, permittee, and contractor employees by not requiring any employee, in the performance of his or her duty, to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his or her health or safey . . . (Management Policies VII-24).

Significance of the Problem

Park employees must be able to maintain and study the cultural resources, visitors must be able to view and inspect them, and these activities must be made as safe as possible. Public visitation to the monument has varied from 10,435 to 12,413 visitors a year, over the last 5 years. Up to 17 employees work at the fort and some of these employees live at the park with their families. The park attracts visitors from all age groups and at times sponsors programs which have as many as 500 people in attendance on one day. Data has been collected over two periods (a 14 year period and a 2 year period) indicating an average of 11 visitor/employee rattlesnake confrontations annually. For more detailed statistics on rattlesnake occurences refer to appendix B.

The one species of rattlesnake known to occur in the monument is long-lived and prolific.

C. viridis: 4-21 liveborne young with a mean litter size of 10, average reproduction rate of 10 biennially. (Rattlesnakes, by L.M. Klauber, p. 700-701).
Primary food source is small mammals; secondary food source is lizards. (Rattlesnakes, by Klauber, p. 474).
For information on the types of small mammals see Rattlesnakes, by Klauber (Chapter 9).
Live 19+ years in captivity; in captivity found to feed every 22.9 days (Jackley, report quoted in Rattlesnake).

without continuous natural controls, a single pair of snakes produce a population of over 50 young within 5 years and annual population doubling is to be expected after that.

The present vegetative characteristics and physical condition of the Fort Union ruins create attractive habitat and strong potential for periodic high density rattlesnake and small rodent populations. Approximately 100 acres of adobe building ruins are composed of partially and totally collapsed walls which create innumerable, interconnected subterranean voids. It is assumed that these holes are used by various small mammals and reptiles as hibernacula (dens) or temporary protective retreats throughout the year. There have been many sightings of snakes u holes known to be used by ground squirrels. The monument also has a high number of bullsnake sightings each year. Besides rattlesnakes and bullsnakes, hognose snakes, garter snakes, and racers are known to inhabit the park area.

Natural conditions contributing to the possibilities for relatively high rattlesnake populations at the ruins are directly related to human activities extending from 1851 to 1891. Cattle and sheep grazing, excluded from the monument in the 1950's, has resulted in better grass stand than in the surrounding area, where grazing has continued. (Historic Vegetation at Fort Union National Monument 1851 - 1983, by S. Schackel). Therefore, rodent populations are suspected to be high and cover is plentiful.

III. History of Management Activities

Historically, neighboring ranchers have killed rattlesnakes on sight. From 1958 - 1971, records indicate that Fort Union National Monument exercised an extermination policy. Although incomplete, the records indicate that extermination did not significantly affect the number of rattlesnake confrontations annually (the number of confrontations seems to have fluctuated, generally increasing over the first 7 years, and decreasing over the next 7 years. See Appendix B). The cycle may continue, but data is not available between 1971 and 1982. There may be a correlation with weather or some other natural limiting factor during the data collection period (1958 - 1971). We suspect that data from 1958 - 1971 may not be comparable to data collected in 1982 - 1983 because increases could be due better record keeping techniques.

IV. Present Management Activity

The present management action is to:

1) Document rattlesnake removals and confirmed sightings on Form 10-343, Case Incident Report.
2) Create awareness of the potential hazards in the ruins by warning visitors through verbal communication and signs. A rattlesnake warning is on the introductory wayside exhibit and in the new unigrid brochure.
3) Encourage the reporting of rattlesnakes by visitors and employees.
4) Confirm that sightings are of rattlesnakes, as opposed to bullsnakes etc., via description and behavior.

5) Investigate each possible sighting so that rattlesnakes may be captured and removed from area of potential confrontation.

6) Live capture of rattlesnakes using appropriate equipment. Snakes found in the residential or visitor use areas are captured and released at the N.E. boundary near the water tank, a distance of 3/4 miles from the Visitor Center. Snakes encountered elsewhere are left alone.

7) Provide on-site employee training in the use of snake capture equipment.

8) Mark captured rattlesnakes with spray paint on rattles.

9) Compile movement information gathered on 10-343's.

10) Perform daily trail patrol (9 or 10 a.m.) to check waysides and locate any rattlesnakes on or near the trails (see Appendices C and D).

11) Mow trailsides to a width of 3 feet to provide increased visibility and to decrease desirable snake habitat during snake season.

12) Maintain staff awareness of rattlesnake bite first aid procedures.

13) Maintain contacts with local medical authorities, i.e. Dr. G. Bunch, Aid Ambulance Service, and Wagon Mound Ambulance Service.

14) Keep emergency telephone numbers within quick and easy access, with the staff informed of location.

15) Watch for rattlesnakes while working in the ruins.

Alternative Management Activities

1. No Action. To attempt no control of rattlesnakes on trails or in the ruins is an action most oriented to maintaining the "natural" ecosystem; however, rattlesnakes would continue periodically to be a significant potential visitor hazard. Small children, especially, might unknowingly approach a reptile too closely; adult visitors become susceptible to snake bite when they inadvertently step too closely to a hidden snake and either do not hear a warning rattle or, unknowingly, move in the wrong direction. Snakebite is always a serious injury, especially to aged persons or those who demonstrate allergenic reactions. Complete medical treatment requires a 30 minute automobile trip from Fort Union National Monument to the hospital facility in Las Vegas, New Mexico (see Appendix E). Taking no action (other than signing) to prevent dangerous situations is in conflict with National Park Service policy and might pose complicated legal questions in regard to injury or death claims from an injured party or survivors. Visitor use is being encouraged in an area that may have strong potential for periodically dense rattlesnake populations. Additionally, park employees must frequently work in grassy areas where the potential for encountering hidden rattlesnakes is rather good. Habitat for rattlesnakes in the ruins area may be a direct or indirect result of man's use and alteration. These facts reduce the desirability of this alternative.

2. Restrict visitor and employee use of the area to time periods of low snake activity. The distance that most visitors travel to see the park makes this a very inconvenient alternative for visitors and would create serious public relations problems. This action would effectively interfere with visitor use and the maintenance of the cultural resources without a corresponding decrease in the chance of seeing a rattlesnake.

3. Donations of rattlesnakes live-captured from Fort Union's high visitor use and employee-use areas to non-profit/ educational institutions for teaching, collection, or research uses. This alternative sounds perfect at first; however it has many problems. To find acceptable sources for donation is extremely difficult. There are legal obstacles in shipping poisonous animals live via commercial services. The isolated location of the fort would require that long distances be traveled to transport the snakes to possible recipients. Snakes would have to be housed and fed until the number captured was high enough to justify the recipient coming to get them or park staff delivering them. Snakes that could not be placed would be killed. On a day-to-day basis, this option could deteriorate into a policy of destroying rattlesnakes. We-- consider this option a last resort effort to control rattlesnakes at the fort.

4. Initiate research on the problem of rattlesnake management in conjunction with various alternatives. Data previously collected indicates that the currently used release site is not sufficient to overcome the homing tendency of the snakes. Other release sites might prove effective, i.e. the Arsenal site. Control of small rodent populations might control the snake population and reduce the potential for bubonic plague also. Questions to be answered:

   a) How large is our rattlesnake population compared to the surrounding area? Is it an unnatural population, caused by human activity?

   b) Are the ruins being used for den sites, or only as a seasonal hunting ground? What control measures can be implemented for suspected den sites?

   c) Could the rodent population be effectively controlled and if so, how?

   d) How would a policy on rodent control affect the snake population?

   e) What effect would prescribed burning have on rodent food supply and population?

   f) Does the removal of snakes leave a vacant niche that will be filled by the migration of additional snakes into the park?

   g) Is the alternative to donate the snakes to institutions realistic?

VI. Implementation

This policy will take effect upon approval.

Specific Actions:

1) Continue activities as in IV., "Present Management Activities".
2) Utilize the First Fort (Arsenal) as release site. This would increase the distance from heavy use areas to 1 mile, and returning snakes would have to cross Wolf Creek.
3) Upgrade snake handling equipment by adding more clearly marked snake boxes and purchasing snake tongs.
4) Recruit researchers, VIP s, (possible contacts are New Mexico Highlands University, New Mexico Game and Fish, University of New Mexico, New Mexico State University, Colorado College, and Colorado State University).
5) Maintain an information log on the release site.
6) Document all rattlesnake removals or confirmed rattlesnake sightings on 10-343's, Case Incident Reports. Note the employee's name, date, approximate size of the snake, note location of initial encounter, disposal method and location.

Live capture for removal: Live capture will be conducted by trained personnel only, using proper tools, equipment, and methods to ensure, to the extent possible, that the life and safety of employees and visitors is protected during capture, transportation, and release. Trained personnel will use a tool equally as safe,

strong, and secure as the Manco snake tongs. Snakes will be placed in a box which has protective screening and a safety hasp. The box will be marked "danger - poisonous snakes".

Location of poisonous snake box: A box and capture tools will be kept in the Visitor Center utility room. An additional tongs and box will be kept in maintenance shop.

BIBLIOGRAPHY

Case Incident Report File

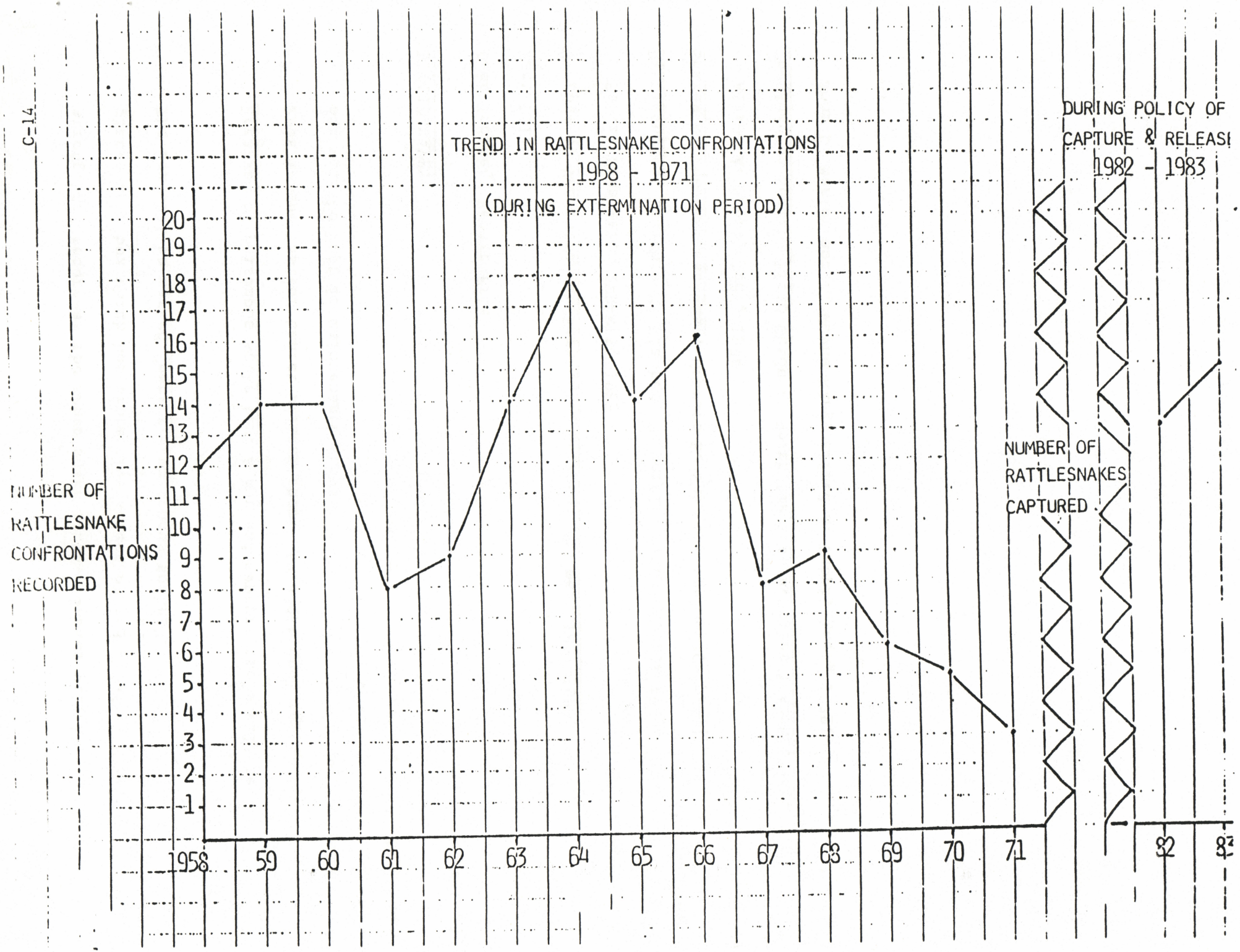
Fact File

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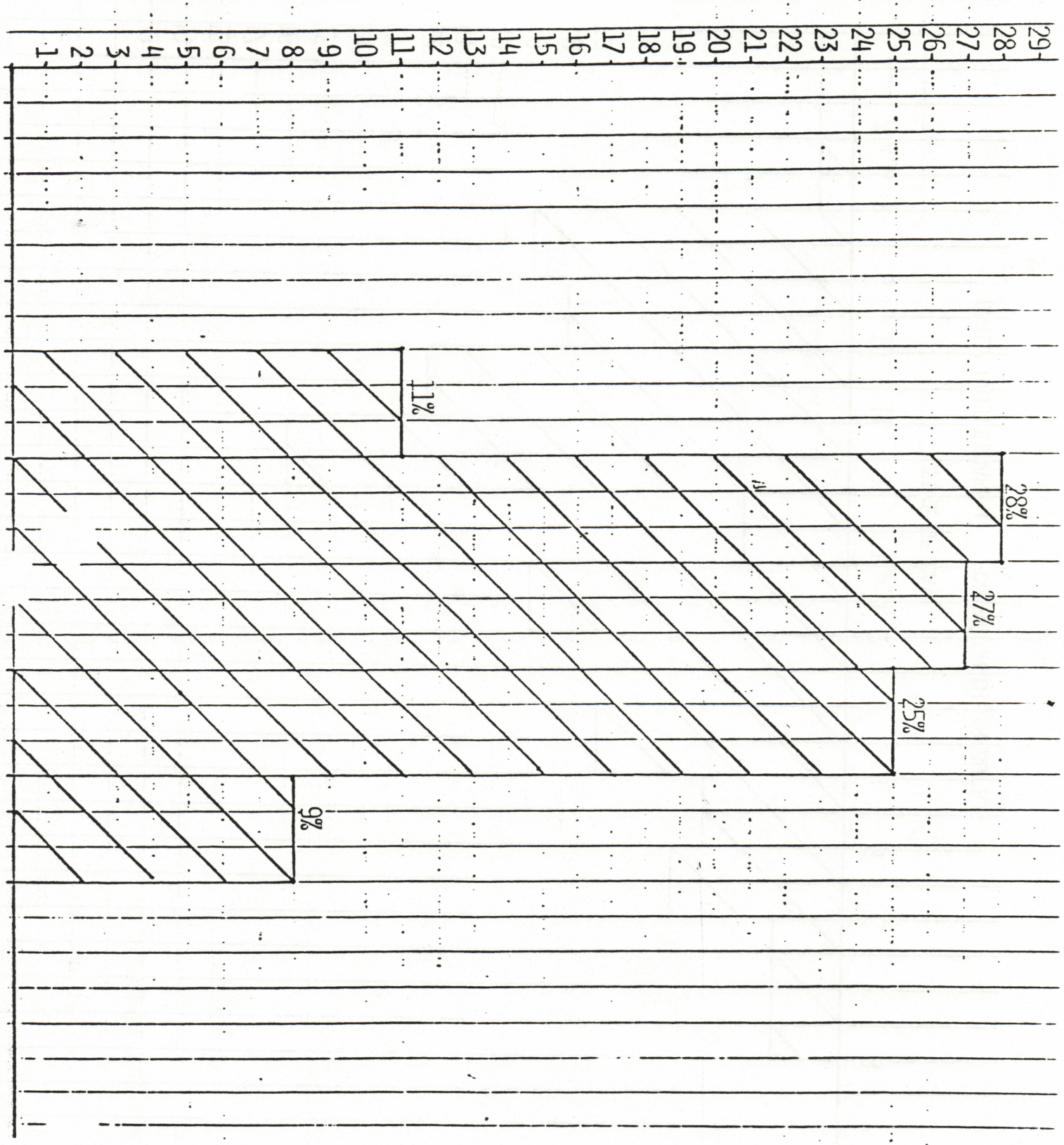
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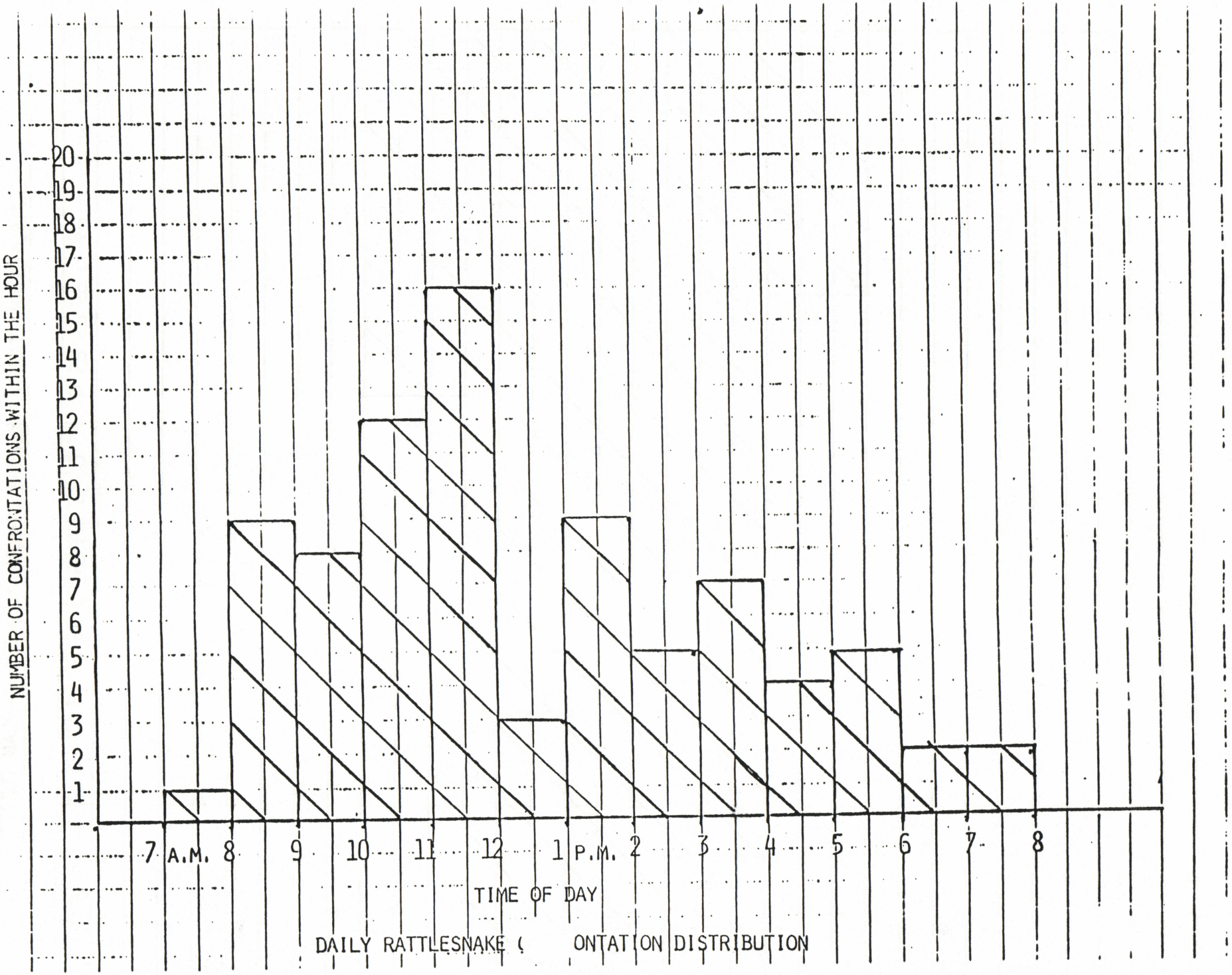
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TREND IN RATTLESNAKE CONFRONTATIONS
1958 - 1971
(DURING EXTERMINATION PERIOD)
DURING POLICY OF
CAPTURE & RELEASE
1982 - 1983
NUMBER OF
RATTLESNAKE
CONFRONTATIONS
RECORDED
NUMBER OF
RATTLESNAKES
CAPTURED
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
1958
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PERCENT OF DAILY VISITATION

FIGURES ARE TAKEN FROM THE GENERAL MANAGEMENT PLAN (DRAFT)





DAILY RATTLESNAKE (ONTATION DISTRIBUTION

APPENDIX D

WILDFIRE MANAGEMENT PLAN (1989)

Completion of the Wildfire Management Plan is anticipated in FY88.

APPENDIX E

INFORMATION BASE CHECKLIST

INFORMATION BASE CHECKLIST

Note: All materials within this checklist are available at FOUN (i.e., library, I&RM files, main files, etc.)

N-1. Natural Resources Base Inventory
1. Historic Vegetation at Fort Union National Monument: National Park Service: 1983.
2. Checklists of flora and fauna compiled by FOUN staff.
3. Climatological data contained in 1) Fire Weather statistics and 2) Daily Reports.
4. Fort Union Fact File

N-2. Climatological Data Collection
1. U.S. Army Archives and Records (microfilm).
2. Fire Weather Records, FOUN.

N-3. Historic Vegetation Baseline Data
1. Historic Vegetation at Fort Union National Monument: Schackel, S., National Park Service: 1983.

N-4. Wildland Fire Management Plan
1. Historic Vegetation at Fort Union National Monument: Schackel, S., National Park Service: 1983.

N-5. Flood Hazard Study
1. Water Resources Management Profile: September, 1982.
2. Emergency Operations Plan: revised April 1986 by FOUN I&RM staff.
3. Flood Hazard Boundary Maps: U.S. Department of Housing and Urban Development, 1977.

N-6. Integrated Pest Management Plan
1. Fort Union daily logs and miscellaneous maintenance records.
2. IPM manuals intermittently issued by the Division of Natural Resources, SWR.

N-7. Historic Scene Management Plan
1. Historic Vegetation at Fort Union National Monument: Schackel, S., National Park Service: 1983.

N-8. Construct Windbreak in Residential Area
1. General Management Plan, Fort Union National Monument: approved 1985.
2. Drip Irrigation Data Sheet, USDA Soil Conservation Service: 1984.

C-1. Stabilization of Adobe Walls
1. Rehabilitation of Adobe Structures. Vols. 1-3: Wilson, Rex L.: 1956-1960.
2. (Interim) Preservation Plan: FOUN. 1981.
3. Miscellaneous Case Incident Reports, Daily Logs, and Maintenance Records. FOUN.
4. History of preservation efforts on adobe ruins at Fort Union; compiled by Carol Kruse.
5. Fort Union slide and photographic print files.

C-2. Ruins Preservation Research
1. Rehabilitation of Adobe Structures. Vols. 1-3.
2. The Third Fort Union, 1863-1891: A Structures Report.
3. Fort Union slide and photographic files.
4. Fort Union daily logs, incident reports and maintenance records.

C-3. Santa Fe Trail Ruts
1. The National Survey of Historic Sites and Buildings: The Santa Fe Trail: National Park Service: 1963.

C-4. Historical Research
1. The Third Fort Union, 1863-1891: A Structures Report.
2. Woodward Report, Vol. 1.
3. Historical Research Management Plan, Fort Union National Monument: Bieser, Nicholas and Emrick, Lois: 1970.
4. Overview of Historical Research: Annotated Bibliography and Recommendations for Future Study: Scott, J.: 1978.
5. Refer to other references is Bibliography.

C-5. Preparation of Collections Management Plan
1. Scope of Collection Statement for Fort Union National Monument: 1982.
2. Final Report and Recommendations Related to Curatorial Project from 9/25/81 to 10/13/83: Boll, D.: memorandum (H2015) dated 10/5/83.
3. Draft Collection Management Plan: Curatorial Services Branch, HFC: 1986.

C-6. Historic Resources Study and Historical Base Map
1. Woodward Report, Vol. 1. Woodward, Arthur: 1958.
2. The Third Fort Union, 1863-1891: A Structures Report: Denver Service Center: 1982.
3. Fort Union and the Santa Fe Trail: National Park Service: 1959.
4. Miscellaneous maps, FOUN map file.
5. Fort Union Fact File.

C-7. Meet Curatorial Storage Requirements
1. Scope of Collection Statement for Fort Union National Monument: 1982.
2. Final Report and Recommendations Related to Curatorial Project from 9/25/81 to 10/13/83: Boll, D.: memorandum (H2015) dated 10/5/83.
3. General Management Plan, Fort Union National Monument: approved 1985.
4. Draft Collection Management Plan: Curatorial Services Branch, HFC: 1986.

C-8. Star Fort Management Program
1. Refer to Miscellaneous References and Bibliography.

C-9. Oral History Project
1. Approximately 30 reel-to-reel tapes in Fort Union Collections

C-11. Historic Structure Reports
1. Woodward Report.
2. The Third Fort Union, 1863-1891: A Structures Report.
3. Sketches of 1st Fort Union by 1) J.K.F. Mansfield, 1853 and 2) Joseph Heger, 1859.
4. Report (rough draft) on First Fort structures, FOUN files (date unknown).

C-12. Collections Condition Survey
1. Scope of Collection Statement for Fort Union National Monument: 1982.
2. Final Report and Recommendations Related to Curatorial Project from 9/25/81 to 10/13/83: Boll, D.: memorandum (H2015) dated 10/5/83.
3. FOUN Museum Catalog Cards and Accession Files.
4. Draft Collection Management Plan for Fort Union National Monument: Curatorial Services Branch, HFC: 1986.

C-13. Archaeological Overview and Assessment
1. Refer to Miscellaneous References and Bibliography

Other References
1. Resource Management Plan and Environmental Assessment for Fort Union National Monument (4/22/82).
2. Statement for Management, Fort Union National Monument (June, 1976).
3. General Management Plan, Fort Union National Monument (2/14/85).
4. Management Directives, Fort Union National Monument (various).
5. New Mexico Joint Powers Operating Plan--Cibola Unit (6/8/83).
6. Threats to the Monument.
7. Interpretive Prospectus, Fort Union National Monument: 1967.
8. Review of Planning Documents, Fort Union National Monument: Scott, Jane: 1978.
9. Bibliography: I&RM Files.

APPENDIX F

RESOURCE PROGRAMMING SHEETS

X NATURAL RESOURCES

CULTURAL RESOURCES

FOUN PARK

SWR REGION

NM STATE

1/87 DATE

NATIONAL PARK SERVICE

RESOURCES PROGRAMMING SHEET

NRP Reference Number	Project & Activity Title	Action Type	Priority	LAST YEAR FY 1986 FUNDED		CURRENT YEAR FY 1987 FUNDED		CURRENT YEAR FY 1987 ADDITIONAL REQUIRED		NEXT YEAR FY 1988 BUDGETED		NEXT YEAR FY 1988 ADDITIONAL REQUIRED		FY 1989 PLANNED		FY 1989 ADDITIONAL REQUIRED		FY 1990 PLANNED		FY 1990 ADDITIONAL REQUIRED	
				WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000
FOUN-N-1	Natural Resource Base Inven.	C	1									.5	10			.5	10				
FOUN-N-6	IPM Plan	A	2			.1	1														
FOUN-N-7	Hist. Scene Management Plan	A/B	3							.1	4			.1	4			.1	4		
FOUN-N-5	Flood Hazard Study	C	4																	.3	10

APPENDIX F

F-1

| NATURAL RESOURCES

X CULTURAL RESOURCES

FOUN PARK

SWR REGION

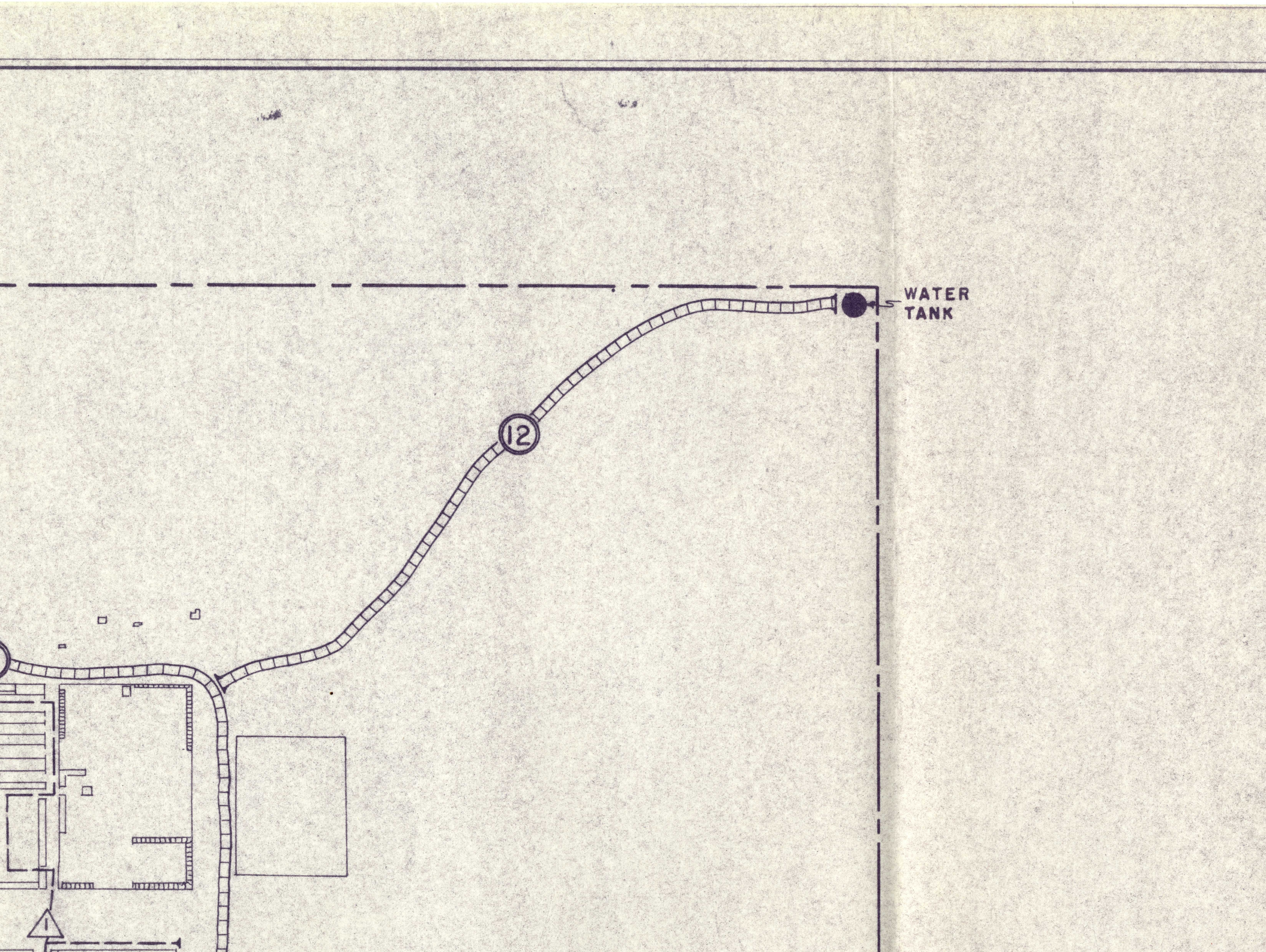
NM STATE

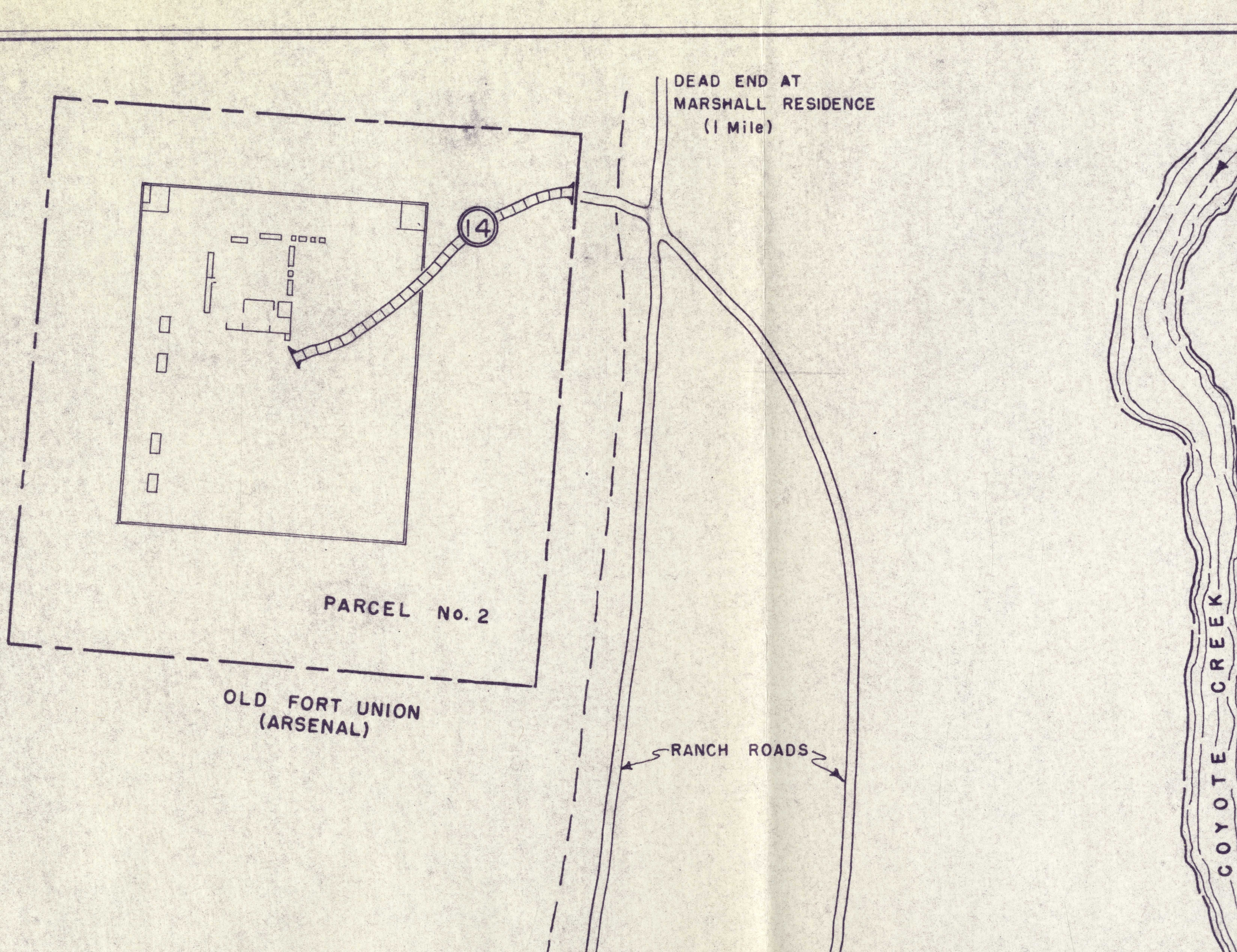
1/87 DATE

NATIONAL PARK SERVICE

RESOURCES PROGRAMMING SHEET

UIP Reference Number	Project & Activity Title	Action Type	Priority	LAST YEAR FY 1986 FUNDED		CURRENT YEAR FY 1987 FUNDED		CURRENT YEAR FY 1987 ADDITIONAL REQUIRED		NEXT YEAR FY 1988 BUDGETED		NEXT YEAR FY 1988 ADDITIONAL REQUIRED		FY 1989 PLANNED		FY 1989 ADDITIONAL REQUIRED		FY 1990 PLANNED		FY 1990 ADDITIONAL REQUIRED	
				WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000	WY	$1000
FOUN-C-1	Stabilization of Adobe Walls	A	2			.3	10					1.6	50								
FOUN-C-2	Ruins Preservation Research	R	1									.7	20								
FOUN-C-6	Historical Resource Study & Hist. Base Map	R	3									1.0	50			.8	25			.8	25
FOUN-C-11	Historical Structures Report First Fort & Arsenal	R	4									.2	10			.7	20				
FOUN-C-7	Meet Curatorial Storage Reqs.	A	5									.5	17			1.0	34			.1	160
FOUN-C-4	Historical Research	R	6									.8	30			.8	30			1.6	65
FOUN-C-12	Collections Condition Survey	A	7													.2	10				
FOUN-C-13	Archaeol. Overview & Assessment	R	8													.5	15			.5	15


WATER
TANK
12


DEAD END AT
MARSHALL RESIDENCE
(1 Mile)
14
PARCEL No. 2
OLD FORT UNION
(ARSENAL)
RANCH ROADS
COYOTE CREEK

AD TO HWY. 85
(5.5 MILES)

RECOMMENDED. /S/Homer F. Hastings
Superintendent

CONCURRED. /S/Harold A. Marsh
Acting Regional Chief, Division of Maintenance

APPROVED. /S/George W. Miller
Assistant Regional Director

PARCEL No. 1

0 400 800 1200 1600

SCALE IN FEET

MARK	DESCRIPTION OF REVISION

ARY (2)

ROUTE & SECTION LIMITS
PARKING AREAS
TRAILS (2)

FOOT
HORSE

TRAIL TERMINI

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
MAINTENANCE BRANCH
PREPARED BY
REGIONAL
OFFICE

ROADS & TRAILS SYSTEMS
TITLE OF DRAWING
AS MAINTAINED
LOCATION WITHIN PARK
FORT UNION NATIONAL MONUME
NAME OF PARK