RESOURCES MANAGEMENT PLAN

FOR

LYNDON B. JOHNSON NATIONAL HISTORICAL PARK

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INTRODUCTION

The Resources Management Plan is a strategic planning document and a key factor in proper management of the resources. The plan includes a set of project statements comprised of proposed actions for implementation as well as 5-year programming sheets for management and research actions. Project statements are determined on the basis of approved Statements for Management and consideration of previously completed research.

The plan provides continuity and serves as a manual for the Superintendent in three ways: (1) for management activities which will help maintain natural ecological processes, (2) for the enlightened management of archeological and historical resources, and (3) a set of research recommendations and priorities which are designed to obtain additional information for management and interpretation.

A. PURPOSE OF THE PARK

The purpose of the Lyndon B. Johnson National Historical Park is to preserve and interpret historically significant properties associated with the life of Lyndon B. Johnson and his heritage. See Public Law 91-134 of December 2, 1969, which established the National Historic Site, the Historic Sites Act of 1935 (See Appendix), and conversations between National Park Service Director George Hartzog and President Johnson (described later in this Statement).

B. SIGNIFICANCE OF THE PARK'S RESOURCES

Lyndon B. Johnson's life had a tremendous impact on this Nation and the world. The historic resources of the National Historical Park document the full story of his life from his grandparents' first settlement in this area, to his birth and boyhood years, to the years when the LBJ Ranch served as the Texas White House, and finally the retirement years and burial at the Johnson Family Cemetery. Here, as in few other historic sites, one can see the lands and structures that represent the origins, ancestry, and full life span of a major historical figure.

The National Historical Park consists of the Johnson City Unit (39.44 acres) (16 ha) and, 15 miles (24 km) west, the LBJ Ranch Unit (201.37 acres) (81 ha). Located in the Johnson City Unit are the Boyhood Home, where Lyndon Johnson lived during his formative years; and the Johnson Settlement Area, which President Johnson's grandfather used as headquarters for his open-range cattle business from 1867-1872. The original log house still stands, as do several stone buildings constructed by later owners. The frontier heritage, family, and community, all had a real influence on Lyndon Johnson's development.

The LBJ Ranch Unit contains the Texas White House and associated structures for communications, transportation, and security; the operating ranch with fields and pastures, showbarn, cattle pens,and registered Herefords; the Birthplace House; the Junction School; and the Johnson Family Cemetery. The full impact of Lyndon Johnson's energy and power can be felt at the LBJ Ranch, scene of serious political decision-making as well as quiet times with family and friends.

In addition to the 98 historic structures maintained by the National Park Service, some 3,000 historic objects are used to furnish or interpret the various sites.

From the 1860's to the 1970's, the historic resources at the LBJ National Historical Park document and communicate the heritage of the 36th President of the United States.

C. LAND CLASSIFICATION

Lyndon B. Johnson National Historical Park is listed on the National Register of Historic Places, and as such, its 249.64 (97 ha) Federally-owned acres are classified as a historic zone, and are managed in compliance with the standards as outlined in Management Policies of the National Park Service (1975), which limit physical development to the minimum needed to preserve, protect, and interpret the historical, cultural, and archeological values, and which limit activities therein to sightseeing and the study of the cultural features. See Appendix A, Management Subzones.

D. INFLUENCES UPON MANAGEMENT

1. Legislative and Administrative Constraints

Constraint documents can be found at Park Headquarters and at Southwest Regional Office in Santa Fe, New Mexico.

Public Law 91-134, December 2, 1969, authorized the Secretary of the Interior to acquire "by donation or by purchase with donated funds" lands for the National Historic Site. The Act authorized "to be appropriated not more than $180,000" to provide for development.

S.2363-1980 Parks Omnibus Bill Title VI Lyndon B. Johnson NHP amends PL 91-134 by changing National Historic Site to National Historical Park, raising the development ceiling to $4,100,000 and authorizing the acquisition of land by purchase with appropriated funding not to exceed $1,400,000.

All management and development decisions and actions must comply with the provisions of the Antiquities Act of 1906;

the National Park Service Organic Act of 1916; the Historic Sites Act of 1936; the National Historic Preservation Act of 1966; the National Environmental Policy Act of 1969; Executive Order 11593 of May 13, 1971; the Historical and Archeological Data Preservation Act of 1974; the Architectural Barriers Act of 1968; and the Handicapped Rehabilitation Act of 1973. In addition, applicable guidance and procedures are provided by the most current activities standards and management policies of the National Park Service.

The President and Mrs. Johnson had meetings with a number of National Park Service and U.S. Department of the Interior officials during which agreements were made which guide the development of the National Historic Park. Those officials included Secretary of the Interior Rogers C.B. Morton, National Park Service Directors George Hartzog and Ronald Walker, National Park Service Regional Directors Frank Kowski and Joseph Rumburg, and Field Assistant to the Regional Director Charlie Boatner. The most important of these agreements and understandings may be summarized as follows:

The President and Mrs. Johnson, along with other members of their family and business associates, would donate buildings and land to the National Park Service for the National Historic Park in increments over the years, subject to concurrence by the donors that the justifications by the National Park Service for additional acreage were valid "by the needs of history, protection, and preservation". President Johnson accepted the recommendation of the National Park Service that he donate certain lands first at the LBJ Ranch (including the Ranch House complex, fields to the north, and river bottom lands) and the Johnson Settlement Area (Bruckner and Cox tracts). As part of the donation understanding Director Hartzog agreed, as suggested by President Johnson, that the President and Mrs. Johnson have lifetime estate in the "LBJ Ranch headquarters building and accessory outbuildings and improvements, together with unrestricted right of ingress and egress"; that a number of President Johnson's employees become National Park Service employees to continue operating the ranch as a "working ranch" rather than a sterile relic of the past; that the Johnsons be responsible for maintenance of the interior of the LBJ Ranch House as long as they continue to live there, and that the National Park Service be responsible for exterior maintenance of the LBJ Ranch House; that the Johnsons allow tours to be conducted via bus by the Ranch House on a mutually-agreed schedule; and that good cooperative relations, including a continued sharing of personnel and equipment, as practiced by President Johnson, be maintained among all individuals, ranchers, community organizations, and local, State, and

Federal Government agencies in the LBJ Ranch Area. The President and Mrs. Johnson expressed the firm view that admission to the park should always be free. "What wasn't given is coming out of their pockets as tax monies--State or Federal." He was speaking of both the State and Federal parks.

Mrs. Johnson, her family and business associates, declared to Regional Director Joseph Rumburg their hope that they will be in a position to donate the remainder of the original portion of the LBJ Ranch and the 37-acre (15 ha) area south of the Johnson Settlement to the National Park Service in years to come.

The deeds donating the ranch lands to the National Park Service convey water rights subject to "first use" by the grantor. Also reserved to the grantor is "joint use" with the National Park Service "of the irrigation water line. . . to Leaky Tank. . . and joint use of said tank as a storage reservoir".

Pending donations of additional land, Mrs. Johnson, her family and business associates are leasing to the National Park Service (at $1.00 per year) other lands and facilities needed for a viable park operation. The leased properties at the LBJ Ranch Unit allow access through the ranch lands of National Park Service tour buses,use of cattle pens, sheds, and the showbarn for maintenance of the cattle operation and interpretation to visitors of the registered Herefords in the showbarn, and use of certain buildings for temporary operations center, including bus parking and maintenance, an office, general storage and curatorial storage. At some time in the future a new ranch operations center should be constructed at a better location.

By agreement among the Texas Parks and Wildlife Department, the National Park Service, and the President and Mrs. Johnson, the State Historical Park on the south side of the Pedernales River includes visitor orientation for both parks, as well as a variety of recreational uses. The National Historical Park concentrates on historic preservation and interpretation with no development of recreational facilities. National Park Service buses pick up visitors at the State Historcal Park Visitor Center for tours of the National Historical Park. There is coordination of park operational activities, signing, equipment use, publications, and training between the two parks.

The National Park Service has proprietary law-enforcement jurisdiction. Good working relationships exist with nearby

Federal, State, and local law-enforcement authorities who assist whenever called upon. At present the Johnson City Night Marshal provides intermittent patrol services at the Johnson City Unit during the late night hours.

2. Regional Influences

The National Historic Park is located in the scenic, rolling, wooded Hill Country of Texas. Visually, it is an enjoyable land with an agriculturally-oriented economy. Some urbanization pressures are apparent, not in the small towns, but in the subdivision of ranches for speculative (and successful) "ranchettes" of five acres (2 ha) or more. The population of the Hill Country region is predominantly white and agrarian, but there are sizable groups of blacks and Mexican-Americans scattered in different sections. Economically the region is stable, supported by a wide, viable range of income sources. Johnson City is a small, agriculturally-oriented town of about 1,000 people, and is the county seat of Blanco County.

The area around the LBJ Ranch Unit, located near Stonewall in Gillespie County, is now a very attractive and viable environment, mostly dedicated to ranching. Large and economical farm units prevail, with a scattering of small villages and single-family residential units. The State has developed the LBJ State Historical Park to preserve lands south of the ranch from commercial exploitation, and purchased additional lands along the Pedernales to preclude loss of pastoral, scenic, and historic qualities, as well as to provide space for additional park facilities and public use.

The LBJ sites are popular with visitors both from within and outside the State. With implementation of the various additional proposals, the "industry" generated could become second only to agriculture in regional economic impact.

Related regional public facilities show the same trend. The LBJ Library in Austin is one of the most popular Presidential libraries. The Admiral Chester W. Nimitz State Historical Park in Fredericksburg, 15 miles (24 km) west of the LBJ Ranch, is also a popular attraction, even partially developed. Both of these sites offer complementary interpretive opportunities to the Lyndon B. Johnson National Historical Park. Pedernales Falls State Park, Blanco State Park in Blanco County, Enchanted Rock State Park and Lady Bird Park in Gillespie County offer camping and a wide variety of recreational activities.

Surrounding the LBJ Ranch Unit on the west, north, and east is a proposed scenic protection zone. (To the south, scenic protection for the LBJ Ranch is provided by the LBJ State Historical Park.) The intent of this zone is to preserve the low density, agricultural character of the land. Local zoning or the purchase of restrictive easements by the National Park Service will accomplish this objective.

3. Within-Park Influences

The Lyndon B. Johnson sites draw large numbers of visitors from all over the United States and the world. For 1981, 136,741 visits were recorded at the Johnson City Unit; 163,944 visits at the LBJ Ranch Unit.

Records kept for three specific functions during 1981, show 54,514 persons carried on the horse-drawn wagon interpretive tour, 94,132 persons conducted on tours through the Boyhood Home, and 159,705 visitors carried on the interpretive bus tour of the LBJ Ranch.

The greatest number of people come during the summer months, but visitation occurs year-round. During spring, and to a lesser extent in the fall, school groups and other special tour groups visit the park in large numbers. Visitors from the northern states come to south Texas for the winter and visit the park in large numbers. Except for a occasional day when visitation is unusually high, the park does provide visitors with a high-quality park experience. If visitation substantially increases, however, the great popularity of the National Historical Park could destroy the quiet dignity of the place--the very thing people come to experience. Fortunately, however, some built-in constraints against overuse will help to preserve the present quality of the visitor experience as well as that of the resource integrity.

Two visitor-carrying-capacity problems exist at present in the Johnson City Unit. First, the temporary visitor center does not have adequate floor space to effectively accomplish the desired informational and interpretive functions. Secondly, with no parking facilities, visitors are forced to park along congested city streets.

The Boyhood Home can comfortably accommodate 20 people at a time on a 20-minute tour--about 60 people per hour, or as many as 480 per an 8-hour day. Of course, evening hours increase this capacity, and the grounds and porches are used to accommodate other visitors. The Johnson Settlement is more spacious, and will not often be over-crowded because access is restricted to horse-drawn wagons and walking.

Access to the historical resources in the LBJ Ranch Unit is largely limited to tours originating from the State Park. Although there is access after hours to certain features by private car, tour-bus service is the only means of getting into the LBJ Ranch itself. The State Park facilities have been enlarged to handle more visitors, to take into account the slower turnover factor that has resulted because of the bus tour which began on June 1, 1973. Traffic congestion, which in the past occurred at the Birthplace House and Cemetery, has been relieved by closing Park Road 49 to private cars during the period the tour buses are running. One busload of 60 persons at a time is the maximum carrying capacity for the LBJ Birthplace. Visits at the Birthplace take approximately 10 minutes. Thus, 360 persons per hour represents the carrying capacity at the Birthplace. On busy days at present, visitation approaches, but rarely exceeds this carrying capacity.

In the future, the critical carrying capacity will be that of the main house. At that time, tours of the house can be designed to both maximize the visitor experience and minimize the adverse impacts on historical resources. Grounds and outbuildings can accommodate many visitors and, in fact, become an integral part of the overall interpretive story.

E. MANAGEMENT OBJECTIVES

1. To identify, evaluate, preserve, and protect the Park's historical resources in a manner consistent with legislative mandates, management policies, and perpetuation of the values for which the National Historical Park was established, by: acquiring the remainder of the LBJ Ranch and adjacent lands necessary to preserve the historic scene; acquiring property or restrictive easements near the Boyhood Home and the Johnson Settlement for development of visitor facilities and preservation of the historic scene; basing all maintenance, resource management, and interpretation on thorough historical research, to ensure that the Site is presented with a high degree of historical authenticity.

2. To provide visitors with opportunities for meaningful park experiences, by offering a varied and balanced interpretive program that offers insights into the heritage of Lyndon B. Johnson, with emphasis on his life at the LBJ Ranch, his family (including his parents and grandparents), and the Hill Country environment in which he was raised.

3. To cooperate with State and local officials and community

organizations to further park objectives and to encourage compatible land uses adjacent to the National Historical Park; and to work closely with the management of the LBJ State Historical Park to coordiante programs to provide visitors with an enjoyable and well-integrated visit to the National Park/State Park complex.

PART I

CULTURAL RESOURCE MANAGEMENT PROGRAM

A. Overview and Needs

1. Principle Resources

   a. LBJ Ranch House
   b. LBJ Hangar
   c. Ancillary Structures (Core Area)
   d. Other Structures (Core Area)
   e. Showbarn Area
   f. Sam Ealy Johnson Farmhouse
   g. Birthplace/Guest House
   h. Junction School
   i. Johnson Family Cemetery
   j. LBJ Boyhood Home
   k. Sam Johnson Log Cabin
   l. Johnson and Bruckner Barns

2. Summary of Research Activities and Concerns

3. Curatorial Operations and Needs

4. Cultural Resource Preservation

A. OVERVIEW AND NEEDS

At Lyndon B. Johnson National Historical Park the National Park Service is managing historic resources of considerable significance. Included in this park are sites which relate to Lyndon B. Johnson's ancestors, his birth, childhood years, public life, retirement and death. Few historic parks embrace the life of one person so comprehensively. The park is presently managed in two units; the Johnson City Unit includes the Boyhood Home and the Johnson Settlement areas and the LBJ Ranch Unit includes the Birthplace, Junction School, Johnson Family Cemetery, Texas White House, and the rest of the LBJ Ranch lands and buildings.

1. PRINCIPLE RESOURCES

a. LBJ Ranch House

The Ranch House was purchased by Senator and Mrs. Johnson in 1951. Over the years, the Johnsons remodeled and added to the house to accommodate the demands of the Senator's work, later Vice Presidential and Presidential activities, and the needs of his wife and their two daughters, Lynda Bird and Luci Baines. It was after Lyndon Johnson became President, however, that the ranch house assumed special significance as the Texas White House. When the President came home, it was the scene of incredible activity. National and world leaders conferred; friends, neighbors, and relatives visited. Somehow the President of the United States managed to find personal solitude and renewal.

The President and Mrs. Johnson donated the Ranch House complex to the National Park Service in December 1972 with the understanding that they would have a life estate. At present, the National Park Serive maintains the exterior and structural fabric of the house and Mrs. Johnson maintains the interior. The National Park Service conducts bus tours of the ranch which include a stop by the Ranch House. Visitors remain on the bus at the Ranch Headquarters complex and receive interpretation through a recording by Mrs. Johnson and the driver's commentary.

The long-range objective is to restore the house and grounds to their appearance during the last year of the Presidency ending in January 1969. An exception to this time frame will be made in several rooms which will be preserved and refurnished to interpret the retirement years. Conducted tours of the house will become the prime visitor attraction at Lyndon B. Johnson National Historical Park.

To properly implement plans to preserve, restore and manage visitor use of the Ranch House, park personnel need studies which document the structural and human history, a maintenance and preservation guide, a furnishing plan, a landscape plan, and a visitor use plan.

b. LBJ Hangar

The Hangar was used by President Johnson to store his airplane, to hold press conferences, to have parties and to show movies for guests and neighbors.

The Hangar is presently owned by the National Park Service with Mrs. Johnson retaining the right to use the Hangar. The Hangar and other out-buildings are interpreted to visitors on the bus tour. The park maintains the exterior of the Hangar to its appearance during the final year of the Presidency.

National Park Service will continue to accurately preserve the exterior appearance of the Hangar. The interior of the main room in the Hangar may be restored to its appearance in January 1968 - January 1969. Visitors may receive orientation/interpretation here in the same manner that was used for LBJ's press conferences and movie showings. Other rooms in the Hangar--restrooms, storage rooms, office, kitchen and quarters--may be put to adaptive use.

c. Ancillary Structures (Core Area)

Significant activity occured in these structures during the Presidential years: objects for family and ranch use were stored in the Old Barn; communications with the President from all over the world came through the White House Communications Agency Switchboard Building; the Secret Service Command Post served as nerve center for the function of protecting the President; the Military Aid Trailer was used as an office and quarters; the Cryptography Trailer was used for coding and decoding important messages for the President. These structures have been donated to the National Park Service with Mrs. Johnson reserving a life estate. The park is attempting to maintain the buildings to their appearance during the final year of the Presidency. The Secret Service Command Post continues to function with Secret Service personnel 24 hours a day.

Only a few minor restoration changes are needed for the exteriors. All of these buildings may be worthy of interior restoration.

Studies are needed which document the structural and human history of these buidlings, refurnishing studies and plans, and maintenance and preservation guides.

d. Other Structures (Core Area)

The following structures served useful functions in the Ranch Headquarters Complex: Klein's Maintenance Shop, the Pumphouse, the Pressure Tank Building, the Water Well Pumphouse, the Freezer-Cooler Shed, the Car Wash Shelter and the Welder Storage Shed. These structures have been donated to the National Park Service with Mrs. Johnson reserving a life estate. The Park is maintaining the exterior of these structures to their appearance during the final year of the Presidency. The interiors are being used for the park's maintenance activities.

We will continue preservation maintenance. Better documentation of the appearance of these structures during 1968 would help to perfect preservation maintenance. The interiors of these structures are not judged worthy of interior restoration and will continue to be adaptively used. Klein's Shop has a large interior which could accommodate adaptive use for orientation, visitor restrooms, and interpretive sales facility. Historical studies and preservation guides are needed.

e. Showbarn Area

The Showbarn was a favorite place of President Johnson's. He would bring visitors here to show his registered Herefords and also to make cattle sales. The Showbarn along with other facilities and land is presently leased to the National Park Service by the LBJ Company for $1.00 per year subject to joint use by the LBJ Company or its lessee. The Showbarn is a very popular stop for visitors on the bus tour of the LBJ Ranch. The park maintains the Showbarn to its general appearance during the years 1963 - 1973. The park ranching staff with modern equipment is headquartered at the Showbarn. The park does not attempt at present to re-create accurately the historic scene which existed in President Johnson's time. The present objective at the Showbarn is to give visitors a feeling for, and understanding of, the ranching atmosphere which was an important part of President Johnson's life.

The National Park Service hopes to acquire the Showbarn and adjoining ranch lands and pens by donation from Mrs. Johnson and her family. In the future (long range), ranching personnel and modern equipment will be moved from the Showbarn to a location which would not intrude upon the historic scene: possibilities would be the old

Fertilizer Shed area--where bus operations are now--or a new location in the Hay Shed Field. At that time, work will be done to restore the historic scene to the 1963-1973 period, including: interior and exterior restoration and preservation maintenance; refurnishing of the rooms, display of the original farm equipment used by President Johnson; continued use by the registered Herefords; and the interpretation will be done by cowboys/ranch hands in period clothing.

Historical studies, preservation guides, and furnishing studies and plans are needed.

f. Sam Ealy Johnson Farmhouse

President Johnson's grandparents, Sam and Eliza Johnson, made this their home in the late nineteenth and early twentieth century. It was used as a rent house for President Johnson's employees during the late 1960's and early 1970's. Mrs. Johnson donated this property to the National Park Service in 1980.

The exterior of the house and the grounds will be preserved as part of the historic scene on the LBJ Ranch, 1963-1973. The interior may be used for National Park Service employee quarters.

g. Birthplace/Guest House

Lyndon Johnson was born in the original house on August 27, 1908, and lived there his first five years. The house was torn down in 1935. President and Mrs. Johnson had the house reconstructed in 1964. Based on the research he conducted "to establish the original appearance" of the house, the architect did a fair job with the reconstruction, but a few errors did occur. The house was used briefly as a guesthouse, then refurnished and opened with volunteers and taped recordings which interpreted President Johnson's childhood years. President and Mrs. Johnson donated the house to the National Park Service in 1970. The National Park Service, with Mrs. Johnson's approval, has made several changes designed to more accurately portray the historic scene of 1908-1913, such as: placement of wide boards on the Birthplace porch; reconstruction of the period barn; privies; fencing; reduction in the number of flower beds; relocation of a modern maintenance shed; and limited furnishings adjustments. Interpretation emphasizes the childhood years. The visiting public also learns that the President and Mrs. Johnson had the Birthplace reconstructed themselves.

The Birthplace will remain as it is presently. Ultimately the barn will be removed and the restrooms and sales area moved nearer the core area, possibly to Klein's Shop.

h. Junction School

At the age of four, Lyndon Johnson walked from the Birthplace House to the Junction School to attend classes with the older children. This historic school was purchased by the National Park Service in 1972 with funds donated by President Johnson. A start toward restoration of the school has been made by removal of the modern additions. The school is presently interpreted to visitors from the tour bus.

The school will be restored to its appearance in 1912-1913. Pending the restoration work the park staff will continue to provide maintenance to preserve the structure as is. A preservation guide is needed.

A wayside exhibit to interpret the signing of the Elementary and Secondary Education Act is planned. The use of the buildings interior is not presently established.

i. Johnson Family Cemetery

President Johnson, his parents, grandparents, brother, sisters, and other relatives are buried here. Other family members will be buried here in the future. The National Park Service perpetuates the simplicity and the peaceful, rural atmosphere of the cemetery. Mrs. Johnson is consulted before any physical change or development takes place in or around the cemetery. The plans she approves (walks, plantings, burial policies, etc.) will become part of the historic scene at the cemetery and be preserved in perpetuity. A wayside exhibit of the cemetery is planned.

Two studies are needed: a history of the cemetery and a preservation/maintenance guide.

j. LBJ Boyhood Home

Lyndon Johnson spent his boyhood years in this house. He had it remodeled in 1964 and donated it to the National Park Service in 1970. In 1973-1974, the National Park Service restored and refurnished the Boyhood Home to its appearance in 1922-1925 when Lyndon Johnson lived there as a growing boy. A period barn similar in size to the original barn was placed on the site of the original barn in 1972. Other outbuildings and fences were reconstructed. Visitors are conducted on guided tours daily.

Plans are to further refine the restoration and refurnishings of the house, grounds and outbuildings to more accurately reflect the historic scene of the boyhood years. The modern garage/restroom building will be removed when permanent restrooms are relocated across the street.

k. Sam Johnson Log Cabin

Lyndon Johnson's frontier heritage had an impact on his life. His grandparents made the log house headquarters for their extensive longhorn cattle business. A portion of this area was purchased for the National Park Service with funds donated by President and Mrs. Johnson in 1972. The National Park Service has restored the original log house. Visitors walking through this area experience the frontier heritage of Lyndon Johnson by seeing the log house, a fair view of the "open range" to the south with a few representative longhorns, a chuck wagon and living history activity.

Refinement of the present program includes: cultivation of more native grass, berries and weeds; relocation of the chuckwagon and continued preservation maintenance.

l. Johnson and Bruckner Barns

The James Polk Johnsons (President Johnson's second cousin and founder of Johnson City) and the John Bruckners lived here during the latter part of the nineteenth century. This area was purchased for the National Park Service with funds donated by President and Mrs. Johnson in 1972. The National Park Service has restored the three original stone buildings and added period type fences, corrals, a windmill, cropland and longhorn cattle. Visitors walking through this area see the transition from the open range cattle days to closed range ranching and farming.

2. SUMMARY OF RESEARCH ACTIVITIES AND CONCERNS

Historic research at Lyndon B. Johnson NHP encompasses two different areas and efforts. The first is that research which supports day-to-day park operations. This entails retrieval of historic information from available documents in the park's files, library and infrequently outside sources. The product is documented information that provides background for accurate interpretive programs and publications. Frequent private sector and other agency requests are also satisfied through this effort. The second area of the park's historic research program is basic research. This is the on-going field research that includes oral history research and interviews and the collection of any available material that pertains to the Presidential period and the pre-Presidential legacy of Lyndon B. Johnson.

In this effort we are documenting the myriad activities which were happening at the ranch when LBJ was President so that we will have information for future planning decisions, interpretive programs, furnishing plans, historic structure reports, etc.

Work currently in progress includes the Historic Structures Report on the Texas White House, completion reports on the restored buildings in Johnson City, and a study of ranching operations at the LBJ Ranch.

We have several areas of critical concern to future interpretation and planning at LBJ NHP. Foremost among them are White House Communications Agency and Secret Service activities at the ranch during the Presidency. These two agencies are by nature highly secretive in their activities and have not been very cooperative in providing the information which will be critical to the success of future interpretive programs at the ranch.

Critical to current and near future operations are the completion reports on the restored buildings in Johnson City, the archeological assessment and survey and the Historic Landscape Study and Plans for the entire park. The completion reports for the Boyhood Home, Johnson Settlement cabin, Bruckner Barn, and James Polk Johnson Barn are underway.

The information which will be contained in these reports is needed for interpretive programs and most critically to document the work that was done. The archeological assessment/survey and Historic Landscape Study and Plans are needed not only for the interpretive information they will contain but for planning and development purposes and for the Park Land Protection Plan.

The Historic Landscape Studies and Plans are a critical need to provide basic data and direction for planning and maintenance of the historic scene. (Historic structures usually receive early funding for studies and plans. Unfortunately the landscape, providing a context for the overall scene is usally neglected in terms of historic record. This deficiency at LYJO should not be ignored any longer.)

Finally, any and all studies programmed for the LBJ Ranch Unit should be done as soon as possible since the primary resources, that is the people involved, are still alive and their input will be invaluable to the success of any research in the area.

3. CURATORIAL OPERATIONS AND NEEDS

Lyndon B. Johnson National Historical Park is unique among Presidential parks and landmarks: within its boundaries are historic resources representative of the culture, ancestry, and full life-span of the 36th President of the United States. The purpose of the park collection will at all times be consistent with the applicable provisions of the master plan, Interpretive Prospectus, furnishing studies plans, and other documents governing park management and interpretation. Such purposes are:

(a) To acquire original objects having appropriate documentable association with the life of Lyndon B. Johnson, during the years expressed in the structures and grounds of the Birthplace House (1908-1913), Junction School (1912), Boyhood Home (1922-1925), and LBJ Ranch (1963-1973).

(b) To acquire original objects having appropriate documentable association with the structures, outbuildings, and grounds of the Johnson Settlement (1867-1900).

(c) To acquire, when necessary, appropriate original objects (or reproductions) representative of the period, to effectively furnish and interpret the sites listed above.

(d) To exclude from the park collection, objects - regardless of provenance or period - that are inappropriate to the interpretive objectives of the site indicated in the Master Plan, Interpretive Prospectus, furnishings studies and plans.

(e) To collect or acquire, as appropriate, natural history specimens that clearly and specifically illustrate the profound effect of the environment upon human history interpreted in the park.

(f) To recognize the intrinsic and irreplaceable value of all original objects in the park collection; to make use of reproductions only, in living history demonstrations; and to take all necessary measures to document, conserve, and safeguard the entire collection.

The Collections Management Plan completed in 1978 has been implemented and most of the recommendations carried out. The status of the museum collection is generally excellent with records well done and up-to-date.

We have been working closely with Mrs. Johnson to determine which furnishings will be left in the Texas White House when she leaves. We are approximately half through this project, however, the contents of the house are completely inventoried, described, and photographed.

The contents and use of the other structures at the ranch are also generally well documented.

Here again, our major problems are documenting and obtaining the contents of the structures associated with the Secret Service and the White House Communications Agency. We have documented the Secret Service Command Post as it was in 1977 just before the interior was renovated. Furnishings removed before and since that time are probably still extant but we cannot obtain

them. We have very little knowledge of the contents of White House Communications buildings and the agency has not been forthcoming with the needed information.

The other area of critical curatorial concern is with the vehicles and farm machinery in the collection. These are such a massive and complicated problem that the work needed to bring their care up to NPS curatorial standards is beyond all but the most superficial efforts of the park staff. We need funds, manpower, and expertise to properly care for these items.

4. CULTURAL RESOURCES PRESERVATION

The cultural resources at LBJ NHP are generally well preserved. With the completion of the restoration work on the Boyhood Home and Johnson Settlement buildings most of the work now consists of preservation maintenance.

There are 43 structures on the list of classified structures. We are in the process of up-dating this list which will ultimately contain approximately 98 structures.

The National Register nomination forms have been completed.

There are several areas of concern which involve cultural resources preservation. The Preservation Guides for the buildings restored at the Johnson Settlement need to be completed and a Preservation Guide for the Texas White House needs to be funded and developed. These are of critical concern to park management.

The park has accumulated a considerable body of material pertaining to the cultural resources in the park. To synthesize and amplify this material we need at least four studies. These are: Historic Resource Study, LBJ Ranch (1960-1972), Archeological Assessment and Survey for the entire park, an 11593 Survey on at least those lands slated for acquisition and a Historic Landscape Study and Plan for the entire park.

PROJECT TITLE: PROVIDE FIRE PROTECTION

PROJECT NUMBER: LYJO C-01

1.0 Statement of Problem:

This area has approximately 60 structures which require fire protection. Thirty-three of them require fire detection systems. Local volunteer fire departments are not consistantly reliable and distance and time factors sometimes render them ineffective.

1.1 Background Information

When the above factors were recognized park management proceeded to form a park fire brigade. Good progress has been made over the last five years in training and acquiring equipment.

However, two serious problems remain:

Effective fire control depends on early detection and suppression. At present four structures have fire detection technology [library, Curatorial Storage, Birthplace, and the Texas White House (partial)]. Five structures are slated for fire detection systems in 1982 (Old Barn, Boyhood Home, Johnson Cabin, Hangar, and Klein's Shop). This leave 21+ structures still unprotected.

The other problem is an inadequate water supply in both Johnson City and at the LBJ Ranch. In Johnson City the nearest fire hydrant to the Boyhood Home is two blocks away. At the Ranch the present water system and one hydrant located in the core area delivers a maximum of 400 gallons per minute. In both cases it is very difficult to obtain enough water to effectively fight a structural fire. Many important structures at the Ranch have no protection at all.

2.0 Alternative Action and Probable Impacts

2.1 No Action

This alternative recognized that we will accept the loss of irreplaceable historic resources.

2.2 Continue Present Management Action

This alternative somewhat mitigates alternative 2.1 as the fire brigade has at least a chance of saving some of the park's resources. Also many of the most significant structures have now or will soon have fire detection systems and at least some water source nearby.

2.3 Install Fire Detection Systems as Needed and Upgrade the Water Supply Systems at the Ranch and in Johnson City.

This alternative would measurably increase our chances of successfully fighting a structural fire anywhere in the park.

2.4 Install Fire Detection Systems and Upgrade Water Supplies. Install Fire Suppression System, i.e. Halon and Sprinkler Systems in all Important Structures.

This alternative furnishes by far the most protection for our historic resources. However, it would be extremely expensive and installation would be difficult.

3.0 Recommended Course of Action

3.1 Alternative 2.3, Install Fire Detection Systems and Upgrade Water Supplies, is the preferred course of action. This in conjunction with the park's fire brigade and a good fire inspection and hazard mitigation program will provide adequate fire protection for the park resources.

Installation of suppression systems should be given substantial consideration if funding should become available or if major renovations or restorations are planned for any structures in the park.

In particular the Texas White House should have a Halon System as soon as it can be feasibly installed. We are presently considering installation of a foam system in the attic spaces of this structure.

4.0 Requirements to Accomplish Action

Research: None (LBJ Ranch Historic Structures Report is in draft form).

Operations: Continue fire brigade training, etc., continue fire inspection and hazard mitigation.

Programming: 10-238's have been written for:
Package #137, Fire Detection or Suppression Systems.
Package #188, LBJ Ranch Water System.
Package # (unassigned), Extend LBJ Ranch water system to the Junction School.
Package # (unassigned), Upgrade water system and install fire hydrants at LBJ Boyhood Home.

PROJECT TITLE: HISTORIC STRUCTURES REPORTS

PROJECT NUMBER: LYJO C-02

1.0 Statement of Problem:

Park management needs historic structures reports for all historic structures in the park. These reports are needed to guide present and future maintenance, preservation and planning.

1.1 Background Information

We have adequate Historic Structures Reports for the LBJ Boyhood Home and the S.E. Johnson Log Cabin. At the LBJ Ranch we have a Historic Structures Report for the Texas White House and for the Junction School. We need Historic Structures Reports for seven major structures at the LBJ Ranch: Secret Service Command Post, Hangar, Airstrip, Communication Building, Pilots Trailer/ Crypto Trailer Complex, Showbarn, Cedar Guest House, LBJ Birthplace, and the S. E. Johnson Farmhouse. Also at the LBJ Ranch there are approximately 30 structures that need less extensive research than the major structures previously listed. In Johnson City, Historic Structures Reports are needed for the Bruckner and James Polk Johnson barns.

2.0 Alternative Actions & Probable Impacts

2.1 No Action

This action recognizes that information will be lost as structures deteriorate and the people who were involved with their construction and use pass away.

2.2 Continue Present Management Action

Management is presently collecting information, as it becomes available, on all Park structures. This is a less than satisfactory substitute for the needed Historic Structures Report.

2.3 Program and Execute Historic Structures Reports for all Remaining Structures

This is the most satisfactory alternative as it will integrate research already done with new research and additional architectural drawings.

3.0 Recommended Course of Action

3.1 Alternative 2.3, Program and Execute Historic Structures Reports for all Remaining Structures, is the recommended course of action as this would preserve the most information in the most usable form.

4.0 Requirements to Accomplish Action

Research: Continue present management action

Operations: None

Programming: 10-238's have been written and approved for the following:
Package #150, Historic Structures Reports, LBJ Ranch (includes core area outbuildings)
Package #154, Historic Structures Report, LBJ Birthplace
Package #164, Historic Structures Report, Johnson Settlement (includes barns)
Package #121, Historic Structures Report, S. E. Johnson Sr. House

PROJECT TITLE: HISTORIC LANDSCAPE STUDIES AND PLANS

PROJECT NUMBER: C-03

1.0 Statement of Problem

Historic landscape studies and plans are needed so that we may restore and/or maintain the landscape surrounding the major historic sites in the park.

1.1 Background Information

We know that the landscapes in the various subzones have changed from what they were during the various time periods being portrayed. What we don't know, in most cases, is how the scene has changed. These studies are needed to compile information on how the landscape looked, document the present scene and make recommendations for future management and maintenance.

2.0 Alternative Actions and Probable Impacts

2.1 No Action

This alternative recognizes that incomplete and inaccurate restoration and poor management decisions will result, if this alternative is chosen.

2.2 Continue Present Management Action

Management presently is collecting information as it becomes available, and documenting changes as they occur.

2.3 Execute the Landscape Studies as Programmed

This is the only alternative that really solves the problem as it would collate and synthesize information already collected and add information from new research. The recommendations for future management would be invaluable.

3.0 Recommended Course of Action

3.1 Alternative 2.3, Execute Landscape Studies as Programmed, is the preferred course of action. This would preserve the most information in the most usable form.

4.0 Requirements to Accomplish Action

Research: Continue present efforts to collect information.

Operations: Continue to document all changes and other actions affecting the historic scene.

Programming: 10-238's have been written for: Package #173, Landscape studies and plans for the Boyhood Home, Johnson Settlement, Birthplace, Junction School and LBJ Rnach Complex. This package will be revised to include the S.E. Johnson, Sr. (Jordan) house. Package # (unassigned), Aerial Photography.

PROJECT TITLE: INTERPRETIVE PROSPECTUS

PROJECT NUMBER: C-04

1.0 Statement of Problem:

Lyndon B. Johnson National Historical Park needs a new Interpretive Prospectus.

1.1 Background Information

The original Interpretive Prospectus was written in 1975. It was out-of-date almost as soon as it was written; little mention was made of interpretation at the Ranch either present or future. A new prospectus is needed to guide interpretive planning, historical research, curatorial acquisitions, etc. A new prospectus is presently programmed for FY 1984.

2.0 Alternative Action and Probable Impacts

2.1 No Action

This alternative recognizes poor or nonexistent planning leads to poor results.

2.2 Continue Present Management Action

Interpretive managers in the park have unofficially modified the present prospectus to reflect current thinking and programs and are collecting information and ideas for the new prospectus. This alternative recognizes this as being better than nothing, but still not ideal.

2.3 Program and Execute New Interpretive Prospectus

This would bring together information and ideas already collected, with outside expertise and hopefully give us a document which would guide interpretive development in the park through its last critical stages.

3.0 Recommended Course of Action

3.1 Alternative 2.3, Program and Execute New Interpretive Prospectus, is the preferred action.

This would give management the needed guidance for interpretive development.

4.0 Requirements to Accomplish Action

Research: None

Operations: Continue present management action.

Programming: A 10-238 has been written for a new Interpretive Prospectus, Package #143.

PROJECT TITLE: HISTORIC PRESERVATION GUIDES

PROJECT NUMBER: LYJO C-05

1.0 Statement of Problem

Park management needs Historic Preservation Guides for all historic structures in the Park except the Boyhood Home. These guides are needed to assist and direct Park management in the preservation of the historic resources in the Park. These guides will also simplify the "XXX" process as we will not have to have work approved which is covered by the preservation guides.

1.1 Background Information

Most of the historic structures in the park are in good to excellent condition. The Historic Preservation Guides are needed so we can keep them in their present condition. All the historic structures at the ranch need Preservation Guides but in particular the Texas White House and LBJ Birthplace. The LBJ Boyhood Home is presently the only structure that has a Preservation Guide. The buildings at the Johnson Settlement hopefully will have Preservations Guides in the near future. The Withers-Spaulding Store is located in Johnson City. It is an adaptively used historic structure. The Johnson City Unit Maintenance Headquarters and the Park Library are located here.

2.0 Alternative Action and Probable Impacts

2.1 No Action

This action recognizes that the buildings may be improperly maintained with the consequent loss of historic integrity and historic fabric.

2.2 Continue Present Management Action

Management by necessity works closely with historic architects in the Southwest Regional Office in an attempt to properly maintain our Historic Resources.

2.3 Program and Execute Preservation Guides for Remaining Structures

This would give Park management and maintenance the needed guidance in preserving the Park's historic resources.

3.0 Recommended Course of Action

3.1 Alternative 2.3, Program and Execute Preservation Guides for Remaining Structures, is the preferred action as this will best solve the problem, and allow us to preserve our resources in the best and most economical fashion.

4.0 Requirement to Accomplish Action

Research: None.

Operations: Continue present management action.

Programming: 10-238's have been written and approved for Preservation Guides for:

Package # 152 LBJ Ranch (All structures).
Package # 155 LBJ Birthplace.
Package # 149 Junction School.
Package # 171 Wither's Store.

PROJECT TITLE: ARCHEOLOGICAL ASSESSMENT AND SURVEY

PROJECT NUMBER: LYJO C-06

1.0 Statement of Problem:

Park management needs an archeological assessment and survey. At present we have little or no idea what the historic and/or prehistoric archeological resources of the Park are or where they are located.

1.1 Background Information

No archeological assessment or survey has ever been done for Lyndon B. Johnson National Historical Park. As a result we have little or no idea whether we have archeological resources or not. We do know that various state institutions, colleges, universities, etc. have conducted several archeological investigations in areas close to both park units. Two salvage digs have been done in the Johnson City Unit; one at the Johnson Settlement probably dated from the 1880's or more recent; and the second the salvage of a portion of an ash pile near the Boyhood Home wash house dated circa. 1940. A salvage dig was done on the site and during the construction of the Birthplace barn but no conclusion was documented.

When the assessment and survey are done the information uncovered will be extremely useful in both long and short term planning. It will also facilitate Section 106 and "XXX" clearance for individual projects. The Remote Sensing parts of the assessment will provide photos and current, up-to-date, maps which can be used in many different phases of park planning and management.

2.0 Alternate Actions and Probable Impacts

2.1 No Action

This alternative recognizes that we are not in compliance with Executive Order 11593 or with NPS Cultural Resources Management Guidelines. The consequences of this are possible resource loss and a complicated and unweildy planning and compliance process.

2.2 Continue Present Management Action

Park Management is presently collecting such information as is available and checking each project for its affect on archeological resources.

2.3 Program and Execute Archeological Assessment and Survey

This would locate all archeological resources in the park and allow us to better protect them.

3.0 Recommended Course of Action

3.1 Alternative 2.3, Program and Execute Archeological Assessment and Survey, is the recommended course of action.

This would bring us into compliance with Resource Management Guidelines and Executive Order 11593. Also knowing what archeological resources we have and where they are located will enhance our planning and compliance efforts.

4.0 Requirements to Accomplish Action

Research: Continue present action.

Operations: Continue present action.

Programming: A 10-238 has been approved: Package #131, Archeological Assessment Survey. 10-238, Package # (unassigned), Aerial Photography.

PROJECT TITLE: HISTORIC RESEARCH, LBJ RANCH

PROJECT NUMBER: LYJO C-07

1.0 Statement of Problem

If we are to properly manage, maintain and interpret the LBJ Ranch a number of historic research projects need to be undertaken.

1.1 Background Information

We have historic studies which cover some facets of the LBJ Ranch story, i.e., the soon to be completed LBJ Ranching study, Texas White House Historic Structures Report, etc. However, the activities at the Ranch during the period 1960 - 1973 have not been thoroughly studied. In particular, the families domestic life and the activities of various Government agencies need to be identified in order to be interpreted.

2.0 Alternative Action and Probable Impacts

2.1 No Action

This alternative recognized that without these research projects we will have inaccurate interpretive programs and poor management decisions.

2.2 Continue Present Management Action

Park management presently collects information on all facets of LBJ Ranch history. This activity consists mainly of collecting information to be included in the various studies, reports, etc. when they are done.

2.3 Program and Execute Historic Research as Needed

This would give us the opportunity to have a professional research historian collect and synthesize information from all available sources into usable studies.

3.0 Recommended Course of Action

3.1 Preferred alternative would be 2.3, Program and Execute Historic Research as Needed. This would give us the most information in the most usable form.

4.0 Requirements to Accomplish Action

Research: Continue present management action.

Operations: None.

Programming: 10-238's have been written and approved for:
Package # 153 Historic Resource Study, LBJ Ranch.
Package # 122 Research Political Process.
Package # 123 Research Family Life.
Package # 124 Research Communications.
Package # 183 Research Vehicles.
Package # 178 Research Available Media.
Package # 190 Oral History Project.

PROJECT TITLE: HISTORIC RESEARCH, LBJ BIRTHPLACE

PROJECT NUMBER: LYJO C-08

1.0 Statement of Problem

If we are to properly manage and interpret the Birthplace and Cemetery several historic research projects are needed.

1.1 Background Information

The only historic study we have on the Birthplace is the LBJ Birthplace Furnishings Study done by Edwin C. Bearss. This is a comprehensive and useful study. However, much more information is needed on the family life and activities at the Birthplace.

2.0 Alternative Actions and Probable Impacts

2.1 No Action

This alternative accepts that interpretation will be less than comprehensive and probably inaccurate, and that management decisions will be based on less than comprehensive and probably inaccurate information.

2.2 Continue Present Management Action

Management presently is collecting information on the Birthplace area as it becomes available, with the expectation that it will eventually be used in formal research studies.

2.3 Program and Execute Historic Research as Needed

This would make available previously collected and new information in the most usable form.

3.0 Recommended Course of Action

3.1 Alternative 2.3, Program and Execute Historic Research as Needed, is the recommended course of action as this would give us the most information in the most usable form.

4.0 Requirements to Accomplish Action

Research: Continue present management action.

Operations: None.

Programming: 10-238's have been written and approved for: Package #158, S.E. Johnson Jr., Farming and Ranching; and Package #120, Research Johnson Family Cemetery.

PROJECT TITLE: HISTORIC RESEARCH, JOHNSON CITY

PROJECT NUMBER: LYJO C-09

1.0 Statement of Problem

If we are to properly manage and accurately interpret the various Park owned resources in Johnson City, several research projects are needed.

1.1 Background Information

The only study we have is the LBJ Historic Resource Study by Edwin C. Bearss which covers the Boyhood Home, Johnson Settlement and the Birthplace. The studies presently planned should give us more detailed information on the family activities at the Boyhood Home and the Johnson Settlement.

2.0 Alternative Actions and Probable Impacts

2.1 No Action

Selection of this alternative recognized that without this information interpretation will not be as accurate as it should be.

2.2 Continue Present Management Action

Management is presently collecting information to be used in these studies.

2.3 Program and Execute Studies as Needed

This would give us the opprotunity to integrate new information with the information already collected resulting in a report useful to both management and field interpreters.

3.0 Recommended Course of Action

3.1 Alternative 2.3, Program and Execute Studies as Needed, is the preferred course of action as this would give us the most information in the most usable form.

4.0 Requirements to Accomplish Action

Research: Continue present management action.

Operations: None

Programming: 10-238's have been written for:
Package #167, LBJ's contact with minorities;
Package #166, Research Rebekah Baines Johnson and family;
Package #162, Farming, Ranching and droving activities at the Johnson Settlement;
Package #117, Research J. P. Johnson occupancy; and
Package #129, Administrative History.

PROJECT TITLE: EXHIBIT PLANS, HISTORIC FURNISHINGS PLANS AND STUDIES, LBJ RANCH

PROJECT NUMBER: LYJO C-10

1.0 Statement of Problem

Exhibit plans and Historic Furnishing Studies and Plans are needed for those structures at the LBJ Ranch which will be open to the public.

1.1 Background Information

Depending on what is decided when the new Interpretive Prospectus is written we will need either exhibit plans or furnishings studies and plans for 10 to 15 structures at the LBJ Ranch. It is important that these studies and plans be carried out in a timely manner as most of the furnishings, etc. are still extant and many are still in their original locations. Also many of the people who were involved are still alive and could be consulted. These studies and plans would give refined direction to the collection of museum objects and historic research in the Park.

2.0 Alternative Actions & Possible Impacts

2.1 No Action

This alternative recognized that invaluable information will be lost with the consequent reduction in the scope and accuracy of the plans and studies when finally completed.

2.2 Continue Present Management Action

At present management continues to document all historic structures and their contents. We also try to document changes as they occur.

2.3 Program and Execute Exhibit Plans and Furnishings Plans and Studies

This would integrate information collected to date with new research thus giving us documents to guide the acquisition of furnishings and exhibit materials and further research.

3.0 Recommended Course of Action

3.1 Alternative 2.3, Program and Execute Exhibit Plans and Furnishings Plans and Studies, is the recommended course of action. This would preserve the information and guide acquisition and further research.

4.0 Requirements to Accomplish Action

Research: Continue present action.

Operations: Continue present management action.

Programming: 10-238's have been written and approved for:

Package # 151	Historic Furnishing Plans, LBJ Ranch
Package # 175	Exhibit Historic Vehicles, LBJ Ranch
Package # 147	Exhibit Plans, Junction School
Package # 174	Exhibit Plans, White House Communications Buildings, LBJ Ranch
Package # 176	Exhibit Plans, Hangar
Package # 177	Exhibit Plans, Secret Service Command Post

PROJECT TITLE: REHABILITATION AND CYCLIC MAINTENANCE OF CULTURAL RESOURCES

PROJECT NUMBER: LYJO C-11

1.0 Statement of Problem

Inadequate funding for maintenance of cultural resources. While everyone agrees that the projects submitted under these two programs are good projects and much needed, there is seldom a significant amount of money forthcoming.

1.1 Background Information

This park has 98 historic structures, 8 other structures, 26 miles of fences and 11 miles of roads, plus 5 separate water and sewer systems to maintain. It is unrealistic to expect that the park maintenance budget base would be able to maintain all this to the required standards.

Many of the structures are in good-excellent condition due to recent restoration or construction. Our goal in these cases is to keep them in their present condition. On the other hand many structures, particularly at the LBJ Ranch, were not built with permanence in mind. Speed of construction was more important than proper construction methods, materials and good workmanship. These structures pose a major maintenance problem as they are presently in poor condition due to lack of funding and manpower.

2.0 Alternative Actions and Probable Impacts

2.1 No Action

This alternative recognizes that we are allowing historically significant resources to deteriorate eventually to the point of loss.

2.2 Continue Present Management Action

This action will somewhat mitigate 2.1, however, continuing as we are now only slows the deterioration.

2.3 Increase Base Funding for Maintenance of Cultural Resources

This would be an ideal solution as it would make available funds and manpower to maintain our resources at proper levels.

2.4 Increase Funding Under the Cyclic Maintenance, and Repair and Rehabilitation Programs

An increase in funding for projects in these two areas would go a long way toward solving our resource maintenance problems.

3.0 Recommended Course of Action

3.1 A combination of 2.3, Increase Base Funding for Maintenance of Cultural Resources, and 2.4, Increase Funding Under the Cyclic Maintenance, and Repair and Rehabilitation Programs, would be the best solution but failing that, 2.4 would at least take care of the worst problems.

4.0 Requirements to Accomplish Action

Research: None

Operations: Continue present management action and refine present cyclic maintenance and repair and rehabilitation programs.

Programming: Submit well defined and well justified projects for regional consideration and program 10-237's and 10-238's as necessary.

PROJECT TITLE: CULTURAL OBJECTS PRESERVATION

PROJECT NUMBER: LYJO C-20

1.0 Statement of Problem

Lyndon B. Johnson National Historical Park has a large collection of artifacts which is generally well maintained. However, there are several problem areas, in particular, the historic farm machinery and Lincoln Continentals. These items are such a massive and complicated problem that they are beyond all but the most superficial efforts of the curatorial staff. There are numerous other items of importance, i.e., the flag from President Johnson's office, etc. are in need of preventive care which cannot be done on site.

1.1 Background Information

Our major curatorial problems are with the two Lincoln Continentals, the historic farm machinery, and with the vehicles Mrs. Johnson has not yet donated.

The two Lincoln Continentals have been stored for many years under open carports with the consequent gradual deterioration of interior and exterior finishes and all mechanical systems. This problem has been partially alleviated as we are presently (1982) getting ready to enclose the carports. However, this does nothing to actually restore the vehicles.

The farm machinery consists of 13 pieces of modern farm machinery ranging from tractors to plows to a feed grinder. These were in use up to the day of their replacement and are all in good to fair condition. They are stored inside. All are in need of conservation/restoration work.

The vehicles Mrs. Johnson has not yet donated present a somewhat different problem. These consist of three golf carts, four motor vehicles, reproduction chuck wagon and a reproduction surrey. These are all stored under an open carport and are receiving minimal care. If they are donated to the park they will require complete restoration and proper storage conditions.

2.0 Alternative Action and Probable Impacts

2.1 No Action

This action recognizes that gradual deterioration and subsequent loss of resources we are mandated to protect is acceptable.

2.2 Continue Present Management Action

Continue doing the best we can with limited staff and funds recognizing that this is only a slower form of 2.1, No Action.

2.3 Program Funding Requests for Conservation/Restoration

With funds in hand we could contract with professionals for the conservation/preservation work needed.

3.0 Recommended Course of Action

3.1 Alternative 2.3, Program Funding Requests for Conservation/Restoration, is the preferred course of action.

This would allow us to have the work done by professionals and to have these items properly stored for future exhibit purposes.

4.0 Requirements to Accomplish Action

Research: Continue to research and document machinery and vehicle use and care.

Operations: Continue present management action.

Programming: Programming done to date:
10-238 written and approved, Package #180, Cultural Objects Preservation;
Rehab/Repair (PRIP request);
Package #430, Lincoln Continentals;
Package #431, Farm Machinery;
Cyclic Maintenance;
Package #432, Boyhood Home Furnishings;
Package #434, Birthplace Furnishings.

RESOURCES PROGRAMMING SHEET

Southwest (Region) | Texas (State) | ___ Natural | X Cultural | 10/82 (Date) |

Priority	Package Title (10-238)	10-238 Pkg #	RMP Proj #	YR 1-1984	YR 2-1985	YR 3-1986	YR 4-1987	YR 5-1988	Total
84-1	Fire Detection & Security Systems, Park Wide	137	C-01	159					
84-2	Water System, LBJ Ranch	188	C-01	200					
84-3	Interpretive Prospectus	143	C-04	18					
84-4	Cultural Objects Preservation	180	C-20	15					
84-5	Archeological Assessment & Survey	131	C-06	15					
84-7	Historic Resource Study, LBJ Ranch (1960-1972)	153	C-07	40					
84-8	Historic Preservation Guides, LBJ Ranch	152	C-05	15					
85-1	Extend Ranch Water System to Junction School	No #	C-01		100				
85-2	Upgrade Water System & Install Fire Hydrants, LBJ Boyhood Home	No #	C-01		25				
85-3	Cultural Objects Preservation	180	C-20		15				
85-4	Historic Landscape Studies & Plans, Park Wide	173	C-03		52				
85-5	Administrative History	129	C-09		7				
85-6	Research Farming, Ranching & Droving, Johnson Settlement	162	C-09		10				

RESOURCES PROGRAMMING SHEET

Southwest Region | Texas State | ____ Natural | X Cultural | 10/82 Date |

Priority	Package Title (10-238)	10-238 Pkg #	RMP Proj #	YR 1-1984	YR 2-1985	YR 3-1986	YR 4-1987	YR 5-1988	Total
85-7	Research Sam E. Johnson Jr. Farming & Ranching	158	C-08		5				
85-8	Study Historic Vehicles, LBJ Ranch	183	C-07		13				
85-9	Historic Preservation Guide, Birthplace	155	C-05		8				
86-1	Research Political Process, LBJ Ranch	122	C-07			35			
86-2	Research Family Life, LBJ Ranch	123	C-07			12			
86-3	Study Communications, LBJ Ranch	124	C-07			15			
86-4	Historic Structures Reports, LBJ Ranch Buildings	150	C-02			30			
86-5	Historic Preservation Guide, Junction School	149	C-05			8			
86-6	Historic Structures Report, LBJ Birthplace	154	C-02			20			
86-7	Historic Structures Report, S.E. Johnson Sr. House	121	C-02			62			
86-8	Rehabilitate S.E. Johnson Jr. House	157	See Appendix			58			
87-1	Oral History Project	190	C-07				20		
87-2	Convert Alexander House to Visitor Center	172	See Appendix				57		

Priority	Package Title (10-238)	10-238 Pkg #	RMP Proj #	YR 1-1984	YR 2-1985	YR 3-1986	YR 4-1987	YR 5-1988	Total
87-3	Research Available Media	178	C-07				10		
87-4	Research Rebekah Baines Johnson & Family	166	C-09				7		
87-5	Research LBJ's Contact With Minorities	167	C-09				10		
87-6	Research Family Cemetery	120	C-08				15		
87-7	Research J.P. Johnson Occupancy of Johnson Settlement	117	C-09				7		
88-1	Oral History Project	190	C-07					20	
88-2	Convert Alexander House to Visitor Center	172	See Appendix					140	
88-3	Furnishing Studies & Plans	151	C-10					160	
88-4	Exhibits, White House Communications	174	C-10					50	
88-5	Exhibit Historic Vehicles, LBJ Ranch	175	C-10					60	
88-6	Exhibits for Hangar	176	C-10					70	
88-7	Exhibits, Secret Service Building	177	C-10					60	
88-8	Wayside Exhibit, Junction School	147	C-10					30	

RESOURCES PROGRAMMING SHEET

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Priority	Package Title (10-238)	10-238 Pkg #	RMP Proj #	YR 1-1984	YR 2-1985	YR 3-1986	YR 4-1987	YR 5-1988	Total
88-9	Historic Structures Report, Johnson Settlement	164	C-02					60	
88-10	Historic Preservation Guide, Withers Store	171	C-05					10	

PART II

NATURAL RESOURCES MANAGEMENT PROGRAM

A. Overview and Needs

1. Summary of Significant Elements

   a. Live Oak Management
   b. Management of Hereford Cattle
   c. Pasture Management
   d. Pecan Management
   e. Ball Moss Control
   f. Water Resources Management
   g. Rodent Pest Control
   h. Native Grass Restoration
   i. Erosion Control to Stabilize Pedernales River Bank
   j. Insect Pest Management

2. Needs

   a. Aerial Photography and Mapping
   b. Historic Landscape Studies and Plans
   c. Hereford Herd Management Plan

A.. OVERVIEW AND NEEDS

1. SUMMARY OF SIGNIFICANT ELEMENTS

Natural resources in and about the Lyndon B. Johnson National Historical Park no longer comprise a native or wild ecosystem. The energies of men have changed this river valley environment into a domestic scene which satisfies human needs for safety, sustenance, comfort, and fulfillment. The Natural Resources Management Plan must give direction that will compliment, preserve, and/or restore the park's natural resources as they appeared in the historic periods defined in the area's management objectives. This should be done with complete regard for safeguarding, complimenting and strengthening the natural environmental systems from which this historic scene was created and within which it still exists. This will mean that though the scene may not change; the maintenance methods will have to change when at all possible, to eliminate or minimize environmental degradation.

The significant elements of this plan's natural resources management program are:

a. Live Oak Management

Live Oak trees are an extremely significant part of the historic landscape scene throughout the park. Many of them are aged and all are subject to an usually fatal disease, Live Oak Wilt, and various other insect or disease threats.

b. Management of Hereford Cattle

The Hereford cattle that the park manages are from the same bloodlines used by President Johnson at the ranch during the historic period in question. They should be maintained as much as possible and a Hereford herd continued in order to preserve the working ranch appearance of the park.

c. Pasture Management

The improved pasture that the park manages is part of the LBJ Ranch historic scene. Therefore, it is important in its own right and secondarily important to maintain the ranch's registered cattle.

d. Pecan Management

Four hundred seventy-five pecan trees scattered throughout the park are a significant part of the historic scene. A large number of these trees occur in the Jordan Pecan Orchard. Most of the trees are hybrid varieties that require protection from various diseases and insect pests.

e. Ball Moss Control

This plant is an epiphyte. It grows nonparasitically on the branches of various indigenous trees. Though it does not derive any nutrients from the trees it can be a negative impact on an already stressed tree, or when the moss proliferates to the point of shading sunlight from the leaves.

f. Water Resources Management

Ground water and surface water are a strategic resource of the park. The Ranch Unit must maintain it's own potable water for domestic and visitor needs. Additionally, surface water is required to irrigate the historic scene and provide for structural fire suppression.

g. Rodent Pest Control

Several rodent species impact on the historic scene in ways consistant with their normal behavior. The negative interface occurs when this behavior conflicts with preservation of a domestic environment. Cyclic species population dynamics cause more damage to resources in some years and less in other years.

h. Native Grass Restoration

In the Johnson Settlement section of the park the objective for the historic scene is to maximize the landscape as it would have appeared in the 1860's. Since that time the area has changed a great deal. Earthen terraces have been built to follow the contour and conserve run-off, use of the land has eliminated numerous plant species, and wild fire suppression has allowed others to abound unrealistically. Restoration of the native grasses and general vegetation such as forbs and Pecan, Live Oak, Cypress and other trees is required to rehabilitate this historic scene.

i. Erosion Control to Stabilize Pedernales River Bank

Recurring flash floods are a phenomenon of the Pedernales River drainage. Irrigation dams and rodents called Nutria are introduced factors that have upset the relative equilibrium that the river water and river banks had achieved over aeons of time. Now when the river floods the banks are susceptible to major erosion and damage to the historic scene.

j. Insect Pest Management

The park's domestic environment is like most other human, commercial environments. Insects and disease are unwelcome factors that are stereotyped as generally being non-beneficial and contributing to human and livestock discomfort. Consequently chemical pesticides have been used to control insect/diseases as a matter of course. Recent awareness and policies to limit the unconditional use of pesticides have caused management to assess and weigh the effects of these controls and to find ways to meet domestic needs without environmental destruction.

2. NEEDS

Programmed Development/Study Package Proposals (Form 10-238) which are required to carry out the natural resources management of the park are in priority order.

Priority:

a. Package Number (New), Aerial Photography and Mapping. (This project was formerly written as part of LYJO Package Number 131.)

It will require the application of remote sensing technology for use while preparing the park's archeological assessment and survey, and the historic landscape studies and plans. This package will increase cost effectiveness for both the archeological and landscape projects by using large scale aerial photography to produce photogrammetric maps and infrared photography to consolidate data gathering. (A separate 10-238 detailing the requirements of this package was submitted concurrently with this revised RMP.)

b. Package #173, Historic Landscape Studies and Plans

This project is identified as LYJO C-3 in the Cultural Resources Management Plan. It will identify historic landscape patterns and prescribe directions to proceed in maintaining or restoring the historic scene. The Historic Landscape Plans are needed to fulfill the research requirements of Natural Resources Management Plan projects, LYJO N-3, N-4, N-8, and N-9.

c. Package Number (New), Hereford Herd Management Plan

Subsequent to the completion of the LBJ Ranch Operations Study a Hereford Herd Management Plan must be developed. This action will prescribe the means by which the park will maintain the herd in accordance with the course of action in the project statement. (A Development/Study Package Proposal will be submitted concurrently with this revised RMP.)

A Detail of Annual Operating Requirements (Form 10-237) will be submitted to ask for increased funding for Live Oak and Pecan Management, LYJO N-1 and N-4.

B. PROJECT STATEMENTS

PROJECT TITLE: LIVE OAK MANAGEMENT

PROJECT NUMBER: LYJO N-01

1.0 Statement of Problem

Live Oak, Quercus virginiana L., the predominant historic landscape tree species in the park is threatened by a pathogenic fungus, Ceratoystis fagacearum (Oak Wilt). Infected groves of oak trees exist within a one mile radious of the park. To date there has been no incidence of the disease in the park. This threat however, has the potential to devastate the park's historic landscape.

1.1 Background Information

Oak Wilt is the name given to a fungus disease that occurs in live oak, red oak and several other members of that family. The pathogenic agent has been identified by Dr. Robert Lewis, Research Plant Pathologist, United States Department of Agriculture, Southern Hardwoods Laboratory, Stoneville, Mississippi. Since 1976 LYJO and Southwest Regional Office, Natural Resources Management personnel have been contracting with the U.S.D.A. to assist Live Oak Wilt research and obtain technical consultation to continually monitor the health of the park's population of Live Oak trees.

Maintenance of these trees is based upon the recommendations of the U.S.D.A. consultants.

Because the Live Oaks are such an important and visible part of the historic scene this project has the highest priority for attention and funding.

1.2 Current Management Action

Dr. Robert Lewis and other U.S.D.A. associates visit the park at least four times a year during the growing season for the Live Oak. The present funding level is $5,000/year from SWR(ONR). Each visit to the park results in inspection of the park's live oaks and any nearby area where oak wilt is known to exist. (In addition the U.S.D.A. pathologists and entomologists also provide consultation on the husbandry of other tree species in the park.) Park maintenance then carries out the actions recommended. Training of park staff has provided a measure of preparedness to recognize the disease as soon as it infects any park tree. An infected tree cannot usually be saved but proper maintenance techniques and specific preventive actions can minimize the chance of the disease spreading to other trees.

2.0 Alternative Actions and Probable Impacts

2.1 No Action

This action is in violation of National Park Service enabling legislation and management policy.

2.2 Current Management Action

This action represents the state of the science and understanding of this plant disease.

2.3 Obtain Consultation from Another Professional or Academic Source

A logical location to seek this assistance is through the Texas Agricultural Extension Service at Texas A & M University. University researchers have recently (1982) subscribed to the theory that Oak Wilt is caused by a single fungal pathogen and they are collaborating with U.S.D.A. research efforts. (The latter directed by Dr. Lewis.) The Southwest Region established a cooperative Park Studies Unit at Texas A & M University in the fall of 1982.

2.4 Apply Preventative Treatment

No such treatment exists.

3.0 Recommended Course of Action

3.1 Alternative 2.2, Current Management Action is appropriate until other professional equivalency and knowledge can be demonstrated and show cost effectiveness or until preventative treatment is available.

4.0 Requirements to Accomplish

Research: None. (Present research being conducted by the U.S.D.A. and the U.S.D.A. and Texas A & M University jointly is adequate and is partially focused at LYJO.)

Operations: Additional funding is necessary, $10,000/year, to assume on-going burden of consultation expense now funded at the regional level.

Programming: A 10-237 detailing a $10,000 increase in annual operating requirements will be prepared for the FY 85 budget call.

PROJECT TITLE: MANAGEMENT OF REGISTERED HEREFORD CATTLE AT LBJ RANCH

PROJECT NUMBER: LYJO N-02

1.0 Statement of Problem

From Lyndon B. Johnson National Historical Park General Management Plan, "The LBJ Ranch will remain a working ranch relecting the activity of the late 1960's", and further, "As part of its living history program, the National Park Service maintains a small herd of registered Hereford descended from President Johnson's original herd, which visitors see in the pastures, show barn, or working pens."

1.1 Background Information

The raising of cattle was an important part of Lyndon Johnson's life at the ranch. The LBJ Ranch, under the management of the National Park Service, continues to be operated as a working ranch with registered Herefords in order to actively maintain the historic scene. The present park herd consists of a nucleus of fifty cows and for the most part contain the blood lines used by President Johnson. At the time the park herd was established the cows selected for the NPS did not represent the "top-end" of the LBJ herd and several years of upgrading has been necessary. Offspring and excess stock are sold in the local Hill Country Hereford Association Sales and at local commercial livestock auctions.

During the late 1960's and the early 1970's the body type of Hereford cattle changed rather drastically. Whereas the body type of the 1950's and 1960's was of short leg, short body, very early maturing with accelerated fat accumulations, the type of the late 1960's and early 1970's is of longer leg, longer body, more upstanding and slower maturing with only limited fat accumulation and more lean meat on the finished carcass. President Johnson, being progressive in cattle breeding as he was in his other undertakings, saw that changes were eminent and necessary in order to stay abreast of the changing type of carcass the American Public was demanding from the local meat counter. In 1970, he challenged his ranch manager, Dale Malechek, to find the best modern type bull in America. After many air miles and days of search, a new modern-type bull was purchased from Weise & Son, Inc., Manning, Iowa, and added to the LBJ herd as the new head-herd sire. The park has continued this practice of locating quality registered bulls to sire the herd.

A park objective at the LBJ Ranch is "to maintain the ranching scene--registered Herefords, fences, buildings, pastures,

grasses and crop lands--to the Presidential and retirement years, 1963-1973". In line with that objective visitors do see registered Herefords descended from President Johnson's original herd, but who conform with more modern day configuration. In as much as President Johnson changed the herd's breeding pattern to produce the longer animals in the last four years of his life, and lived to see the benefits of the change, the park continues to breed this type of cattle and will follow the same philosophy he used in terms of staying with market trends. A representative sample of the short fatty type animal he once raised will also be maintained and interpreted to park visitors.

Early in 1976 Dale Malechek, Chief of Maintenance, Ranching and Resource Management and Edward Meier, Ranch Foreman, analyzed the pros and cons of maintaining a 25 cow herd rather than a 50 cow herd. Their study shows that it is beneficial to the Park, dollar wise, to retain a 50 cow herd on the presently owned ranch lands. As more land becomes available increasing the herd size should be evaluated with cost benefit considerations in mind. As much of the cost of maintaining the herd as can be recovered should be.

1.2 Current Management Action

The park continues to maintain and manage the subject registered Hereford herd. In the fall of 1981 LYJO Ranch Foreman Meier returned to Weise and Son, Inc. and purchased three additional cows. In addition Mr. Weise Sr. donated a young bull selected by Meier for its qualities to meet LYJO resources management needs. Each of these "Iowa" Herefords is descended from the 1970 "Iowa" herd sire (W.F. Beau Intense) previously purchased for President Johnson by the Ranch Manager, Dale Malechek.

2.0 Alternative Actions and Probable Impacts

2.1 No Action

This alternative implies the discontinuance of the Hereford herd and cattle management as part of the historic preservation of the LBJ Ranch scene. This would relinquish a direct genetic living link with the activities and accomplishments of President Johnson at the LBJ Ranch.

2.2 Current Management Action

This action is in a state of transition and reflects management pragmatism in reacting to administration philosophy and the pressures of economic reality. The direction of this action is stated in alternative 2.4.

2.3 Manage the Herd to Maintain the Historical Hereford Appearance

Continue to manage the registered Herefords so that they will maintain the same general appearance they had during the last years of President Johnson's life. If the Hereford industry begins breeding in a new direction in the future, the National Park Service herd will not change, even if economically advantageous. The objective of the historical park is to maintain the ranch and the cattle as they looked in President Johnson's day.

Funds reimbursable to maintain herd operation from sale of surplus cattle would not be maximized because these animals would not conform to contemporary industry and Hereford standards or commercial demand.

2.4 Manage the Herd to Conform to Contemporary Trends in Hereford Husbandry

This action would follow the direction that President Johnson was taking when he owned the herd. The herd would be breed to closely conform to Hereford industry and commercial trends. This would follow current Administration directives and policy to explore means to defray operational expenses. Returns from the sale of excess cattle would be maximized and reimbursable to herd operations. The historic appearance of the herd would be changed but the historic scene of a working Hereford ranch would be maintained. A few representive samples of the shorter fatter animals would be kept and comparatively interpreted to park visitors.

2.5 Lease the Hereford Cattle Operation to a Private Sector Operation

This action could be specified to follow either alternative 2.3 or 2.4, however, this would be unlikely to appeal to private sector interests.

3.0 Recommended Course of Action

3.1 Manage the Herd to Conform to Contemporary Trends in Hereford Husbandry (2.4)

This would follow the philosophy of the President plus maximize the return on sales to offset the cost of operating this interpretive demonstration. Representative samples would still be available for interpretive purposes.

4.0 Requirements to Accomplish Action

Research: The first draft of the LBJ Ranching Operations Study is being written by National Park Service Chief Historian Edwin C. Bearss. Field research has been completed. 10-238 package #118. Subsequent to the completion of the LBJ Ranch Operations Study a follow-up plan must be developed. The plan will prescribe the means by which the park will maintain the working ranch appearance while staying current with modern techniques that will better offset operations cost through sales. A Development/Study Package Proposal will be submitted concurrently with this revised RMP.

Operations: When available apply above study to management of the herd.

Programming: A Development/Study Package Proposal, form 10-238, to produce a Hereford Management (Action) Plan will be written and submitted concurrently with this RMP.

PROJECT TITLE: PASTURE MANAGEMENT AT LBJ RANCH

PROJECT NUMBER: LYJO N-03

1.0 Statement of Problem

Park management must endeavor to maintain the historic scene of improved pasture land at the LBJ Ranch.

1.1 Background Information

At the LBJ Ranch, approximately 145 acres (59 hectares) of the total area are devoted to forage production for the herd of registered Hereford cattle. Historically, the cultivated field is usually double-cropped, oats have been planted for winter grazing and then cut and baled in the late spring or harvested as feed grain for the animals; a hybrid sudan is planted for additional summer hay or grazing. The grass and farm lands management is kept to the period of Lyndon Johnson's Presidential and retirement years.

1.2 Current Management Action

The ranch lands continue to be used for forage hay production and cattle grazing. The fields are planted with historical crops. Fertilization is based upon yearly soil samples. Irrigation which is dependent on fuel costs and available water is applied to maximize the yield. Modern tools and farm equipment are used.

2.0 Alternative Action and Probable Impacts

2.1 No Action

This action would eliminate the intensive management and labor required to maintain improved pastureland. Consequently the historic scene would deteriorate.

2.2 Current Management Action

This action relies on the record residual historic scene as it has been maintained by park employees who were contemporaries with the President and in some cases formerly employed by him. This action is dependent upon the first hand knowledge. Written documentation does not now exist.

Without a historic landscape plan based upon a ranching operations study and historic landscape study the historic scene will be subject to gradual change.

2.3 Preparation of a Historic Landscape Plan for Management Direction

Reference: LYJO C-03

3.0 Recommended Course of Action

3.1 Alternative 2.3, Preparation of a Historic Landscape Plan for Management Direction,.

This will provide definitive written direction.

4.0 Requirements to Accomplish Action

Research: Funding to carry out required and programmed research and continue present efforts to collect information.

Operations: Continue current management while documenting all changes and other actions affecting the historic scene.

Programming: 10-238, Package #118, LBJ Ranching Operations Study
10-238, Package #173, Historic Landscape Studies and Plans.
10-238, Package # (unassigned), Aerial Photography

PROJECT TITLE: PECAN TREE MANAGEMENT

PROJECT NUMBER: LYJO N-04

1.0 Statement of Problem

There are some 475 pecan trees existing in the park. The pecan grows naturally on the bottomlands and the park is within the species native habitate. Hybrid varieties of pecans are grown as a commercial cash crop throughout its native range. Several commercial orchards exist within the park. In as much as they were part of the historic period and scene that the National Park Service must manage, they must be cared for to the advantage that best serves the intent of the park.

1.1 Background Information

A history of the park's pecan trees is detailed in Appendix H. Management of the orchards until 1980 had generally followed the methods recommended to local growers via the Texas A & M University Agricultural Extension Service or as these methods have been consulted and individually modified by growers.

Hybrid pecan varieties require intensive management to maintain their foliage and vigor and all pecans, native and hybrid, must be carefully cared for to produce crops that will be worth harvesting. When pecans are grown successfully they can be a lucrative cash crop.

In 1980 a land exchange with Mrs. Johnson gave 11.4 acres of the Jordan Pecan Orchard to the park. At about the same time the advent of very much more restrictive NPS pesticide use guidelines produced the need to find alternate methods to take care of the pecans.

In the spring of 1981 Southwest Regional Office, Division of Natural Resources Management, wrote a draft Pecan Orchard Management Plan. The park and region have endeavored since that time to refine this plan to accomplish desirable management objectives and goals while striving toward an ideal of integrated pest management which would leave our environment unharmed.

2.0 Alternative Action and Probable Impacts

2.1 No Action

This will result in a deterioration of the pecan trees and an unacceptable historic scene.

2.2 Continue Present Management Action

This action is described in the park's Pecan Management Plan. Following this course will permit management to meet the many management policies and guidelines that are applicable to this problem. (See Appendix H.)

2.3 Follow Generally Accepted Commerical Pecan Husbandry Practices

This approach makes primary use of the state of the science in chemical technology which is contrary to United States Department of the Interior, National Park Service policies.

3.0 Recommended Course of Action

3.1 Alternative 2.2, Continue Present Management Action, is the preferred course. At present this action may be more labor intensive and otherwise more costly.

4.0 Requirements to Accomplish Action

Research: Literature search and retrival of most effective mechanical and biological integrated pest management strategies.

Operations: Continue to refine maintenance and Integrated Pest Management Plan.

Programming: 10-238's have been written for: Package #173, Historic Landscape Studies and Plans (this package must be revised to include the "Jordan" track and Sam E. Johnson Sr. buildings acquired in 1980).

A Detail of Annual Operating Requirements (Form 10-237) requesting a $18,300 operating increase was submitted with the FY 84 Budget Call. A majority of this funding will be applied to maintenance of the park's pecan, live oak, and other hardwood trees.

PROJECT TITLE: BALL MOSS CONTROL

PROJECT NUMBER: LYJO N-05

1.0 Statement of Problem

Many of the live oak trees at the LBJ Ranch are heavily infested with ball moss, Tilandsia recrunata, an epiphyte, that does not get its nourishment from the tree, but from the air and rain. Damage does occur to the tree from crowding and shading of the tree leaves. If left unattended, the moss eventually denudes the limbs of leaves and results in a limb that is covered with tennis ball-size moss accumulations with resultant death of the limb.

1.1 Background Information

Past park efforts to control and reduce the incidence of ball moss have included applications of chemical solutions and hand picking.

Ball moss is controlled by spraying the trees, to the point of run-off, with Kocide 101, a copper derivative product which is diluted with water at the rate of six pounds per 100 gallons. This method has been tried on some of the trees in the park with good results.

Another method of control that has been used is the picking of the moss from the trees manually. Although effective, this method was not only extremely expensive because of the number of employee hours involved but was dangerous for the employee as he climbed onto the small brittle tree limbs.

2.0 Alternative Action and Probable Impacts

2.1 No Action

This alternative will allow the ball moss to proliferate naturally. It is an indigenous species. Its affect on individual trees is dependent on numerous factors. The moss certainly causes stress to the trees but probably is not normally harmful to youthful healthy trees. However, many of the live oaks at the ranch are not youthful and reduction of this stress is desirable.

2.2 Chemical Control

This alternative will accomplish the desired immediate end. The overall consequences of applying the required quantities of copper compounds for control to the vegetation is thought to be benign.

2.3 Mechanical Harvesting of the Ball Moss via Hand Picking

This alternative is labor intensive, costly and if it is done by climbing the trees it is dangerous. By using a "cherry picker" hydraulic extension bucket to carry employees up to the area, the hazard can be reduced but costs remain high.

3.0 Recommended Course of Actions

3.1 A combination of all three alternatives, 2.1, 2.2, and 2.3, are desirable.

The tree and the situation must be evaluated on a case by case basis and the most effective approach selected.

4.0 Requirements to Accomplish Action

Research: None. A literature search and review should be maintained to obtain latest information as it is forthcoming.

Operations: Continue maintenance.

Programming: None. If 2.3 is chosen, 10-237 for increased funding will be needed.

PROJECT TITLE: WATER RESOURCE MANAGEMENT

PROJECT NUMBER: LYJO N-06

1.0 Statement of Problem

Our major water management problem is with water rights, or rather the lack of water rights, at the LBJ Ranch.

1.1 Background Information

Water rights on the Pedernales were adjudicated in 1979. The water rights granted to the NPS are shared with the LBJ Company. The LBJ Company reserves the first right-of-use on all of the shared water rights. This creates an obvious problem in that they could use all the water granted leaving none for use by the National Park Service. (For detailed information on LBJ NHP Water Resources see Appendix C.)

2.0 Alternative Actions & Probable Impacts

2.1 No Action

Selection of this alternative recognizes that water for irrigation and maintenance of the historic scene will probably not be available when needed.

2.2. Continue Present Management Action

Management is presently counting on the generosity of the LBJ Company to not use all the water available. Our faith may or may not be misplaced.

2.3 Attempt to Separate Our Water Rights From Those of the LBJ Company

Management needs to reach an agreement with the LBJ Company concerning who gets what. A number of other alternatives are presently being explored by the Southwest Regional Office.

3.0 Recommended Course of Action

3.1 Alternative 2.3, Attempt to Separate Our Water Rights From Those of the LBJ Company, is recommended. This would guarantee the NPS sufficient water to maintain the LBJ Ranch scene.

4.0 Requirements to Accomplish Action

Research: None

Operations: Continue to work with Southwest Regional Office towards a solution.

PROJECT TITLE: RODENT PEST CONTROL

PROJECT NUMBER: LYJO N-07

1.0 Statement of Problem

The behavior of several rodent species is causing damage to park historic resources, structures and grounds. These animals burrow holes in the lawns, cause serious erosion problems to the Pedernales River bank and gnaw on furniture, the wooden siding, facings and soffits of historic structures. Intermittent efforts have been made to control these rodents, but a more definitive rodent control program is needed because the rodents in question are so resilient.

1.1 Background Information

The increasing population of Nutria (an imported exotic rodent) in the Pedernales River presents a problem of major concern. Nutria establish their dens by burrowing into the riverbanks below the stream water level. During periods of flooding, the banks made less stable because of the den holes, erode and collapse. In the spring of 1976, local neighbors and the LBJ State Historical Park, working in cooperation with the U.S. Fish and Wildlife Service, actively engaged in a successful control program on the south banks of the Pedernales River, without any observable harmful effects on other wildlife. Control of the nutria was accomplished by using poison baits consisting of fresh carrots cut into two inch lengths, dipped in zinc phosphide and placed on anchored rafts in the middle of the river.

In recent years nutria and other rodents in question have been directly reduced on an intermittent, case by case basis as their numbers have become a problem to the historic resource and the domestic park operations.

1.2 Current Management Action

In August 1982 the park began to operate under an approved rodent control direct reduction plan. All actions under this plan are the responsibility of the LYJO park protection unit. (Refer to Appendix D.)

2.0 Alternative Actions and Probable Impacts

2.1 No Action

This action is unacceptable for resource protection and preservation.

2.2 Reduce Rodent Pest Populations With Chemical Poisons

This method was used formerly and observation did not detect harmful effects to other zoological populations in the area. Nevertheless the potency of zinc phosphide is such that the risk to other wildlife and humans is judged to be unacceptable.

2.3 Reduce Rodent Pest Populations With Steel Traps

This alternative is cost prohibitive, labor intensive, and considered by many to be "inhumane".

2.4 Reduce Rodent Pest Populations by Use of Live Traps

This method has been attempted with an unacceptable level of success. It is very labor intensive and time ineffective. All of the park's live traps were deployed in June 1982 when an unknown person(s) stole each one.

2.5 Current Management Action

Direct reduction of the identified pest species on an opportunity basis and at feeding stations is the method currently being used. This method is labor conservative, productive and highly effective.

2.6 Reduce Rodent Pest Population via Biological Methods

The introduction of natural mammalian predators is unacceptable in a domestic environment. Other biological agents if available could not be targeted to a specific location.

3.0 Recommended Course of Action

3.1 Alternative 2.5, Current Management Action, is the recommended course of action.

The park's security guards will observe the identified rodents and shoot them when the opportunity is presented. The guards work daily, 5:00 p.m. to 9:00 a.m., and the problem animals are generally nocturnal. The shooting of the animals can be done safely and effectively during that time with no intrusion of the visiting public.

Impact on the overall rodent species populations in question is judged to be negligible to non-existent beyond the park boundaries. Population reduction within the park will be only temporary because individual populations beyond park boundaries will seek to fill the void. The species identified are not endangered. This population reduction program will necessarily be on-going.

4.0 Requirements to Accomplish Action

Research: None

Operations: Maintain direct reduction program.

Programming: None

PROJECT TITLE: NATIVE GRASS RESTORATION - JOHNSON SETTLEMENT

PROJECT NUMBER: LYJO N-08

1.0 Statement of Problem

In all of the fields and pastures at the Johnson Settlement the ultimate goal is to have tall native grasses of the 1860's period. The goal is, to extent possible, to restore the botanical distribution as it was during the subject period.

1.1 Background Information

The native grasses which were growing when Lyndon Johnson's grandparents came to this area have largely disappeared through farming, overgrazing and other land uses. Re-establishment of the native grasses is needed to more accurately restore the historic scene. In 1974 the park staff chiseled, disked and planted native grass seeds in the northwest portion of the Johnson Settlment.

The park has prepared a plan to further provide for the increase in native grasses. The plan calls for the planting of native grass seeds in certain areas, the scattering of native grass seeds in other areas, and the shredding or grazing of the land to be carefully timed to encourage the propagation of native grasses. This plan will be coordinated with interpretive programs and development plans. It will be reviewed and updated at least once each year. Soil Conservation Service personnel, research historians and other knowledgeable persons have been consulted.

1.2 Current Management Action

In the spring of 1981 a Soil and Water Conservation Plan was prepared by personnel of the Soil Conservation Service, USDA, Pedernales Soil & Water Conservation District Office. The soils and a vegetative resource inventory were documented. A conservation plan and schedule of action was prepared to accomplish the stated objective. Current area management is following the prescribed treatment. (Refer to Appendix F.)

2.0 Alternative Action and Probable Impact

2.1 No Action

This alternative implies acceptance of the status quo. The present landscape has been altered by 120 years of

intensive agriculture use and abuse. The remaining botanical distribution is not accurate or representative of the historical period.

2.2 Continue Present Management Action

This alternative will gradually restore a more desireable historic mix of vegetation. It will require constant, patient nurturing of the available native species and reintroduction of native species that have disappeared from the site. Hybrid varieties of pecan trees now on the site will be removed. Management accepts the fact that it will be impossible to exactly reproduce the target period botanical landscape.

3.0 Recommended Course of Action

3.1 Alternative 2.2 Continue Present Management Action

4.0 Requirements to Accomplish

Research: With assistance of the Soil Conservation Service annually evaluate and ammend the Johnson Settlement Soil and Water Conservation Plan. Solicit information: sources, practices and techniques used in similar projects on other Federal, states, local and private parklands and reserves.

Operations: Continue restoration and maintenance.

Programming: 10-238's have been written, package #173, Historic Landscape Studies and Plans. Package # (unassigned), Aerial Photography.

PROJECT TITLE: EROSION CONTROL TO STABILIZE PEDERNALES RIVERBANKS

PROJECT NUMBER: LYJO N-09

1.0 Statement of Problem

The PEDERNALES RIVER is subject to frequent flooding. It may flood several times a year. When the floods occur the river's turbulance washes away the banks. This continuous loss of soil eventually takes with it the mature pecans, other hardwood trees and other landmarks that have been a part of the historic scene.

1.1 Background Information

The above circumstance were inevitable when the natural flow of the river was interrupted when ranchers built dams in the river to provide water for crop irrigation.

Three dams are built in the river bottom at and near the ranch. The Johnson and Jordan Dams are LYJO classified structures. The third dam was built by the LBJ State Historical Park and is about two-thirds of a mile upstream from the Johnson Dam. The Johnson Dam impounds the river water immediately in front of the LBJ Ranch House. Each dam negatively influences the integrity of the river bank in the park.

This problem is compounded by the presence of nutria, an exotic rodent species. The nutria make their dens in the bank of the river. They burrow into the bank from beneath the waterline and then tunnel upward to establish a den above the watertable. There activity serves to weaken the bank and make it less resistant to erosive flood waters.

The river erosion is a natural phenomena. It is only accelerated laterally by the effects of the dams and nutria.

Efforts have been made to retard the erosion. In 1975-1976, the major portion of the north riverbank in front of the ranch house was backsloped and shaped. In early 1982 2,450 feet of the south bank across from the ranch house was shaped and stabilized with gabions or petromat.

Action to reduce the nutria population has also been undertaken from time to time.

1.2 Current Management Action

The 1982 project to reinforce the south riverbank essentially completed the major earth work projects required to protect the historic scene to the best of management's knowledge.

However this project has not been tested. No flooding has occurred since its completion. The park has also established a rodent control program which is addressed in Project Number LYJO N-07. A lesser project will need to be addressed in the near future where the north end of the Jordan Dam is being circumvented.

2.0 Alternative Actions and Probable Impacts

2.1 No Action

This alternative would permit continuous slow distruction of the historic scene. The consequences would be the eventual breaching of circumvention of the Johnson and Jordan Dams.

2.2 Continue Present Management Action

This alternative requires park management to continually inspect the riverbank and dam structures for signs of deterioration. Whenever such signs appear the circumstances and effects will have to be evaluated and maintenance action taken. Nutria control will have to continue indefinitely.

3.0 Recommended Course of Action

3.1 Alternative 2.2, Continue Present Management Action, is the recommended course to take.

4.0 Requirements to Accomplish Action

Research: The LBJ Ranch Historic Structures Report is in draft form. Historic Landscape Studies and Plans are programmed.

Operations: Continue observation, maintenance, and rehabilitation as necessary.

Programming: 10-238's have been written for Historic Landscape Studies and Plans, Package #173. A Development/Study Package Proposal (10-238)has been written to provide funding to rehabilitate the Jordan Dam.

PROJECT TITLE: INSECT PEST MANAGEMENT

PROJECT NUMBER: LYJO N-10

1.0 Statement of Problem

Insects and disease pose a current problem and a potential threat in almost every area of the park's historical resources. From Live Oak Wilt, to moth larva in museum collection garments and fabrics, to pecan scab, to fire ants, to ear ticks, to wheat rust, to fly specks, etc., these threats and many more are a daily management concern.

1.1 Background Information

Insects and other organisms that cause disease, discomfort, and decomposition are usually unacceptable and are none-the-less so in a National Historical Park. Man's historic and unconditional desire and effort to eliminate these pests is legend.

Recently, however, National Park Service, United States Department of the Interior, pesticide use policies and guidelines have imposed conditions on the means with which management may react to control pest organisms.

Over the years LYJO management has dealt with such pests as: powder post beatles, termites and wood ants in wooden structures and furniture; Ambrosia Beatles and Wilt in Live Oak trees; fire ants in visitor use areas; army worms in the Sudan and Coastal Bermuda grasses; nut, cigar, and leaf casebearers, hickory shuck worm, weevil, and scab (a fungus) in the pecan trees; and various flies, mites, ticks and worms in the cattle and draft horses. There are a host of others that are not mentioned here.

Most recently, September 1982, management learned about an oak twig pruner that is in the oak trees at the LBJ Ranch. The organism is the larva form of a beatle, genus Agrilus, that has yet to be specifically identified.

1.2 Current Management Action

In the past the immediate reaction that management first thought of when it encounters an insect/disease threat was to call upon a chemical pesticide as a "panacea" that would solve the problem. Now the NPS pesticide use policy has forced us to find other means to deal with these organisms. Biological, mechanical or chemical methods must be integrated to the end that the selected alternatives present minimal environmental hazard.

2.0 Alternative Actions and Problable Impacts

2.1 No Action

This alternative would accept the results of insect pest activity. The consequences are contrary to management objectives.

2.2 Current Management Action

The park will conform to the NPS Pesticide Use Policy and Guidelines. When encountering insect and disease threats, management will evaluate all available mechanical and biological methods before resorting to chemical pesticides.

2.3 Use All Force to Suppress Insect and Disease Threats to Park Resources

This alternative would use all commercially available means that are unrestricted by the Environmental Protection Agency to react to insect and organisms that threaten LYJO resources. Such management policy would be irresponsible. In many cases it would pose a serious threat to employees, visitors, and other harmless or beneficial organisms.

3.0 Recommended Course of Action

3.1 Alternative 2.2, Continue Present Management Action

Park management will endeavor to increase its awareness of IPM practices and methods and agents through training and other available opportunities. The park will subscribe to the IPM Practitioner, continue to consult with Southwest Regional Office and use it as a means to monitor IPM developments, opportunities and techniques.

4.0 Requirements to Accomplish Action

Research: None

Operations: No additional funding is necessary to follow recommended course of action.

RESOURCES PROGRAMMING SHEET

Southwest (Region) | Texas (State) | X Natural | Cultural | 10/82 (Date) | Page 1 of 1

Priority	Package Title (10-238)	10-238 Pkg #	RMP Proj #	YR 1-1984	YR 2-1985	YR 3-1986	YR 4-1987	YR 5-1988	Total
1	Aerial Photography & Mapping	No #	C-03,06 N-	Fletcher to call					
2	Historic Landscape Studies & Plans	173	C-03 N-		52				
3	Hereford Herd Management Plan	No #	N-02		5				

PART III

ENVIRONMENTAL ASSESSMENT

A. OVERVIEW

The following is a reivew of all actions proposed within the Resource Management Plan and outlined in four categories.

1. Those Actions Whose Implementation Will Have A Significant And Measurable Effect on the Environment.

   No such actions are planned. Each project included in the Resources Management Plan was considered on its own merit and, in every case, those actions planned do not have a significant and measurable effect on the environment. All of the actions fall into categories II, III, or IV.

2. Those Actions Which Will Continue Existing Maintenance.

   Projects that fall into this category are: LYJO C-1, C-5, C-11, C-20 and LYJO N-1, N-2, N-3, N-4, N-5, N-6, N-7, N-8, N-9, and N-10.

3. Those Actions Which Will Initiate New Maintenance.

   Projects that fall into that category are: LYJO C-1, C-5, C-11, and LYJO N-4, N-6, N-9, and N-10.

4. Those Actions Which Will Entail Continuing Study or Research.

   Projects that fall into this category are: LYJO C-2, C-3, C-4, C-6, C-7, C-8, C-9, C-10, and LYJO N-1, N-2, N-4, N-7, N-8, and N-10.

DETERMINATION:

It is determined that all actions above are maintenance or research in character and do not significantly effect the environment or cause controversy.

Therefore, in accordance to the following paragraph of "Guidelines for the Preparation and Review of Environmental Assessments and Statements" (National Park Service, July 20, 1974, page 6).

> Based on an overview of all actions affecting the environment, the responsible official may determine that many plans, projects and operational decisions have negligible potential to cause controversial or significant environment impact and therefore do not require preparation of environmental assessments.

NO ENVIRONMENTAL ASSESSMENT WILL BE PREPARED.

ENVIRONMENTAL MATRIX

SYSTEM		RESOURCE BASIC INVENTORY	CULTURAL INFLUENCES	NATURAL INFLUENCES	DOCUMENTATION	APPLICATION
ABIOTIC	AIR	No Data Base	Air pollution minimal	Assumed to be little	Some visual, otherwise none	None
	WATER	Ground water analysis current, surface run-off, no data base, potable water adequate, irrigation inadequate	Pollutants from agricultural run-off (both organic & inorganic), and human waste systems suspected	Flood, known to be significant. Drought.	Visual - Good Plans of Operation - Good Research - Adequate	N-6, N-9
	GEOLOGY	Adequate: Soil Conservation Service Dist. Soil Survey for Blanco and Gillespie Counties, Annual soil analysis by field	Erosion from human river management and agricultural practices	Wind and water	Visual - Good Research - Adequate	N-9, N-3, N-4, N-8
	OIL & GAS MINERAL	Not applicable to geology	None	None	None	
	CLIMATE	Adequate	None	Tropical, Sub-humid, 30" precipitation/year	General Information - Good Research - Unnecessary	None
	FIRE	Structural resources adequate. Natural or Wild Fire general and adequate.	Accidental ignitions, fire suppression, external encroachment, and prescribed burning	Lightening, drought	Reports - Good Visual - Good Research - Unnecessary	C-1
BIOTIC	FLORA	General Information - Adequate, Historical Data - Inadequate	Grazing, Agricultural Practices, Pecan Management, Live Oak Management, Prescribed burning, Native Grass Restoration	Native vegetation, Encroachment on Domestic landscape, insects, and disease. Climate.	General Information - Good Historical Information - Poor Research - Poor Plans of Operation - Good	C-3, N-1, N-8, N-5
	UNIQUE SPECIES	Exotic Landscape/Horticulture specimens, data base incomplete.	Landscape Management, Domestic Landscape and Agricultural Species.		Visual - Good Research - None	N-3, N-4, N-8, C-3
	FAUNA	General Information - Adequate, Historical Data - Adequate.	Domestic agricultural species, Hunting, Rodent Control, Visitor Use. Remaining native species exist inspite of domestic activity.	Native species encroaching upon domestic landscape, climate, rodent behavior and population dynamics	Visual - Good Research - Adequate Plans of Operation - Poor	N-7, N-10
	UNIQUE SPECIES	Endemic - None Exotic - Nutria Domestic - Conforms to local ranching trends.			Visual - Good Research - Adequate Plans of Operation - Good	N-2, N-7, N-10
HUMAN	HISTORIC ACTIVITIES (Events)	Ranching Operations Study Historic Resource Study Oral History Collection Historic Research Files (library)	Legislation Administrative Philosophy Researcher interpretation and objectivity Management interpretation and politics	None	Incomplete. Research - Continuing	C-4, C-6, C-7, C-8, C-9, N-2, N-3, N-4, N-5
	STRUCTURES	Historic Structures Reports -Johnson City Unit, complete -Junction School -Texas White House, 50% Preservation Guide, Boyhood Home Library resources: files and oral history collection	Employee and visitor use Maintenance Management Funding	Climate/Weather Mildew Rodents, Insects	Incomplete Research - Continuing	C-1, C-2, C-3, C-4, C-5, C-6, N-10, C-11
	POSSESSIONS (Artifacts)	Furnishing Study and Plan, Boyhood Home, Furnishing Study, Birthplace, Collection Management Plan, Museum Collection Administrative Records, Furnishings Inventory on all ranch structures.	Employee and vistor use Curatorial Management Funding	Climate/Weather Mildew Rodents, Insects	Incomplete Research - Continuing	C-1, C-4, C-6, C-10, C-11, C-20, N-10

BIBLIOGRAPHY

PLANS AND STUDIES

The following plans and studies are on file in the Park Library:

Bearss, Edwin C.

1971 Historic Resource Study, Johnson City Unit, 200 pp., 33 pp. illustrations and maps History of the LBJ Ranch and Hill Country, 1837-1965

1973 Historic Structure Report and Furnishing Study of the Blacksmith Shop, Denver Service Center, 58 pp.

1973 Historic Structure Report, Historical Data, Junction School, Denver Service Center, 81 pp.

1973 Transportation System, Boyhood Home to Old Ranch, 4 pp.

Ketcham, Sally Johnson

1973 Furnishings Plan, The Sam Ealy Johnson Cabin, Section E, 76 pp.

1973 Furnishings Plan, The Sam Ealy Johnson Cabin, Section F, 13 pp.

1973 Furnishings Plan, The Sam Ealy Johnson Cabin, (Old Ranch) Section F, 70 pp.

1973 Furnishings Plan, Lyndon B. Johnson Boyhood Home, Section E, 164 pp.

Malechek, Dale

1976 Cattle management by the National Park Service at the LBJ Ranch

1976 Grass Management and Grazing of Johnson Settlement Pastures

National Park Service

1973 Lyndon B. Johnson National Historic Site, Briefing book, a compedium of facts and figures concerning the site, 94 pp.

- Lyndon B. Johnson National Historic Site, 91st Congress - 1st Session. This briefing book was used during congressional hearings, another compendium of facts and figures concerning Lyndon B. Johnson National Historic Site.

1973 Mrs. Bobbitt's Observations on Draft of Boyhood Home Furnishing Plan, (Mrs. Bobbitt is LBJ's sister), 52 pp.

1975 List of Classified Structures

1975 Summary of discussion of plans for Lyndon B. Johnson National Historic Site by Mrs. Lady Bird Johnson, Regional Director Joe Rumburg and others.

Neilsen, Chester V.

1973 Historical Study of the Johnson Settlement, 24 pp.

United States Department of the Interior/National Park Service

1977 Statement for Management, 15 pp.

1976 Master Plan, 30 pp.

1976 Proposal Analysis, An assessment of the Planning Alternatives

1975 Interpretive Prospectus, 36 pp. (Johnson City Unit, Ranch Tour and Birthplace only)

1976 Negative Declaration, published in Federal Register, June 21, 1976

OTHER RELATED PLANS AND STUDIES

Author Unknown (possibly Liz Carpenter)
- The Story of the LBJ Ranch and Home, 29 pp. Primarily about the Texas White House from its earliest years to the present including photographs. Xerox copy.

White, Roy J.
1964 The Restoration of the Birthplace of President Lyndon B. Johnson, 10 pp.

ARCHEOLOGICAL STUDIES, NATIONAL PARK SERVICE

Carter, Susan A.
1973 Archeological Investigations at the Johnson Brothers Cattle Company Ranch Headquarters, Lyndon B. Johnson National Historic Site, Blanco County, Texas, Texas Archeological Survey, the University of Texas, 18 pp.

ARCHEOLOGICAL STUDIES, STATE OF TEXAS

Tunnell, Curtis D.,; Jensen, Harald P., Jr.
1969 Archeological Program (Excavations in Lyndon B. Johnson State Park), State Building Commission, 96 pp.

REGIONAL, STATE AND LOCAL STUDIES AND PLANS

Blanco County Commissioners Court
1973 Blanco County Transportation Plan, City of Johnson City, City of Blanco, Texas Highway Department, 14 pp.

1973 Blanco County Water and Sewer Plan and Texas Water Plan, 15 pp.

Freese and Nichols Consulting Engineers
1975 Environmental Assessment Wastewater System Improvements, Johnson City, Texas, 48 pp.

Kott, Nancy and Harlan, Gerald

- Furnishing Plan, Visitor Center and Associated Cabin, Texas Parks and Wildlife Department, 128 pp.

1974 Eastern Hill Country: Mason, Llano, Lampasas, Burnet, Gillespie, Blanco. Resource Conservation and Development Project Plan

- Lyndon B. Johnson State Park, Master Plan, Texas Parks and Wildlife Department

1972 Development Plan LBJ State Park, Texas Parks and Wildlife Department

- Preliminary Interpretive Plannin, Visitor Center and Cabin Furnishing Plan--Other Park Features, Texas Parks and Wildlife Department, 142 pp.

LIBRARY

Lyndon B. Johnson National Historical Park has a small but growing library, containing general works covering a time span of 125 years pertaining to Lyndon B. Johnson, western history, Texas and Hill Country history. In addition to the above, we have approximately 400 reels of audio tape containing the reminiscences of approximately 150 persons who knew LBJ during his lifetime. A few of the most important interviews include:

1. Mrs. Lyndon B. Johnson
2. Luci Johnson, daughter
3. Lynda Robb, daughter
4. Dale Malechek, Ranch Foreman
5. Truman Fawcett, Johnson friend & neighbor
6. Mrs. Kittie Clyde Leonard, friend, neighbor, and school teacher
7. Liz Carpenter, personal secretary of Mrs. Johnson
8. Lawrence Klein, employee
9. James Davis, employee
10. Norman Dietel, newspaper owner, editor, publisher

There is also a growing body of historic photographs and other documentary material. The above materials have proved to be invaluable to all phases of park operations.

Below are listed those volumes which have proved to be the most valuable.

HISTORY BIBLIOGRAPHY

Carpenter, Liz
1970 Ruffles and Flourishes, Doubleday and Co., Inc., New York, 341 pp.

Evans, Rowland and Novak, Robert
1966 The Exercise of Power, The New American Library Inc., 598 pp.

Johnson, Claudia T.
1970 A White House Diary, Holt, Rinehart and Winston, 806 pp.

Johnson, Lyndon B.
1971 The Vantage Point, Perspectives of the Presidency, 1963-1969, LBJ, Popular Library, New York, 636 pp.

Johnson, Rebekah Baines
1954 A Family Album, McGraw-Hill Book Company, New York, 146 pp.

Kearns, Doris
1976 Lyndon Johnson and the American Dream, Harper and Row Publishers, 432 pp.

Kinnison, Virginia Saunders
- The Baines in Blanco, Xerox copy, 54 pp.

Miller, Merle
1980 Lyndon An Oral Biography, G.P. Putnam and Sons, 645 pp.

Mooney, Booth
1964 The Lyndon Johnson Story, Farrar, Straus and Co., New York, 198 pp.

Pool, William; Craddock, Emmie; Conrad, David
1965 Lyndon Baines Johnson, The Formative Years, Southwest Texas State College Press, San Marcos, 185 pp.

Poterfield, Bill
- LBJ Country, The country that shaped a President, Doubleday and Co., Inc. New York, 141 pp.

Rogers, Jerry L.
1970 History of LBJ Country, Xerox copy, 68 pp.

NATURAL HISTORY BIBLIOGRAPHY

Bell, Hershel M.,
1973 Rangeland Management for Livestock Production, University of Oklahoma Press, 303 pp.

Borror, Donald J. and White, Richard E.
1970 A Field Guide to the Insects of America North of Mexico, Houghton Mifflin Co., Boston, 404 pp., National Audubon Society and National Wildlife Federation

Conant, Roger
1975 A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Second Edition, Houghton Mifflin Co., Boston, 424 pp., National Audubon Society and National Wildlife Federation

Davis, William B.
1974 The Mammals of Texas, Texas Parks and Wildlife, 294 pp.

Donahue, Royl; Follet, Roy H. and Tulloch, Rodney W.,
1976 Our Soils and Their Management, Interstate Publishers, 794 pp.

Ensminger, M.E.
1976 Beef Cattle Science, Interstate Publishers, 1556 pp.

1978 The Stockman's Handbook, Interstate Publishers, 1192 pp.

1977 Animal Science, Interstate Publishers, 1047 pp.

Gould, Frank W.
1975 The Grasses of Texas, The Texas A&M University Press, 653 pp.

Hampton, Nan and Diercks, Char
1973 A Guide to the Animals, Austin Natural Science Center, Austin Parks and Recreation Department, 57 pp.

Irwin, Howard S.
1961 Roadside Flowers of Texas, University of Texas Press, Austin, 295 pp.

McVichar, Malcolm H.
1974 Approved Practices in Pasture Management, Interstate Publishers, 400 pp.

Oberholser, Harry C.
1974 The Bird Life of Texas, University of Texas Press, Vol. 2, 1069 pp.

Peattie, Donald Culross
1953 A Natural History of Western Trees, Bonanza Books, New York, 751 pp.

Peterson, Roger Tory
1950 *A Field Guide to the Birds of Texas and Adjacent States, Houghton Mifflin Co., Boston, 304 pp. Texas Game and Fish Commission and National Audubon Society

Petrides, George A.
1972 A Field Guide to Trees and Shrubs, Second Edition, Houghton Mifflin Co., Boston, 428 pp. National Audubon Society and National Wildlife Federation

Phelan, Richard
1976 Texas Wild, Excalibur Books, 256 pp.

Ramsey, Charles
- Texotics, Bulletin No. 49, Texas Parks and Wildlife, 46 pp.

Rodale Press Inc.
1978 Encyclopedia of Organic Gardening, Rodale Press, 1236 pp.

Singleton, J.R.
1974 Waterfowl Habitat Management in Texas Bulletin No. 47, 65 pp. Texas Parks and Wildlife

Teer, James G.
1963 Trees, Shrubs, and Woody Vines of the Southwest, University of Texas Press, Austin, 1104 pp.

Texas Agriculture Extension Service
- Know Your Grasses, Texas A&M University Press, 45 pp.

USDA
1941 Climate and Man, Government Printing Office, 1248 pp.

USDA Soil Conservation Service
8/1979 Soil Survey of Blanco Co., Tx., 116 pp. and soil maps

USDA Soil Conservation Service
5/1975 Soil Survey of Gillespie Co., Tx., 80 pp. and soil maps

Vines, Robert A.
1960 Trees, Shrubs and Wood Vines of the Southwest, University Texas Press, 1104 pp.

Werler, John E.
1970 Poisonous Snakes of Texas and First Aid Treatment of Their Bites, Bulletin No. 31, Texas Parks and Wildlife Department, 62 pp.

MAPS AND PLANNING DRAWINGS

The maps listed below are from a variety of sources and have been found to be useful in the past, for research and planning purposes.

MAPS PERTAINING TO THE ENTIRE PARK

Denver Service Center

1974 Location and Index Map for LBJ National Historic Site

1974 Land Status Map 01, Johnson City Unit

1974 Land Status Map 02, LBJ Ranch Unit

1973 Drawing of Radio System Location, LBJ National Historic Site

National Park Service

- Land Acquisition, Southwest Regional Office, Land Acquisition Division

U.S. Department of Agriculture

1974 Aerial Photographs, Stonewall and Johnson City Areas

MAPS OF JOHNSON CITY UNIT AND JOHNSON CITY

Armstrong, Alford L.

1972 Survey Map of James Fentres Grant, Blanco County, Texas

National Park Service

- Johnson City Unit, General Development Map

- LBJ Boyhood Home and Johnson Settlement, Lyndon B. Johnson National Historic Site, General Development Map

- Map of Existing Land Uses, Johnson City, Texas

- Map Showing Structures of Architectural Merit

- Map Showing Proposed Historic District

- Boundary Map for Boyhood Home and Birthplace

Southwest Regional Office

- Land Ownership Plat for Lyndon B. Johnson National Historic Site Boyhood Home

1972 Map of Boyhood Home and Surrounding Area

United States Department of the Interior/National Park Service

1975 Map of Johnson City Unit, Lyndon B. Johnson National Historic Site, Texas

1969 Map of City of Johnson City, Texas

- Map of Sewage System of Johnson City, Texas

MAPS OF LYNDON B. JOHNSON RANCH UNIT

National Park Service

- The Birthplace, General Development Plan

- Map of LBJ Ranch Unit, Lyndon B. Johnson National Historic Site, Texas

- Map of Road System at LBJ Ranch and Ranch Area

- Topographic Map of the LBJ Ranch Unit, San Francisco

- Planning and Service Center, Design and Construction

Nixon, Victor L.

- Contour Map of Johnson Family Cemetery, National Park Service

REGIONAL AND COUNTY MAPS

Resource Conservation and Development Project

1974 General Soil Map Eastern Hill Country, Blanco, Burnet, Gillespie, Lampasas, Llano and Mason Counties, Texas

1974 Land Resource Area Map Eastern Hill Country, Blanco, Burnet, Gillespie, Lampasas, Llano and Mason Counties, Texas

1974 Land Use Map Eastern Hill Country, Blanco, Burnet, Gillespie, Lampasas, Llano and Mason Counties, Texas

Texas State Highway Department, Planning and Research
1975 General Highway Map,Blanco County, Texas

1975 General Highway Map, Gillespie County, Texas

HISTORIC MAPS

Dietz
1862 Land Use Map of Blanco County, Texas, General Land Office

1871 Land Use Map of Blanco County, Texas, General Land Office

U.S. Geological Survey
1894 Topographical Map Blanco County, Texas

GEOLOGIC SURVEY MAPS

Barnes, Virgil E.
1952 Cain City Quadrangle Gillespie and Kendall Counties, Texas Bureau of Economic Geology, The University of Texas

1967 Geology of the Cave Creek School Quadrangle, Gillespie County, Texas

1965 Geology of the Hye Quadrangle, Blanco, Gillespie and Kendall Counties, Texas

1963 Geology of the Johnson City Quadrangle, Blanco County, Texas reprinted November 1969

1967 Geology of the Monument Hill Quadrangle, Blanco County, Texas

1965 Geology of the Rocky Creek Quadrangle, Blanco and Gillespie Counties, Texas

1966 Geology of the Stonewall Quadrangle, Gillespie and Kendall Counties, Texas

1967 Geology of the Yeager Creek Quadrangle, Blanco and Hays Counties, Texas

- Map showing correlation of Geologic, Gravity and Magnetic Observations, Blanco and Gillespie Counties, Texas

1952 Stonewall Quadrangle, Gillespie and Kendall Counties, Texas

APPENDIX A

A. MANAGEMENT SUBZONES WITHIN THE PROPOSED PARK BOUNDARIES

Lyndon B. Johnson National Historica Park is classified as a Historic Zone. Special subzones described below and shown on Drawings A and B have been established to designate where various strategies for management and use will best fulfill the park objectives. These subzones are based on the inherent nature of park resources and the suitablility of the land for the proposed uses and management. In all of these subzones physical development shall be the minimum needed to preserve, protect and interpret the historical values. Adaptive uses of historic structures and lands will be permitted when such use is appropriate and does not impair the structural or visual integrity of the structure or site.

LBJ RANCH UNIT

LBJ Ranch House Subzone. Because the Presidential years are the most important historically, the Ranch Headquarters complex--buildings and grounds--will be preserved and restored to its appearance during the last year of the Presidency, 1968-1969. The only exception to this policy will be preservation and interpretation of several rooms in the Ranch House to the years, 1969-1973.

LBJ Ranch Lands Subzone. The objective for the ranch lands is to maintain the ranching scene--registered Herefords, fences, buildings, pastures, grasses, crop lands--to the Presidential and retirement years, 1963-1973. The time frame for the ranch lands will be broader than the time frame for the Ranch House Complex for practical operational reasons and because President Johnson actually spent much more time with the ranching operation during the retirement years than during the Presidential years.

Birthplace Subzone. The reconstructed Birthplace/Guest House will be maintained as President Johnson built it. Our interpretive programs will use that scene primarily to show the early influences on LBJ when he lived there as a child, 1908-1913. The reconstructed barn will be removed when it is no longer needed for restrooms and sales area.

Junction School Subzone. The school and grounds will be restored to their appearance in 1912-1913, the year Lyndon B. Johnson, a precocious four-year-old, attended school there. Interpretation will also include his return to the school as President in 1965 to sign an education bill.

Johnson Family Cemetery Subzone. President Johnson, his parents, grandparents, brother, sisters, and other relatives are buried here. The National Park Service will perpetuate the simplicity and peaceful atmosphere of the cemetery. Mrs. Johnson will be consulted before any physical change or development takes place in or

around the cemetery. The plans she approves (walks, plantings, burial policies, etc.) will become part of the historic scene at the cemetery and be preserved in perpetuity.

JOHNSON CITY UNIT

Boyhood Home Subzone. The objective is to present this area much as it was in 1922-1925 when Lyndon Johnson was growing up in Johnson City.

Grandfather Johnson Subzone at the Johnson Settlement. Here, at the original log house of Lyndon Johnson's grandparents, the sights and sounds of the 1867-1872 era are presented. Longhorns, cowboys and primitive living conditions were part of Lyndon Johnson's frontier heritage.

The Farming Era Subzone at the Johnson Settlement. Through preservation of original historic structures and restoration of the historic scene, visitors see the transition from open range ranching to closed range ranching and farming as practiced by Lyndon Johnson's ancestors and neighbors, 1872-1900.

General Use Subzone. Visitor facilities and park operational facilities will be appropriately located in this area. Restoration of the secondary historic structures and natural features in this area couple with the horse-drawn wagon transportation system will increase visitor awareness of both continuity and change from the nineteenth to the early twentieth century in the lives of the Johnson Family.

APPENDIX B

B. RECOMMENDATIONS FOR LAND USE ADJACENT TO THE PARK BOUNDARIES

LBJ RANCH UNIT

The Lyndon B. Johnson State Historical Park provides scenic protection south of the ranch, visitors orientation for both parks, a starting and ending point for the bus tour of the Ranch as well as a variety of recreational uses.

A Proposed Scenic Zone surrounds the LBJ Ranch Unit on the west, north and east. The intent of this zone is to preserve the low density, agricultural character of the land. Deed restrictions by owners, local zoning, or the purchase of restrictive easements by the National Park Service will accomplish this objective.

JOHNSON CITY UNIT

A Proposed Scenic Zone around the Boyhood Home and part of the Johnson Settlement will restrict commercial use and encourage preservation of those structures associated with Lyndon Johnson such as the Pedernales Electric Cooperative Building, the Lyndon B. Johnson Hospital, the Federal/Post Office Building and some of the houses. The objective is to preserve the character and atmosphere of Lyndon Johnson's hometown as he knew it as a boy and as a man. Preservation of some of the houses near the Boyhood Home will perpetuate the residential character of the neighborhood where Lyndon Johnson grew up. Preservation of the institutional buildings and other houses will perpetuate the appearance of Johnson City that Lyndon Johnson knew as President and show in part the beneficial effect of his Presidency on his hometown. Deed restrictions by the owners, local zoning, or the purchase of restrictive easements by the National Park Service will accomplish this objective.

WATER RESOURCES PROFILE

LYNDON B. JOHNSON NATIONAL HISTORICAL PARK
SOUTHWEST REGION
NATIONAL PARK SERVICE

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F. Underground Water Sources Johnson City Unit
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Appendix B

INTRODUCTION

Lyndon B. Johnson NHP is made up of two units. The Johnson City Unit located in Blanco County, Johnson City, Texas and the LBJ Ranch Unit located in Gillespie County near Stonewall, Texas. Both units lie in the Pedernales River Valley which cuts through a geologic region known as the Llano Uplift. The county is characterized by hills covered by cedar and oak. Elevations range from 1,000-2,500 ft. above sea level. The climate is dry sub-humid with Blanco County averaging 34 inches of rain per year and Gillespie County 27.44 inches. The summers are generally hot and the winters mild. The average length of the growing season is 234 days in Blanco County and 219 days in Gillespie County. The average annual free water evaporation is 58 inches in Blanco County and 62 inches in Gillespie County.

The soils in the Johnson City area are the shallow loamy, clayey, sometimes stoney soils of the Brackett-Puryis, Doss Association. The soils in the LBJ Ranch area are the deep sandy to loamy soils of the Luckenbach-Pedernales-Heatly Association.

A. SURFACE WATERS LBJ RANCH UNIT

1. Pedernales River

The Pedernales River originates in southeast Kimble Co. and flows southeasterly about 123 miles into the Colorado River. The total drainage area is 1,302 sq. mi.; the area drained by the river before it reaches the Park is approximately 608 sq. mi. The watershed topography consists of plateau and hills broken by spring-fed streams.

Stream Flow Data (1980)

Jan.	250 cfs	July	301 cfs
Feb.	404 cfs	Aug.	192 cfs
Mar.	441 cfs	Sept.	70 cfs
Apr.	529 cfs	Oct.	72 cfs
May	455 cfs	Nov.	88 cfs
June	1,492 cfs	Dec.	132 cfs

Average CFS for 1980 was 369.

2. IMPOUNDMENTS

Lyndon B. Johnson NHP has two dams on the Pedernales.

The Johnson Dam impounds 48 ac. feet of water used for irrigation, fire protection and for filling stock tanks. 33 ac. feet of water were used in 1981 for irrigation.

The Jordan Dam impounds 35 ac. feet of water used for irrigation and filling stock ponds. No water was withdrawn from this impoundment in 1981 for irrigation.

3. WATER RIGHTS

All water rights owned by the Park are shared with the LBJ Company. When water rights were adjudicated in 1979 all LBJ Company and NPS claims were considered together and adjudicated on the basis of shared water rights. LBJ Company reserves the first right of use on all withdrawals. This presents an obvious problem to the NPS in that the LBJ Company could divert all the water granted, leaving the NPS high and dry (literally). We are at present (1982) attempting to correct this situation.

Present NPS water rights are as follows:

#14-1464 - 12.38 ac. feet of water to irrigate 12.38 ac., located south of the river across from the Ranch House. Water may be diverted at a rate of 1750 gpm.

#14-1465 - 114 ac. feet needed to irrigate 114 ac. located: NPS Riverbottom north of river, Headquarters tracts (Coastal, Oatfield, Little Tank and Leaky Tank). Water may be diverted at a rate of 1,750 gpm.

#14-1466 - 1,260 ac. feet to irrigate 1,367 ac. This is for land east and north of the airstrip. The NPS does not presently own land in this area, however at least some acreage in this area is slated for future donation. Water may be diverted at a rate of 4,050 gpm.

#14-1467 - 220 ac. feet to irrigate 214 ac. This includes all Jordan land, Riverbottom, Junction School and Birthplace. The NPS presently claims 55.93 ac. feet to irrigate 55.93 acres. Water may be diverted at the rate of 1,750 gpm.

All withdrawals of water are on an honor system with annual reports filed with the controlling agency, the Texas Department of Water Resources. Water quality, etc. is controlled by both the Department of Water Resources and the Texas Department of Health.

4. FLOODS

Floods on the Pedernales are an annual event. For information on flooding see Appendix B, "Special Flood Hazard Information Report" prepared by the Corps of Engineers, Dec. 1979.

5. EROSION

Erosion along the Pedernales has been a major problem during floods. Two projects have been undertaken to control this situation. The first in 1975-76 was on the north side of the river. The riverbank was backsloped and shaped. The second on the south side of the river was in 1982 when 2,450 ft. of riverbank directly across from

the Ranch House was shaped and stabilized with rock gabions and petromat. The second phase of this project is still pending.

B. OTHER SURFACE WATERS

The other surface waters in the Ranch Unit consist of earthen dams and tanks (ponds). These were built in conjunction with terracing of the various fields to provide erosion control, stock water and in some cases for irrigation. These tanks are described as follows:

Little Tank - Size: 3 ac. ft.
Source: Runoff/can be filled by pumping from river.
Use: Stock water/has been used for irrigation by President Johnson.

Leaky Tank - Size: 4½ ac. ft.
Source: Runoff/can be filled by pumping from river.
Use: Stock water/has been used for irrigation by President Johnson.

Dale's Tank - Size: 1 ac. ft.
Source: Runoff/could be filled from well.
Use: Stock water.

Fertilizer Field Tank - Size: 3 ac. ft.
Source: Runoff/could be filled from well.
Use: Stock water.

West Fertilizer Field Tank - Size: 3 ac. ft.
Source: Runoff/could be filled from well.
Use: Stock water.

North Airstrip Tank - Size: 3 ac. ft.
Source: Runoff/could be filled from well.
Use: Stock water.

East Airstrip Tank - Size: 2 ac. ft.
Source: Runoff/could be filled from well.
Use: Stock water.

Fish Tank - Size: 3 ac. ft.
Source: Runoff/could be filled by pumping from river.
Use: Stock water/has been used for irrigation by President Johnson.

Reagan Tank - Size: 3 ac. ft.
Source: Runoff/could be filled by pumping from river.
Use: Stock water.

Jockey's Tank - Size: 4 ac. ft.
Source: To be filled by pumping from river.
Use: Reservoir for irrigation.

Jordan Tank - Size: 3 ac. ft.
Source: Runoff/well
Use: Stock water

C. UNDERGROUND WATER SOURCES

The information listed below is all that we have been able to find on the wells in the park. There are undoubtly wells both in use and abandoned which are not listed, and we have little or no information on a number of the wells that are listed. However we are still researching this subject and will revise this section when all the information is obtained.

D. UNDERGROUND WATER SOURCES LBJ RANCH UNIT

1. WELLS PRESENTLY IN USE

Birthplace (New well)
Drilled: 1972
Size: 6 1/8"
Depth: 160'
GPM(Test): 106
Quality: Good
Use: Public water supply

Birthplace (Old well)
Drilled:
Size:
Depth:
GPM(Test):
Quality: Contaminated
Use: Stock water for Mrs. Johnson's leasee.

The missing data in Section D below is being collected from the well drilling firms that did the work. This information will be inserted as it is received.

Jordan Well
Drilled:
Size:
Depth:
GPM(Test):
Quality:
Use:

Cedar Guest House Well
Drilled:
Size:
Depth:
GPM(Test):
Use:

Texas White House, Well #1 (Location: North of Texas White House
East of Secret Service Building)

Drilled: 1965
Size: 6 1/8"
Depth: 280'
GPM(Test): 7
Quality: Good
Use: Domestic Supply

Texas White House Wells, Well #2 (Location: North of Texas White House East of Secret Service Building)

Drilled: 1965
Size: 6 5/8"
Depth: 200'
GPM(Test): 40
Quality: Good
Use: Domestic Supply

Texas White Wells, Well #3 (Location: Southwest fence corner in front of Texas White House)

Drilled:
Size:
Depth:
GPM(Test):
Quality: Contaminated
Use: Abandoned

Texas White Wells, Well #4 (Location: South of water softener building West of Texas White House)

Drilled:
Size:
Depth:
GPM(Test):
Quality: Contaminated
Use: Abandoned

Texas White Wells, Well #5 (Location: North of taxiway by triangle field gate)

Drilled:
Size:
Depth:
GPM(Test):
Quality:
Use: Abandoned

Fertilizer Field Well

Drilled: 1966
Size: 6 1/8"
Depth: 250'
GPM(Test): 171
Quality: Good
Use: Domestic supply at present. Will be public water supply after installation of Showbarn drinking fountain in Spring 1983.

Well at Foreman's House

Drilled:
Size:
Depth:
GPM(Test):
Quality:
Use:

2. ABANDONED WELLS

Junction School Well
Hand-dug well located behind the Junction School. Not used or maintained.

Birthplace Cistern
Cistern located near back porch of LBJ Birthplace. Maintained for historic purposes.

S. E. Johnson Well
Hand-dug well located behind S. E. Johnson Farmhouse. Maintained for historic purposes.

Well at Foreman's House
Drilled well located near Foreman's house not on NPS property.

3. FIXED RIVER PUMPS

The NPS maintains two fixed river pumps at the LBJ Ranch.

Pump #1 is located in front of the Texas White House and is used for fire protection and to irrigate the grounds.

Pump #2 is located in the southwest corner of the Johnson Family Cemetery and is used to irrigate the Cemetery and Birthplace grounds.

E. SURFACE WATERS JOHNSON CITY UNIT

Town Creek

Town Creek is an intermittent stream flowing through the Johnson Settlement Area. The NPS has no impoundment or water rights on this stream. The only major flooding problem (foot bridge washout) was in 1979 during a thunderstorm with a rainfall rate in excess of 5 inches per hour. There are no recorded major erosion problems except road and trail washouts during periods of heavy rainfall.

1. SURFACE WATERS

Johnson Pond

The Johnson Pond is located in the Johnson Settlement Area. It is a spring-fed pond and impounds approximately 1 ac. ft. of water.

F. UNDERGROUND WATER SOURCES JOHNSON CITY UNIT

1. WELLS PRESENTLY IN USE

Boyhood Home Well
Drilled:
Size:
Depth: 250'
GPM(Test):
Quality: Contaminated
Use: Irrigation/fire protection

Johnson Settlement Well (Formerly a city well)
Dug: 1950
Size: 16 sq. ft. - 256 sq. ft.
Depth: 32'
GPM(Test): 90
Quality: Contaminated
Use: Fire protection/stock water

2. ABANDONED WELLS

Boyhood Home Well (Windmill)

Formerly supplies water for the Johnson Family. Maintained for historic purposes. Located behind Boyhood Home.

Boyhood Home (Hand-dug Well)

Formerly supplied water for the Johnson Family. Maintained for historic purposes.

Johnson Well

Located in front of the Cabin at the Johnson Settlement. This is a hand-dug well maintained for historic purposes. (Approximately 20' deep.)

J. P. Johnson Well (Windmill)

Located next to the Cooler House at the Johnson Settlement. This is a hand-dug well maintained for historic purposes. (Approximately 20' deep.)

All water for public and staff consumption at the Johnson City Unit comes from the municipal water system.

G. REFERENCES CITED

U.S.D.A., Soil Conservation Service, Soil Survey Gillespie Co., Tx., 1975

U.S.D.A., Soil Conservation Service, Soil Survey Blanco & Burnet Co., Tx., 1979.

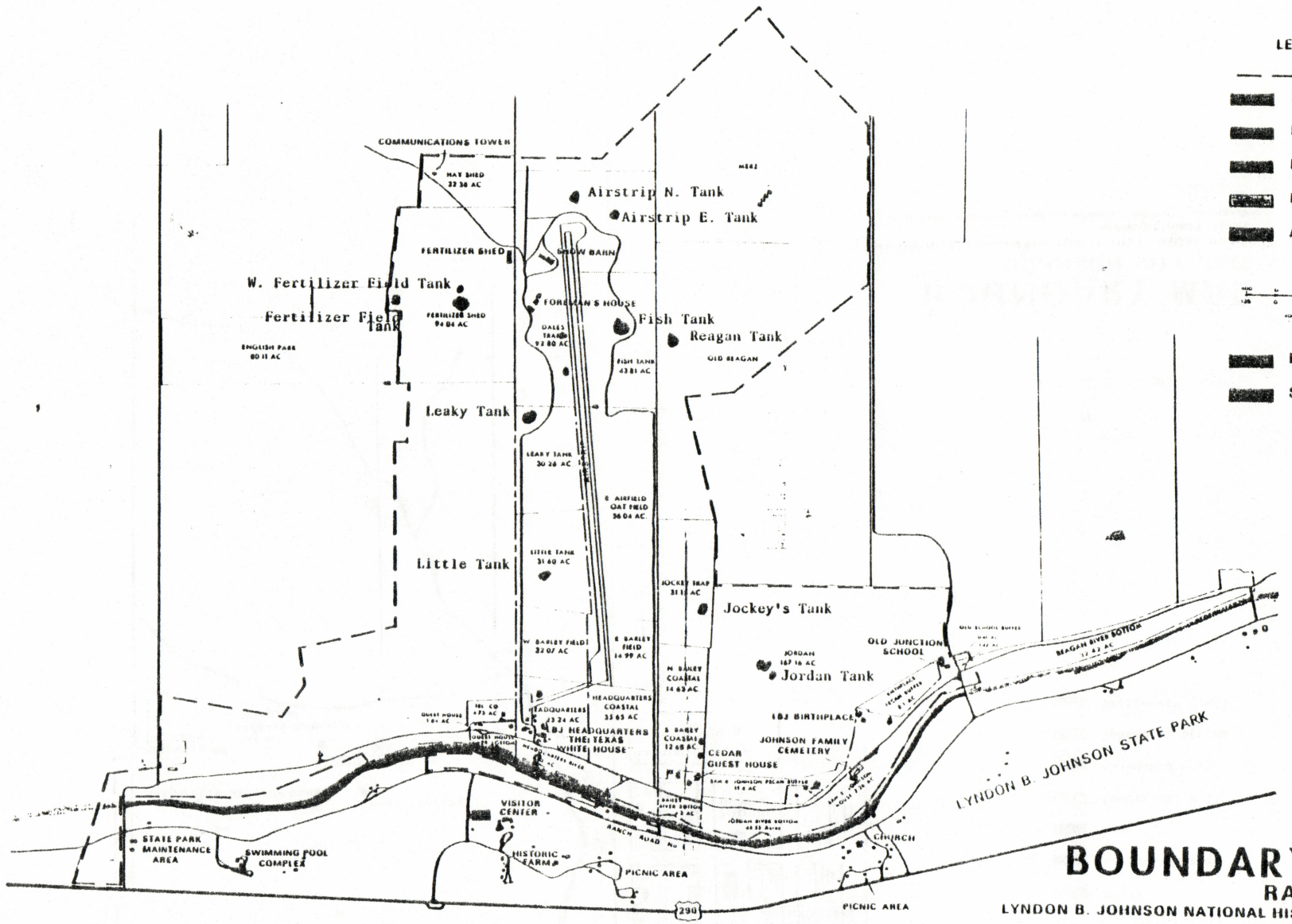
Phelan Richard, Texas Wild, Excalibur Books, 1976.

Texas Dept. of Water Resources, Notice of Final Determination of Water Rights in the Pedernales River Watershed, 1979.

Lyndon B. Johnson NHP Resources Management Plan.

Lyndon B. Johnson NHP central office and history resource files.

National Weather Service, San Antonio, Tx.



BOUNDARY MAP

RANCH UNIT

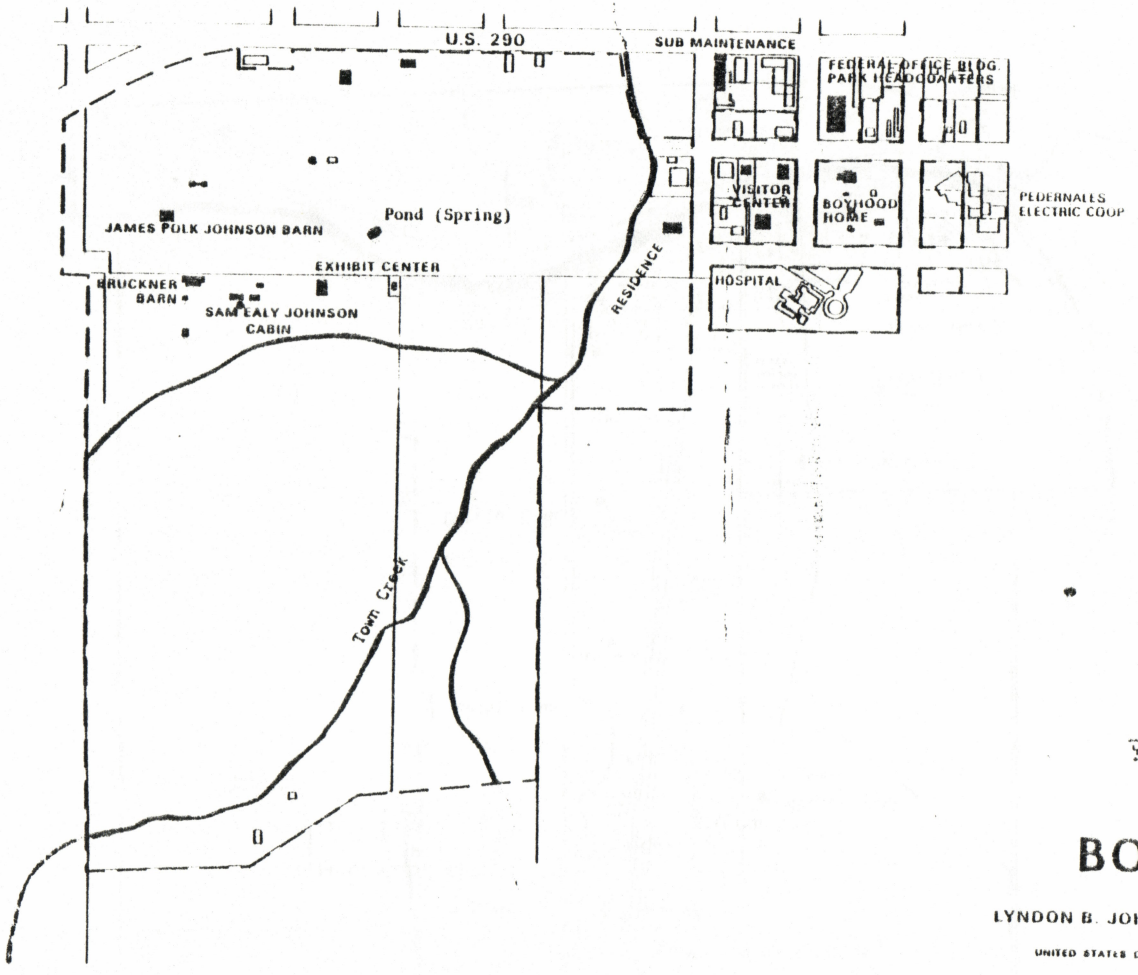
LYNDON B. JOHNSON NATIONAL HISTORICAL PARK

GILLESPIE COUNTY, TEXAS

UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

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LEGEND

- BOUNDARY
- Ponds
- Parental Stream
- Dam
- Functional Well
- Abandoned Well
- Ephemeral Stream
- Stationary Pumps

N

BOUNDARY MAP

JOHNSON CITY UNIT

LYNDON B. JOHNSON NATIONAL HISTORICAL PARK

BLANCO COUNTY, TEXAS

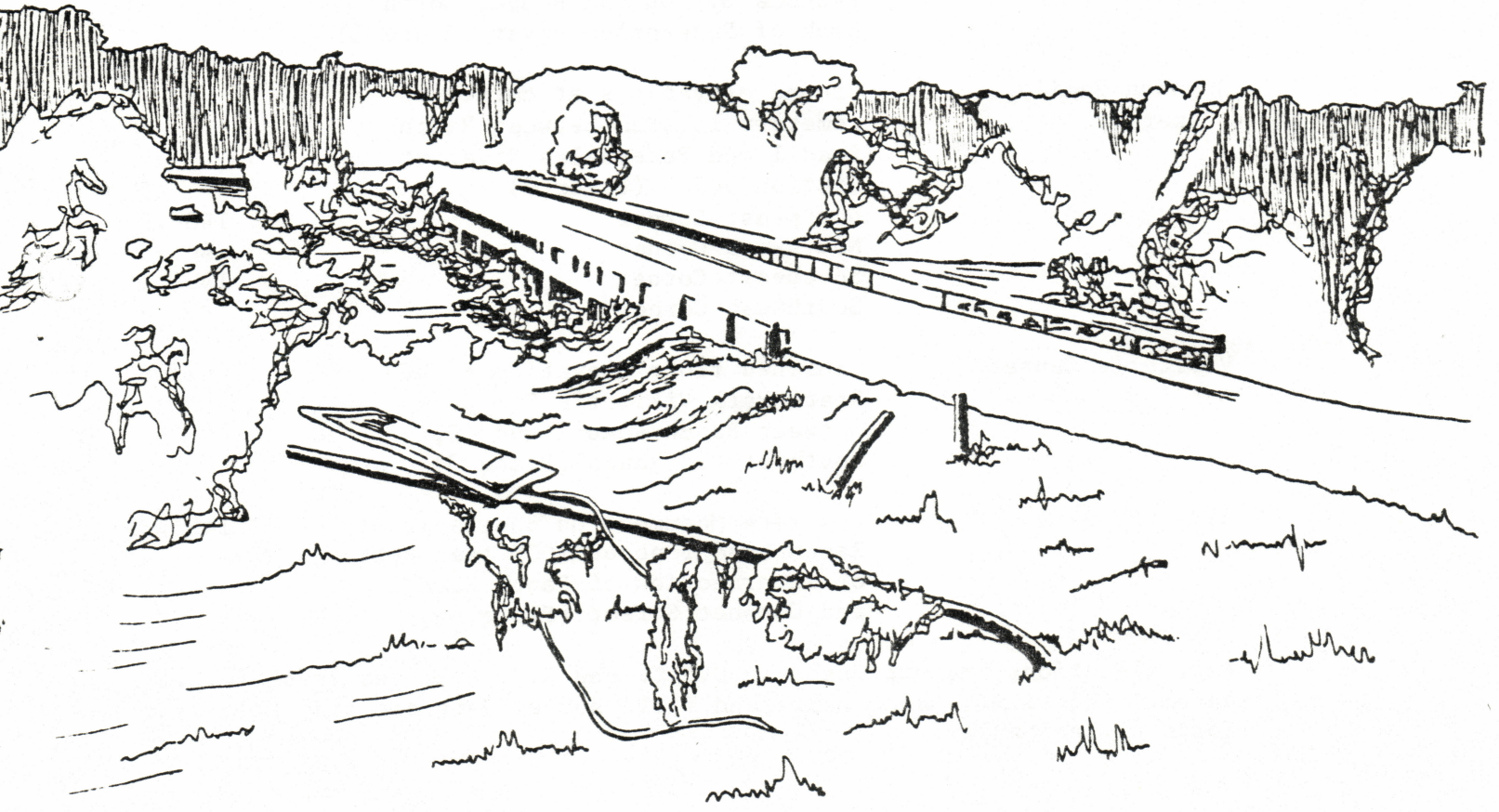
UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

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LBJ Files

SPECIAL FLOOD HAZARD INFORMATION REPORT

PEDERNALES RIVER
LYNDON B. JOHNSON NATIONAL HISTORIC SITE
AND STATE PARK
GILLESPIE COUNTY, TEXAS



PREPARED FOR
THE NATIONAL PARK SERVICE
BY
CORPS OF ENGINEERS, U.S. ARMY
FORT WORTH, TEXAS

DECEMBER 1979

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SPECIAL FLOOD HAZARD INFORMATION REPORT
PEDERNALES RIVER
LYNDON B. JOHNSON NATIONAL HISTORIC SITE AND STATE PARK
GILLESPIE COUNTY, TEXAS

INTRODUCTION

This report provides flood plain information on the areas within and adjacent to the Lyndon B. Johnson State Park and the Lyndon B. Johnson National Historic Site that are subject to flooding from the Pedernales River. Plate 1 is a vicinity map showing the general area of study. The report was prepared to identify the 2-, 10-, 25-, 50-, 100-, and 500-year frequency flood profiles and to delineate the 100-year flood plain.

AUTHORITY

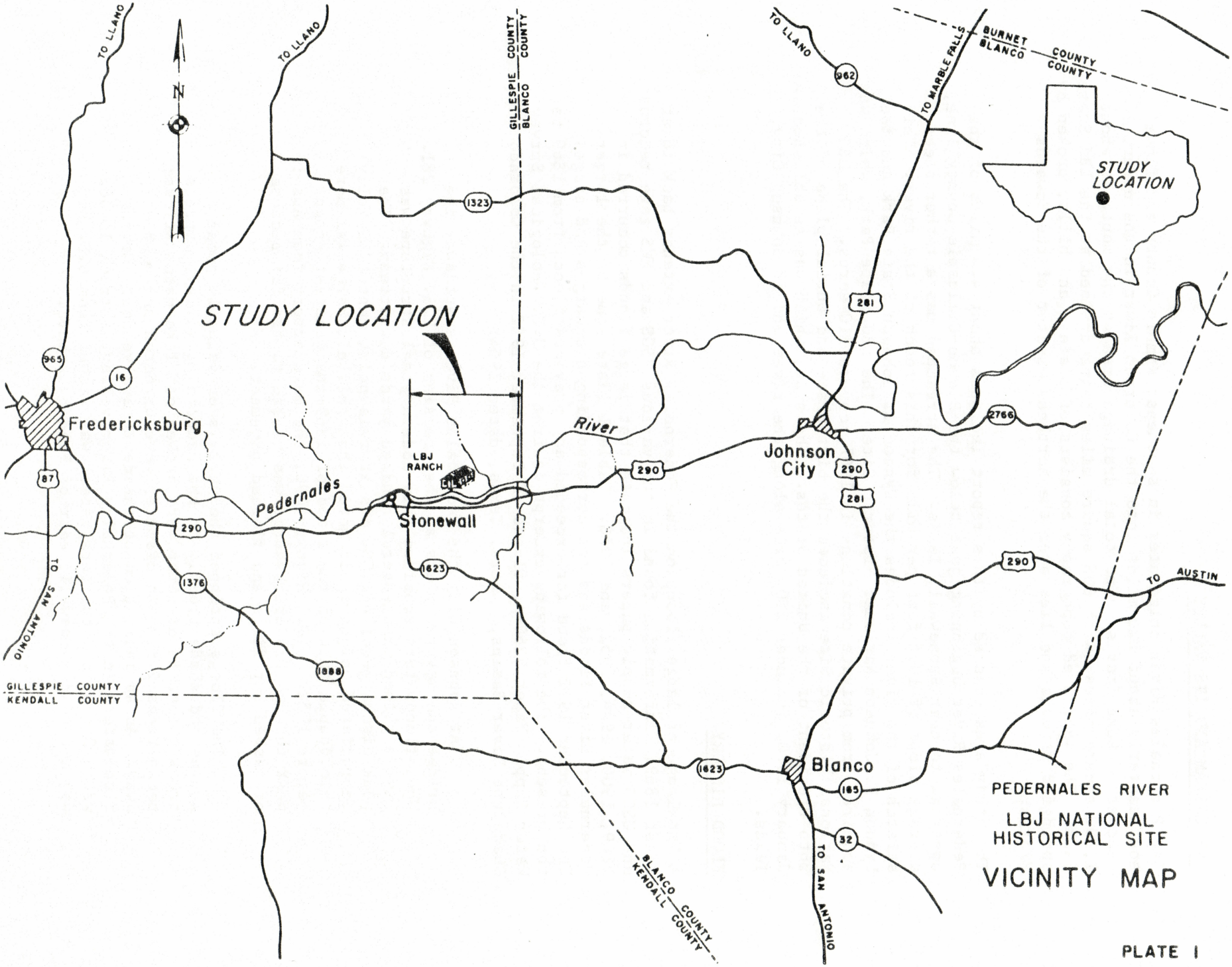
This study was prepared at the request of the National Park Service and under the continuing authority of Section 206 of the 1960 Flood Control Act (Public Law 86-645), as amended. The Fort Worth District of the Corps of Engineers, on request, will provide technical assistance in the interpretation and use of the data presented in the report.

SOURCES OF DATA

Topographic mapping used in this study for flooded area maps were provided by the Texas Parks and Wildlife Department. These maps with a scale of 1" = 400 and two-foot contour intervals, were prepared in January 1972. U.S. Geological Survey (USGS) quadrangel maps were used for drainage area delineation and other hydrologic studies. All elevations appearing in this report are based on U.S. Coast and Geodetic Survey mean sea level (m.s.l.) datum.

Cross sections for hydraulic computations were obtained by field surveys conducted in December 1978. Typical cross sections for the Pedernales River are shown on Plate 7.

Stream stage and discharge records for the Pedernales River were obtained from USGS and National Weather Service (NWS) gage records. The USGS maintained a recording stream gage on the Pedernales River at Stonewall, Texas from July 1924 to September 1934. Since April 1965 the NWS has maintained a staff gage about one mile upstream from the LBJ Ranch. Another USGS gage, downstream from the study area at Johnson City, has been maintained since May 1939.



PEDERNALES RIVER

LBJ NATIONAL HISTORICAL SITE

VICINITY MAP

PLATE I

THE STREAM AND ITS VALLEY

The Pedernales River originates in southeast Kimble County and flows southeasterly about 123 miles into the Colorado River in the upper reaches of Lake Travis. The total drainage area at the mouth is about 1,302 square miles, with 608 square miles being drained at the LBJ State Park. The watershed topography consists of plateau and hills, broken by springfed streams and lies over the northeast sector of the Edwards Plateau.

The study area covered by this report includes about 4.4 miles of the Pedernales River beginning just below the Blanco-Gillespie County line, upstream to near Stonewall, Texas. The streambed has a rather steep average slope of 10.5 feet per mile for this reach of the river. This stretch of the river includes the Lyndon B. Johnson State Park and the Lyndon B. Johnson National Historic Site. The LBJ State Park, which was acquired from private donations in 1967, covers 710 acres. The LBJ National Historic Site includes the birthplace and burial place of the 36th President of the United States. The site, which was established 14 January 1970, includes 250 acres along the river and in Johnson City, Texas.

FLOOD HISTORY

A knowledge of large floods on the Pedernales River extends back to at least 1869. Information found in the various USGS and NWS gage records and USGS water supply papers indicate that large floods occurred in 1869, 1900, 1944, 1952, and 1978. Table 1 lists some of the larger Pedernales River floods and the corresponding discharges and stages. The September 1952 flood far exceeded any previous floods from 1869 to the present. The following excerpt is from the U.S. Geological Survey Water Supply Paper 1260-A, floods of September 1952 in the Colorado and Guadalupe River Basins, Central Texas, dated 1954:

> "At Johnson City the Pedernales River swept away the bridge and several piers at the crossing of U.S. Highway 281. When floodwaters subsided this modern steel structure was left a ruined mass several hundred yards downstream. The peak discharge of 441,000 cfs at this point cannot be fully appreciated unless it is noted that this discharge was more than double that of the flood of 1869-the greatest known before 1952. U.S. Highway 290, the main artery from Austin west through Fredericksburg, was closed to traffic because of washed out fills and flooded pavement.
>
> The floods stripped the valleys of valuable pecan groves and shade trees. In the Pedernales valley, cypress trees 5 feet in diameter were broken off like match sticks; pecan trees 2 feet in diameter were uprooted and washed away. As an indication of the depth and velocity of the floodwaters in the Pedernales River valley, a truck loaded with 19 tons of structural steel was washed from U.S. Highway 290 near Stonewall, east of Fredericksburg."

The LBJ State Park is located in a hydrologic province that places it in the path of tropical and semi-tropical storms which result in some of the highest rainfall rates experienced in the United States. Most of the flood producing storms that occur over the Pedernales River watershed are experienced in the spring and fall. Most of the higher floods that have occurred in the general geographical region have resulted from generally heavy rains during this time; however, severe flooding can be produced by intense local thunder- storms. Although thunderstorms occur more frequently during the spring and summer months in this area of south central Texas, they may occur at any time. Figures 1 and 2 are photographs of historical floods on the Pedernales River near the study area.

TABLE 1

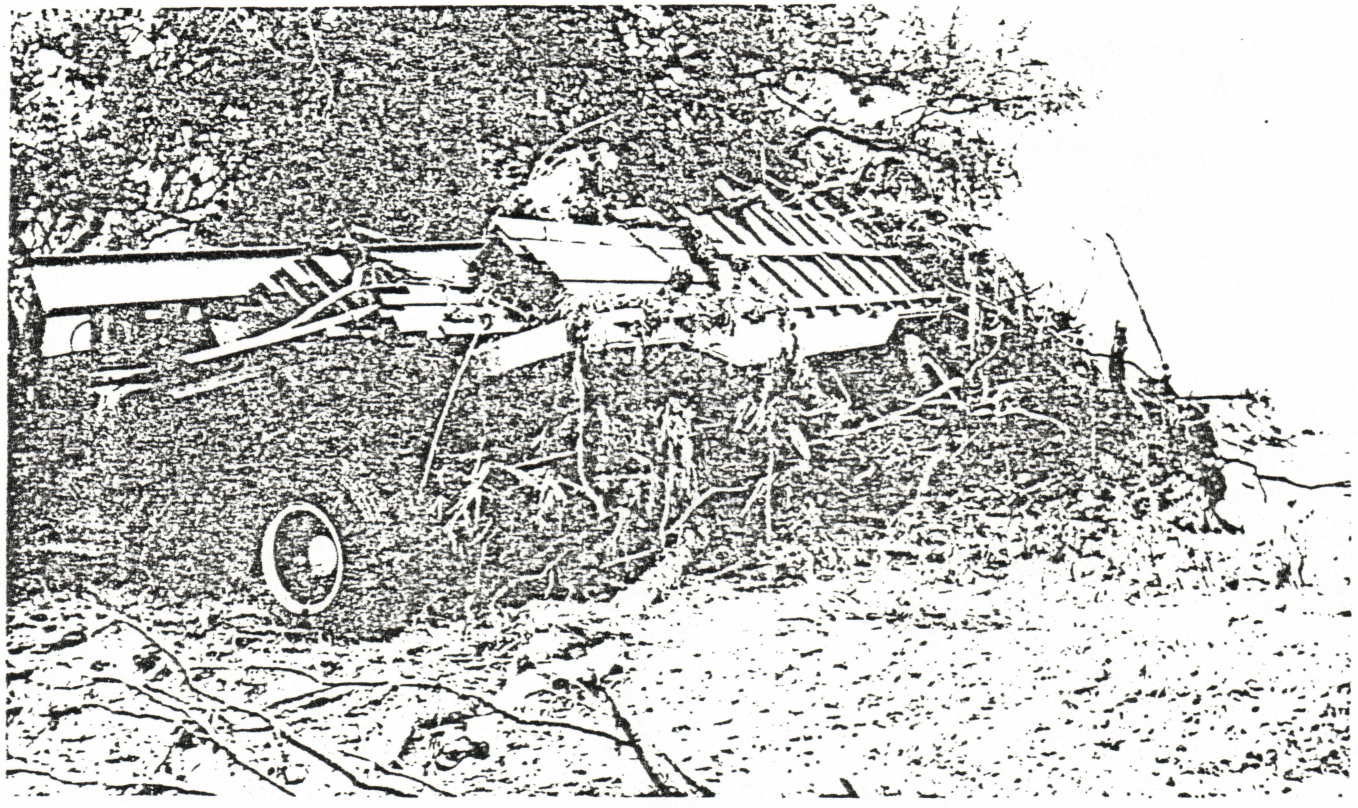
MAXIMUM KNOWN DISCHARGES
PEDERNALES RIVER NEAR STONEWALL, TEXAS*

Date	State (feet)	Discharge (Cubic feet per second)
1869	27	156,000
April 1900	22	102,000
28 May 1929	-	28,300
11 Sept 1952	30	202,000
3 Aug 1978	24	120,000

*Drainage Area = Approximately 600 square miles.



Pedernales River near Johnson City, Tex., showing destruction of bridge on U.S. Highway 281. Photo by Neal Douglas, Austin, Texas.



Truck, loaded with 19 tons of structural steel, washed from U.S. Highway 290 near Stonewall, Tex., by floodwaters of the Pedernales River, Sept. 10, 1952. Photograph by Fredericksburg Publishing Co., Fredericksburg, Tex.

Figure 1 - Scenes of September 1952 Flood on Pedernales River.



FIGURE 2 - Small Dam on Pedernales River About One Half Mile Upstream of LBJ Ranch. This photograph was taken on 2 August 1978 between flood peaks.

HYDROLOGIC AND HYDRAULIC ANALYSES HYDROLOGY

The relative magnitude of a flood is expressed by its frequency of occurrence. The probability of a flood of a given magnitude being equalled or exceeded is determined through statistical analysis of the frequency of the occurrence of floods and their relative magnitude. A one-year flood has a 100 percent probability of being equalled or exceeded in any year. A 100-year flood could occur in any year or even in successive years and that even larger floods are possible. The 500-year flood has a 0.2 percent chance of being equalled or exceeded in any year. The 10-year and 50-year floods are similarly defined, having exceedence probabilities in any year of ten and two percent, respectively.

The stream gage records for the Pedernales River near Stonewall (old USGS gage and later National Weather Service gage) and the Pedernales River near Johnson City, Texas, were considered in developing unit hydrographs and discharge-frequency estimates for the Pedernales River in the vicinity of the LBJ State Park.

A synthetic unit hydrograph was developed for the Pedernales River near the LBJ Ranch for a drainage area of 607.6 square miles. Snyders unit graph coefficients of 640 Cp = 520 and Ct = 0.90 were adopted. Other pertinent unit graph data follow:

tpR = 7.57 hours
L = 52.49
Lca = 24.07
Qpr = 41,736 c.f.s.

Rainfall for the 2-, 10-, 25-, 50-, and 100-year storms was developed based on NWS "Technical Paper 40, Rainfall Frequency Atlas of the United States" (T.P. 40) and adjusted for drainage area by use of the depth-area-duration curves included in figure 15 of that report. Rainfall distribution was determined in accordance with EM 1110-2-1411 (Civil Works Engineer Bulletin No. 52-8). Frequency peak discharges were determined by subtracting the initial losses and infiltration rates from the rainfalls and appropriate unit hydrographs. The frequency peak discharges are shown in Table 2. The 500-peak is based on extrapolation of the discharge-frequency curve.

TABLE 2

FREQUENCY PEAK DISCHARGES

PEDERNALES RIVER NEAR LBJ STATE PARK

Frequency (years)	Discharge (c.f.s.)
2	16,400
10	86,000
25	139,000
50	179,700
100	220,200
500	320,000

HYDRAULICS

The study area subject to flooding from the 100-year frequency flood are shown on Plates 2-4. The Corps of Engineers' HEC-2 computer programs was used in developing the water surface flood profiles of the 2-, 10-, 25-, 50-, 100-, and 500-year frequency floods for the Pedernales River in the study reach. These flood profiles are shown on Plates 5 and 6. The flood profiles are graphic representations of estimated floodwater surface elevations along the river and can be used to determine potential floodwater depths at any point within the study area. The expected depth of flooding at locations along the river can be found by comparing the flood elevation with the ground elevation at the site.

Water velocities during floods depend largely on the size and shape of the river cross sections, conditions of the stream (vegetation, obstructions) and the streambed slope, all of which vary at different locations on the same stream. Table 3 shows the main channel and overbank area velocities, as well as other characteristics of the Pedernales River for two floods at one typical cross section.

TABLE 3

STREAM CHARACTERISTICS

PEDERNALES RIVER AT LBJ HISTORICAL SITE

Cross Section 13-Station 206+20

Characteristic	10-Year Flood	100-Year Flood
Peak Discharge	86,000	220,200
Height of Rise Above Bank Full Stage (feet)	20	25
Velocity in Channel (feet per second)	18	21
Average Velocity in Overbanks (feet per second)	9 to 11	11 to 14

FLOOD FORECASTING AND WARNING

The National Oceanic and Atmospheric Administration, National Weather Service Office in Austin, Texas, issues flash flood warnings for the Pedernales River Basin where the study area is located. Flash flood watches for this area are issued by the Weather Service Forecast Office in San Antonio. The National Weather Service Meteorological Observatory in Hondo, Texas, provides radar coverage for evaluation of rainfall over the Pedernales River Basin and provides for the detection of storms which may produce excessive rainfall and flash flooding.

The Civil Defense Director for Gillespie County supervises a Flash Flood Warning Scheme and rain gage network for the Pedernales River near Fredericksburg. The National Weather Service also has flash flood warning schemes for the Pedernales River near Stonewall and at Johnson City. These are positive approaches to the flash flood problem. Accurate flash flood forecasting also requires adequate and timely rainfall and river stage data. Emergency and national disaster plans should be made and kept curent by every community faced with potentially hazardous situations that occasionally result in excessive precipitation and the resultant flooding.

GLOSSARY OF TERMS

DISCHARGE

As applied to a stream, the rate of flow, or volume of water flowing in a given stream at a given place and within a given period of time, usually quoted in cubic feet per second (cfs) or gallons per minute (gpm).

DRAINAGE AREA

The area tributary to a lake, stream, sewer, or drain. Also called catchment area, watershed, and river basin.

FLASH FLOOD

A flood which follows within a few hours of heavy or excessive rainfall, dam or levee failure, or a sudden release of water impounded by an ice jam.

FLASH FLOOD WARNING

Means flooding has been reported or is imminent - take necessary precautions.

FLASH FLOOD WATCH

Means flooding is possible within the watch area.

FLOOD

An overflow of land not normally covered by water and that is used or usable by man. Floods have two essential characteristics; the inundation of land is temporary; and the land is adjacent to and inundated by overflow from a river or stream or an ocean, lake or other body of standing water.

Normally, a "flood" is considered as any temporary rise in streamflow or stage, but not the ponding of surface water, that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other favorable situations by deposition of materials in stream channels during flood recessions, rise of groundwater coincident with increased streamflow and other problems.

FLOOD FREQUENCY

A means of expressing the probability of flood occurrences as determined from a statistical analysis of representative streamflow or rainfall and runoff records. A 10-year frequency flood would have an average frequency of occurrence in the order of once in 10 years (a ten percent chance of being equalled or exceeded in any given year). A 50-year frequency flood would have an average frequency of occurrence in the order of once in 50 years (a two percent chance of being equalled or exceeded in any given year). A 100-year frequency flood would have an average frequency of

occurrence in the order of once in 100 years (a one percent chance of being equalled or exceeded in any given year). A 500-year frequency flood would have an average frequency of occurrence in the order of once in 500 years (a 0.2 percent chance of being equalled or exceeded in any given year).

FLOOD PEAK

The maximum instantaneous discharge of a flood at a given location. It usually occurs at or near the time of the flood crest.

FLOOD PLAIN

The relatively flat area or lowlands adjoining the channel of a river, stream or watercourse or ocean, lake or other body of standing water, which has been or may be covered by floodwater.

FLOOD PROFILE

A graph showing the relationship of water surface elevation to location, the latter generally expressed as distance above mouth for a stream of water flowing in an open channel. It is generally drawn to show surface elevation for the crest of a specific flood, but may be prepared for conditions at a given time or stage.

FLOOD STAGE

The elevation, or stage, at which overflow of the natural banks of a stream begins to cause damage, or begins to present a potential flood damage hazard.

HYDROGRAPH

A graph showing the variation in time of some hydrological observation data as stage discharge, velocity, sediment load, etc.

MEAN SEA LEVEL

A determination of mean sea level that has been adopted as a standard datum for heights. Elevation in feet and decimals thereof is a measurement vertically above the datum as used in surveys and engineering reports.

ONE HUNDRED YEAR FLOOD

A flood having an average frequency of occurrence in the order of once in 100 years, at a designated location, although the flood may occur in any year and possibly in successive years. It would have a one percent chance of being equalled or exceeded in any year. In the past, this flood has been referred to as the Intermediate Regional Flood.

RIVER FORECAST

A forecast of the expected stage or discharge at a specified time at one or more points along a stream.

RIVER GAGE OR STREAM GAGE

A device for measuring the river stage.

STAGE

Elevation of the water surface of a stream relative to a datum.

STAGE HYDROGRAPH

A graph showing flow (discharge) values against time at a given point, usually measured in cubic feet per second (cfs). The area under the curve indicates total volume of flow.

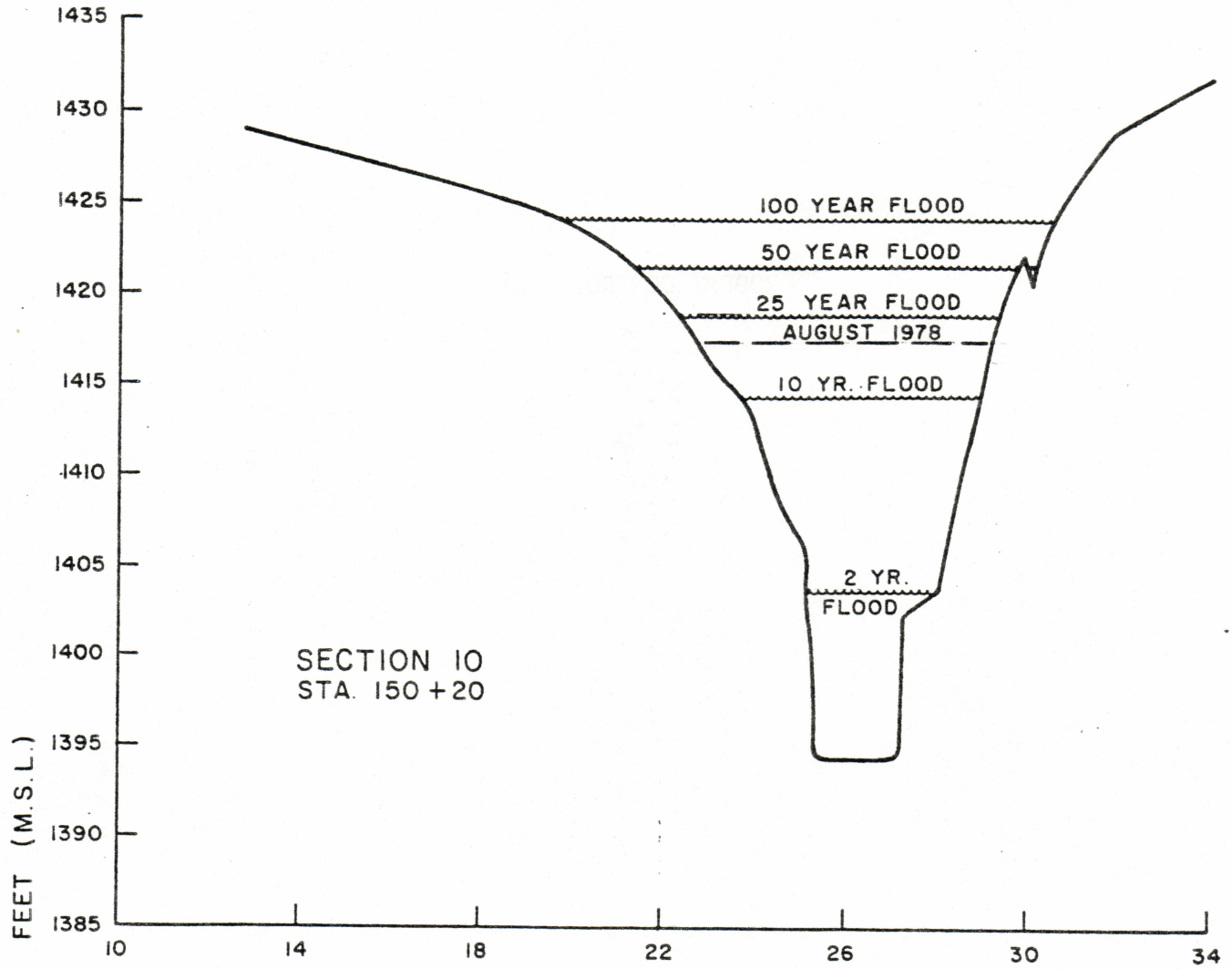
WATERSHED

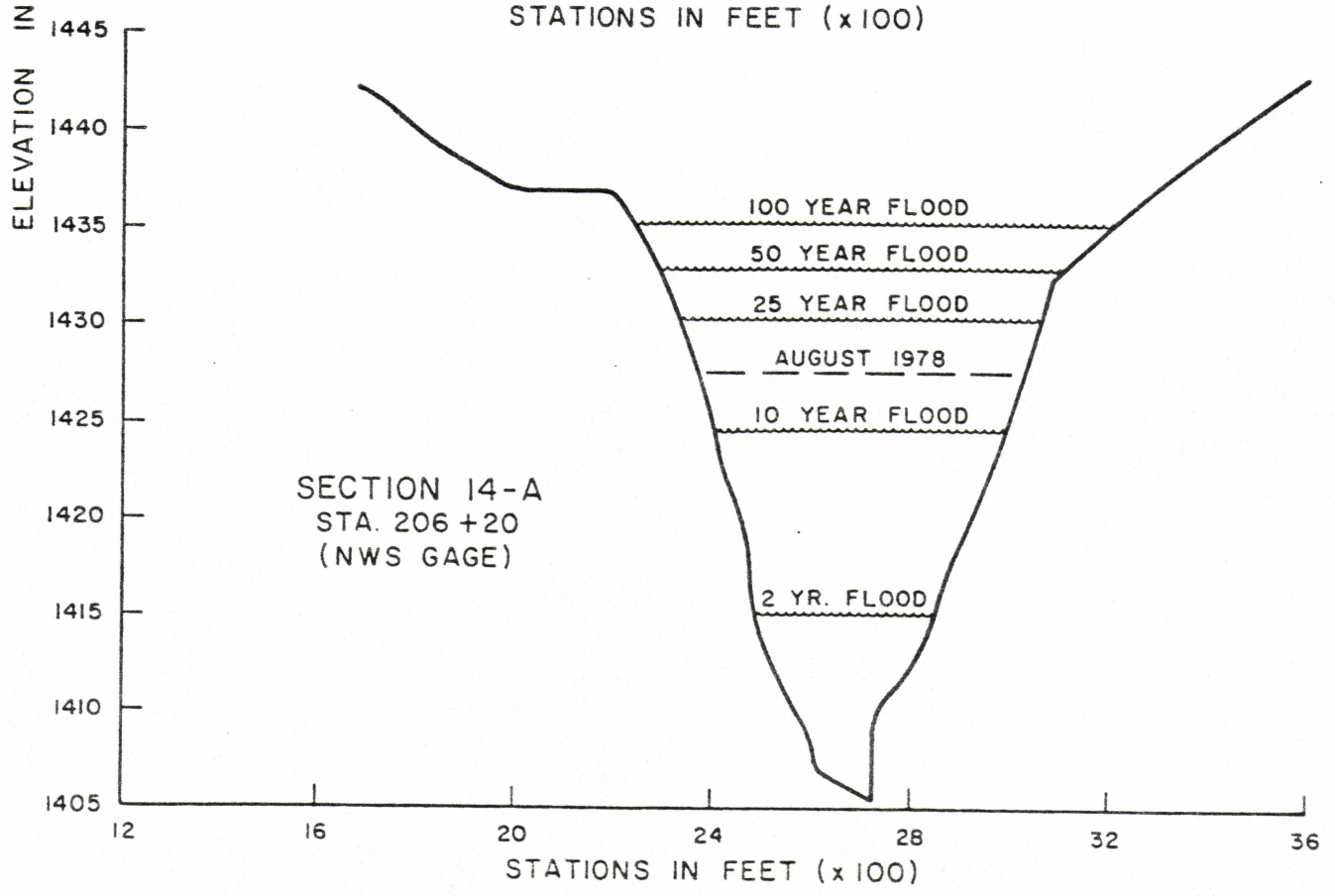
(1) The area contained within a divide above a specified point on a stream; (2) the divide between drainage basins.

ELEVATION DATA*

Designation	Description	Elevation
B.M. Y-202	U.S.C.&G.S. Monument @ N.E. Corner of Concrete Bridge of Ranch Road 1 on Tributary of Pedernales River, about 1100 feet from intersection with U.S. Highway 290, in Blanco County (Plate 2)	1390.97
B.M. LBJ SP-3	Concrete Monument on Southside of Ranch Road 1, about 400 feet west of Trinity Lutheran Church (Plate 3)	1408.43
LBJ's Birthplace	Finished floor elevation of Rebecca B. Johnson House, North bank of Pedernales River (Plate 3)	1408.7
Johnson Family Cemetery	Ground elevations at corner of cemetery located between Ranch Road 1 and Pedernales River at Station 90+00 (Plate 3)	
	Northeast Corner	1406.9
	Northwest Corner	1407.6
	Southeast Corner	1402.5
	Southwest Corner	1402.2
Visitor's Center	Finished floor elevation of LBJ State Park Visitor's Center between Ranch Road 1 and 52, South of LBJ Ranch (Plate 3)	1427.87
B.M. LBJ SP-8	Concrete Monument on Southside of Ranch Road 1 about 1000 feet west of intersection of Ranch Road 1 and Coronet Street (Plate 4)	1435.39

*All elevations are expressed in U.S.C. and G.S. mean sea level (m.s.l.) datum. Additional bench marks and field survey data are available from Corps of Engineers.





TYPICAL RIVER CROSS SECTIONS

PLATE 7

RODENT CONTROL PLAN

United States Department of the Interior
NATIONAL PARK SERVICE
LYNDON B. JOHNSON NATIONAL HISTORIC SITE
P. O. BOX 329
JOHNSON CITY, TEXAS 78636

IN REPLY REFER TO:

N50

August 4, 1982

Memorandum

To: Regional Director, Southwest Region

From: Acting Superintendent, Lyndon B. Johnson NHP

Subject: Rodent Control at Lyndon B. Johnson NHP

For the past year we have been working on a rodent control plan for the park because of various forms of damage they are causing to our historic structures and grounds. These animals are burrowing holes around the structures, causing serious erosion problems to the riverbank and grounds and gnawing on wooden siding and overhangs of the buildings. Intermittent efforts have been made to control some of these rodents, but a more definitive rodent control program is needed because of the resiliency of some of the species.

Nutria (Myocastor coypus) [Molina] have been a primary offender in eroding the riverbank of the Pedernales River in front of the Texas White House. An expensive and extensive bank stabilization program relieved the nutria problem in that particular area; however, further upstream and downstream signs of the same are being observed.

Squirrels (Sciurus niger and Spermophilus variegatus [Erxleben] are a special concern in the Johnson Settlement and Birthplace areas. The squirrels have damaged the roof and beams at the Exhibit Center in the Johnson Settlement area. Oakum (an insulation) at the Johnson Settlement log cabin is being carried away from the cabin by the squirrels. Food stuffs and materials that are used in living history, i.e., cotton for quilts, sausage, fabrics, etc. have also been ruined.

Armadillos (Dasypus novemcinctus) and skunks (Mephitis mephitis) have caused extensive damage in the Birthplace tool shed, digging up ground inside, completely covering tools and equipment with dirt. Holes are dug around the foundation of the Bus Barn and Junction School. Holes under the rock walls and around the grave stones in the Johnson Family Cemetery are ever increasing, possibly causing collapse of the walls and stones. Armadillos have undermined and made nonfunctional a security light at the Birthplace, and depressions/holes in the Birthplace yard create openings that visitors could easily turn an ankle in.

Several other rodents such as raccoons, opposums, rats and mice cause some minor problems and will be controlled only when a specific problem occurs.

In each case of raccoon and opposum problems, individual animals will be live trapped and relocated to a non-public use area. Rats and mice will be controlled by the use of WASO approved pesticides and/or glue traps.

With the nutria, squirrel, armadillo and skunk problem steadily increasing, assistance from the U.S. Fish and Wildlife Service has been sought. We have been working with Mike Machucca, Wildlife Technician, U.S. Fish and Wildlife Service, and have confirmed that damage in the areas mentioned have definitely been caused by these rodents. Together we have identified the following alternatives and their effectiveness for regulating these pests.

1. Poison bait stations - extremely hazardous to other wildlife and humans.
2. Steel traps - costly, labor intensive, and "inhuman".
3. Live traps - have been deployed. These also are very labor intensive and time ineffective. (All of the park's live traps that were deployed were stolen, 6/82).
4. Hunting with firearms - shooting the identified pest on an opportunity basis and at bait stations. Labor conservative, highly effective.
5. Introduced and/or native predators - labor intensive research, time ineffective and incompatible with "improved" human ecosystems.
6. Take no action - unacceptable to cultural resources preservation.

The alternative found to be most reasonable and effective is #4 hunting with firearms. We will have the park's security guards observe the identified rodents and shoot them when the opportunity is presented. The guards work daily, 5:00 p.m.-9:00 a.m., and the problem animals are generally nocturnal. The shooting of the animals can be done safely and effectively during that time with no intrusion on the visiting public.

Impact on the overall rodent species populations in question is judged to be negligible to non-existent beyond the park boundaries. Population reduction within the park will be only temporary because individual populations beyond park boundaries will seek to fill the void. The species identified are not endangered. This population reduction program will necessarily be on-going.

Policy

"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. Non-native species shall not be allowed to displace native species if this displacement can be prevented by management. The need for, and results of, regulating animal populations, either native or non-native, shall be documented and evaluated by research studies." NPS Management Policies, 2-78, IV-7.

Procedure

Each park guard will satisfactorily complete the Texas Hunters Safety Course, Texas Department of Parks and Wildlife, and be instructed in the care and safety of firearms given by the LYJO Protection Supervisor (documented by certification and/or 10-343). The weapon employed in this program will be a 20-gauge shotgun. The shotgun will be stored out of sight and locked in the patrol vehicle. Training will be supplemented with instruction on NPS Management Policies, CFR 36:2.32, and LYJO Natural Resources Management Plan

which addressed the rodent problems and the section of the NPS Management Policies which we used in order to establish these procedures. As always your comments are welcomed.

MacDonald Heebner III

References:
James Evan, about nutria control
Pat Hoherty, Wildlife Damage Control Center
Mike Machucca, U.S. Fish and Wildlife Service
Floyd Potter, State Fish and Game
NPS Management Policies

Enclosures

L4T0: Resources Mgmt Plan

7. PROJECT: NUTRIA CONTROL

Present Situation: The increasing population of Nutria (an imported exotic rodent) in the Pedernales River presents a problem of major concern. Nutria establish their dens by burrowing into the river banks below the stream water level. During periods of flooding, the banks are eroded and collapse as a result of the den holes. In the spring of 1976, local neighbors and the LBJ State Historical Park, working in cooperation with the U.S. Fish and Wildlife Service, actively engaged in a successful control program on the south banks of the Pedernales River, without any observable harmful effects on other wildlife. Control of the nutria was accomplished by using poison baits consisting of fresh carrots cut into two inch lengths, dipped in zinc phosphide and placed on anchored rafts in the middle of the river. Nutria control has been researched and a booklet published by the U.S. Fish and Wildlife Service, Department of Interior.

Action: Continue Maintenance

Future Action: We recommend cooperating with the Texas Parks and Wildlife Department and the U.S. Fish and Wildlife Service in the continuation of the carrot-baiting program, as needed.

11. PROJECT: NOXIOUS ANIMAL CONTROL

Present Situation: Skunks, raccoons, armadillos, and snakes are prevalent on Lyndon B. Johnson National Historic Site. Skunks and snakes are a hazard in high use areas, and, at times, raccoons destroy and scent up calf creep feed with their feces. Armadillos also present a problem by digging burrows in the cemetary and areas of irrigation and intensive use.

Action: Continue Maintenance

Future Plans: Raccoons will be eliminated individually when they present problems with animal food stuffs. Snakes and skunks will be eliminated by trained park personnel when found in areas of high visitor use; otherwise, they will be left unharmed. Since the LBJ Ranch is maintained as a working ranch, there is no philosophical reason why nuisance animals should not be destroyed when necessary.

MANAGEMENT OF ANIMAL POPULATIONS

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 of law and consistent with the following 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 species are those that occur, or occurred due to natural processes on those lands designated as the park. These do not include species that have moved into those areas, directly or indirectly as the result of human activities.

Native animal life in the National Park System shall be given protection against harvest, removal, destruction, harassment, or harm through human action, except where:

- hunting and trapping are permitted by law;

- fishing is permitted by law for either sport or commercial use or is not specifically prohibited;

- control of specific populations of wildlife is required for the maintenance of a healthy park ecosystem; or

- 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. Non-native species shall not be allowed to displace native species if this displacement can be prevented by management. The need for, and results of, regulating animal populations, either native or non-native, shall be documented and evaluated by research studies.

(See Wildlife Observation VII- 7 .)

HUNTING

Hunting, trapping, or other methods of harvest of native wildlife, is not permitted by the public in natural and historic zones, except where specifically permitted by law. Where specifically authorized by Congress, public hunting shall be in accordance with applicable State and Federal laws and regulations. However, the Service may designate zones where, and establish periods when, no hunting shall be permitted for reasons of public safety, administration, or other public use and enjoyment of the area. Under the above provision, the Service, in consultation with States, may ban hunting in part or all of a park for any or all legally huntable game or non-game species for reasons of their:

- being officially designated as endangered, threatened, or locally of rare or unusual occurrence in the park;

- occurring in numbers below the natural capacity of their range; or

- being of greater overall value for wildlife viewing and interpretation.

Regulations prescribing such restrictions shall be issued after consultation with the States.

~~themes. Offsite exhibit locations must be opened to the public without charge. Standards for design and content should be as high as those established for more permanent exhibits.~~

WILDLIFE OBSERVATION

Opportunities should be provided for visitors to view park wildlife (meaning, as defined here, all forms of animal life--not just mammals). Overlooks adjacent to park roads, wildlife trails, special tours, improved information techniques, and special publications are encouraged. Activities which harass wildlife and misuse wildlife habitat are not permitted.

It is intended that wildlife should be viewed in their natural environment. However, when ascertained as desirable in the park's interpretive program and approved by the Regional Director, small species of wildlife, mainly reptiles, fish, amphibia, and invertebrates, may be kept in various kinds of enclosures or otherwise tastefully displayed for interpretive and educational purposes only. Care of such species must be exemplary, and, when no longer needed for display, they should be returned to their native habitat.

RECREATIONAL ACTIVITIES

The Service encourages those recreational uses which draw their meaning from association with, and direct relation to, park resources, and which are consistent with the protection of such resources. Recreation uses which do not fit the above description may be provided in certain areas under careful regulation and control, as spelled out in statements contained below.

REGULATION OF RECREATION USE

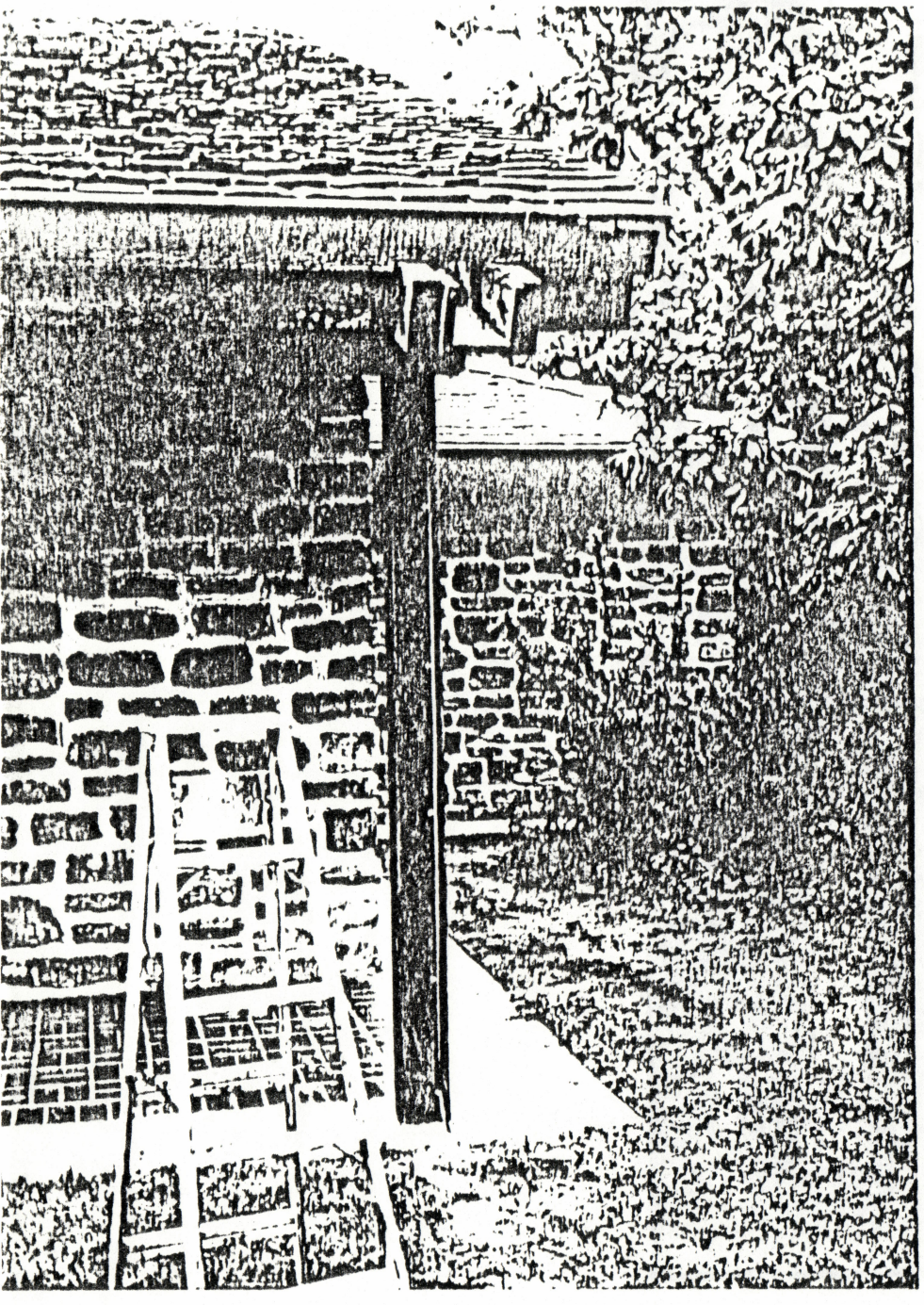
Each park area will develop, and publish as appropriate in the Code of Federal Regulations, regulations regarding any form of recreational use which are required in the interest of visitor safety and resource protection.

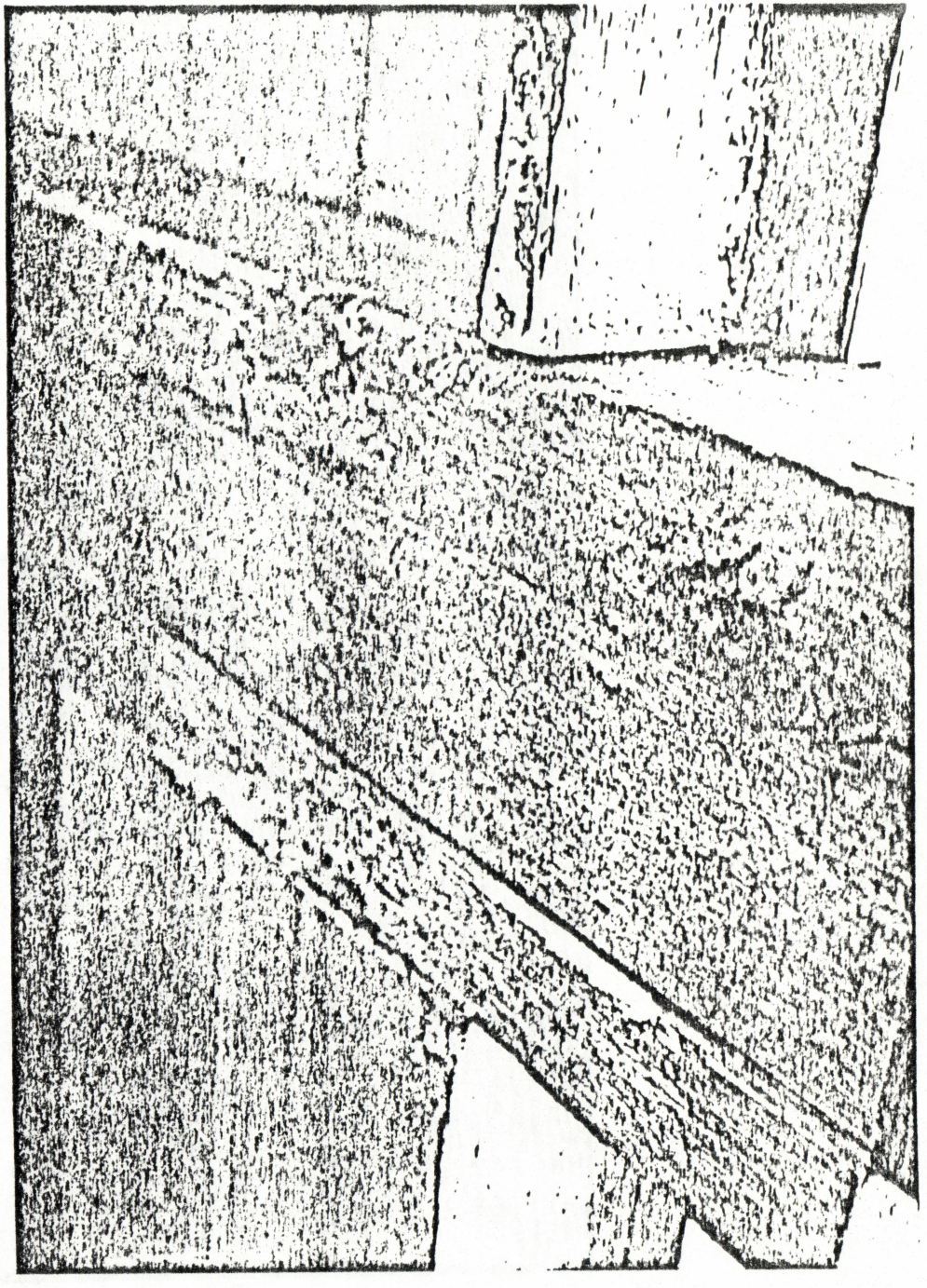
(See Limitation of Visitor Use VII-1 .)

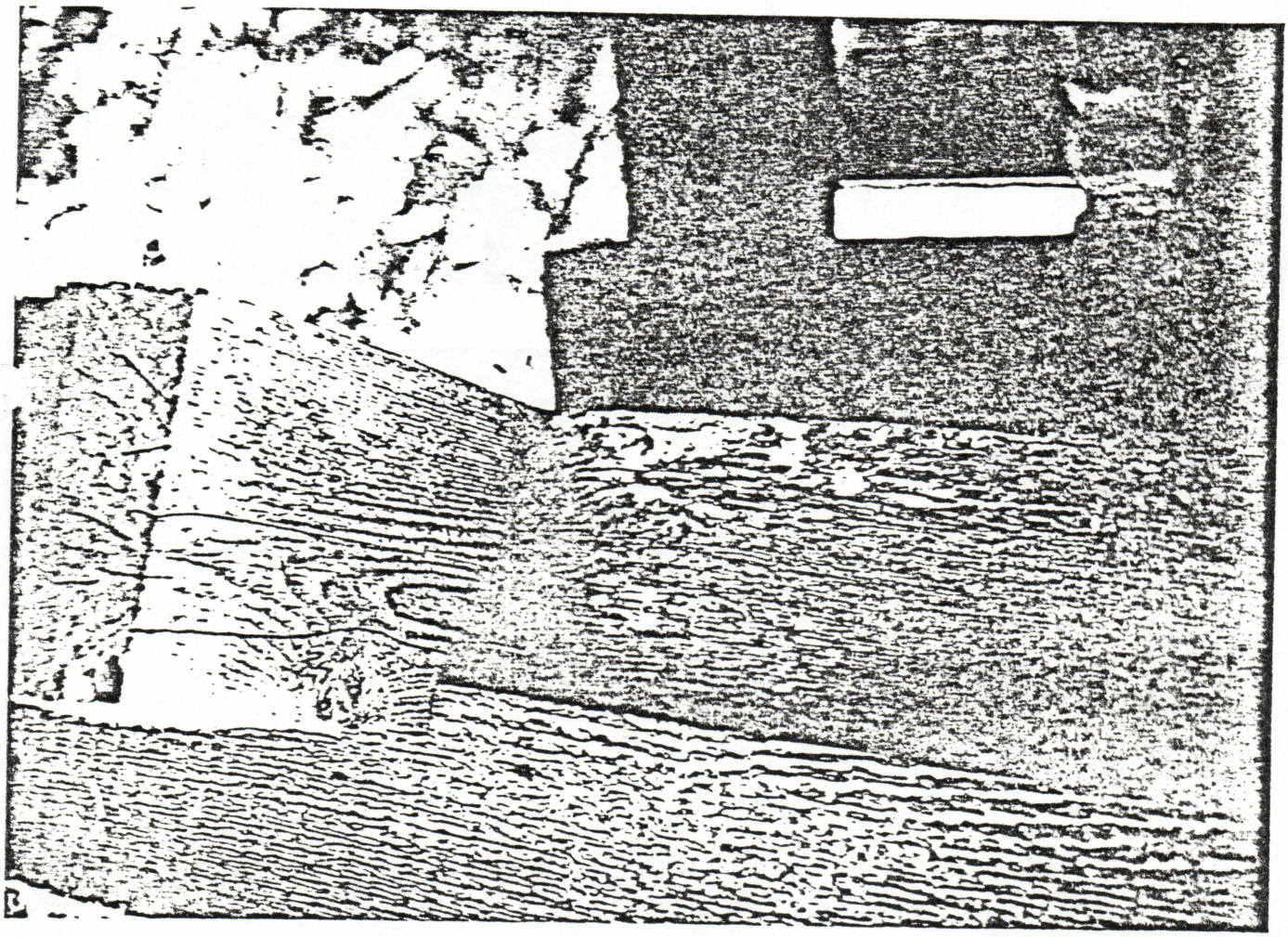
NONTRADITIONAL RECREATIONAL USES

Certain outdoor recreational activities which are not necessarily dependent upon park resources for their realization, and which do not constitute traditional or customary park uses, may be permitted when they do not:

- interfere with normal park usage;







FIRE MANAGEMENT PLAN

F I R E M A N A G E M E N T P L A N

LYNDON B. JOHNSON NATIONAL HISTORICAL PARK

Submitted: Chrysandra L. Walter 10/29/82
Superintendent Date

Concurred: _____ _____
Chief, Division of Protection &
Visitor Use Management, SWRO

_____ _____
Chief, Division of Natural
Resource Management, SWRO

Approved: _____ _____
Regional Director, SWRO

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I. Management Objectives (from Statement for Management 12/77).

1. To identify, evaluate, preserve, and protect the site's historical resources in a manner consistent with legislative mandates, management policies, and perpetuation of the values for which the National Historical Park was established, by: acquiring the remainder of the LBJ Ranch and adjacent lands necessary to preserve the historic scene; acquiring property or restrictive easements near the Boyhood Home and the Johnson Settlement for development of visitor facilities and preservation of the historic scene; basing all maintenance, resource management, and interpretation on thorough historical research, to ensure that the site is presented with a high degree of historical authenticity.

2. To provide visitors with opportunities for meaningful park experiences, by offering a varied and balanced interpretive program that offers insights into the heritage of Lyndon B. Johnson, with emphasis on his life at the LBJ Ranch, his family (including his parents and grandparents), and the Hill Country environment in which he was raised.

3. To cooperate with State and local officials and community organizations to further park objectives and to encourage compatible land uses adjacent to the National Historical Park; and to work closely with the management of the LBJ State Historical Park to coordinate programs to provide visitors with an enjoyable and well-integrated visit to the National Park/State Park complex. .

II. Fire Policy

"The historic scene--the landscape and its condition, the plant and animal life and the miscellaneous marks of human activity--constitutes an important park cultural resource. The service will perpetuate the historic scene in a manner appropriate to each historic place." National Park Service Management Policies, Chapter V, page 24, 1978.

The fire policy at Lyndon B. Johnson National Historical Park will be in strict accordance with the above stated policy. All "accidental" fires, whether man-caused or natural, will be suppressed as soon as possible so that the historic scene is preserved.

The use of fire as a resource management tool is viable however and will be used to:

1. Eliminate collected landscape refuse including:

   --flood plain debris deposited by recurring river floods.
   --slash and plants from the maintenance of the improved park landscape.

2. Reduce accumulated field debris for the purpose of seeding native grasses and forbes according to the recommendations included in the Lyndon B. Johnson NHP Resources Management Plan/native grass restoration project.

Lyndon B. Johnson NHP management fires will conform to NPS policy and guidelines and to Regulation I (31 TAC, Chapter 111) of the Texas Air Quality Control Board.

III. Fire Management Objectives

To immediately suppress all accidental fires in an effort to preserve the historic scene, and to safely control all management fires.

IV. Brief Description of Area

1. Topography and Soils

The topography of the park and surrounding area is gently rolling hills. There are a few rock/earth embankments that form creek and river edges. Topography is not a significant factor in navigability about the area.

About 74% of the soils are very shallow. Topography is gently sloping, undulating and hilly.

There are numerous stock tanks or creeks throughout both areas of the park. (See Appendix 5 for Johnson City and Ranch Unit Maps.)

2. Climate

The Blanco and Gillespie County area has a humid and subtropical climate with hot summers and mild winters. The mean annual rainfall is 34.39 inches. Rainfall is rather evenly distributed throughout the year, and the rainfall pattern, typical of that of the Edwards Plateau, has a double maxima in May and September. September is generally the wettest month and July the driest. About 2/3 of the average annual rainfall is in April through October. Because a large part of this warm seasonal rainfall is the result of thunderstorm activity, the amount varies from year to year. Total annual precipitation in the area has ranged from 55.06 inches in 1919 to 12.98 in 1901 (Blanco County). In September 1952, 17.47 inches of rain fell at Blanco within a single 24-hour period. More than 8 inches have fallen within 24-hours in April and May.

Temperatures in the winter months are generally mild. Freezing temperatures occur 2 out of 5 nights during an average winter. The average daily maxima in January, the coldest month, is 60.3 degrees F. Frequent "northers" may bring sharp drops in temperature, but periods of cold weather are short and are soon moderated by sunshine and southerly winds. Cloudiness is most prevalent in winter. Precipitation is commonly in the form of light rain or drizzle. Significant amounts of snowfall are rare and snow generally melts as it falls. The lowest recorded temperature at Blanco is -6 degrees F.

3. Vegetation

The area around the two park sites can be characterized as 88 percent rangeland, about 6 percent cultivated crops, and 1[illegible] percent in pasture with a 10-20 percent brush canopy. The Blanco/Gillespie County area is in a Juniper-Oak-Mesquite-Savanna vegetation region which is formally characterized as short grasses intermixed with junipers, oaks, and mesquite trees. Native plants are little bluestem, Indiangrass, Texas wintergrass, live oak and post oak. Common rangeland vegetation is cedar, oak, agarita, persimmon, mesquite and whitebrush.

The vegetation of both park units (total of 242 acres) is principally rangeland and pasture with some areas of numerous live oak trees. There is a pecan orchard of several acres of the Johnson Settlement and also at the LBJ Ranch. No vegetation maps have been provided due to the simplicity of park vegetation and small size of park units.

4. Fire History

The park has experienced no grass fires in the past 10 years. Although there have been frequent grass fires in the 10-mile area surrounding the park units none have threatened either park unit. The park has had no structural fires since its inception. Two fires involving malfunctioning equipment have occurred.

a. Fire when the gas range in the Texas White House malfunctioned was quickly extinguished by U.S. Secret Service personnel. The range was repaired and is currently in use. No structural or smoke damage occurred. 1979.

b. Fire when a fuel line worked loose, disconnected, and diesel fuel ignited on a park tractor was also extinguished by park personnel with no damage to vehicle. The malfunction was repaired. No damage was caused to the tractor. 1982.

5. Fire Season

In the Johnson City and Stonewall area there is no real "range fire season" in that dry periods occur year around. Lacking any formal fire history records, it is difficult to define a season.

--TEMPERATURE AND PRECIPITATION DATA

[Data were recorded in the period 1941-70 at Blanco, Texas. An asterisk in a column indicates less than one half. TR means trace.]

Month	Temperature					Average number of growing degree days [1]	Precipitation				Average number of days			
									Snow, Sleet			Temperatures		
												Maximum		Minimum
	Average daily maximum	Average daily minimum	Average	Record highest	Record lowest		Average	Greatest daily	Average	Maximum monthly	Precipitation .10 inch or more	90° and above	32° and below	32° and below
	°F	°F	°F	°F	°F	Units	In	In	In	In		°F	°F	°F
January	60.3	34.0	47.2	91	-6	595	2.12	3.21	0.6	11.0	4	0	1	15
February	63.6	37.3	50.5	91	-5	445	3.00	4.65	0.4	5.0	5	*	*	11
March	70.8	42.2	56.5	99	15	292	2.10	2.59	0.1	4.0	4	*	0	6
April	79.1	53.2	66.2	103	29	76	3.54	5.12	0	0	5	1	0	*
May	85.1	60.7	72.9	103	38	15	3.98	8.13	0	0	6	8	0	0
June	92.2	67.7	80.0	103	49	1	2.92	4.33	0	0	4	22	0	0
July	96.0	69.6	82.8	109	56	0	1.98	4.21	0	0	2	28	0	0
August	96.6	68.7	82.7	109	53	0	2.21	5.05	0	0	3	28	0	0
September	90.0	63.3	76.7	106	39	4	4.65	17.47	0	0	6	17	0	0
October	81.5	53.4	67.5	99	28	73	3.60	6.88	0	0	4	3	0	*
November	70.2	42.1	56.2	95	17	308	2.09	2.91	0.2	4.0	4	*	*	6
December	53.3	36.1	49.7	91	12	446	2.20	3.50	TR	TR	4	0	*	13
Years:														
Average	79.1	52.4	65.8								51	107	1	51
Extreme				109	-6									
Total						2255	34.39	17.47	1.3	11.0				

[1] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum daily temperatures, dividing by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

V. Physical Fitness Standards for personnel entering a burning structure or building fire break

The following requirements apply only to those employees who are required to enter a burning structure for the purpose of extinguishment or search and rescue. These standards also apply to people building fire breaks at range fires.

1. Before an employee is assigned as a member of a fire fighting team with duties of entering a burning structure, the employee must be either certified by a physician that he/she is capable of performing such strenuous work (see physical exam form Appendix 1) or pass the step test or 1½ mile run with a minimum score of 45.

2. Annually, thereafter, the employee must be recertified by a physical exam, or pass the step test or 1½ mile run with a minimum score of 45.

3. All employees assigned as fire team members shall be encouraged to participate in a physical fitness program.

Support personnel on a fire scene: hose handlers; engineers; and salvage assistants, etc. will not be required to meet the above standards.

VI. Job Responsibilities

1. Fire Chief

--Directs work of NPS employees at fire scene.
--Issues instructions to all NPS units and manpower on scene.
--Coordinates NPS efforts and equipment with local fire and police jurisdictions.
--Requests any supplemental equipment or manpower that may be needed such as food, drinks, hand tools, radioes, etc.
--Works with teams as needed.

2. Firetruck drivers and Pump operators

--Drives vehicles.
--Respond to get truck started.
--Keep abreast of latest fire scene information.
--Operate radio.
--Operate pumps at fire scene.
--Stay at pump at all times.
--Respond to truck to check out pump and to load any extra equipment on truck.

3. Nozzlemen

--Operate nozzle and hoses inside burning buildings.
--Respond to check and fill water cans, canteens, and to load any extra equipment on truck.
--Work fire as needed.

--Search and rescue inside burning building.
--Checking air pack operation and uses airpack.
--Salvage and overhaul.

4. Firefighters

--Assist with hose handling on outside of building.
--Ventilating.
--Salvage and overhaul.
--Repack equipment and hoses.
--Help nozzlemen change air packs.
--Setting up pool pump.

5. Dispatcher

--Coordinate communication with fire scene with other Agencies.
--At the request of Fire Chief procure equipment and supplies.
--Log telephone and radio communications and fire progress.
--Call out park personnel.

VII. Personnel Assignments

Because of numerous considerations including living and work location, skill level, leadership abilities, etc. park personnel are assigned and authorized to work in the following capacities at a fire scene.

1. Fire Scene Chief - (Chain of command in priority order) The highest ranking person will assume leadership after being briefed on situation.

LBJ Ranch Unit

1. Phil Hecker (Park Structural & Wildfire Officer)
2. Mac Heebner
3. Buddy Hodges
4. Edward Meier
5. Bill Lindig
6. Bob Hoff
7. Evelyn Klein
8. Joel Rodriguez
9. John Tiff
10. Kurt Weinheimer
11. Bill Scott
12. Steve Robinson
13. Ray Kunkel

Johnson City Unit

1. Phil Hecker
2. Mac Heebner
3. Buddy Hodges
4. Roy Bruemmer
5. Sandy Earley
6. Ray Kunkel
7. John Tiff

2. Nozzlemen - The following people only may qualify for first attack on an interior fire which requires entry into a burning structure wearing an air pack.

Bill Lindig (3)
Edward Meier (3)
K. Weinheimer (3)
B. Scott (3)
J. Manley (2 & 3)
S. Earley (3)
E. Klein (3)
M. Heebner (3)
A. Lindig (3)
R. Kunkel (3)
F. Adcock (3)
F. Mares (2 & 3)
S. Robinson (1)
R. Bruemmer (1)
B. Hoff (1)
M. Koennecke (3)
L. Cosby (2 & 3)
B. Hodges (3)

(1) Qualified.
(2) Not presently qualified by training as of 6/21/82.
(3) Not physically certified as of 6/21/82.

3. Firefighters - These additional employees are only allowed to serve as firefighters and can not enter a burning building. They will be assigned a job responsibility by the Fire Chief upon arrival at the scene.

John Tiff
Joel Rodriguez
Carol Webb
Jewell Malechek
Otto Schumann
James Davis
Jodie Brodbeck
Jim Brandenberger
Linda Roberts
Marie Mitchell
Clifford Schumann
Arnold Klein

4. Fire Truck Drivers and Pump Operators - These employees are or will be trained in the operation of both firetrucks and the pumping gear. They are the only employees authorized to drive and operate the fire trucks.

Ranch Unit

Joel Rodriguez
Bill Scott
Carol Webb
Bob Hoff
Evelyn Klein
Steve Robinson
Edward Meier
Bill Lindig
Kurt Weinheimer
Buddy Hodges
Mac Heebner
Floyd Adcock
Sonny Carrillo
Al Lindig

Johnson City Unit

Roy Bruemmer
Ray Kunkel
John Tiff
Sandy Earley
Armando Urbina
Mac Heebner
Bob Hoff (need training)
Steve Robinson (need training)

5. Consultant to Fire Chief (Ranch Unit)

Lawrence Klein

Will advise Fire Chief on Ranch House electrical system, structure, water supply, etc.

6. Salvage Coordinators

Will salvage various artifacts from house as authorized by the Fire Chief.

	Ranch Unit	Johnson City Unit
1st Coordinator	Libby Hulett	Libby Hulett
2nd Coordinator	John Tiff	John Tiff
3rd Coordinator	Jewell Malechek	Jodie Brodbeck
	Pearl Weed	Sally Wells
		Stella Corpus

7. Dispatchers - persons assigned will work at either Johnson City Headquarters or the LBJ Ranch depending on where they live or work when a fire occurs. This position will be primary communication with fire scene and will procure necessary services. A log of communications (radio and telephone) will be recorded.

1. Elizabeth Lindig
2. Bonnie Jenschke
3. Frankie Hohenberger
4. Vicki Brodbeck

8. Public Information - Media contact and public affairs will be the responsibility of the Park Superintendent or her designee.

VIII. Fire Prevention/Protection Plan

The Fire Prevention Program for the Lyndon B. Johnson National Historical Park will consist of the following:

1. The designation of the Supervisory Park Ranger, Protection, as Fire Chief, who will be primarily responsible for implementing, reviewing, and evaluating the fire prevention/protection program. The Fire Chief will make frequent spot checks of all sites and areas to assess potential for fire.

2. Annual and monthly fire prevention/protection training for all employees. Year 'round employees will have a major training session in the spring but will receive training continuously throughout the year. Seasonal employees will receive training at the beginning of the "summer" season. All fire training offered will be in accordance with the current American National Standard Institute standards. Training will be accomplished both in-park and at appropriate training conferences. It will be directed towards obtaining or maintaining necessary levels

of qualification. (See Appendix 2 for current year Training Plan.) A current listing of employee training completed will also be maintained. (Appendix 3.)

3. Each month the Fire Chief will check the placement of and make the annual inspection of fire extinguishers and other equipment in or near park buildings.

4. An annual Fire Hazard/Safety Inspection will be made by the park Safety and Fire Officer. This inspection will be made in October with written recommendations to the Superintendent.

5. A walk-through fire and safety inspection by the interpreters on duty at opening and closing each day will be made at each site. Each site supervisor shall emphasize and implement this procedure.

6. Fire detection and suppression systems in all structures will be planned and installed as funds permit.

7. The night security guards shall prevent, as far as possible, the possibility of fire by regular patrols and alertness.

8. Pre-fire plans for each building will be kept up-to-date.

9. The Public Relations Program for the park will consist of the following:

    1. Maintaining a good working relationship with the Johnson City Fire Department, the Stonewall Fire Department, the Fredericksburg Fire Department, the LBJ State Park, the U.S. Secret Service, and neighbors will be done by the Superintendent, Chief, I,P&RM, Chief of Ranching and Maintenance and Fire Chief.

    2. Invitations to all park fire training sessions will be issued to local fire departments, the Secret Service, and the LBJ State Park.

    3. Press release of park's firefighting program will periodically be circulated to local newspapers.

10. An inventory of park fire equipment is outlined in Appendix 4. The park Protection Ranger is responsible for this equipment and will at the minimum perform the following pre-suppression functions:

    1. Maintain proper fuel, water, and oil levels in park fire equipment year round.
    2. Run trucks and pump motors at least once per week year round.
    3. Maintain a log of these maintenance activities.

IX. Emergency Procedures in Case of Fire

1. Protection of Human Life and Resuce

   When a fire occurs, safety of employees and visitors is the first consideration. Upon learning of a building fire, remain calm and organize your thoughts. Regardless of the fire size, remove people from the building or fire area.

2. Survey of Situation

   a. Where is the fire located? What is burning? Where are indications of smoke and flames? Where are the nearest openings (if in building) where access can be gained for control?

   b. Estimate the fire size in order to estimate the size of crew necessary to control fire.

   c. Check wind direction in reference to fire.

   d. What type of equipment and methods are needed to extinguish fire--fire extinguishers, garden hose, flappers or wet sacks, sprayer, booster line on reels, fire department?

   e. Check the immediate danger of fire spreading to other buildings or areas.

   f. Can you put the fire out with extinguishers, booster hose reels, or hand tools?

3. Sounding of Alarm

   After surveying the situation and being sure of what you are going to relay, sound alarm by whatever means possible. If in a location where a telephone is located, call for assistance from any or all sources available in the various locations. If in a building or location where telephone is not available but two-way radio is available, call Headquarters or Dispatch. If in area where neither is available, send someone or go yourself, and sound the alarm. The Fire Chief will be responsible for seeing that telephone numbers to call in case of fire, are placed by each telephone in the park.

4. Prevention of Fire Spread

   a. If fire is being spread or fed by some type of fuel, try to cut off fuel supply to building or area.

   b. If fire is in a building, cut off power supply. See Pre-Fire Plans or ask your supervisor.

   c. Close doors and windows if possible.

5. Removal of Historic Objects from Buildings

Historic objects should be removed from a burning building by park employees only if the following conditions are met:

a. All people are safely out of the building.
b. Park employees are not needed to fight the fire.
c. The objects can be removed without hazard to the employees in the task.

6. Transportation Systems

Park tour buses carry portable fire extinguishers inside each bus, mounted in a holding bracket. These extinguishers shall be visually checked by each driver prior to leaving the Bus Maintenance area. The bus supervisor shall be notified of any problem. The park-owned mini-buses which utilize propane have a cut-off valve at the tank and a cut-off valve at the carburetor. Each driver shall be familiar with the location of these valves. It is imperative that all tour bus drivers know the following procedures in the event of an electrical fire or if a propane tank leak occurs (or is even suspected).

a. Turn motor off immediately, remove key, and actuate hazard warning signal lights (flashers).
b. Remove portable radio from mount.
c. Evacuate all visitors from the bus.
d. Close cut-off valve at the propane tank--at discretion of driver.
e. Locate sources of electrical fire and use fire extinguisher to extinguish fire--at discretion of driver.
f. Place traffic cone and reflectors in appropriate location and distances. On a straight road, a reflector should be placed at a distance of 10' and another 110' behind the vehicle and a reflector 100' in front of vehicle. On a curved road, or where vision is obscured, a reflector should be placed at a distance of 10' and another not more than 500' behind the vehicle and a reflector 100' in front of the vehicle.
g. Radio Dispatcher for assistance and relief bus.

7. Other Vehicles

All park-owned and other GSA vehicles also carry portable fire extinguishers inside each vehicle mounted in a hold bracket. A frequent visual check of these fire extinguishers shall be the responsibility of the operator. The Fire Chief shall be notified of any problem.

X. Park Fire Teams

Park fire teams will be dispatched to work with local fire departments when requested as well as responding to in-park fires.

Teams are expected to remain at the fire scene until dismissed by the Fire Chief. Depending on the situation, team members will be released to go home, placed on overtime, or given the opportunity to stay at the fire scene. Hazardous duty pay will be given to team members while on duty at a fire scene as a National Park Service employee.

Each team is expected to ready the equipment (fill gas cans and tanks, top off water elvels, clean and sharpen equipment, store equipment properly, etc.) prior to leaving for home after each use of the equipment.

All team members will receive the training and they are expected to stay familiar with equipment and be ready to respond. Unless there is a compelling reason, team members must respond when called.

XI. Call Out Procedures

On receipt of a call notifying you of a fire follow the emergency call out rosters in the park's Emergency Operations Plan (EOP) and Fire Management Plan (FMP). EOPs and FMPs are located in each park office and work space. The appropriate fire call will depend on the Fire Class (I or II), time of day or whether it's during the week or weekend.

Class I Fires - all fires that are contained and extinguished by initial reaction of employee at the scene. The park Fire Chief (Hecker) or his representative will be called immediately and employee at the scene shall wait for Fire Chief at the fire.

Class II Fires - any fire which is not immediately extinguishable with equipment at hand. Begin Emergency Call Out outlined on subsequent pages.

Dispatcher -

Dispatchers will be assigned for the duration of the NPS effort and will maintain communications with fire teams until relieved.

After initial call out the dispatcher will notify the Superintendent who will notify the Southwest Regional Office by telephone as soon as possible after the discovery of an in-park fire which:

1. Could not be controlled during the first burning period;
2. Burned into a neighboring jurisdiction;
3. Significantly affect park operations, natural resources or facilities;
4. Likely will result in a request for outside assistance.

These calls will be directed to the following individuals:

	FTS	AC 505 Commercial	AC 505 Home
1. Roger Siglin	476-1371	988-6371	982-8308
2. Galen Warren	476-6438	988-6438	471-7356
3. Mike Warren	476-1412	988-6412	982-8257
4. Milford Fletcher	476-1412	988-6412	471-5917
5. Assoc. Reg. Dir. Neckels	476-1383	988-6383	471-1597

XI. 1. EMERGENCY CALL OUT - STRUCTURAL FIRE
LBJ RANCH UNIT
LYNDON B. JOHNSON NATIONAL HISTORICAL PARK

NIGHTS
5:00 p.m. - 9:00 a.m.

Alert: Secret Service - (644-2289) who will call:

1. Stonewall Volunteer Fire Dept. 644-5571
2. Fredericksburg Volunteer Fire Dept. 997-8080
3. Bonnie Jenschke: 644-2236
   -Call:
   a. Hodges: 644-2345
   b. Meier: 644-2398
   c. E. Klein: 644-2255
   d. Weinheimer: 644-2316
   e. Kunkel: 644-2329
   f. L. Klein: 644-2250
   g. J. Malechek: 644-2319
   h. B. Scott: 644-5598
   i. Other Dispatchers (a)
4. Elizabeth Lindig: 868-7207
   -Call:
   a. Hecker: 868-7383
   b. Heebner: 868-4310
   c. B. Lindig: 868-4864
   d. J. Tiff: 868-4633
   e. Other Dispatchers (a)
5. Frankie Hohenberger: 868-7401
   -Call:
   a. L. Roberts: 644-5595
   b. L. Bravo: 644-2256
   c. J. Davis: 868-4664
   d. L. Hulett: 997-2942
   e. B. Hoff: 868-4548
   f. C. Webb: 997-8021
   g. M. Mitchell: 644-2349
   h. P. Weed: 997-2479
   i. S. Walter: 868-4305
   j. Other Dispatchers (a)
6. Vicki Brodbeck: 868-7485
   -Call:
   a. S. Robinson: 868-4800
   b. J. Rodriguez: 997-9706
   c. A. Lindig: 868-4688
   d. F. Adcock: 644-2406
   e. C. Schumann: 644-2407
   f. A. Klein: 644-2257
   g. Other Dispatchers (a)

WEEKDAYS
9:00 a.m. - 5:00 p.m.

Alert: Dispatch or Hdq. -
(Dispatch 644-2241)
(Hdq. 868-7128) who will call:

1. Radio Emergency Alarm (b)
2. Stonewall V.F.D. 644-5571
3. Fredericksburg V.F.D. 997-8080
4. Headquarters (c) 868-7128
   Call: work spaces
   a. Bus Maintenance 644-2261
   b. Klein's Shop 644-2228
   c. Birthplace 644-2348
   d. State Park 644-2252
   e. Curatorial Storage 644-2322
   f. Show Barn 644-2214
5. Secret Service 644-2289

WEEKEND DAYS
9:00 a.m. - 5:00 p.m.

Alert: Bus Barn Dispatch or TC Desk
(Dispatch 644-2241 or
TC Desk 644-2420) who will call:

1. Radio Emergency Alarm (b)
2. Stonewall V.F.D. 644-5571
3. Fredericksburg V.F.D. 997-8080
4. Bus Maintenance 644-2261
5. Numbers 3-6 in First Column (i.e. Bonnie Jenschke, Elizabeth Lindig, Frankie Hohenberger, Vicki Brodbeck)
6. Birthplace 644-2348
7. Tour Coordinator 644-2420
8. Show Barn 644-2214
9. Secret Service 644-2289

(a) Check other dispatchers by phone; if no answer call their list of names, follow priority order.
(b) Radio alarm: Park General - location of fire; repeat twice.
(c) Headquarters becomes park Dispatch, ranch dispatch goes to fire.

XI. 2. EMERGENCY CALL OUT - STRUCTURAL FIRE
JOHNSON CITY UNIT
LYNDON B. JOHNSON NATIONAL HISTORICAL PARK

NIGHTS
5:00 p.m. - 8:00 a.m.

Alert: Phil, Mac, or John T. - who will call:

1. Elizabeth Lindig: 868-7207
   -Call: a. Hecker: 868-7207
   b. Heebner: 868-4310
   c. Earley: 868-7519
   d. J. Tiff: 868-4633
   e. O. Schumann: 644-2384
   f. Other Dispatchers (a)

2. Bonnie Jenschke: 644-2236
   -Call: a. S. Robinson: 868-4800
   b. Hodges: 644-2345
   c. Bruemmer: 833-4986
   d. A. Lindig: 868-4688
   e. Conby: 868-4590
   f. L. Roberts: 644-5595
   g. Other Dispatchers (a)

3. Frankie Hohenberger: 868-7401
   -Call: a. Manley: 868-4590
   b. J. Brodbeck: 868-4452
   c. B. Hoff: 868-4548
   d. E. Meier: 644-2398
   e. R. Kunkel: 644-2329
   f. S. Wells: 868-7268
   g. J. Davis: 868-4664
   h. S. Walter: 868-4305
   i. Other Dispatchers (a)

4. Vicki Brodbeck: 868-7485
   -Call: a. J.C.V.F.D.: 868-4400
   b. B. Lindig: 868-4864
   c. E. Klein: 644-2255
   d. K.Weinheimer: 644-2316
   e. B. Scott: 644-5598
   f. C. Schumann: 644-2407
   g. Other Dispatchers (a)

WEEKDAYS
8:00 a.m. - 5:00 p.m.

Alert: Headquarters: 868-7128 - who will call:

1. Radio Emergency Alarm (b)
2. Offices/Work Spaces:
   a. Visitor Center: 868-4241
   b. Exhibit Center: 868-7212
   c. Red Maintenance: 868-7521
   d. Library: 868-7521
3. Johnson City V.F.D. 868-4400

WEEKEND DAYS
9:00 a.m. - 5:00 p.m.

Alert: Ranch Dispatcher 644-2241 - who will call:

1. Radio Emergency Alarm (b)
2. Work Spaces:
   a. Visitor Center: 868-4241
   b. Exhibit Center: 868-7212
   c. Red Maintenance: 868-7521
3. Numbers 1-4 in first column (i.e. Elizabeth, Bonnie, Frankie, Vicki)
4. Johnson City V.F.D. 868-4400

(a) Check other dispatchers by phone, if no answer call the their list of names, follow priority order.
(b) Radio Alarm: 1st Park General - give location of fire: repeat twice.

XI. 3. EMERGENCY CALL OUT - GRASS FIRE (a)
LBJ RANCH UNIT
LYNDON B. JOHNSON NATIONAL HISTORICAL PARK

WEEKDAYS
9:00 a.m. - 5:00 p.m.

Alert: Bus Barn Dispatch - who will call: 644-2241

1. Radio Emergency Alarm (b,c,d)
2. Stonewall V.F.D. 644-5571
3. Headquarters 868-7128
   -Call: work spaces (e)
   a. Bus Maintenance 644-2261
   b. Klein's Shop 644-2228
   c. Birthplace 644-2348
   d. Tour Coordinator 644-2420
   e. Show Barn 644-2214
4. Secret Service 644-2289

NIGHT

Alert: Secret Service - 644-2289
who will call:

1. Stonewall V.F.D. 644-5571
2. Buddy Hodges 644-2345

WEEKEND DAYS
9:00 a.m. - 5:00 p.m.

Alert: Dispatch - call (e)

1. Radio Emergency Alarm (b,c,d)
2. Stonewall V.F.D. 644-5571
3. Bus Maintenance 644-2261
4. Birthplace 644-2348
5. Show Barn 644-2214
6. Tour Coordinator 644-2420
7. Secret Service 644-2289

GRASS AND RANGE FIRE SUPPRESSION WILL BE LIMITED TO CENTRAL TEXAS AND "HILL COUNTRY" MECHANIZED TECHNIQUES AND PROCEDURES. PARK LANDS AND ADJACENT PROPERTY POSE A MINIMAL THREAT AND ACCIDENTIAL FIRES CAN BE EASILY CONTAINED BY NUMEROUS NATURAL AND MANMADE FIRE BREAKS. FINE FUELS ARE SPARCE.

(a) Grass fires will be handled by class: a grass fire is either Class I or Class II.
(b) Only personnel designated as Truck Drivers or Nozzlemen will go to grass fires. Only qualified nozzlemen will use hand tools. Truck Drivers will operate Bean sprayers for laying wet lines; and Ward LaFrance structural truck for structure protection.
(c) Radio Alarm: Broadcast to Park General; location of grass fire; repeat twice.
(d) Headquarters becomes fire dispatch.
(e) Indicate grass fire and location and summons truck drivers and nozzlemen.

XI. 4. EMERGENCY CALL OUT - GRASS FIRE (a)
JOHNSON CITY UNIT
LYNDON B. JOHNSON NATIONAL HISTORICAL PARK

WEEKDAYS
9:00 a.m. - 5:00 p.m.

Alert: Headquarters - Call:

1. Radio Emergency Alarm (b,c)
2. Johnson City V.F.D. 868-4400
3. Work Spaces (c)
   a. Visitor Center 868-4241
   b. Exhibit Center 868-7212
   c. Red Maintenance 868-7521
   d. Library 868-7521
4. Ranch Unit Dispatch: FYI - (additional personnel as indicated by Fire Chief)

NIGHT

Alert: Mac, Phil, John T.

Johnson City V.F.D. 868-4400

WEEKEND DAYS
9:00 a.m. - 5:00 p.m.

Alert: Ranch Dispatcher 644-2241 - Call

1. Radio Emergency Alarm (b,c)
2. Johnson City V.F.D. 868-4400
3. Work Spaces (e)
   a. Visitor Center 868-4241
   b. Exhibit Center 868-7212
   c. Red Maintenance 868-7521
   d. Ranch Unit personnel as indicated by Fire Chief

GRASS AND RANGE FIRE SUPPRESSION WILL BE LIMITED TO CENTRAL TEXAS AND "HILL COUNTRY" MECHANIZED TECHNIQUES AND PROCEDURES. PARK LANDS AND ADJACENT PROPERTY POSE A MINIMAL THREAT AND ACCIDENTAL FIRES CAN BE EASILY CONTAINED BY NUMEROUS NATURAL AND MANMADE FIRE BREAKS. FINE FUELS ARE SPARCE.

(a) Grass fires will be handled by class: A grass fire is either Class I or Class II.
(b) Only personnel designated as Truck Drivers or Nozzlemen will go to grass fires. Only qualified nozzlemen will use hand tools. Truck Drivers will use Bean sprayer to lay wet line; and 6x6 structural truck will first insure protection of endangered structures.
(c) Radio Alarm: Broadcast to Park General; location of grass fire; repeat twice.
(d) Indicate grass fire and location and summons truck drivers and nozzlemen.

XII. Cooperative Agreements

This park maintains cooperative agreements (Appendix 6,7, & 8) with the Johnson City, the Stonewall Fire Department, and the Fredericksburg Fire Department.

Our response to their call for assistance will be equipment, trucks with drivers and pump operators and any park fire team members who can be spared from duties.

All requests for assistance from the park will be based on cooperative agreements and will be approved by the Park Superintendent, Chief of Interpretation, Protection and Resource Management, General Foreman, Supervisory Protection Ranger, or their designated acting representatives.

Every effort will be made to include these departments in our park training programs and to participate in their meetings.

Requests for assistance from local departments should be done in accordance with emergency call out procedures outlined in XII-4.

Johnson City	-	868-4400 (24 hours)
Stonewall	-	644-2266 or 2388, or 2487 days, after 5:00 p.m. 644-2266, 2366, or 2393
Fredericksburg	-	997-2133 (24 hours)

XIII. Salvage and Overhaul

Salvage work consists of those methods and operating procedures which further reduce fire, water and smoke damage during and after fires. Some damage to structures and furnishings will be unavoidable due to necessary suppression operations, but improved extinguishment plus prompt and effective salvage procedures can significantly minimize losses.

Overhaul work consists of search for and extinguishment of hidden or remaining fires; placing the building, and the fire area in a safe condition; determining the cause of the fire; and recognizing and preserving any evidence of arson.

All firefighting personnel are to be trained in salvage work and the use of salvage equipment. Park firefighters and nozzlemen will be trained in Overhaul work and the use of overhaul equipment.

XIV. Records and Reports

The Supervisory Park Ranger, Protection is responsible for completion of required fire reports. The park Administrative Officer is responsible for completion and submission of any fiscal reports.

★ U.S. Government Printing Office: 1981 348-082

APPENDIX I.

TO BE GIVEN TO PERSON EXAMINED WITH A PRE-ADDRESSED "CONFIDENTIAL-MEDICAL" ENVELOPE.

UNITED STATES CIVIL SERVICE COMMISSION
CERTIFICATE OF MEDICAL EXAMINATION

Form Approved
Budget Bureau
No. 50-R0073

Part A. TO BE COMPLETED BY APPLICANT OR EMPLOYEE *(typewrite or print in ink)*

1. NAME *(last, first, middle)*	2. SOCIAL SECURITY ACCOUNT NO.	3. SEX ☐ MALE ☐ FEMALE	4. DATE OF BIRTH

5. DO YOU HAVE ANY MEDICAL DISORDER OR PHYSICAL IMPAIRMENT WHICH WOULD INTERFERE IN ANY WAY WITH THE FULL PERFORMANCE OF THE DUTIES SHOWN BELOW? ☐ YES ☐ NO

(If your answer is "YES" explain fully to the physician performing the examination)

6. I CERTIFY THAT ALL THE INFORMATION GIVEN BY ME IN CONNECTION WITH THIS EXAMINATION IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF

_____
(signature of applicant)

Part B. TO BE COMPLETED BEFORE EXAMINATION BY APPOINTING OFFICER

1. PURPOSE OF EXAMINATION
☐ PREAPPOINTMENT
☒ OTHER (specify) Fitness for Duty

2. POSITION TITLE
Structural firefighter

3. BRIEF DESCRIPTION OF WHAT POSITION REQUIRES EMPLOYEE TO DO Incumbent must fight fire by entering burning structures to perform search & rescue for occupants & to extinguish fire. Activity requires working in extreme hazardous chemical & physical environments. Both physical & mental stamina & endurance are required because work is performed while wearing lbs. of protective clothing & self-contained breathing equipment. The combination of additional weight, insulating clothing, & high temperatures will cause excessive perspiration and energy consumption.

4. Circle the number preceding *each* functional requirement and *each* environmental factor essential to the duties of this position. List any additional essential factors in the blank spaces. Also, if the position involves law enforcement, air traffic control, or fire fighting, attach the specific medical standards for the information of the examining physician.

A. FUNCTIONAL REQUIREMENTS

* 1. Heavy lifting, 45 pounds and over
2. Moderate lifting, 15-44 pounds
3. Light lifting, under 15 pounds
* 4. Heavy carrying, 45 pounds and over
5. Moderate carrying, 15-44 pounds
6. Light carrying, under 15 pounds
7. Straight pulling (hours)
* 8. Pulling hand over hand (hours)
* 9. Pushing (1 hours)
*10. Reaching above shoulder
*11. Use of fingers
*12. Both hands required
*13. Walking (4 hours)
*14. Standing (4 hours)
*15. Crawling (4 hours)
*16. Kneeling (4 hours)
*17. Repeated bending (hours)
*18. Climbing, legs only (hours)
*19. Climbing, use of legs and arms
*20. Both legs required
21. Operation of crane, truck, tractor, or motor vehicle
*22. Ability for rapid mental and muscular coordination simultaneously
23. Ability to use and desirability of using firearms
24. Near vision correctable at 13" to 16" to Jaeger 1 to 4
25. Far vision correctable in one eye to 20/20 and to 20/40 in the other
26. Far vision correctable in one eye to 20/50 and to 20/100 in the other
27. Specific visual requirement *(specify)*
*28. Both eyes required
*29. Depth perception
*30. Ability to distinguish basic colors
31. Ability to distinguish shades of colors
32. Hearing *(aid permitted)*
*33. Hearing without aid
34. Specific hearing requirements *(specify)*
*35. Other *(specify)* free from disease or disability that could recur on job.

B. ENVIRONMENTAL FACTORS

1. Outside
* 2. Outside and inside
* 3. Excessive heat
* 4. Excessive cold
5. Excessive humidity
6. Excessive dampness or chilling
7. Dry atmospheric conditions
* 8. Excessive noise, intermittent
9. Constant noise
*10. Dust
11. Silica, asbestos, etc.
* 12. Fumes, smoke, or gases
13. Solvents (degreasing agents)
* 14. Grease and oils
15. Radiant energy
16. Electrical energy
* 17. Slippery or uneven walking surfaces
* 18. Working around machinery with moving parts
* 19. Working around moving objects or vehicles
*20. Working on ladders or scaffolding
21. Working below ground
*22. Unusual fatigue factors *(specify)* (See description above)
23. Working with hands in water
24. Explosives
25. Vibration
*26. Working closely with others
*27. Working alone
28. Protracted or irregular hours of work
29. Other *(specify)*

Part C. TO BE COMPLETED BY EXAMINING PHYSICIAN

1. EXAMINING PHYSICIAN'S NAME *(type or print)*	3. SIGNATURE OF EXAMINING PHYSICIAN
2. ADDRESS *(including ZIP Code)*	_____ *(signature)* _____ *(date)*

IMPORTANT: After signing, return *the entire form intact* in the pre-addressed "Confidential-Medical" envelope which the person you examined gave you.

STANDARD FORM NO. 78
OCTOBER 1969 (REVISION)

APPENDIX 2.

Park Fire Training Plan

Course Subject	Location	Employees Attending	Course Coordinator	Date
Fire Coordination	Ranch Unit	Ranch Unit Fire Chiefs	Phil Hecker	
Fire Coordination	J.C. Unit	J.C. Unit Fire Chiefs	Phil Hecker	
First Attack (Interior Fire)	Ranch Unit	Ranch Unit Nozzlemen	Phil Hecker	
First Attack (Interior Fire)	J.C. Unit	J.C. Unit Nozzlemen	Phil Hecker	
Search & Rescue (Interior Fire)	Ranch Unit	Ranch Unit Nozzlemen	Mac Heebner	
Search & Rescue (Interior Fire)	J.C. Unit	J.C. Unit Nozzlemen	Mac Heebner	
Air Pack Use	Show Barn	Park Nozzlemen		
Personal Protection	Hangar	All Park Firefighters		
Hose Lays	Ranch Unit	Ranch Unit Firefighters		
Hose Lays	J.C. Unit	J.C. Unit Firefighters		
Fire Chemistry	Hangar	All Park Firefighters		
Use of ladders	Ranch Unit	Ranch Unit Nozzlemen & Firefighters		

Use of ladders	J.C. Unit	J.C. Unit Nozzlemen & Firefighters
Operation of Pool Pump	Ranch Unit	Ranch Unit Firefighters
Dispatching & Call Out Procedures	Headquarters	Dispatchers & Call out Employees
Salvage	Ranch Unit	Ranch Unit Salvage Crew & Firefighters
Salvage	J.C. Unit	J.C. Unit Salvage Crew & Firefighters
Overhaul	Hangar	All Park Firefighters
Hydrant Operation	Ranch Unit	Ranch Unit Firefighters
Hydrant Operation	J.C. Unit	J.C. Unit Firefighters
Pump Operations	Ranch Unit	Ranch Unit Pump Operators
Pump Operations	J.C. Unit	J.C. Unit Pump Operators
Sprayer Operations	J.C. Unit	J.C. Unit Pump Operators
Firetruck Driving	Ranch Unit	Ranch Unit Truck Drivers
Firetruck Driving	J.C. Unit	J.C. Unit Truck Drivers

Public Relations & Crowd Control	Hangar	All Park Firefighters
Ventilation	Ranch Unit	Ranch Unit Firefighters
Ventilation	J.C. Unit	J.C. Unit Firefighters
Drills:	Boyhood Home	J.C. Unit Firecrew
	Red Maint. Bldg.	J.C. Unit Firecrew
	Visitor Center	J.C. Unit Firecrew
	Exhibit Center	J.C. Unit Firecrew
	Settlement	J.C. Unit Firecrew
	Grassfire	J.C. Unit Firecrew
	Grassfire	Ranch Unit Firecrew
	Texas White House	Ranch Unit Firecrew
	Hangar	Ranch Unit Firecrew
	Curatorial Storage	Ranch Unit Firecrew

	Klein's Shop	Ranch Crew Firecrew
	Secret Service Building	Ranch Unit Firecrew
	Show Barn	Ranch Unit Firecrew
	Bus Barn	Ranch Unit Firecrew
	Jordan House/ Tile House	Ranch Unit Firecrew
	Birthplace	Ranch Unit Firecrew
	Junction School	Ranch Unit Firecrew
	Guest Houses	Ranch Unit Firecrew
	Ranch Foreman House	Ranch Unit Firecrew
Unannounced Nighttime Drill	Ranch Unit	Dispatchers & Ranch Unit Nighttime Fire Team
Unnanounced Nighttime Drill	J.C. Unit	Dispatchers & J.C. Unit Nighttime Fire Team
Unnanounced Weekday Drill	Ranch Unit	Ranch Unit Weekday Fire Team
Unannounced Weekday Drill	J.C. Unit	J.C. Unit Weekday Fire Team

Unannounced Weekend Drill	Ranch Unit	Ranch Unit Weekend Fire Team		
Unannounced Weekend Drill	J.C. Unit	J.C. Unit Weekend Fire Team		
Overall LBJ Fire Program	Hangar	All Park Fire Team Members	Phil Hecker	Annually
Advanced Fire Coordination Training	SWRO or outside sources	Phil Hecker Mac Heebner Buddy Hodges		When Available
Firemanship I	Texas A&M		Texas A&M	

APPENDIX 3

Current Employee Fire Training Record

John Tiff (01/16/43)

Fire Fighting I, Texas A&M, 39 hours, 07/78
Fire School, LYJO, 24 hrs., 02/78
Fire Training LYJO/State Forestry, 32 hrs., 02/79
Basic Fire Fighting, NPS, 40 hrs., 2/4-8/80.
Fire Dept. Organ. & Fire Science, NPS, LYJO, 14 hrs., 9/9-10/80
Fire Trng. Refresher Course, 4 hrs., LYJO, 5/14/81
Structural/Wildfire Fire Trng., LYJO, 32 hrs., 2/23-26/81, Texas A&M
Fire Training, LYJO, 2 hrs., 07/22/81
Fire Training, LYJO, 2 hrs., 11/09/81
Fire Training, LYJO, 2 hrs., 01/19/82
Fire Training, LYJO, 28 hrs., 2/23-26/82, Texas A&M

Phil Hecker (10/25/23)

North Dakota Annual Fire School, 8 hrs., 1968
North Dakota Regional Fire School, 8 hrs., 1968
North Dakota Annual Fire School, 24 hrs., 1969
North Dakota Regional Fire School, 8 hrs., 1970
North Dakota Annual Fire School, 24 hrs., 1971
Theodore Roosevelt National Park, 1964-1971, 192 hours fire training
Bif Horn Canyon NRA, 1972-73, 80 hrs., fire and rescue training
Grand Canyon National Park, 1973-78, 120 hrs., of fire search & rescue trng.
Fire Fighting III, Texas A&M, 39 hrs., 02/78
Fire Training LYJO/State Forestry, 32 hrs., 02/79
Fire Protection Seminar, Fredericksburg, TX., 8 hrs., 01/79
Fire Training, Texas Forestry Dept./NPS, 32 hrs., 2/27-3/2/79
Basic Fire Fighting, NPS, 40 hrs., 2/4-8/80
Structural/Wildfire Fire Trng., 32 hrs., LYJO, 2/23-26/81, Texas A&M
Firemanship I, New Mexico State Univ., 8/17-21/81, 40 hrs.
Survair Tech. School Maint. & Repair Course, Fredericksburg, TX., 3/11/82, 8 hrs.
Fire Training, LYJO, 28 hrs., 2/23-26/82, Texas A&M

Larry Salazar (11/13/30)

Fire School, LYJO, 24 hrs., 02/78
Fire Fighting I, 40 hrs., Las Cruces, NM, 08/78
Fire Protection Seminar, Fredericksburg, TX, 8 hrs., 01/79
Fire Fighting LYJO/State Forestry, 32 hrs., 02/79
Firemanship II, 32 hrs., Las Cruces, NM, 08/79
Basic Fire Fighting, NPS, 40 hrs., 2/4-8/80
Fire Dept. Organ. & Fire Science, NPS, LYJO, 14 hrs., 9/9-10/80
Structural/Wildfire, 32 hrs., LYJO, Texas A&M, 2/23-26/81
Fire Dept. Pump Maint., Texas A&M, 48 hrs., 7/19-24/81
Fire Trng., LYJO, 2 hrs., 1/19/82
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Floyd Adcock (5/31/33)

Fire School, LYJO, 24 hrs., 02/78
Fire Fighting I, Texas A&M, 32 hrs., 07/79
Fire Trng., LYJO, 2 hrs., 1/19/82
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Kurt Weinheimer (12/5/35)

Fire Training, LYJO, State Forestry, 32 hrs., 02/79
Firemanship I, 32 hrs., Las Cruces, NM, 08/79
Structural/Wildfire Fire Trng., 32 hrs., LYJO, 2/23-26/81, Texas A&M
Fire Trng, LYJO, 2 hrs., 1/19/82

Otto Schumann (3/20/13)

Fire Training, LYJO/State Forestry, 32 hrs., 02/79
Fire Dept. Organ. & Fire Science, LYJO, NPS, 7 hrs. only, 9/10/82
Fire Trng. Refresher Course, 4 hrs., LYJO, 2/2/81
Fire Trng., LYJO, 2 hrs., 11/9/81
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Sandy Earley (9/7/45)

Fire Training, LYJO/State Forestry, 32 hrs., 02/79
Basic Fire Fighting, NPS, 40 hrs., 2/4-8/80
Fire Dept. Organ. & Fire Science, NPS, LYJO, 14 hrs., 9/9-10/80
Fire Trng., LYJO, 2 hrs., 7/22/81
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Roy Bruemmer (10/6/28)

Fire School, LYJO, 24 hrs., 02/78
Fire Training LYJO/State Forestry, 32 hrs., 02/79
Fire Fighting I, Texas A&M, 32 hrs., 07/79
Fire Dept. Ogran. & Fire Science, 14 hrs., LYJO, NPS, 9/9-10/80
Fire Trng., LYJO, 2 hrs., 7/22/81
Fire Trng., LYJO, 2 hrs., 1/19/81
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Lawrence Klein (4/29/14)

Fire Fighting III, Texas A&M, 39 hrs., 07/78
Fire Trng. LYJO/State Forestry, 32 hrs., 02/79
Basic Fire Fighting, NPS, 40 hrs., 2/4-8/80
Fire Trng. Refresher Course, 4 hrs., LYJO, 5/14/81
Structural/Wildfire Fire Trng., LYJO, 32 hrs., 2/23-26/81, Texas A&M
Fire Trng., LYJO, 2 hrs., 7/22/81
Fire Trng., LYJO, 2 hrs., 1/19/82

James Davis (8/12/20)

Fire School, LYJO, 24 hrs., 02/78
Fire Fighting I, 40 hrs., Las Cruces, NM, 08/78

Clifford Schumann (12/21/27)

Fire School, LYJO, 24 hrs., 02/78
Fire Trng. LYJO/State Forestry, 32 hrs., 02/79
Fire Fighting I, Texas A&M, 32 hrs., 07/79
Basic Fire Fighting, NPS, 40 hrs., 2/4-8/80
Fire Dept. Organ. & Fire Science, LYJO, NPS, 14 hrs., 9/9-10/80
Fire Trng. Refresher Course, 4 hrs., LYJO, 5/14/81
Structural/Wildfire Fire Trng., 32 hrs., LYJO, 2/23-26/81, Texas A&M
Fire Trng., LYJO, 2 hrs., 1/19/82
Fire Trng., LYJO, 32 hrs., 2/23-26/82, Texas A&M

Edward Meier (3/3/48)

Fire School, LYJO, 24 hrs., 02/78
Fire Training LYJO/State Forestry, 32 hrs., 02/79
Basic Fire Fighting, NPS, 40 hrs., 2/4-8/80
Fire Trng. Refresher Course, 4 hrs., LYJO, 5/4/81

Buddy Hodges (9/23/31)

Basic Firemanship, NPS, 32 hrs., Las Cruces, NM, 08/77
Fire Training LYJO/State Forestry, 32 hrs., 02/79
Basic Fire Fighting, NPS, 40 hrs., 2/4-2/8/80
Fire Dept. Organ. & Fire Science, LYJO, NPS, 14 hrs., 9/9-9/10/80
Fire Trng. Refresher Course, 4 hrs., LYJO, 5/14/81
Structural/Wildfire Fire Trng., LYJO, 32 hrs., 2/23-26/81, Texas A&M
Fire Trng., LYJO, 7 hrs., 2/25/82, Texas A&M

Bill Lindig (4/21/50)

Fire School, LYJO, 24 hrs., 02/78
Fire Training LYJO/State Forestry, 32 hrs., 02/79
Fire Fighting I, Texas A&M, 32 hrs., 07/79
Basic Fire Fighting, NPS, 40 hrs., 2/4-8/80
Fire Trng. Refresher Course, 4 hrs., LYJO, 5/14/81
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Armando Urbina (8/19/25)

Basic Firemanship, NPS, 32 hrs., Las Cruces, NM, 08/77
Fire Fighting II, Texas A&M, 39 hrs., 07/78
Fire Fighting III, Texas A&M, 32 hrs., 07/79
Basic Fire Fighting, NPS, 40 hrs., 2/8/80
Structural/Wildfire Fire Trng., LYJO, 32 hrs., 2/23-26/81, Texas A&M
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Bob Moore (3/6/21)

Fire Fighting I, Texas A&M, 32 hrs., 07/78
Fire Training LYJO/State Forestry, 32 hrs., 02/79
Firemanship II, 32 hrs., Las Cruces, NM, 08/79
Basic Fire Fighting, NPS, 40 hrs., 2/4-8/80
Fire Trng. Refresher Course, 4 hrs., LYJO, 2/2/81
Fire Trng., LYJO, 2 hrs., 11/9/81

Bob Hoff (5/20/47)

S110, S130, S190, 32 hrs., included 1 day of SFC
S230 - Crew Boss, 24 hrs.
S - Organizing for Fire Suppression, 16 hrs.
Structural Fire Control, 24 hrs., NM State Fire Marshall's Office.
Basic Fire Fighting, NPS, 40 hrs., 2/4-8/80, LYJO
Fire Dept. Organ. & Fire Science, LYJO, NPS, 14 hrs., 9/9-10/80
Fire Trng. Refresher Course, 4 hrs., LYJO, 5/14/81
Structural/Wildfire Fire Trng., LYJO, 32 hrs., 2/23-26/81, Texas A&M
Fire Trng., LYJO, 2 hrs., 11/9/81
Fire Trng., LYJO, 2 hrs., 1/19/82
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Jodie Brodbeck (5/27/29)

Fire Fighter I, 40 hrs., Las Cruces, NM, 08/78
Fire Trng. LYJO/State Forestry, 32 hrs., 02/79
Basic Fire Fighting, NPS, 40 hrs., 2/8/80
Fire Dept. Organ. & Fire Science, LYJO, NPS, 14 hrs., 9/9-10/80
Fire Trng., LYJO, 2 hrs., 11/9/81

Evelyn Klein (9/28/42)

Firefighter I, 40 hrs., Las Cruces, NM, 08/78
Basic Fire Fighting, NPS, 40 hrs., 2/4-8/80
Fire Trng. Refresher Course, 4 hrs., LYJO, 5/14/81
Structural/Wildfire Fire Trng., 32 hrs., LYJO, 2/23-26/81, Texas A&M
Fire Trng., LYJO, 2 hrs., 1/19/82
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Marie Mitchell (8/9/49)

Fire Training LYJO/State Forestry, 32 hrs., 02/79
Firemanship I, 32 hrs., Las Cruces, NM, 08/79
Fire Trng. Refresher Course, 4 hrs., LYJO, 5/14/81
Structural/Wildfire Fire Trng., LYJO, 32 hrs., 2/23-26/81, Texas A&M
Fire Trng., LYJO, 2 hrs., 1/19/82
Fire Trng., LYJO, 16 hrs., 2/23-25/82, Texas A&M

Bill Scott (6/16/34)

Fire Fighting I, Texas A&M, 32 hrs., 07/79
Fire Trng., LYJO, 2 hrs., 1/19/82
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Linda Roberts (3/16/51)

Fire Trng., LYJO, 2 hrs., 1/19/82
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Jewell Malechek (8/26/33)

Structural/Wildfire Fire Trng., LYJO, 32 hrs., 2/23-26/81, Texas A&M
Fire Trng., LYJO, 2 hrs., 7/22/81
Fire Trng., LYJO, 2 hrs., 1/19/82
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Steve Robinson (6/18/57)

Structural/Wildfire Fire Trng., LYJO, 32 hrs., 2/23-26/81, Texas A&M
Fire Trng., LYJO, 2 hrs., 7/22/81
Fire Trng., LYJO, 2 hrs., 1/19/82
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Sally Wells (12/1/37)

Fire Trng., 2 hrs., LYJO, 7/22/81
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Mark Koennecke (9/15/53)

Fire Trng. Refresher Course, 4 hrs., LYJO, 2/2/81
Structural/Wildfire Fire Trng., LYJO, 32 hrs., 2/23-26/81, Texas A&M
Fire Trng., LYJO, 2 hrs., 7/22/81
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Jim Brandenberger (7/16/30)

Basic Fire Trng., NPS, 40 hrs., 2/28/80
Fire Trng., LYJO, 2 hrs., 11/9/81
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Henry Krueger (10/16/22)

Fire Trng. Refresher Course, 4 hrs., LYJO, 2/2/81

Carol Webb (1/28/53)

Fire Dept. Pump Maint., Texas A&M, 48 hrs., 7/19-24/81
Surviaire Tech. School Maint. & Repair Course, Fredericksburg, TX, 8 hrs., 3/11/82
Fire Trng., LYJO, 2 hrs., 1/19/82

Joel Rodriguez (8/14/48)

Fire Trng. Refresher Course, 4 hrs., 5/14/81
Fire Trng. LYJO, 2 hrs., 1/19/82

Wallace Davidson (7/20/24)

Structural/Wildfire Fire Trng., LYJO, 32 hrs., 2/23-26/81, Texas A&M
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Al Lindig (12/19/48)

Basic Fire Fighting, NPS, 40 hrs., 2/4-8/80
Fire Training Refresher Course, 4 hrs., LYJO, 2/2/81
Structural/Wildfire Fire Trng., LYJO, 32 hrs., 2/23-26/81, Texas A&M

Jacinto Carrillo (6/3/34)

Basic Structural Fire Fighting, Buffalo NR, Harrison, AK, 40 hrs., 9/14-18/81

Mac Heebner (1/17/44)

Fire Dept. Organ. & Fire Science, NPS, LYJO, 14 hrs., 9/9-10/80
Fire Trng. Refresher Course, 4 hrs., LYJO, 5/14/81
Structural/Wildfire Fire Trng., LYJO, 32 hrs., 2/23-26/81, Texas A&M
Firemanship II, New Mexico State Univ., 40 hrs., 8/17-21/81
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Ray Kunkel (8/4/37)

Fire Trng., LYJO, 2 hrs., 11/09/81
Fire Trng., LYJO, 2 hrs., 1/19/82
Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Bonnie Jenschke (6/16/52)

Fire Trng., LYJO, 28 hrs., 2/23-26/82, Texas A&M

Elizabeth Lindig (1/6/52)

Fire Trng., LYJO, 18 hrs., 2/23-26/82, Texas A&M (partial attendance)

APPENDIX 4

Park Fire Equipment List

Johnson City Truck - 6 x 6 truck, 1500 gallon tanker*

1. 500 ft. 2½" fire hose on truck
2. 350 ft. 1½" hose on truck
3. 1 smoke ejector, 100 volt, extension cord 100 ft.
4. 1-24 ft. extension ladder
5. 1-14 ft. roof ladder
6. 1-2½ x ½ wye
7. 2-1½" nozzles, 30-120 GPM
8. 1-2½" nozzle, 125-250 GPM
9. 2 air packs, breathing apparatus, 30 minutes
10. 2-30 minute tanks (spare)
11. 1-10 ft. pike pole
12. 1-250 GPM pump with 2-1½" and 1-2½" outlets
13. 1-7½ ft. draft hose, 2½"
14. 1 fire axe
15. 2 fire shovels
16. 2 fire racks, McLeod tools
17. 2 Pulaski
18. 2-6" spanner wrenches
19. 1 fire hydrant wrench
20. 1 red flashing light
21. 1 blue flashing light
22. 2 flashlights
23. 1 box of tools
24. 2 sets turnout clothing, boots, gloves, helmets in wool warehouse storage area
25. First aid kit
26. 5 gallons of gas

*V4 Wisconsin with a volume pump of 40 psi max. pressure

Ranch Fire Truck, 750 GPM pumper

1. 600 ft. 2½" fire hose in rack
2. 150 ft. 1½" fire hose preconnected.
3. 300 ft. 1½" fire hose in rack
4. 1 smoke ejector, 110 volt, 1-100 ft. extension cord
5. 1-20 ft. extension ladder
6. 1-12 ft. roof ladder
7. 1-2½"x1½"x1½" wye
8. 2-1½" nozzle, 30-120 GPM
9. 1-2½" nozzle, 125-250 GPM
10. 2 air packs breathing apparatus, 30 minutes
11. 2-30 minute air tanks (spare)
12. 1-10 ft. pike pole
13. 2 flood lights, back
14. 2-8 ft. draft hose, 4½"
15. 1-8 ft. draft hose, 2½"
16. 2 spanner wrenches 6"
17. 1 fire hydrant wrench
18. 1 red flashing light
19. 2 flashlights
20. 1 box of tools
21. 7 sets turnout clothing, boots, gloves, helmets
22. 1 fire axe
23. 2 fire shovels

RANCH UNIT - OLD BARN

1. Portable Pump, 100 GPM
2. 400 ft. 2½" hose
   - on same hose cart
3. 600 ft. 1½" hose
4. 2-7½" draft hose, 2½" with screen
5. Hydrant wrench
6. 2 - spanner wrenches
7. 2½"x1½" "y"
8. 1-1½" nozzle

COOPERATIVE AGREEMEN
NPS-20

Guideline
Chapter 2
Exhibit 1

DATA SHEET
COOPERATIVE AGREEMENTS

1. Title of Agreement Cooperative Firefighting Agreement

2. Agreement Number MA7350-81-02

3. Parties to Agreement Lyndon B. Johnson National Historical Park and Johnson City Volunteer Fire Department

4. Term of Agreement (Beginning and Ending Dates, Month and Year)
02/81 through 02/86

5. Date of Supplementals or Reaffirmations (if any)
None

6. Category (Always a primary and a secondary if necessary)
01-Fire

7. Purpose of Agreement
Mutual aid fire control--both wildfire and structural

8. Legislative or Other Authority
Acts of 8/25/16 and 8/21/35

9. Name, title, and office of NPS Official Signing Agreement
Ted M. Cockrell, Acting Superintendent, Lyndon B. Johnson National Historical Park

Typed name, title, and office of official submitting report	Signature	Date
Same as #9 above.	Ted M. Cockrell Acting Superintendent	2-20-81

GPO 924-222

JOHNSON CITY VOL. FIRE DEPT
A44 LYJO

United States Department of the Interior
NATIONAL PARK SERVICE

LYNDON B. JOHNSON NATIONAL HISTORIC SITE
P. O. BOX 329
JOHNSON CITY, TEXAS 78636

IN REPLY REFER TO:

No. MA 7350-81-02
(replaces numbered agreement dated 2/21/78)

Memorandum of Agreement
between
the
Lyndon B. Johnson National Historical Park
and the
Johnson City Volunteer Fire Department

In accordance with the Act of August 25, 1916, as amended and supplemented, and the Act of August 21, 1935, as amended, the National Park Service, Lyndon B. Johnson National Historical Park and the Johnson City Volunteer Fire Department hereby enter into an agreement to coordinate major fire suppression efforts on structural and wildland fires. The primary intent of this agreement is fire control, with minimum delay, in either party's area of jurisdiction.

1. Both parties shall furnish the other with the names and telephone numbers of persons to call when assistance is necessary. The National Park Service will require a written confirmation following any verbal request for assistance.

2. It shall be the duty of both parties to immediately report to the other party fires that endanger or exist on the protected area or land within the jurisdiction of the other party.

3. The fire suppression organization of either party is authorized to dispatch fire fighting crews when called upon to do so by the responsible official of the other party; and to assist in suppression of fires on or threatening lands protected by the other party. Suppression personnel of either party will take initial action when fires are discovered, but will report the fires to the responsible party as soon thereafter as possible.

4. Each party will furnish its own transportation and equipment unless the emergency requires that other arrangements be made. It is understood by both parties participating in this agreement that neither shall be liable to the other for any damage or personal injuries incident to the performance of work or use of equipment under the provision set forth in this agreement.

5. Neither organization shall jeopardize the security of an area by dispatching all available manpower and equipment to a going fire in the territory of the other party. The amount of necessary reserve will be determined by the responsible authority of each party.

6. The fire boss, or fire chief, on a going fire will be the ranking representative of the area in which the fire occurs unless the fire is first reached by a representative(s) of the other party; in which case he will be responsible for the initial attack and will remain on the fire until released by the party of primary responsibility and will thereafter be subordinate until released.

7. In the event of uncertainty or possible difference of interpretation of any of the foregoing provisions, the responsible officer from the area of the going fire will act upon his own initiative and good judgment to hasten the suppression of the fire.

8. As mutual training and equipment familiarization will be of great benefit during any fire, each party is encouraged to participate in the training activities of the other.

9. This agreement shall be effective on the date of signature by both parties and shall remain in effect for a period of five (5) years unless terminated by either party. Either party desiring to terminate this agreement shall provide written notice of such intent not less than sixty (60) days prior to the effective termination date.

10. No official or individual of either organization covered by, or a party to, this agreement shall receive or be entitled to any personal benefit.

11. During the performance of this agreement, the cooperators agree to abide by the terms of Executive Order 11.246 on nondiscrimination and will not discriminate against any person because of race, color, religion, sex, or national origin.

12. This is a continuation of the original agreement entered into on 2/21/78. This Memorandum of Agreement is issued for the purpose of conforming to the Federal Grant and Cooperative Agreement Act of 1977 (Public Law 95-224) and the provisions of NPS 20, Federal Assistance and Interagency Agreements Guidelines, dated 12/11/78.

Don E Lusman — Signature — 2-19-81 — Date

Ted M. Cockrell — Signature — 2/12/81 — Date

DATA SHEET
COOPERATIVE AGREEMENTS

Title of Agreement Cooperative Firefighting Agreement

2. Agreement Number MA7350-81-03

3. Parties to Agreement Lyndon B. Johnson National Historical Park and Stonewall Volunteer Fire Department

4. Term of Agreement (Beginning and Ending Dates, Month and Year)
02/81 through 02/86

5. Date of Supplementals or Reaffirmations (if any)
None

6. Category (Always a primary and a secondary if necessary)
01-Fire

Purpose of Agreement
Mutual aid fire control--both wildfires and structural

8. Legislative or Other Authority
Acts of 8/25/16 and 8/21/35

9. Name, title, and office of NPS Official Signing Agreement
Ted M. Cockrell, Acting Superintendent, Lyndon B. Johnson National Historical Park

Typed name, title, and office of official submitting report	Signature	Date
Same as #9 above.	Ted M. Cockrell Ted M. Cockrell, Acting Superintendent	2-20-81

GPO 924-222

December 1977

STONE WALL VOL. FIRE DEPT.
A44 LYJO

United States Department of the Interior
NATIONAL PARK SERVICE
LYNDON B. JOHNSON NATIONAL HISTORIC SITE
P. O. BOX 329
JOHNSON CITY, TEXAS 78636

IN REPLY REFER TO:

No. MA 7350-81-03
(replaces numbered agreement dated 7/27/77)

Memorandum of Agreement
between
the
Lyndon B. Johnson National Historical Park
and the
Stonewall Volunteer Fire Department

In accordance with the Act of August 25, 1916, as amended and supplemented, and the Act of August 21, 1935, as amended, the National Park Service, Lyndon B. Johnson National Historical Park and the Stonewall Volunteer Fire Department hereby enter into an agreement to coordinate major fire suppression efforts on structural and wildland fires. The primary intent of this agreement is fire control, with minimum delay, in either party's area of jurisdiction.

1. Both parties shall furnish the other with the names and telephone numbers of persons to call when assistance is necessary. The National Park Service will require a written confirmation following any verbal request for assistance.

2. It shall be the duty of both parties to immediately report to the other party fires that endanger or exist on the protected area or land within the jurisdiction of the other party.

3. The fire suppression organization of either party is authorized to dispatch fire fighting crews when called upon to do so by the responsible official of the other party; and to assist in suppression of fires on or threatening lands protected by the other party. Suppression personnel of either party will take initial action when fires are discovered, but will report the fires to the responsible party as soon thereafter as possible.

4. Each party will furnish its own transportation and equipment unless the emergency requires that other arrangements be made. It is understood by both parties participating in this agreement that neither shall be liable to the other for any damage or personal injuries incident to the performance of work or use of equipment under the provision set forth in this agreement.

5. Neither organization shall jeopardize the security of an area by dispatching all available manpower and equipment to a going fire in the territory of the other party. The amount of necessary reserve will be determined by the responsible authority of each party.

6. The fire boss, or fire chief, on a going fire will be the ranking representative of the area in which the fire occurs unless the fire is first reached by a representative(s) of the other party; in which case he will be responsible for the initial attack and will remain on the fire until released by the party of primary responsibility and will thereafter be subordinate until released.

7. In the event of uncertainty or possible difference of interpretation of any of the foregoing provisions, the responsible officer from the area of the going fire will act upon his own initiative and good judgment to hasten the suppression of the fire.

8. As mutual training and equipment familiarization will be of great benefit during any fire, each party is encouraged to participate in the training activities of the other.

9. This agreement shall be effective on the date of signature by both parties and shall remain in effect for a period of five (5) years unless terminated by either party. Either party desiring to terminate this agreement shall provide written notice of such intent not less than sixty (60) days prior to the effective termination date.

10. No official or individual of either organization covered by, or party to, this agreement shall receive or be entitled to any personal benefit.

11. During the performance of this agreement, the cooperators agree to abide by the terms of Executive Order 11.246 on nondiscrimination and will not discriminate against any person because of race, color, religion, sex, or national origin.

12. This is a continuation of the original agreement entered into on 8/31/77. This Memorandum of Agreement is issued for the purpose of conforming to the Federal Grant and Cooperative Agreement Act of 1977 (Public Law 95-224) and the provisions of NPS 20, Federal Assistance and Interagency Agreements Guidelines, dated 12/11/78.

Signature _____ Date 2/14/81

Signature _____ Date 2/12/81

DATA SHEET
COOPERATIVE AGREEMENTS

1. Title of Agreement Cooperative Firefighting Agreement

2. Agreement Number MA7350-81-05

3. Parties to Agreement Lyndon B. Johnson National Historical Park and Fredericksburg Volunteer Fire Department

4. Term of Agreement (Beginning and Ending Dates, Month and Year)
10/81 through 10/86

5. Date of Supplementals or Reaffirmations (if any)
None

6. Category (Always a primary and a secondary if necessary)
01-Fire

Purpose of Agreement
Mutual aid fire control-both wildfires and structural

8. Legislative or Other Authority
Acts of 8/25/16 and 8/21/35

9. Name, title, and office of NPS Official Signing Agreement
Chrysandra Walter, Superintendent, Lyndon B. Johnson National Historical Park

Typed name, title, and office of official submitting report	Signature	Date
Same as #9 above	Chrysandra Walter Chrysandra Walter Superintendent	10/19/81

444 (special)

United States Department of the Interior
NATIONAL PARK SERVICE
LYNDON B. JOHNSON NATIONAL HISTORIC SITE
P. O. BOX 329
JOHNSON CITY, TEXAS 78636

IN REPLY REFER TO:

A44

No. MA 7350-81-05

Memorandum of Agreement
between
the
Lyndon B. Johnson National Historical Park
and the
Fredericksburg Volunteer Fire Department

In accordance with the Act of August 25, 1916, as amended and supplemented, and the Act of August 21, 1935, as amended, the National Park Service, Lyndon B. Johnson National Historical Park and the Fredericksburg Volunteer Fire Department hereby enter into an agreement to coordinate major fire suppression efforts on structural and wildland fires. The primary intent of this agreement is fire control, with minimum delay, in either party's area of jurisdiction.

1. Both parties shall furnish the other with the names and telephone numbers of persons to call when assistance is necessary. The National Park Service will require a written confirmation following any verbal request for assistance.

2. It shall be the duty of both parties to immediately report to the other party fires that endanger or exist on the protected area or land within the jurisdiction of the other party.

3. The fire suppression organization of either party is authorized to dispatch fire fighting crews when called upon to do so by the responsible official of the other party; and to assist in suppression of fires on or threatening lands protected by the other party. Suppression personnel of either party will take initial action when fires are discovered, but will report the fires to the responsible party as soon thereafter as possible.

4. Each party will furnish its own transportation and equipment unless the emergency requires that other arrangements be made. It is understood by both parties participating in this agreement that neither shall be liable to the other for any damage or personal injuries incident to the performance of work or use of equipment under the provision set forth in this agreement.

5. Neither organization shall jeopardize the security of an area by dispatching all available manpower and equipment to a going fire in the territory of the other party. The amount of necessary reserve will be determined by the responsible authority of each party.

6. The fire boss, or fire chief, on a going fire will be the ranking representative of the area in which the fire occurs unless the fire is first reached by the representative(s) of the other party; in which case he will be responsible for the initial attack and will remain on the fire until released by the party of primary responsibility and will thereafter be subordinate until released.

7. In the event of uncertainty or possible difference of interpretation of any of the foregoing provisions, the responsible officer from the area of the going fire will act upon his own initiative and good judgment to hasten the suppression of the fire.

8. As mutual training and equipment familiarization will be of great benefit during any fire, each party is encouraged to participate in the training activities of the other.

9. This agreement shall be effective on the date of signature by both parties and shall remain in effect for a period of five (5) years unless terminated by either party. Either party desiring to terminate this agreement shall provide written notice of such intent not less than sixty (60) days prior to the effective termination date.

10. No official or individual of either organization covered by, or party to, this agreement shall receive or be entitled to any personal benefit.

11. During the performance of this agreement, the cooperators agree to abide by the terms of Executive Order 11.246 on nondiscrimination and will not discriminate against any person because of race, color, religion, sex, or national origin.

12. This Memorandum of Agreement is issued for the purpose of conforming to the Federal Grant and Cooperative Agreement Act of 1977 (Public Law 95-224) and the provisions of NPS 20, Federal Assistance and Interagency Agreements Guidelines, dated 12/11/78.

Chrysandra F. Watkin — Signature

10/9/81 — Date

Dennis Herrmann — Signature

10/11/81 — Date

APPENDIX 9

WILDLAND STANDARD FIRE FIGHTING ORDERS

1. Keep informed on fire weather conditions and forecasts.
2. Know what your fire is doing at all times--observe personally, use scouts.
3. Base all actions on current and expected behavior of fire.
4. Have excape routes for everyone and make them known.
5. Post a lookout when there is possible danger.
6. Be alert, keep calm, think clearly, act decisively.
7. Maintain prompt communication with your men, your boss, and adjoining forces.
8. Give clear instructions and be sure they are understood.
9. Maintain control of your men at all times.
10. Fight fire aggressively but provide for safety first.

Fire Situations That Shout "WATCH OUT!"

1. You are building line downhill toward a fire.
2. You are fighting fire on a hillside where rolling material can ignite fuel below you.
3. You notice the wind begins to blow or increase or change directions.
4. You feel the weather getting hotter and drier.
5. You are on a line in heavy cover with unburned fuel between you and the fire.
6. You are away from burned area where terrain and/or cover makes the travel difficult and slow.
7. You are in country you have not seen in the daylight.
8. You are in an area where you are unfamiliar with local factors influencing fire behavior.

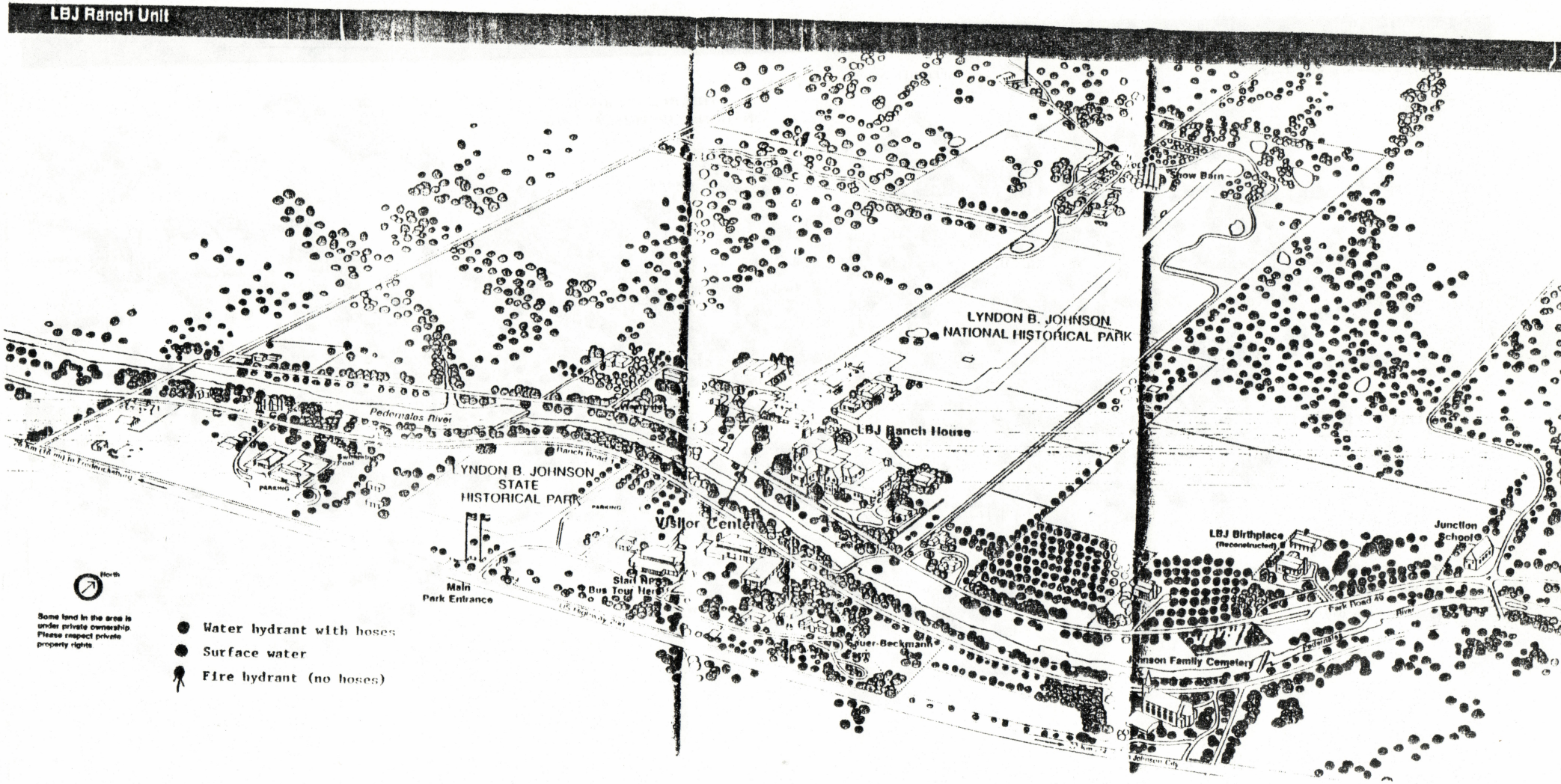
9. You are attempting a frontal assault on a fire with tankers.

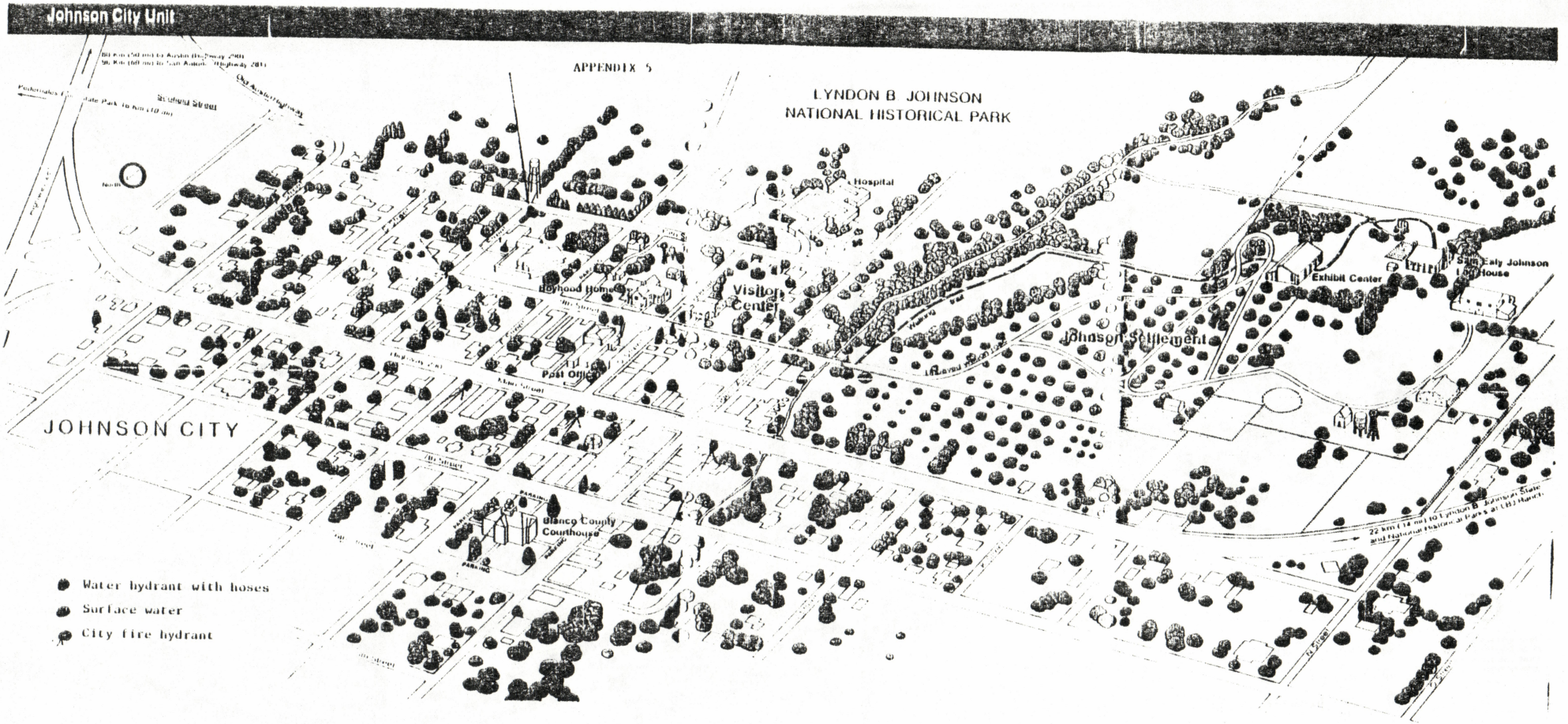
10. You are getting frequent spot fires over your line.

11. You cannot see the main fire and you are not in communication with anyone who can.

12. You have been given an assignment or instructions not clear to you.

13. You feel like taking a little nap near the fire line.


LBJ Ranch Unit
LYNDON B. JOHNSON
NATIONAL HISTORICAL PARK
LBJ Ranch House
Pedernales River
LYNDON B. JOHNSON
STATE
HISTORICAL PARK
Visitor Center
Main
Park Entrance
Bus Tour Here
Start Here
Sauer-Beckmann
Show Barn
LBJ Birthplace
(Reconstructed)
Junction
School
Park Road 49
Johnson Family Cemetery
North
Some land in the area is
under private ownership.
Please respect private
property rights
Water hydrant with hoses
Surface water
Fire hydrant (no hoses)


Johnson City Unit
APPENDIX 5
LYNDON B JOHNSON
NATIONAL HISTORICAL PARK
Hospital
Boyhood Home
Visitor Center
Exhibit Center
Sam Ealy Johnson House
Johnson Settlement
Post Office
JOHNSON CITY
Blanco County Courthouse
Water hydrant with hoses
Surface water
City fire hydrant

NATIONAL PARK SERVICE

SOUTHWEST REGION

TELEPHONIC REPORT OF SERIOUS WILDLAND FIRES

1. NPS AREA _____
2. LOCATION OF FIRE _____
3. HOW FIRE STARTED _____
4. WHEN FIRE STARTED _____
5. WHO IS IN CHARGE (AGENCY & FIRE BOSS) _____

   _____
6. WHAT AGENCIES ARE COOPERATING _____
7. NUMBER OF MEN & EQUIPMENT ON FIRE _____
8. SIZE OF FIRE _____
9. ESTIMATED TIME OF CONTROL _____
10. WEATHER FORECAST _____
11. TOPOGRAPHY, FUELS, ACCESSIBILITY, ETC. _____

    _____

REPORT RECEIVED FROM:

Name _____

Date _____

Time _____

By _____

NATIVE GRASS RESTORATION PLAN (SCS)

SCS-CONS-40
Rev. 3-69

SOIL AND WATER

CONSERVATION

PLAN

LYNDON B. JOHNSON NATIONAL HISTORICAL PARK

Cooperator

~~PEDERNALES SOIL AND WATER~~

CONSERVATION DISTRICT 218

Assisted by

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

U.S. GOVERNMENT PRINTING OFFICE 16—72303-4

U. S. Department of Agriculture
Soil Conservation Service

CONSERVATION PLAN AND PROGRESS IN APPLICATION

TX-CONS-832
Rev. 4-69
File Code No. CONS 14

COOPERATOR Lyndon B. Johnson National Historical Park AGREEMENT NO. III-2

LAND USES AND ACRES Recreationland/Rangeland - 85 acres; Otherland - 4 acres.

TOTAL ACRES 89

FIELDS OR PASTURES	WHAT IS TO BE DONE	AMOUNT OR EXTENT	AVERAGE COST $	TIME SCHEDULE AND ESTIMATED COST BY YEARS				
				19 81	19 82	19 83	19 84	19 85
CONSERVATION TREATMENT UNIT NO. 1 Recreationland/Rangeland - 85 ac. Fields - 1,2,3,4,5,6,7,8,11,13,14 and 15.								
1,3,4,5,6	RANGE SEEDING * Establish a mixture of native	29 ac.		(1 & 3) 10 ac.	(5 & 6) 19 ac.			
	grasses. Seedbed preparation- In fields 1 and 6							
	a prescribed fire will be carried out to re-							
	move the residue prior to the seeding. Fields 3							
	and 5 will be deep plowed twice with farm equip-							
	ment such as chisels to break up the hoof pan.							
	This to be followed by disking to control win-							
	ter weeds. If seedbed too loose, firm by using							
	a packer or roller prior to seeding. In field							
	4, a spike-tooth harrow or similar equipment							
	will be ~~drag~~ dragged to break up the crust on the soil							
	surface.							
	Seeding operation - Will be done with a Nis-							
	bet type grass drill.							

U. S. Department of Agriculture
Soil Conservation Service

CONSERVATION PLAN AND PROGRESS IN APPLICATION (Continued)

TX-CONS-832a
Rev. 4/69
File Code No. CONS 14

COOPERATOR Lyndon B. Johnson National Historical Park AGREEMENT NO. III-2

FIELDS OR PASTURES	WHAT IS TO BE DONE	AMOUNT OR EXTENT	AVERAGE COST $	TIME SCHEDULE AND ESTIMATED COST BY YEARS				
				1981	1982	1983	1984	1985
CONSERVATION TREATMENT UNIT NO. 1 continued.								
	Range seeding mixture at 100% seeding rate:							
	60% Little bluestem, 4.0 lbs. PLS per acre.	70 lbs.		24 lbs.	46 lbs.			
	20% Indiangrass, 5.0 lbs. PLS per acre.	29 lbs.		10 lbs.	19 lbs.			
	20% Sideoats grama, 6.0 lbs. PLS per acre.	35 lbs.		12 lbs.	23 lbs.			
1,2,3,4,5,6,7	WEED CONTROL * Weeds will be controlled by shredding	41 ac.		41 ac.	41 ac.	41 ac.	41 ac.	41 ac.
	and mowing about 1 inch above the average height							
	of growing grass, anytime shading or competition							
	becomes important. Mowing may necessitate remov-							
	al of some of the material to prevent shading or							
	smothering of the grass seedings. In field no.							
	7, being that it is under heavy pedestrian traf-							
	fic, vegetation will be maintained by fertilizing							
	annually and frequent mowings.							

U. S. Department of Agriculture
Soil Conservation Service

CONSERVATION PLAN AND PROGRESS IN APPLICATION (Continued)

TX-CONS-832a
Rev. 4/69
File Code No. CONS 14

COOPERATOR Lyndon B. Johnson National Historical Park AGREEMENT NO. III-2

FIELDS OR PASTURES	WHAT IS TO BE DONE	AMOUNT OR EXTENT	AVERAGE COST $	TIME SCHEDULE AND ESTIMATED COST BY YEARS				
				1981	1982	1983	1984	1985
CONSERVATION TREATMENT UNIT NO.1 continued								
1,2,3,4,5,6, 7	FERTILIZER APPLICATION * Fields 1,3,4,5 and 6 should be fertilized with about: 30 lbs. of Nitrogen per acre and 40 lbs. of Phosphorous per acre, for establishment of the Range Seeded grasses. Thereafter, these fields along with fields 2 and 7 should be fertilized according to a current soil test so as to maintain a good stand of grasses.	41 ac.		41 ac.	41 ac.	41 ac.	41 ac.	41 ac.
1,2,3,4,5,6, 11	DEFERRED GRAZING * Range seeded fields should be rested for one full growing season following the seeding, two if necessary. Thereafter fields should be rested at least 3 months during the growing season once every 3 years.	56 ac.		10 ac.	19 ac.	56 ac.	56 ac.	56 ac.

U. S. Department of Agriculture
Soil Conservation Service

CONSERVATION PLAN AND PROGRESS IN APPLICATION (Continued)

TX-CONS-832a
Rev. 4/69
File Code No. CONS 14

COOPERATOR Lyndon B. Johnson National Historical Park AGREEMENT NO. III-2

FIELDS OR PASTURES	WHAT IS TO BE DONE	AMOUNT OR EXTENT	AVERAGE COST $	TIME SCHEDULE AND ESTIMATED COST BY YEARS				
				1981	1982	1983	1984	1985
CONSERVATION TREATMENT UNIT NO.1 continued.								
1,2,3,4,5,6, 11	PROPER GRAZING USE * Will be obtained by grazing	56 ac.		56 ac.	56 ac.	56 ac.	56 ac	56 ac.
	no more than 50% by weight of the annual year's							
	growth of the key grass species. (See SCS Form							
	414 Proper grazing use)							
1,2,3,4,5,6, 11	PLANNED GRAZING SYSTEM * Grazing will be in such	56 ac.		56 ac	56 ac.	56 ac	56 ac.	56 ac.
	a manner that each field will be rested3 months							
	during the growing season once every 3 years.							
	Grasses will be allowed to go to seed and mature							
	so as to provide a continuous native grass seed							
	source, every other year. In such an instance							
	remove livestock from field on or about the month							
	of June.							

U. S. Department of Agriculture
Soil Conservation Service

CONSERVATION PLAN AND PROGRESS IN APPLICATION (Continued)

TX-CONS-832a
Rev. 4/69
File Code No. CONS 14

COOPERATOR Lyndon B. Johnson National Historical Park AGREEMENT NO. III-2

FIELDS OR PASTURES	WHAT IS TO BE DONE	AMOUNT OR EXTENT	AVERAGE COST $	TIME SCHEDULE AND ESTIMATED COST BY YEARS				
				19 81	19 82	19 83	19 84	1985
CONSERVATION TREATMENT UNIT NO. 1 continued.								
6,7,15	RECREATION AREA IMPROVEMENT* Prune tree limbs to above head height; remove undesirable underbrush around rest benches, and maintain existing trails to be used for pedestrian traffic.	19 ac.		19 ac.	19 ac.	19 ac.	19 ac.	19 ac.

TEXAS — FORAGE INVENTORY

SALVADOR SALINAS 6-17-81

LBJ NATIONAL HISTORICAL PARK

FIELD NUMBER	TOTAL ACRES	RANGE CONDITION	RANGE SITE *	ACRES/SITE	ACRES/ANIMAL-UNIT/YEAR-LONG	ANIMAL UNITS	TOTAL ANIMAL UNITS	ANIMAL UNIT MONTHS	
6	12	POOR	CL	12	18	0.6	1.0	12	
5	4	POOR	CL	1.5	18	.08			
		POOR	RSL	0.5	18	.03			
		POOR	RL	2	18	.1	0.2	2.5	
4	3	POOR	RSL	2.5	18	.1			
			RL	.5	18	.03	.13	1.6	
3	2	POOR	RL	2	18	.1	.1	1.3	
2	6	POOR	DR	6	17	.4	.4	4.8	
1	8	POOR	DR	8	17	.5	.5	6.0	
11	21	FAIR	DR	10	16	.6			
		FAIR	CL	11	16	.7	1.3	15.6	
							4	44	← TOTAL APPX.

* CL – CLAY LOAM
RSL – RED SANDY LOAM
RL – REDLAND
DR – DEEP REDLAND

802.1 The following animal unit equivalents will be used in Texas:

*Cow or cow with calf	1.00 AU
Bull - mature	1.25 AU
**Calf - weaned to 1 year	.60 AU
Steer - 1 year old	.70 AU
Steer - 2 years old	.90 AU
Horse - mature	1.25 AU
5 ewes with or without lambs	1.00 AU
5 rams	1.00 AU
8 lambs - weaned to 1 year past	1.00 AU
6 nannies with kids	1.00 AU
6 billies	1.00 AU
10 kids - weaned and yearling	1.00 AU
6 mutton goats - mature	1.00 AU
7 white-tailed deer	1.00 AU
5 mule deer	1.00 AU
7 antelope	1.00 AU
Exotics:	
5 Axis, Aoudad, Fallow, Mouflon	1.00 AU
9 Blackbuck antelope	1.00 AU
7 Sika	1.00 AU
2.5 Red deer	1.00 AU
1 Eland	1.00 AU

*Cow equivalent is based on a 1000-pound average weight. Animal units may be adjusted for cattle varying significantly from this weight.

**As a general rule, weaned light calves to 600 pounds equal .10 of an AU/100 pounds body weight. When computing animal unit equivalents of stocker animals consideration must be given to the projected growth of these animals as it occurs during the grazing period.

FARMER

DISTRICT COOPERATIVE AGREEMENT

RANCHER

Pedernales Soil and Water Conservation District

STATE OF TEXAS

This agreement is entered into by the Pedernales Soil and Water Conservation District, referred to hereinafter as the "District", and

Lyndon B. Johnson Nat'l Historical Park, P.O. Box 329

Johnson City, Texas 78636,

Referred to hereinafter as the "Farmer" "Rancher"

THE DISTRICT AGREES TO:

Assist in carrying out the conservation plan by furnishing to the (farmer, rancher) such (1) information, (2) technical assistance and supervision, and (3) other assistance as it may have available at the time the work is to be done.

THE FARMER / RANCHER AGREES TO:

1. Use his land within its capabilities.
2. Treat his land in keeping with its needs.
3. Develop as rapidly as feasible a conservation plan for his entire farm.
4. Start applying one or more conservation practices in keeping with these objectives and the technical standards of the district.
5. Maintain all structures established in an effective condition, and to continue the use of all other conservation measures put into effect.
6. Use any materials or equipment made available to him by the district for the purpose and in the manner provided for it.

IT IS FURTHER AGREED THAT:

1. This agreement will become effective on the date of the last signature and may be terminated or modified by the mutual agreement of parties hereto.
2. The provisions of this agreement are understood by the (farmer, rancher) and the district, and neither shall be liable for damage to the other's property resulting from carrying out this agreement unless such damage is caused by negligence or misconduct.

WITNESS THE FOLLOWING SIGNATURES:

Salvador Salinas (Witness)	6-22-81 (Date)	Jack D. Cockrell (Owner) Acting Superintendent
(Witness)	(Date)	(Owner)

Pedernales Soil and Water Conservation District

Date 6-22-81 By D. J. Whittington Jr

CONSERVATION PLAN MAP 2726 1

Owner Lyndon B. Johnson Nat'l Historical Park Operator Park Superintendent

County/Parish Blanco State Texas Date March 11, 1981

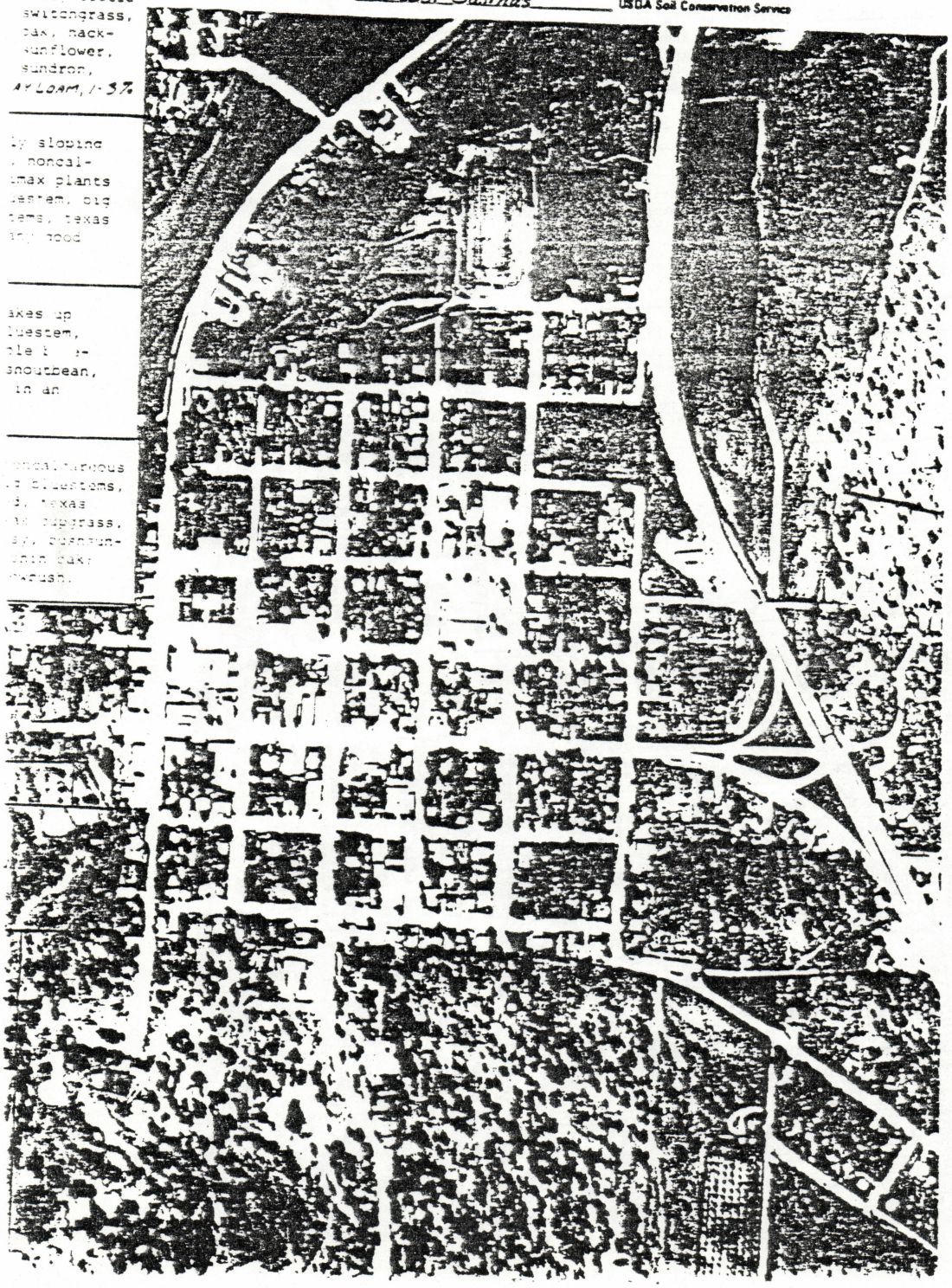
Approximate acres 89 ac. Approximate scale 1" = 440'

Cooperating with Pedernales Soil & Water Conservation District # 218

N

Plan identification III-4 Photo number Blanco Co. Soil Survey Sheet #44

Assisted by Salvador Salinas USDA Soil Conservation Service



Cc

Owner Lyndon B. Johnson Nat'l Historica

County/Parish Blanco

Approximate acres 89 ac

Cooperating with Pedernales Soil & Wate

Plan identification III-4

Assisted by Salvador

N

RANGE CONDITION CLASS:

The condition of a range refers to a comparison of the present native vegetative cover with the original plants which grew on this site.

Range condition is divided into the four following classes, depending on the percentage of desirable plants remaining.

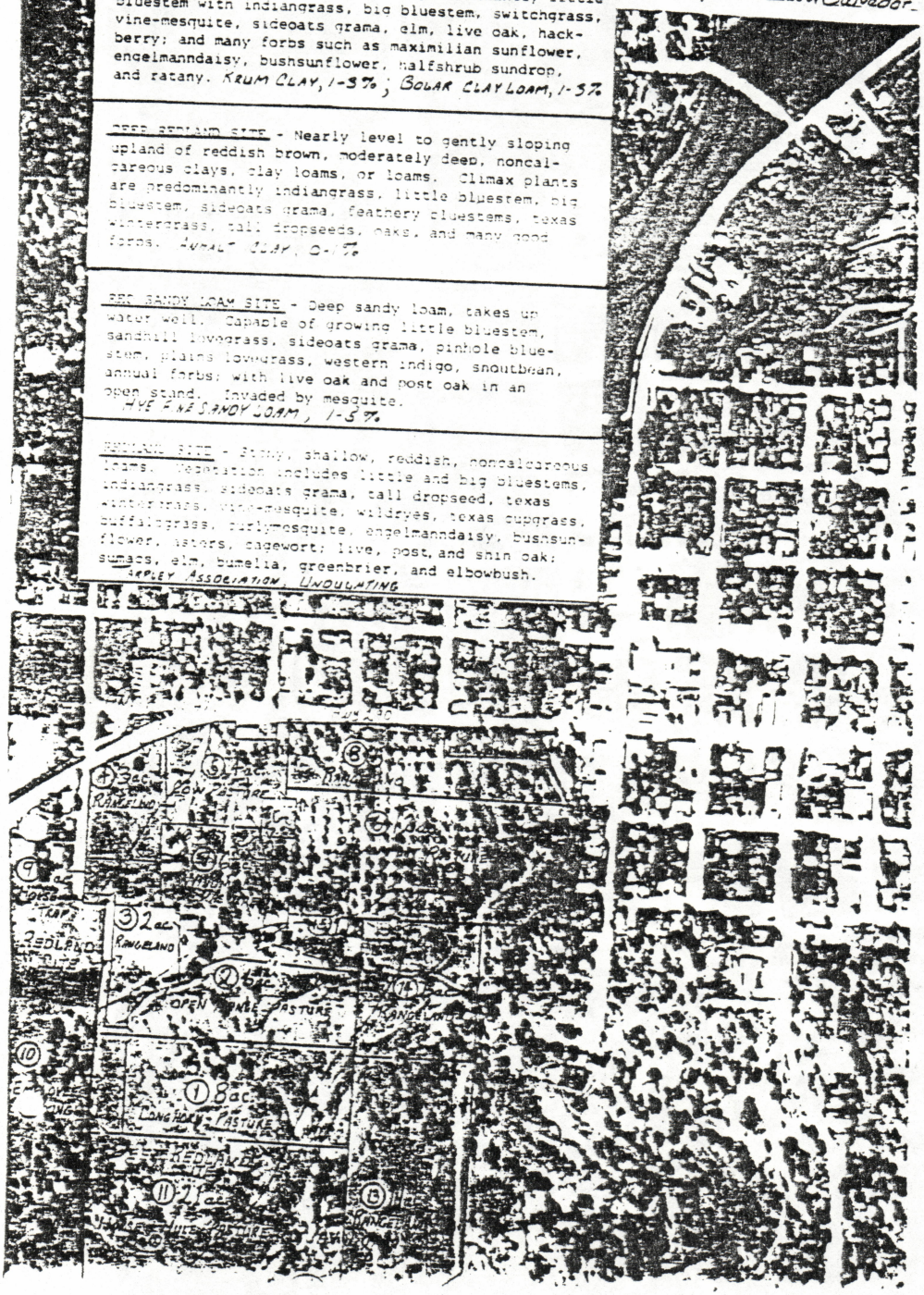
Excellent Condition	76-100%	Fair Condition	26-50%
Good Condition	51-75%	Poor Condition	0-25%

CLAY LOAM SITE - Nearly level to rolling uplands of clayey soils. Climax plants are predominantly little bluestem with indiangrass, big bluestem, switchgrass, vine-mesquite, sideoats grama, elm, live oak, hackberry; and many forbs such as maximilian sunflower, engelmanndaisy, bushsunflower, halfshrub sundrop, and ratany. KRUM CLAY, 1-3%; BOLAR CLAY LOAM, 1-3%

DEEP REDLAND SITE - Nearly level to gently sloping upland of reddish brown, moderately deep, noncalcareous clays, clay loams, or loams. Climax plants are predominantly indiangrass, little bluestem, big bluestem, sideoats grama, feathery bluestems, texas wintergrass, tall dropseeds, oaks, and many good forbs. ANNAL SOAK, 0-1%

DEEP SANDY LOAM SITE - Deep sandy loam, takes up water well. Capable of growing little bluestem, sandhill lovegrass, sideoats grama, pinhole bluestem, plains lovegrass, western indigo, snoutbean, annual forbs; with live oak and post oak in an open stand. Invaded by mesquite.
HYE FINE SANDY LOAM, 1-3%

REDLAND SITE - Stony, shallow, reddish, noncalcareous loams. Vegetation includes little and big bluestems, indiangrass, sideoats grama, tall dropseed, texas wintergrass, vine-mesquite, wildrye, texas cupgrass, buffalograss, curlymesquite, engelmanndaisy, bushsunflower, asters, cagewort; live, post, and shin oak; sumacs, elm, bumelia, greenbrier, and elbowbush.
BRACKETT ASSOCIATION, UNDULATING



CONSERVATION PLAN MAP 22726

Owner Lyndon B. Johnson Nat'l Historical Park Operator Park Superintendent

County/~~Parish~~ Blanco State Texas Date 3-11-81

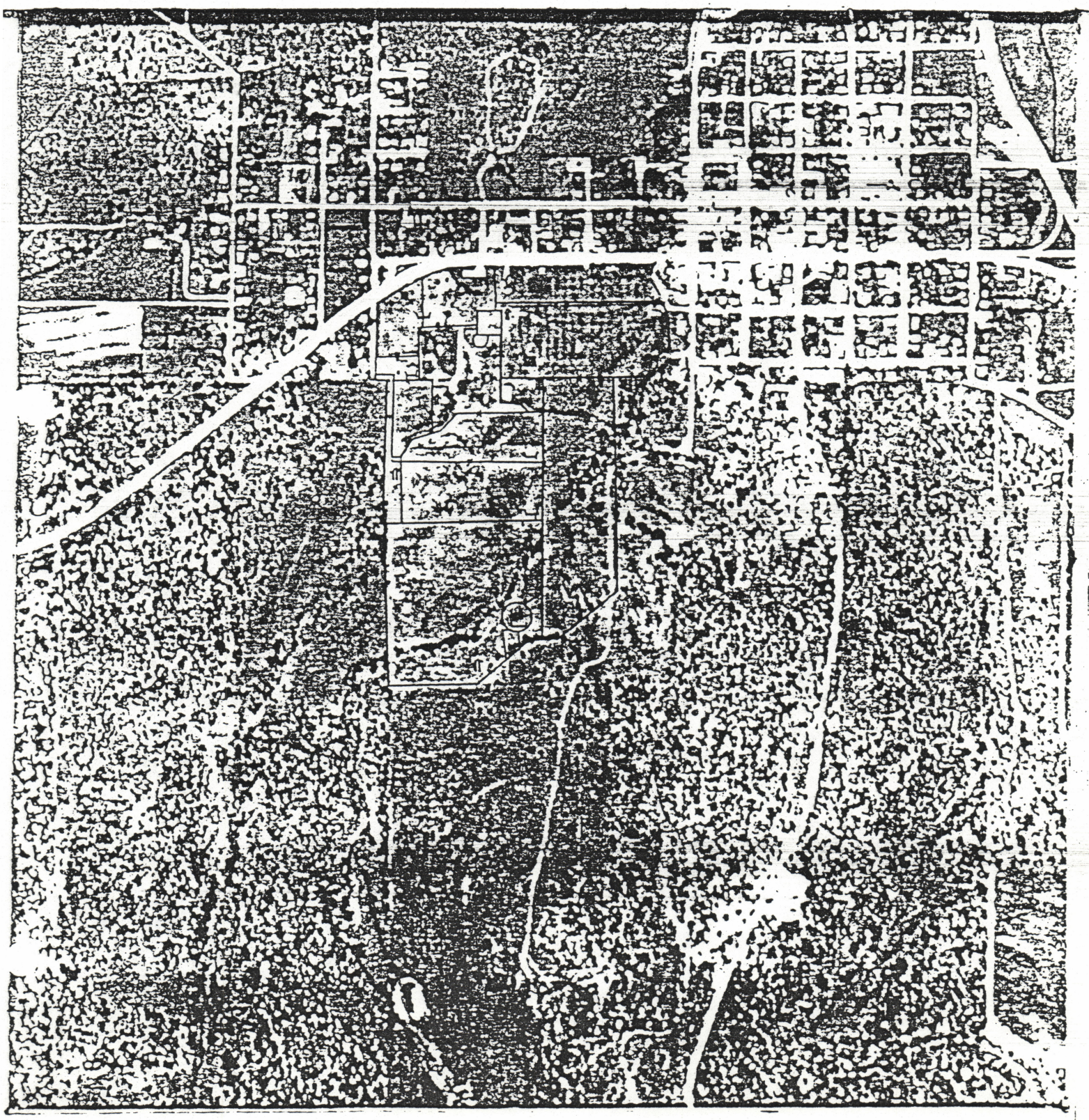
Approximate acres _____ Approximate scale 1" = 880'

Cooperating with Pedernales Soil & Water Conservation District # 218

N

Plan identification III-4 Photo number sheet # 44

Assisted by Salvador Salinas USDA Soil Conservation Service



CONSERVATION PLAN MAP SYMBOLS

Roads

Public Road

Farm or Ranch road

TRAIL — Trail (label)

Railroads

Single track

Bridge

GAS ETC / WATER — Pipeline (label)

Power-transmission line
(Label *"BURIED"* if underground)

TTTTTT — Telephone or telegraph line
(Label *"BURIED"* if underground)

Buildings

School

Church

CEM — Cemetery

Gravel pit, open mine, or quarry (label)

Small

GRAVEL PIT — Large

Levee

Without road

With road

Corral

CATTLEGUARD — Gate or cattle guard (label)

Perennial streams

Intermittent streams

LAKE — Lake

Intermittent lake or pond

Spring

Swamp or marsh (large areas)

Ownership boundary

Field or land use boundary

Land capability, range or woodland site boundary

Range condition boundary

EC GC FC PC — Range Condition

H — Farmstead

(2) — Field number

Vegetative waterway

Fence

Pipeline

Flume or syphon

CANAL / CANAL — Canal (label)
(If lined indicate in label)

Irrigation ditch

Irrigation or Row direction

Diversion

Diversion (Level)

Diversion (Net Wire)

Drainage or open drain

Closed or tile drain

Terrace (Level)

Terrace (Gradient)

Division box or turnout

TX-802

U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, TEMPLE, TEXAS
REV. 6-70

CONSERVATION PLAN MAP SYMBOLS (Continued)



Drop Structure



Dam and reservoir



Stock pond or tank

Spring development

Trough



Well (label)



Windmill



Water tank (label)



Pump



Small reservoir

Project Measures



Floodwater retarding structure



Water supply structure



Multiple-purpose structure



Stabilization or sediment storage structure



Stream channel improvement for flood prevention

Indicate purpose of water supply: I-Irrigation, M-Municipal, FW-Fish and wildlife, R-Recreation

Other Symbols

U. S. Department of Agriculture
Soil Conservation Service

TX-RANGE-802
Rev. 2/72
File Code No. RANGE 14

WORKSHEET FOR DETERMINING RANGE CONDITION AND EVALUATING FORAGE PREFERENCES & USE

Range Site CLAY LOAM
Pasture No. 6
Date 4-29-91

Location BLACK (R) ON PLAN MAP
Operator LBJ NAT'L PARK SUPERINTENDENT
Conservationist SALVADOR SALINAS

Species Potential & Present	% in Climax	Present Composition Lbs.	Present Composition %	% Climax Present	Interpretations - Plants Reaction to continuous grazing or preference by: Kinds of grazing animal: CATTLE	DEER
LITTLE BLUESTEM	40				P	LV
INDIANGRASS			4	4	P	LU
BIG BLUESTEM	20				P	LV
SWITCHGRASS					P	LV
CANADA WILDRYE			T		P	S
VIRGINIA WILDRYE					P	S
CANE BLUESTEM			6	6	S	LV
PINHOLE BLUESTEM	15				S	LU
VINE-MESQUITE					S	LU
SIDEOATS GRAMA					S	LU
TEXAS CUPGRASS					P	LU
TALL DROPSEEDS			T		S	LU
PLAINS LOVEGRASS					S	LU
BUFFALOGRASS					S	LU
LOW PANICUMS	5		T		S	P
SEDGES			T		S	LV
ELM					LU	P
LIVE OAK	10				LU	P
HACKBERRY					LU	P
SUMAC SPECIES					LU	S
KUMELIA	T				LV	P
ELBOWBUSH					LV	P
MAXIMILIAN SUNFLOWER					P	P
ENGELMANNDAISY			T		P	P
BUSHSUNFLOWER					P	P
FAYFEATHER			T		LV	S

U. S. Department of Agriculture
Soil Conservation Service

TX-RANGE-802
Rev. 2/72
File Code No. RANGE 14

WORKSHEET FOR DETERMINING RANGE CONDITION AND EVALUATING FORAGE PREFERENCES & USE

Range Site CLAY LOAM — Location BLACK ⊗ ON PLAN MAP
Pasture No. C — Operator LBJ (NAT'L) PARK SUPERINTENDENT
Date 4-29-81 — Conservationist SALVADOR SALINAS

Species Potential & Present	% in Climax	Present Composition Lbs.	Present Composition %	% Climax Present	Interpretations - Plants Reaction to continuous grazing or preference by: Kinds of grazing animal: CATTLE	DEER
BLACKSAMSON					P	LV
PENTSEMON					P	P
HALFSHRUB SUNDROP					P	P
BUNDLEFLOWER					S	P
SENSITIVEBRIAR					S	P
DALEAS	10				S	P
PRAIRIECLOVER					S	P
VETCH					S	S
CATANY					S	S
YELLOW NEPTUNIA					S	P
WILDBEANS					S	P
MILKPEA					LV	P
TICKCLOVER					S	S
WESTERN RAGWEED	T				LV	LV
SNOW-ON-THE-MOUNTAIN					LV	LV
PURPLETOP			3		P	LV
JOHNSONGRASS			28		S	LV
TEXAS WINTERGRASS			5		S	S
PURPLE THREE-AWN			6		LV	LV
TEXAS GRAMA			1		LV	LV
WHITE TRIDENS			1		P	LV
SAW-TOOTH GREENBRIAR			4		LV	P
LUY-TREEBINE			1		LV	LV
PECAN			3		LV	LV
HONEY MESQUITE			1		LV	LV
FLAME-LEAF SUMAC			3		LV	LV
BUR CLOVER			4		S	P
STORKSBILL			4		LV	P

U. S. Department of Agriculture
Soil Conservation Service

TX-RANGE-802
Rev. 2/72
File Code No. RANGE 14

WORKSHEET FOR DETERMINING RANGE CONDITION AND EVALUATING FORAGE PREFERENCES & USE

Range Site _____ Location _____
Pasture No. _____ Operator _____
Date _____ Conservationist _____

Species Potential & Present	% in Climax	Present Composition Lbs.	Present Composition %	% Climax Present	Interpretations - Plants Reaction to continuous grazing or preference by: Kinds of grazing animal: CATTLE	DEER
MILKVETCH			T		LV	P
DANDELION			T		LV	LV
DAKOTA VERBENA			1		LV	P
WILD BUCKWHEAT			T		LV	LV
UPRIGHT PRAIRIE CONEFLOWER			5		LV	LV
THISTLE			1		LV	LV
THELESPERMA			3		LV	S
REDSEED PLANTAIN			4		LV	P
ROSE-RING GALLARDIA			6		LV	LV
TEXAS BLUEBONNETT			8		LV	LV
TOTALS	100%	1200 lbs	100	10%		

Est. Initial Stocking rate 20 ac/AU/10-Lg

Range Trend 0
Up Static Down
\+ 0 -
Canopy % _____

Range Condition

Range condition is the % of present plants that are climax -- Excellent 76-100; Good 51-75; Fair 26-50; Poor 0-25

*Key Grazing Plant
Int = Introduced
P - Primary - Decreases
S - Secondary - Increases
LV - Low Value - Increase & Invader

TOTAL ESTIMATED YIELD IN CLIMAX 3000 - 6500 # AIRDRY VEGETATION

U. S. Department of Agriculture
Soil Conservation Service

TX-RANGE-802
Rev. 2/72
File Code No. RANGE 14

WORKSHEET FOR DETERMINING RANGE CONDITION AND EVALUATING FORAGE PREFERENCES & USE

Range Site DEEP REDLAND — Location SEE FIELD D. PLAN MAP
Pasture No. 11 — Operator LBJ NAT'L PARK SUPERINTENDENT
Date 4-29-81 — Conservationist SILVESTRE FLORES

Species Potential & Present	% in Climax	Present Composition Lbs.	Present Composition %	% Climax Present	Interpretations - Plants Reaction to continuous grazing or preference by: Kinds of grazing animal: CATTLE	DEER
LITTLE BLUESTEM	45				P	LU
INDIANGRASS					P	LU
SIDEOATS GRAMA	10				S	LU
PINHOLE BLUESTEM	10				S	LU
TEXAS CUPGRASS					S	LU
MEADOW DROPSEED	5		T		S	LU
VINE-MESQUITE					S	LU
WHITE TRIDENS	5				S	LU
CANADA WILDRYE					P	S
TEXAS WINTERGRASS	10		24	10	S	S
PLAINS LOVEGRASS					S	LU
BUFFALOGRASS			18	5	LU	LU
CURLY MESQUITE					LU	LU
FALL WITCHGRASS	5				S	S
SCRIBNERS PANICUM					S	S
SEDGES					LU	LU
POST OAK					LU	S
BLACKJACK OAK	5				LU	S
LIVE OAK					LU	S
GREENBRIAR			T	T	LU	P
ENGELMANNDAISY					S	P
RUSH SUNFLOWER					P	P
SENSITIVE BRIAR	4				LU	P
BUNDLEFLOWER			3	3	S	P
CLIARA					P	P
MALLOW SP.					LU	P
ANNUAL FORBS	1		7	1	LU	P

U. S. Department of Agriculture
Soil Conservation Service

TX-RANGE-802
Rev. 2/72
File Code No. RANGE 14

WORKSHEET FOR DETERMINING RANGE CONDITION AND EVALUATING FORAGE PREFERENCES & USE

Range Site DEEP REDLAND
Pasture No. 11
Date 4-29-81

Location BLACK ⊗ ON PLAN MAP
Operator LBJ NAT'L PARK SUPERINTENDENT
Conservationist SALVADOR SALINAS

Species Potential & Present	% in Climax	Present Composition Lbs.	Present Composition %	% Climax Present	Interpretations - Plants Reaction to continuous grazing or preference by: Kinds of grazing animal: CATTLE	DEER
TEXAS ERAMA			14		LV	LV
PURPLE THREE-AWN			3		LV	LV
PLAINS BRISTLEGRASS			3		S	LV
HAIRY TRIDENS			T		LV	LV
BLUEBERRY JUNIPER (CEDAR)			2		LV	LV
PECAN			T		LV	LV
HONEY MESQUITE			T		LV	LV
HACKBERRY			T		LV	S
BACCHARIS			T		LV	LV
CLOVER			7		LV	P
MILKVETCH			3		LV	P
STORKSBILL			T		LV	P
DAKOTA VERBENA			2		LV	P
SLENDER VERBENA			T		LV	P
RABBIT TOBACCO			5		LV	S
BUTTERCUP			T		LV	P
QUEENS DELIGHT			5		LV	S
MEADOW-PINK			2		LV	P
REDSEED PLANTAIN			2		LV	P
TOTALS	100%	1300 lbs.	100%	19% → POOR CONDITION		

Est. Initial Stocking rate 20 ac/AU/YR 26.

Range Trend 0
Up Static Down
\+ 0 -
Canopy % 0-5%

Range Condition

Range condition is the % of present plants that are climax -- Excellent 76-100; Good 51-75; Fair 26-50; Poor 0-25

*Key Grazing Plant
Int = Introduced
P - Primary - Decreases
S - Secondary - Increases
LV - Low Value - Increase & Invader

TOTAL ESTIMATED YIELD IN CLIMAX 2500 - 5000# AIR-DRY VEGETATION

APPENDIX G

IMPLEMENTATION OF DEVELOPMENT CONCEPT PLAN

In 1980 a Development Concept Plan was written and approved by Lyndon B. Johnson National Historical Park. This plan was used as a basis for legislation which raised the development ceiling and authorizes acquisition of land and easements by both purchase and donation.

The implementation of this plan awaits funds for land acquisition. In the meantime we have programmed the following projects which will be required for full implementation:

11593 Survey (Park Wide)
Construct Park Operation Center (Ranch)
Construct Sewer System & Treatment Plant (Ranch)
Improve Birthplace/Cemetery Area (Ranch)
Rehabilitate S. E. Johnson Farmhouse (Ranch)
Construct Trail, LBJ Ranch
Rehabilitate Roads, LBJ Ranch
Rehabilitate Alexander House for Visitor Center (Johnson City)
Rehabilitate Rosa House for Restrooms (Johnson City)
Improve Visitor Parking and Trails (Johnson City Unit)
Construct Connection Between Airstrip and Bailey Road (Ranch)
Improve Interpretive Exhibits and Signs (Park Wide)
Rehabilitate Walker House for Library (Johnson City)
Rehabilitate Cox House for Office/Workshop (Johnson City)
Rehabilitate Wilson House for Ranger Residence (Johnson City)
Improve and Relocate Cedar Rail Fencing (Johnson City)

APPENDIX H

PECAN MANAGEMENT PLAN

(This action plan is in the form of a working draft. The recommendation and methodology are in use and the plan is being field tested.)

INTEGRATED PEST MANAGEMENT PLAN
FOR LYNDON B. JOHNSON NATIONAL HISTORICAL PARK
PECAN ORCHARDS

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INTEGRATED PEST MANAGEMENT PLAN
FOR LYNDON B. JOHNSON NATIONAL HISTORICAL PARK
PECAN ORCHARDS

HISTORICAL INTRODUCTION

The existing Jordan Pecan Orchard at Lyndon B. Johnson National Historical Park (LYJO) is situated adjacent to the 1889 farmhouse where President Johnson was born. Sam Ealy Johnson, Jr., President Johnson's father, inherited the house and adjoining land from his father (Sam Ealy Johnson, Sr.); however, in 1947, Harvey A. Jordon, an individual who previously owned a pecan shelling business in San Antonio, Texas, bought the property now supporting the (LYJO) pecan orchard. Jordan named his new enterprise the Bar-B-J Orchards and, within a year, according to a former orchard operator, hired local laborers (Ferdinand Gellermann, Henry Beckmann, Clifton Burg, and Rudy Perez) to hand-dig holes in which he planted budded pecan trees in approximate proportions of: Western Schley-70%; Burkett-15%; John Garner-5%; San Saba Improved-5%; and Desireable-5%. Jordan also planted a few acres of peach trees on his land and began raising cover crops of small grains, corn, sudan grass, and hay under pecan trees as cattle and sheep forage. He erected a dam on the Pedernales River in 1947 not only as an aid in flood control and to supply surface water for irrigating his orchards and field crops but, and most importantly to Jordan, as a means for raising the ground water level for subsurface irrigation of pecan trees.

During fall and winter months of the 1960's, Jordan engaged in profitable roadside business selling pecans to travelers visiting the LBJ birthplace and touring along what is now Park Road 49. His pecan trees remained quite productive during the 1960's and 1970's because weather conditions were ideal and because of supplemental irrigation supplied the trees.

President and Mrs. Johnson purchased the Sam Ealy Johnson Farmhouse in 1963 along with a few attached acres of land in order to reconstruct the President's birthplace. The reconstruction was completed in 1964 but title to the land did not pass from the Johnson's to the National Park Service until about 1969. Ten budded and 4 native pecan trees were acquired by the National Park Service on acreage accompanying this transfer.

The Texas Broadcasting Corporation (a Lyndon B. Johnson company) leased 233 acres of property for ranching and farming interests from Harvey Jordan in 1964. That lease, however, provided Jordan would care for the orchards and be entitled to any profit from the pecan trees. The lease continued until the property was actually purchased from Jordan by the Texas Broadcasting Corporation in 1972. From 1964 to 1970, Mr. William B. Hodges operated the Jordan pecan grove for Mr. Jordan and Hodges received one-half of the profits from the pecan harvests. Mr. Jordan died in 1970 but Hodges continued under the same contract with the Harvey A. Jordan Estate for 1970 and 1971 harvests and continued under similar contract with the new land owners, Texas Broadcasting Corporation, for the 1972 harvest.

In December 1972, 201 acres of land from the Johnson holdings were donated by President and Mrs. Johnson to the National Park Service for the expansion of

the developing Lyndon B. Johnson National Historical Site. That parcel contained 97 budded and 62 native pecan trees. Also, President and Mrs. Johnson contributed funds to the National Parks Foundation in late 1972 for the purchase of 35 additional acres of land at Johnson City, Texas, known as the "Old Ranch" of President Johnson's grandfather and great uncle. That acreage became part of the Lyndon B. Johnson National Historical Site and contains 139 budded and 114 native pecan trees. But 72 of the budded trees were removed in 1981 to recreate the historical landscape. Other acreage to the south, known as the "Back Forty" of the "Old Ranch," was leased by the National Park Service and contains 106 native pecan trees. The budded pecan trees on both the "Old Ranch" and on the Back Forty" (Burkett and Western Schley varieties) were planted by Ohlen and Ava Cox in December 1928 and January 1929.

From 1973 to 1982, Mr. Dale Malechek leased original Jordan property (except for portions within the National Historic Site) from the Texas Broadcasting Corporation for ranching, farming, and pecan growing purposes. During the early and mid-1970's, Malechek grazed cattle and sheep in the orchards on winter oats and sudan grass cover crops. The pecan trees seemed to prosper during those years, probably because of irrigation supplied to cover crops.

Mrs. Johnson donated about 13 acres of riverbottom lands south of the Pedernales River (directly in front of the main ranch house) to the National Park Service in 1978. That tract contained only one budded but 75 native pecan trees. In 1980, Mrs. Johnson traded 11.4-acres of the original Jordan Pecan Orchard land to the National Park Service for another tract known as "Reagan Riverbottoms," containing 140 budded and 10 native pecan trees, which became part of the Lyndon B. Johnson National Historical Site.

All native pecan trees in the Lyndon B. Johnson National Historical Park are indigenous and range in age to an estimated 400 years. The total number of pecan trees on the Historical Site (as of September 1982) is:

	BUDDED	NATIVE
LBJ RANCH AREA.....	238	156
JOHNSON CITY AREA.....	139	220
TOTAL	377	376
ELIMINATED 1981	- 72	
TOTAL	305	376

STATEMENT FOR MANAGEMENT

The Statement for Management of the Lyndon B. Johnson National Historical Park outlines one goal of park management to be maintenance of historical park settings similar to those existing between the years 1963 and 1973. The orchards and pecan trees are considered representative of that period of time in President Johnson's life and, thus, become objects of historical concern.

The objectives of this plan are to outline methodologies for:

(1) Preparation of economic/aesthetic thresholds of biological pest control.

(2) Description of conditions under which chemical pesticides/fungicides may be used.

(3) Development of guidelines for insect pest controls that, with as natural means as possible, provide for good tree health and pecan havests which may be sold for profit by the park.

INTRODUCTION TO INTEGRATED PEST MANAGEMENT PLAN

"Successful pecan orchard management relies upon the development and maintenance of healthy pecan trees kept relatively free from insect damage and disease." At least 80 leaflets are required to synthesize sufficient carbohydrates to produce a single pecan nut; therefore, optimum nut harvest, depends on keeping trees in leaf as long in the season as possible. Abundantly leafed trees are also regarded to be of considerable aesthetic benefit to visitors who enjoy strolling in the shade and eating a nut or two.

Various planning practices used by commercial orchards (i.e., site analysis, orchard design, selection of hybrid varieties, relatively unrestricted use of chemical pesticides and herbicides, etc.) are partly or totally out of National Park Service control because:

- the service has taken over already established pecan groves,
- is restrained in the use of certain pesticides/herbicides or combinations of such materials and,
- has the responsibility to manage already established, older, native trees, some of which occur randomly along bands of the Pedernales River.

However, certain other orchard management prerogatives still remain with the Service:

- intercropping,
- grounds maintenance and field sanitation practices,
- irrigation methodologies,
- soil improvement techniques,
- pruning,
- decisions encouraging relatively natural biological control over insects/pests/diseases.

The costs of these orchard management practices, when compared with expected and actual net monetary gains from nut sales, permit cost/benefit analyses (as in Appendix II). These analyses provide basic data facilitating economic decisions on feasible intensities of orchard maintenance.

This Orchard Management Plan is designed to suggest alternatives and consider what seem the best, most logical, and modern of methodologies for management of the LYJO pecan orchards given existing regulations on use of pesticides. The plan is intended to be a "living" document, permitting, as necessary, periodic testing, revision, and modification of techniques/treatments used by park management so as to best and most economically grow and maintain healthy, attractive trees.

Although production of saleable pecans is of secondary importance in the plan, potential income from nut harvests should not be overlooked. Provisions exist to allow for profits from nut sales to be applied to park orchard/living history budgets; however, cost/benefit analyses must be carefully considered. Necessary expenses, both in time and manpower, for disease, pest control or

other actions enhancing production of saleable nuts should not too greatly exceed expected crop income.

IPM ORCHARD MANAGEMENT PLAN OBJECTIVES

Primarily important in this Plan is the successful maintenance of healthy pecan trees by as many permissible natural/biological control methodologies as feasible. Information and knowledge gained from successful natural/biological controls could (and, should) serve as practical guidelines for neighboring commercial growers: demonstrating balanced natural/biological/chemical control of pecan pests/diseases as based on strong concerns for environmental integrity and preservation.

Selection of "No Control" alternatives for orchard pest management are not desirable and would result in defoliation, decreased vitality, and death of many trees while producing minimal to zero pecan nut crop returns. However, conversely, neither is it desirable for the park to follow locally accepted commercial grower standards for maximum pecan nut crop returns, which require elaborate chemical/pesticide/herbicide spray programs, killing not only detrimental but also beneficial insects (as well as higher order organisms) and assuring orchards remain in their current unnatural predator/prey balance. Just as importantly, commercial pesticide programs provide unacceptable and damaging levels of specific chemical pesticides/ herbicides that continue to build up and remain in the environment.

NECESSARY IPM INFORMATION BASE

An effective integrated pest management program for LBJ requires a variety of important information:

1. A complete knowledge of both pest and beneficial organisms.
2. Adequate insect monitoring programs which detail changes in predator/prey populations.
3. Ability to ascertain expected and actual plant injury levels.
4. Knowledge of preventative strategies, alternatives and techniques.
5. Economic and aesthetic thresholds to initiate pest control.
6. Selective suppressive tactics.
7. Evaluation of procedures used.

The park and Regional Office will continue to develop information files on these and other related topics until such time as sufficient new information becomes available to bring about revision of this plan.

INTEGRATED PEST MANAGEMENT PROGRAM

SUGGESTED MECHANICAL METHODOLOGIES

1. Soils and Soil Improvement Studies

Proper substrate and drainage are vitally important for plant growth; however, knowledge of physical soil characteristics at LBJ is rather limited. Studies will be planned, funded, and conducted to determine the existing condition of soils in which LBJ pecan trees are growing (i.e., organic content, soil profile studies, soil percolation, calcium testing, pH, soil moisture regimes, soil texture and depth) so that judicious use be maximally made of water and soil enrichment possibilities. Healthy plants are known to better be able to resist and throw off pest and disease influences and be maximally productive relative to other controlling circumstances.

2. Sanitation Practices and Weed Control

Many insect pests and disease organisms are known to overwinter or thrive in debris from previous season's growth which accumulates beneath trees. Certain weeds are known to be vectors of disease and insect pests as well as strongly competing with trees for water and soil nitrogen. Scheduled soil disking (a depth less than 3 inches to prevent damage to tree roots) 3 to 6 times a year and plowing, raking, and clean-up under trees will be scheduled, Soil tilling will destroy stinkbug hosts, beggarweed, thistle, jimsonweed, and maypop. Fence rows will be kept clear of brush, All dead trees, limbs, and pecan nut parts will be promptly removed/disked so infected parts do not spread disease. It is important to recognize that good grounds maintenance is a first and major step in controlling insect pests and disease.

Although some of these efforts may not be considered totally compatible with maintenance of desired historical scenes, they are regarded better environmental alternatives than use of chemical pesticides.

Grazing of the orchards with a balanced diversity of domestic livestock types (cattle, sheep, horses, goats, etc.) may be considered compatible with good control of weeds and excessive vegetation growth; however, soil compaction, resulting from such grazing, could prevent fullest use of this alternative.

All soil disturbance factors on lowland, river bank sites, are known to increase the potentials for sheet erosion and result in great loss and facilitating undesirable changes in river course. Pecan trees on alluvial river soils will require slighty different grounds maintenance (i.e., methods that do no alter the soil surface) to prevent insect/disease damage.

3. Pruning and Spacing of Trees

Certain pruning regimes and tree spacing arrangements have been shown effective for providing greater air circulation through and around pecan trees, reducing humidity and deterring the incidence of fungal diseases. Dead limbs and excessive tree growth will be pruned every 2 years. Lower limbs

will be trimmed to facilitate air flow through and around trees to reduce humidity and decrease fungal incidence. Greater space within the tree canopy and fewer lower limbs not only assists in being able to work closer to the trees with orchard maintenance equipment, but also enhances production of relatively greater sized pecan nuts.

4. Intercropping

Various orchard ground cover intercrops are known to be beneficial as "green lost in cropping. Additionally, attractive ground cover has an agreeable aesthetic value. Suggested ground cover for the LBJ pecan orchards are small grain plantings (oats) and hairy vetch which, to be most useful, should be plowed back into the soil, increasing soil organic content and soil aeration. Organic soils are also known to be capable of holding large quantities of water. Added irrigation, necessary to maintain ground cover, is expected to be of addition benefit to pecan tree growth.

5. Zinc Management

Zinc is necessary as a trace element in the photosynthetic processes of pecan leaves for production of carbohydrates. Highly alkaline soils at LBJ, and generally throughout South Texas, bind zinc into chemical combinations unavailable to pecan trees. Foliar application of zinc, although inferior to supplying it to the roots, is the only effective way to provide this mineral to pecans in South Texas. Thus, foliar spray applications of zinc should be applied in combination with any other pecan spray treatments for as long as the trees are in leaf. Zinc nitrate, however, is not considered a desirable chemical to apply to pecans in South Texas. (It can be toxic to trees when applied under conditions of high atmospheric humidity.) Test of pecan leaf tissue for zinc uptake which has taken place during preceding growing seasons will be planned for late fall each year. Results of such tests will supply important guidelines for planning yearly zinc application strategies. Guidelines for plant tissue sampling, including names and addresses of testing laboratories and recommended authorities, will be obtained by the park and Region and attached to this plan as an Appendix.

6. Nitrogen Management

Nitrogen, necessary for plant growth and development, must be replaced to soils as successive crops are harvested. Proper terminal growth in pecans requires 90-120 lbs. of nitrogen per acre and, may be periodically applied through the growing season as a foliar spray and or soil application. All applications of nitrogen should terminate in June in order to prevent encouragement (stimulation) of tender shoot growth which could be damaged by cold weather conditions.

7. Irrigation Management

Pecan trees require at least 48 inches (but not more than 70 inches) of water per year. Three (May, June, and July) to four deep waterings per year (each adding 6-12 additional inches of water) should be supplied to trees located at

any appreciable distance from natural sources of surface or subsurface water. Water can also be beneficially applied at rates of 1-1/2 to 2 inches per week during summer or by drip or low volume sprinkler irrigation. Studies will be conducted to determine the best methods for irrigating the orchards but such methodology must include considerations for the least possible increase in relative humidity. High humidity conditions enhance the growth and spread of various fungal diseases and ball moss.

8. Tree Replacement

Inevitably, all living things become diseased, debilitated, or nonproductive in old age or die. Specific plans for tree replacement will be prepared by the park and provide for replanting or top-grafting trees with pecan varieties resistant to major South Texas disease and insect problems. Scab resistant varieties of pecan tree stock will be "top-worked" (grafted) onto a given number of trees per year, depending on available funds and manpower. "Top worked" trees require about 3 years to return to pretreatment production levels and 5 years to regain their original form. Although grafting can only be performed during a 6-7 week period in the spring of the year, the entire orchard could rather easily be made both more productive and less dependent upon commercial scab preventative chemicals over a period of years.

INSECT AND DISEASE CONTROL

INTRODUCTION

South Texas pecan orchards are generally not seriously troubled by pecan weevil infestations; however, constant management is needed to control pecan nut and leaf casebearers, hickory shuckworms, yellow and black aphids, walnut caterpillar, webworms, and various fungal diseases. Previously, combinations of a variety of commercial-grade chemical pesticides/herbicides were used in LBJ orchards. However, studies show that insecticides often cause new or previously unimportant pests to increase because chemicals not only kill harmful pests but also destroy naturally occurring predatory insects. Since many pest insects have a faster rate of natural increase than their predators, continuous cycles of pest multiplication, removal with insects with pesticides, and resurgence of pests have been maintained without permitting for the build up of adequate natural control. NPS policies not only restrict use of specific chemical pesticides but also restrict other chemicals, otherwise individually permitted, when used in combinations because of still unknown and synergistic effects to the environment.

Recent reports indicate that biological control of insect pests has been much more successful for orchard and tree crops than for other agricultural crops. This is true because orchards are not continually cycled through bare ground conditions (i.e., plant growth, harvest, plowing stubble under, and new plant growth). Thus, permanent orchard vegetation provides continual habitat for both beneficial and pest insects. An important goal of biological control is to not totally remove all pest insects, rather to permit survival of minimal pest populations which serve as a food source for predatory insects.

Principally, biological control of insect pests aims to change only the level about which detrimental insect populations fluctuate: to maintain pest population levels below those considered detrimental to crop production but to also maintain population levels low enough to be effectively controlled by resident predatory insects.

A biological and integrated pest management program (IPM) for LYJO requires specific monitoring programs to determine which insect pests, and when such insect pests, should be controlled and by what feasible means. That, instead of periodic recycling and elimination of all detrimental and beneficial insects through applications of broad pesticides at specific calendar regularity. A principal part of this plan requires introduction or enhancement of insects, bacteria, or viruses known to be predators upon or detrimental to populations of insect pests. Another important part depends strongly upon effective mechanical ground maintenance programs and methodologies that disrupt life history events of detrimental insects and, yet, maximally protect beneficial insects; thereby, reducing plant or crop loss to minimal and acceptable levels.

Residual populations of pecan pest insects are considered beneficial for three reasons:

1. Pest insects possess inherent abilities to help reduce over-abundant nut production during some years; therefore, similar to mechanical pruning, limit the trees to production of fewer but relatively larger nuts.

2. Residual populations of pest insects encourage and support the continuance and growth of predatory insect populations.

3. Efforts to attain total, 100%, pest control could easily cost much more than would be expected in net profit return from nut sales.

PEST CONTROL

1. Bacillus thuringinesis (BT; sold under trade names, Agritol, Biotral, BTB, Parasporin, Dipel, Thuricide, and Bactur) is an effective microbial insecticide that can be used to control leaf-eating worms. It creates intestinal disturbance in leaf-feeders causing them to starve to death, but isn't harmful to beneficial insects, humans, pets, bees, or wildlife. Applications of BT will not burn young leaves. Reports show 70-80% success in pest reduction with use of this organism under proper conditions.

   Beginning about the middle of May, pecan orchards will be sprayed with BT on schedules appropriate to control pecan nut casebearers, leaf casebearers, walnut caterpillars, and webworms. Guidelines and suppliers are noted in Appendix I of this plan.

2. Insecticidal soaps ("fatty acid salts") cause a disruption of lipoprotein matrix in cellular membranes of soft-bodied insects and results in insect death; however, most hard-bodied and predatory insects are not greatly affected. Direct applications of "soaps" affect aphids, adelgids, mealy bugs, whiteflies, pear psylla, earwigs, and mites and will be applied and tested in LYJO pecan orchards as a biological control agent.

3. Dormant oil sprays encase trees in a tight, continuous and oxygen-proof film which smothers many harmful insects still remaining on trees when no tree leaves are present. It is a particularly effective control for a host of sucking and chewing insect pests as such aphids, thrips, mealybugs, whiteflies, pear psylla, and various forms of scale and red spider mites. It also destroys the eggs of an assorted group of leaf rollers and cankerworms. Dormant oil sprays will be applied to LYJO pecan trees during late winter, before leaf buds open, and/or in the late fall after the leaves have dropped.

4. Lacewings, tricogamma wasps, preying mantids, and ladybird beetles are predatory insects which feed on a wide variety of insect pests: "generalists" (i.e., mantids); aphids, scale and mealy bugs (feed on by lady bird beetles); scale, mealy bugs, aphids, whitefly, mites, thrips, and caterpillars (fed on by lacewings); casebearers, webworms, certain leafrollers (fed on by Trichogramma wasps). The use of predatory insect species will be tested in LYJO pecan orchards by releasing them in schedules most conducive to their attack on pest insects.

5. Chemical Pesticides/Fungicides/Herbicides Natural, biological control of insect pests and pecan diseases may not, in all cases, be sufficient nor appropriate to counter serious infestations or sudden outbreaks, particularly during years supporting rapid insect or disease increase. Moreover, there appears to be no acceptable IPM strategy preventing pecan leaf scab. Scab-infected tree leaves do not develop and nut yields from infested trees are drastically reduced. If scab isn't controlled, no reason remains to initiate IPM programs

because trees without leaves do not produce plant reserves necessary for nut production. Thus, LYJO pecan orchards will be sprayed with the fungicide Benomyl three times during the year: once around May 15, once again approximately 42 days later, and a third spray about 42 days later than the second. Once the pecan orchards are replaced (top-grafted) with scab-resistant strains of pecan trees, Benomyl sprays will probably not be required.

In some years it may be necessary to use the chemical insecticide Zolone to quickly control the first hatch of pecan casebearers but it is our intent to avoid this unless natural controls prove to be totally ineffectual. The use of any chemical control agents will be considered only in good and rational awareness of the significant disadvantages involved with the use of such materials:

1) The powerful direct and indirect effects of chemicals upon <u>all</u> ecological systems and individual species, and particularly, humans.

2) Chemicals are derived from limited fuel deposits, are increasingly expensive, and are more costly than natural controls.

3) Chemicals are quite likely to produce genetic resistance in target pests and in direct proportion to their rates and frequency of use.

4) Chemicals are likely to produce target pest resurgence because of reduction or total elimination of natural predator populations.

5) Chemicals produce unnecessary (indiscriminate) killing of beneficial insects - insects which may have been holding other or more severe insect pest problems in check. Chemicals easily produce secondary pest problems when natural predators of non-target organisms are unknowingly killed.

Commercial, chemical sprays will be used <u>only</u> when decidedly needed and when no other effective, affordable, alternative exists, and when all other control measures have been proven unfeasible. Then, correct chemicals, correct placements, proper timing, and proper amounts of chemicals will be used to provide economic/aesthetic control while not permitting them to unduly damage natural conditions of the orchards.

Guidelines and restrictions for the use of chemicals will include:

1. Effectiveness
2. Selectivity (effects on predators, parasites, pathogens, non-target species.
3. Operator safety
4. Environmental persistence
5. Resistance of pests

PLAN COORDINATION

Methodologies for management of the LYJO pecan orchards will primarily be coordinated through appropriate university specialists at Texas A&M University, College Station, Texas. The proximity of that school as well as the good familiarity of A & M faculty with the LBJ area and related environmental conditions make A & M a most valuable contact. However, university advisors must always remain aware of the distinct restrictions, objectives, thresholds, and policies which guide the LYJO pest management program towards the best possible alternatives and protection of overall park resources. Personnel from the park and the Southwest Regional Office may, at their discretion, request information, counsel, or recommendations from other sources, recognizing that numerous and diverse alternatives must be weighed by LYJO management to arrive at appropriate orchard maintenance methodologies. Ultimate responsibiltiy for planning, authorization, and outcome of all pest management practices rests with the Superintendent of LYJO. Thus, he/she, as authorized by the Regional Director, Southwest Region, serves as the final decision maker for the park pest management program.

CONSULTANTS

1. Dr. Richard K. Morrison, Research Entomologist, USFA-FR/SEA, Texas A & M University, College Station Texas; (713)846-8821 ext. 353.

2. C. Malcolm Beck - 7561 Evans Road, San Antonio, Texas 78218, (512)651-6115; pecan grower.

3. Buddy Maedgen, Biogenesis, Box 36, Mathis, Texas 78368, (512)547-3250; Trichogramma culturist.

4. Bluefford Hancock, Extension Horticulture, Texas A & M University, College Station, Texas 77843 (713)845-7341; college professor.

5. Organic Gardening Magazine, Rodale Press, Research and Development Division, 33 East Minor Street, Emmaus, Pennsylvania 18049, (215)967-5171.

Appendix I - Natural Control Organisms

and Control Compounds

APPENDIX I

1. Bacillus thuringiensis ("BT")

"BT" (Bacillus thuringiensis) is a bacterial bug-killer which, after being ingested from plant leaves by pest insects, disrupts insect digestive cellular function and paralyzes digestive processes. "BT" poses no threat to human health. Insects infested with "BT" usually stop feeding on crops within an hour and eventually starve to death within 2-3 days. Applications of "BT", therefore, must be made in such manner so as to guarantee that insects ingest the pathogen.

Application Suggestions: Wet plant foliage thoroughly but not to the point of excessive run-off. All parts of plant leaves, especially the undersides, should be thoroughly covered. Spraying the bottom half of leaves is additionally beneficial because the BT bacteriological spores are not hit by direct sunlight and thus remain viable and active longer. Often, a tablespoon of fish emulsion (or other additive-i.e. dish detergent) mixed with each gallon of spray will assist BT spores to stick to the leaves. Additives are particularly helpful where heavy dew or rain is expected. "BT" formulated as a liquid concentrate usually adheres well enough to plant leaves without additives.

"BT" is available either as a wetable dust or in liquid concentrate. Mix concentrations of "BT" with water in a separate container before it is poured into the sprayer, making sure all particles have been dissolved into solution. Often, it helps to first make a paste of the powder with luke-warm water, crushing "BT" powder with a spoon, then adding the rest of the water to the mixture. As spraying proceeds, keep the sprayer agitated to avoid clogging and to keep the mixture stirred. Do not store diluted mixture for more than 12 hours.

"BT" has no residual effect as do chemical pesticides, rather it quickly deteriorates from leaves in direct sunlight. Therefore, apply "BT" when feeding larvae are actually present. "BT" applications should be repeated at weekly intervals because insect eggs hatch at different times and "BT" is only effective for a short time. Use of "BT" has shown it to be most effective in spring and late summer when larvae are small and feeding activity is the greatest. Monitoring the hatching of pest insects can rather easily be performed by placing cardboard shields around specifically marked "monitor" trees or plants which entice pest insects to lay eggs in protected, shaded places. Such "live monitor populations" can be watched under natural environmental conditions to better know when to release control organisms.

Concentrated "BT" remains viable indefinitely if kept at 40-50°F. temperature and usually remains alive for 2-3 years when kept at 70°F. "BT", however, only remains viable for about 1 month when kept at temperatures of 110-120°F. "BT" concentrates cost about $18 per gallon (1982 price).

SUPPLIERS

- Abbott Labs, North Chicago, Illinois 60064
- Galt Research, Inc. Box 245-A, Route 1, Box 245 Tragalgar, Indiana 46181
- International Minerals and Chemical Corp., Box 192, Libertyville, Illinois 60048
- Nichols Herb Garden, 1190 North Pacific Highway, Albany, Oregon 97321
- Nutrilite Products, Inc., 5400 Beach Blvd., Buena Park, California 90620
- Orcon Organic Control, Inc., 5132 Venice Blvd., Los Angeles, California 90019; 213/937-7444
- Peaceful Valley Farms, Route 1, Box 319, Nevada City, California 95959
- Sandox, Inc., 480 Camino del Rio South, San Diego, California 92108; 714/298-4343.
- The Famine's End Company, Fairplay Road, Somerset, California 95684
- Thomason-Hayward, P.O. Box 2383 Kansas City, Kansas 66110; 913/321-3131
- W. Atlee Burpee Co., Warminster, Pennsylvania 18991

2. Trichogramma wasps

Trichogramma wasps are small parasitic wasps and are effective egg parasites on a variety of lepidopterous larvae. Their life span is short, only covering about 7 days, but their 9 day long reproductive cycle enables populations to rapidly increase in number.

APPLICATION SUGGESTIONS: One successful Texas user of Trichogramma suggests making a couple of wasp releases about a week or more before moths lay eggs so the wasps may "clean up" other sources of food and enhance the effectiveness of subsequent wasps released closer to the time of major egg laying. Releases of Trichogramma should continue every 3-5 days (depending upon the density of moth eggs) and continue until all the eggs hatch. Timing of wasp releases is very important since Trichogramma parasitizes moth eggs. Cardboard shields placed around specific "monitor" trees will entice moths to lay eggs behind them and give the grower living monitor populations that will allow him to better estimate development of casebearer life cycle under natural conditions. High winds or poor Trichogramma hatching often are noted as reasons for decreased effectiveness of parasitic wasps.

Weekly releases of a minimum of 10,000 Trichogramma per release are suggested. Aerial broadcast in 50-foot swathes at 25-30 feet height has proven to be a reliable method for use. Use in pecan orchards: for trees under 25 feet tall, release 25,000 (1/2 gram) per acre at 4-day intervals for 3 weeks beginning at initial moth emergence. Double this quantity for trees over 25 feet tall.

Prices for Trichogramma are approximately $10 per gram (1982 price).

SUPPLIERS

- Beneficial Insects, Ltd., P.O. Box 154, Banta, California 95304
- Biogenesis, Inc., Box 36 Mathis, Texas 78368; 512/547-3259 or 512/547-3169
- California Green Lacewings, P.O. Box 2495 Merced, California 95340; 209/722-4895
- Gurney Seed & Nursery Co., 2nd & Capitol, Yankton, South Dakota 57079 605/665-1671
- King Laboratory, Box 69-G, Limerick, Pennsylvania 19468
- Lakeland Nurseries, Hanover, Pennsylvania 17331
- Mellinger's Nursery, 2310 W. South Range Rd., North Lims, Ohio 44452; 216/549-9861
- Peaceful Valley Farms, Route 1, Box 319, Nevada City, California 95959; 916/265-3339
- Pyramid Nursery, 4640 Attawa Ave., Sacramento, California 95822
- Rincon-Vitova Insectary, Inc., P.O. Box 95, Ventura, California 93022; 805/643-5407
- Spalding Laboratories, Route 2, Box 737, Arroyo Grande, California 93520
- TRIK-O, Gothard, Inc., P.O. Box 370, Canutillo, Texas 79835
- Unique Nursery, 4504 Sperry Drive, Citrus Heights, California 95610; 916/961-7945 or 967-7082
- World Garden Products, 2 First Street, East Norwalk, Connecticut 06855
- Other suppliers are noted on attached supplier listings.

**Note: Dr. Richard K. Morrison, U.S.D.A. Cotton Research Laboratory, Texas A&M University, College Station, Texas (713/846-8821, ext. 353) is a (if not THE) most knowledgeable person in the United States for Trichogramma and can supply updated information on the current status of Trichogramma uses.

3. Lacewings (Chrysopa species)

Lacewings are predatory flying insects which attack the eggs and adults of insect pests and are also effective in aphid control. Chrysopa carnea (green lacewing) adults feed on honeydew, nectar, and pollen. Adults deposit eggs at random on plants, which, when hatched, produce larvae which feed on almost all garden pest insects. Lacewings are well-known predators of aphids, red mites, leaf hoppers, thrips, and moth eggs.

SUGGESTIONS FOR RELEASE: use 1 gallon of defatted lacewings per 5 acres or 1,000 larvae per acre: defatted lacewings cost about $15 per gallon, larvae $1.90 per gallon (1982 price).

SUPPLIERS

- Beneficial Insects, Ltd., P.O. Box 154 Banta, California 95304
- Biotrol, Inc., 54 So. Bear Creek Drive, Merced, California 95340
- California Green Lacewings, P.O. Box 2495 Merced, California 95340; 209/722-4985
- King Entomological Laboratories, Box 69, Limerick, Pennsylvania 19468
- Peaceful Valley Farms, Route 1, Box 319, Nevada City, California 95959; 916/265-3339
- Pyramid Nursery, 4640 Attawa Avenue, Sacramento, California 95822
- Rincon-Vitova Insectary, Inc., P.O. Box 95, Oak View, California 93022, 805/643-5407
  N. Ventura Ave, Ventura, California 93022; 805/643-5407.
  Riverside Plant 19522 El Rivino Road, Riverside, California; 714/683-8584.
- Unique Nursery, 5504 Sperry Drive, Citrus Height, California 95610 916/961-7945 or 967-7082
- World Garden Products 2 First Street, East Norwalk, Connecticut 06855
- Other sources are noted in supplier listings attached to this plan.

4. Ladybug Beetles

Ladybug beetles (a variety of species: Cycloneda sanguinea, Scimnus loewi, Colomegilla maculata, Hippodamia convergens, and others) are predatory adult beetles which attack a variety of insect pests on wheat, cotton, grass, maize, sorghum, and cultivated plants. Ladybug beetles are commonly used in citrus crops, alfalfa, sugar cane, cacao, walnuts, grape, sesame, apple, anise, pepper, ornamental plant, and lettuce crops. Suggested quantities of adult ladybug beetles are released which prey on insect pests. Contact suppliers for specific information.

Suppliers

- Beneficial Insect Company, P.O. Box 323, Brownville, California 95919; 916/675-2251
- Bio-Control Company, 13451 Highway 174, P.O. Box 247, Cedar Ridge, California 95924; 916/272-1997.
- Fountain's Sierra Bug Company, P.O. Box 114, Rough & Ready, California 95975; 916/273-0513
- Gurney Seed and Nursery Co., 2nd & Capital, Yankton, South Dakota 57079; 605/665-1671
- Inestcoast Ladybug Sales, Route 1, Box 93A, Biggs, California 95917
- Lakeland Nurseries, 340 Poplar Street, Hanover, Pennsylvania 17331; 717/637-5555
- Mellinger's Nursery, 2310 W. South Range Rd., North Lima, Ohio 44452; 216/549-9861
- Natural Pest Controls, 9397 Premier Way, Sacramento, California 95826; 916/362-2660
- Orcon Organic Controls, Inc., 5132 Venice Boulevard, Los Angeles, California 90019; 213/937-7444.
- Peaceful Valley Farms, 11173 Peaceful Valley Road, Nevada City, California 95959; 916/265-3339
- Pyramid Nursery, 4640 Attawa Avenue, Sacramento, California 95822
- Rincon-Vitova Insectary, Inc., P.O. Box 95, Oak View, California 93022; 805/643-5407
  Riverside Plant 19522 El Rivino Road, Riverside, California; 714/683-8584.
- Unique Nursery, 5504 Sperry Drive, Citrus Heights, California 95610; 916/961-4945 or 967-7082
- W. Atlee Burpee Co., P.O. Box 748, Riverside, California 92502
- World Garden Products, 2 First Street, East Norwalk, Connecticut 06855

5. Preying Mantis

Preying Mantis (Tenodera aridirolia sinensis) is a predatory insect which stalks and feeds on a wide assortment of other insects. Usually mantid egg cases are purchased from which young mantids emerge. Contact suppliers for suggested release dates and densities.

Suppliers

- Bio-Control Company, 10180 Ladybird Drive, Auburn, California 95603
- Gurney Seed and Nursery Company, Yankton, South Dakota 57078
- King Entomological Laboratories, Box 69, Limerick, Pennsylvania 19468
- Lakeland Nurseries, Hanover, Pennsylvania 17331
- Mellinger's Nursery, 2310 W. South Range Rd., North Lims, Ohio 44452
- Mincemoyer's Nursery, Route 526, Jackson, New Jersey 08527
- Natural Pest Controls, Jeff Hadden, 9397 Premier Way, Sacramento, California 95826
- Orcon Organic Controls, Inc., 5132 Venice Boulevard, Los Angeles, California 90019; 213/937-7444.
- Peaceful Valley Farms, Route 1, Box 319, Nevada City, California 95959
- Pyramid Nursery, 4640 Attawa Avenue, Sacramento, California 95822
- Unique Nursery, P.O. Box 22245, Sacramento, California 95822
- W. Atlee Burpee Co., P.O. Box 748, Riverside, California 92502'
- West Coast Lady Bug Sales, Route 1, Box 93-A, Biggs, California 95917
- World Garden Products, 2 First Street, East Norwalk, Connecticut 06855

6. Dormant Oil.

Dormant oil is an oily mixture which, when sprayed on trees, provides a continuous oxygen barrier, suffocating sucking and chewing insects. Particularly affected are: aphids, thrips, mealy bugs, whiteflies, psylla, scale, and red spider mites. Dormant oil also destroys eggs of codling moths, Oriental fruit moths, and assorted leaf rollers and cankerworms.

APPLICATION SUGGESTION: Insects hatching from eggs laid the previous fall can generally be effectively killed with dormant oil from February through May (depending of geographic locality). The protective coverings of insects are softer during the early spring than during winter. Dormant oil, however, can not be applied after leaves emerge on trees or the oil will suffocate or severely burn the leaves.

Dormant oil should contain 97% petroleum oils and 3% inert ingredients. Use 1/3 pint of oil to each gallon of water when making dilutions. To prepare the oil concentrate, mix 1/4 pint fish oil with 1/4 pint No. 10 mineral oil and 1 cup liquid detergent (Ivory soap, Fels, naptha, etc.); shake well and add 2 gallons of water. Another recipe suggests: heat 1 quart of good lubricating oil (10 wt.) free of additives (white mineral oil is preferred) with 1 pint of water and 4 ounces of potash fish-oil soap. Yellow kitchen bar soap can be used as a substitute for fish-oil soap. Heat to boiling and pour back and forth until blended. For deciduous trees, mix 5 teaspoons of concentrate with 1 quart of water. For evergreens, use 2 teaspoons per quart. Reheat and remix leftover concentrate before using again.

Suppliers

- B.G. Pratt Company, 204 21st Avenue, Paterson, New Jersey 07503. The dormant oil, Scaleside, kills scale, red mites and aphids, It is manufactured by Pratt Company but only available through distributors.

7. Insecticidal Soaps.

Insecticidal (fatty acid) soaps are simple hydrocarbon compounds which are organic in nature and yet disruptive to lipoprotein matrices of cellular insect membranes, causing death to the insects. Soft bodied insects such as aphids, adelgids, mealy bugs, whitefles, pear psylla, earwigs, and mites are particularly susceptible to fatty acid soaps. Tussock moths, winter moths, and gypsy moths are less affected. Least affected are beetles, weevils and harder bodied insects. This selectivity is very important since it can reduce impacts on certain natural enemy groups (predators).

For Further information, contact supplier or references.

Suppliers

- Safer Agro-Chem Company, 3233 Vista Diego Rd., Jamal, California 92035 714/469-0775

Information Sources

- Puritch, Pacific Forest Research Centre, 506 W. Burnside Road, Victoria, British Columbia

8. Dimilin

Dimilin is a relatively new organic (?) compound, proported to break down some insect skeletal structures and inhibit reproduction. It has been noted as particularly beneficial against weevils. Further information is not yet available; however, interested parties should contact the supplier.

Suppliers

- Thompson-Hayward Company, 913/321-3131

This column, developed by the staff of the Center for the Integration of the Applied Sciences, a division of the John Muir Institute, under a Cooperative Agreement with the U.S. Environmental Protection Agency (EPA), is a regular feature of the *IPM Practitioner*. Information contained in this column was not reviewed in advance by the EPA, and the authors are solely responsible for its contents.

Use of the Microbial Insecticide *Bacillus thuringiensis* in IPM

After a pest species has been properly identified and an assessment has been made that injury by the pest will exceed tolerable levels, the pest population in question must be suppressed. For this purpose, "biological" insecticides are desirable, because such materials offer target pest selectivity as well as greater safety to applicators than do conventional insecticides. It is also encouraging that biological insecticides are developed from materials based on renewable solar energy sources in comparison to conventional insecticides which are derived from dwindling fossil fuel supplies.

One of the most important of the biological controls now available is the microbe *Bacillus thuringiensis*. This bacterium is formulated into a number of microbial insecticides (under such trade names as Thuricide® Biotrol® and Dipel®) which are generally referred to as BT. Unlike broad-spectrum materials, BT does not kill the natural enemies of pest species; therefore, its use does not lead to development of secondary pests and resurgence of target pest populations. Thus it can reduce the need for subsequent treatments.

This bulletin has been prepared to provide basic information about BT largely because many members of the public—including gardeners, farmers, foresters, pest control operators, and professional pest managers responsible for maintenance of vegetation—have not yet learned to use it effectively.

The Development of BT as a Commercial Product

B. thuringiensis was first discovered in 1901 by Ishiwata in Japan during an outbreak of a silkworm disease. Berliner rediscovered the organism in 1911, this time in diseased larvae of the Mediterranean flour moth, *Anagasta kuehniella*. He named it after the German province Thuringia in which it was found. In 1927, Mattes rediscovered the Berliner strain and awakened interest in the microbe as an insecticide. The Mattes isolate was later used in the early years of commercial production.

This discovery lay dormant until 1953. Thereafter, developments were rapid. In 1956, the first large-scale commercial work started, primarily through efforts by E. A. Steinhaus and Pacific Yeast Products (later to become the Bioferm Corporation). After two years of field work and safety tests, including human volunteers, in 1958 the Food and Drug Administration granted a temporary exemption from tolerance, indicating that the material was so safe that no specified dosage was judged toxic to human beings. Thereafter, experimental permits were issued allowing BT to be used on vegetable and forage crops. In 1960 the FDA granted a full exemption from tolerance and the product was registered under the trade name Thuricide® by the Pesticide Regulation Division of the U.S. Department of Agriculture. For a detailed summary of the experimental work submitted with Bioferm's petition to the FDA, see Heimpel (1971). Early commercial developments are reviewed by Hall (1963). Presently, at least twelve firms in five countries product BT (Falcon, 1971). Several hundred tons of BT are used annually in the United States alone.

How BT Works

B. thuringiensis is a rod-shaped spore-forming bacterium in the genus *Bacillus*. The organism closely resembles the soil bacterium *B. cereus* but differs in that in addition to the spore, *B. thuringiensis* produces a diamond-shaped protein crystal which is toxic to many insects. When a caterpillar ingests BT, the toxin damages its gut wall, allowing the bacteria to invade the insect, killing it. Although either the toxin or the spore alone has been found to be lethal, the combination of the two is most effective.

The damage to the gut wall caused by the toxin may lead to paralysis and almost immediate cessation of feeding. Thus, although insects might remain alive for a period of time after treatment, they would not be feeding, thereby further damaging the plants. Although the bacterium multiplies within the body of the insect, the spores and crystals are almost never produced under such conditions. Consequently, insects killed by BT cannot serve as sources for new infections. This is largely the reason BT cannot be expected to infect subsequent generations of the pest.

Host Specificity and Safety

The major reason for the success of BT as a pest control tool is the specificity of its effect. The key to this specificity is the insect gut where either high pH (= high alkalinity) or specific enzymes dissolve the crystal, thereby releasing the toxin. There are about 150+ species of insect susceptible to BT because their guts have the proper alkalinity and/or enzyme necessary to dissolve the crystal. As a result, natural enemies normally killed by conventional insecticides through contact or fumigant action are not affected by BT.

This specificity of BT saves the costs of additional applications against target pest populations which would have resurged or against secondary pests which would have been released from their natural controls if the beneficial insects had been decimated. In addition, humans, rats, mice, swine, rabbits, guinea pigs, dogs, chickens, pheasants and partridges are non-susceptible species because their gut conditions are unfavorable. Thus BT is safe as well as economical.

The bee industry also benefits from the use of BT since BT does not kill bees. The industry suffers heavy losses each year due to use of conventional insecticides (see Box 1).

> Every year pesticides destroy about 10 percent of the nation's hives and substantially reduce populations of another 30 percent. Since 1967, the indemnification program launched by USDA has paid out about $23.5 million to reimburse apiarists for losses. Bee industry specialists, however, believe that less than ¼ of total losses are being claimed. They estimate actual losses to be over $100 million a year or about 400,000 hives. Honey and pollination losses are proportionate. (From T. Temple, Pesticides and bees, *EPA Journal*, April 1978.)

Box 1. Pesticide-caused losses to bee industry

Strains of BT

Many types or strains of *B. thuringiensis* have been described. These strains differ in their ability to kill different insects. One strain, for example, may be highly effective in killing caterpillars (Lepidoptera) while another may be effective against flies. This variation reflects differences in toxin production. In 1979, 23 strains of *B. thuringiensis* were known (Dulmage, 1979). Currently, the strain used in commercial production for the control of caterpillars is *B. thuringiensis* var. *kurstaki* strain HD-1.

How to Use BT

Commercial formulations of BT may be used in conventional spray equipment. Because it is so safe, BT is not regulated as a hazardous material, i.e., there are no reentry periods and no need to establish tolerances. Commercial sources include:

Abbott Labs, North Chicago, IL 60064

Thomason-Hayward, Kansas City, KS 66110

International Minerals and Chemical Corp., Box 192, Libertyville, IL 60048

Consult producers for further details about application methods and susceptible pests. (For a partial list, see Table 1.)

Application

Foliage applications require attention to dispersion of spores and feeding habits of susceptible (usually early larval) stages. Correct application can reduce dosages, save material, and further cut costs. Species with larvae that feed on lower leaf surfaces should receive highest dosages on lower leaf surfaces where possible. Early instars are generally more favorable targets than later ones since greater mortalities can be achieved against smaller larvae given the same spore distributions. Persistence of spores on plants also needs to be considered. Since BT degrades primarily from exposure to ultraviolet light (commercial formulations contain UV inhibitors such as carbon black), spores last 5–25 days at effective dosages on lower leaf surfaces as compared to approximately ½ day on upper leaf surfaces, or 10–50 times longer. For these reasons, applications should be timed to coincide as nearly as possible with the susceptible stage of the target pest. Monitoring programs need to focus on determining periods when maximal numbers of the most highly susceptible stage of the pest are present.

Leave a Pest Residue

Another important issue is the desirable pest mortality. Recent research indicates that the common conception—that maximum pest mortality is best—is not true, particularly with highly susceptible pest species. Field studies indicate that extremely high mortalities decrease pest populations to the point where natural enemies lack adequate food to survive. Once the natural enemies are reduced, the pest population can resurge. Therefore, ideally, over time an IPM practitioner should be able to determine the amount of BT that will control the pest while allowing the natural enemies to maintain themselves. The desirable mortality level leaves a "pest residue" to provide food sources for beneficials.

The Future

Future use of BT will probably involve calculating desirable mortalities and dosages based on stages of pests present, age of the commercial product, natural enemy activity, acceptable damage levels, and other variables. Decision-making in the future will probably involve small portable computers with varius sets of programs, more comprehensive field monitoring, and macro- and microclimatic measurements. If recent developments are any indication, BT will be more heavily used in the future. BT has recently been registered against two stored product pests—the Indian meal moth and the almond moth. A very important recent development is the discovery of *B. thuringiensis* var. *israelensis* which is proving highly effective against mosquito, blackfly, and midge larvae (Garcia 1980). These new developments lead one to speculate that still further discoveries are to come.

References

Dulmage, H.T. 1979. Genetic manipulation of pathogens: selection of different strains. In *Genetics in relation to insect management (working papers—the Rockefeller Foundation)*, ed. M.A. Hoy and J.J. McKelvey, Jr., pp. 116–127. New York: Rockefeller Foundation.

Falcon, L.A. 1971. Use of bacteria for microbial control of insects. In *Microbial control of insects and mites*, ed. H.D. Burges and N.W. Hussey, pp. 67–95. New York: Academic Press.

Garcia, R., Federici, B.A., Hall, I.M., Mulla, M.S., and Schaefer, C. 1980. BTI—a potent new biological weapon. *California Agriculture*, March 1980, pp. 18–19.

Hall, I.M. 1963. Microbial control. In *Insect pathology: an advanced treatise*, vol. 2, ed. E.A. Steinhaus, pp. 477–517. New York: Academic Press.

Heimpel, A.M. 1971. Safety of insect pathogens for man and vertebrates. In *Microbial control of insects and mites*, ed. H.D. Burges and N.W. Hussey, pp. 469–490. New York: Academic Press.

Acknowledgments

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Table 1. Some Lepidoptera species susceptible to infection with *B. thuringiensis*

Scientific name	Common name	Scientific Name	Common Name
Alsophila pometaria	Fall cankerworm	*Nygmia phaeorrhoea*	Brown tail moth
Anagasta kühniella	Mediterranean flour moth	*Operophtera brumata*	Winter moth
Anarsia lineatella	Peach twig borer	*Ostrinia nubilalis*	European corn borer
Archips fervidanus	Oak webworm	*Paleacrita vernata*	Spring cankerworm
Carpocapsa pomonella	Codling moth	*Pectinophora gossypiella*	Pink bollworm
Choristoneura fumiferana	Spruce budworm	*Pieris rapae*	Imported cabbageworm
Colias eurytheme	Alfalfa caterpillar	*Phryganidia californica*	California oakworm
Crambus sperryillus	Lawn moth	*Platyptilia pusillodactyla*	Lantana plume moth
Ennomos subsignarius	Elm spanworm	*Plutella maculipennis*	Diamondback moth
Erannis tiliana	Linden looper	*Porthetria dispar*	Gypsy moth
Estigmene acraea	Salt marsh caterpillar	*Prodenia praefica*	Western striped armyworm
Galleria mellonella	Greater wax moth	*Protoparce quinquemaculata*	Tomato hornworm
Heliothis virescens	Tobacco budworm	*Protoparce sexta*	Tobacco hornworm
Heliothis zea	Corn earworm (tomato fruitworm	*Spodoptera exigua*	Beet armyworm
		Spodoptera frugiperda	Fall armyworm
Heterocampa vetusta	Western tussock moth	*Thyridopteryx ephemeraeformis*	Bagworm
Hyphantria cunea	Fall webworm		
Malacosoma disstria	Forest tent caterpillar	*Trichoplusia ni*	Cabbage looper

The following list of suppliers of beneficial organisms is cross referenced: You can look up the company and see what it supplies, or you can look up the organism and see which companies supply it. Microbial organisms such as *Bacillus thuringiensis* and *Nosema locustae* which require registration through the EPA aren't included. Let us know of additions needed to the list. We will update it yearly. For information on producers in Eurpoe, write to: Glasshouse Crops Research and Experiment Station, P.O. Box 8, 2677AA Naaldwijk, The Netherlands.

"P" after the name of a supplier indicates that they produce some or all of the insects that they sell. When the specific species of fly or scale parasite or predatory mite is not indicated after the name of a company, it means that they did not specify to us which species they sell. (October, 1982)

BENEFICIAL ORGANISMS

	COMMON NAME	SCIENTIFIC NAME	TARGET PEST(S)	SUPPLIERS
			PREDATORS	
A	decollate snail	*Rumina decollata*	*Helix aspersa*	2,17,18,24,39,40,44
B	fly predator	*Carcinops* sp.	flies	38,45
C	green lacewing	*Chrysopa carnea*	aphids, mites, thrips, insect eggs	8,10,14,23,24,26,30,33,35 38,40,44,46
D	lady beetle	*Hippodamia convergens*	aphids and other insects	5,8,10,19,20,22,23,24,26, 28,29,33,35,37,38,40,44,46
E	mealybug predator	*Cryptolaemus montrouzieri*	citrus, citrophilus, long-tailed and other mealybugs	2,10,18,23,24,26,30,33,35, 38,40,44
F	praying mantis	*Tenodera aridifolia sinensis*	many insects	8,22,28,29,31,32,33,37,40,46
G	predatory mites		many mites	35
		G-1: *Amblyseius californicus*	mites such as the Williamette mite	10,12,23,24,33,34,40,44
		G-2: *A. hibisci*	many mites	2,40
		G-3: *Metaseiulus occidentalis*	spider mites such as the Pacific mite	10,12,23,24,33,34,40,44
		G-4: *Phytoseiulus persimilis*	mites such as *Tetranychus urticae*	1,7,10,12,16,23,24,33,34,40, 41,42,43,44
H	predatory nematodes	*Neoaplectana carpocapsea* + others	many soil larvae and grubs	13,36,40
			PARASITOIDS	
I	egg parasitoid	*Trichogramma* sp.	Lepidopterous eggs	6,8,9,10,11,14,18,19,21,22, 23,24,26,27,29,33,35,38,40,46
J	fly parasitoids		flies	8,14,26,35,38,46
		J-1:*Muscidifurax zaraptor*	"	3,10,24,33,40,44,45
		J-2:*Nasonia vitripennis*	"	4,18
		J-3:*Spalangia endius*	"	3,4,18,24,33,40,44,45
		J-4:*Sphegigaster* sp.	"	3,44,45
		J-5:*Tachinaephagus zealandicus*	"	45
K	Greenhouse whitefly parasitoid	*Encarsia formosa*	*Trialeurodes vaporariorum* + others	1,7,10,16,24,30,33,38,40,41 42,43,44,46,47
L	Mexican bean beetle parasitoid	*Pediobius foveolatus*	*Epilachna varivestis*	25,30
M	navel orangeworm parasitoid	*Goniozus legneri* and *Pentalitomastix plethoricus*	*Paramyelois transitella*	14,40,44
N	scale parasitoids		red and black scales	38
		N-1:*Aphytis melinus*	*Aonidiella aurantii* (red scale)	10,17,18,24,40,44
		N-2:*Comperiella bifasciata*	"	2,40
		N-3:*Metaphycus helvolus*	*Saissetia oleae* (black scale)	2,10,17,18,24,44

SUPPLIERS

	FIRM	ORGANISMS SUPPLIED
1	Applied Bionomics (P) Agriculture Canada Research Station 8801 East Saanich Road Sidney, B.C. Canada V8L1H1 604-656-2123	G-4, K
2	Associates Insectary (P) P.O. Box 969 Santa Paula, CA 93060 805-933-1301	A,E,G-2,N-2,N-3
3	Beneficial Biosystems (P) 1603-F 63rd Street Emeryville, CA 94608 415-655-3928	J-1,J-3,J-4
4	Beneficial Insectary (P) 245 Oak Run Road Oak Run, CA 96069 916-472-3715	J-2,J-3
5	Beneficial Insects Co. P.O. Box 323 Brownsville, CA 95919 916-675-2251	D
6	Beneficial Insects Ltd. P.O. Box 154 Banta, CA 95304	I

	FIRM	ORGANISMS SUPPLIED
7	Better Yield Insects 13310 Riverside Drive East Tecumseh, Ontario, Canada	G-4,K
8	Bio Control Company 13451 Highway 174, P.O. Box 247 Cedar Ridge, CA 95924 916-272-1997	C,D,F,I,J
9	Biogenesis, Inc.(P) Box 36 Mathis, TX 78368 512-547-3259	I
10	Bio Insect Control 1710 S. Broadway Plainview, TX 79072 806-293-5861	C,D,E,G-1,G-3,G-4, I,J-1,K,N-1,N-3
11	Bio Insect Control Box 9134 Alexandria, VA 22304 703-642-5727	I
12	Biotactics, Inc. 7765 Lakeside Drive Riverside, CA 92509 714-685-7681 after 6 pm	G-1,G-3,G-4
13	B.R. Supply Company (P) P.O. Box 845 Exeter, CA 93221 209-732-2738	H
14	California Green Lacewings (P) P.O. Box 2495 Merced, CA 95340 209-722-4985	C,I,J,M
15	Colorado Insectary P.O. Box 3256 Durango, CO 81301 303-247-5360,303-259-4200	J-1,J-3,L
16	Elk Lake Garden Centre 5450 Patricia Bay Highway Victoria B.C. Canada V8Y1T1	G-4,K
17	Fillmore Insectary (P) 533-C Sespe Ave. Fillmore, CA 93015	(Not for sale - used for members.) A,N-1,N-3
18	Foothill Agricultural Research, Inc. (P) 510 W. Chase Drive Corona, CA 91720 714-371-0120	A,E,I,J-2,J-3,N-1,N-3
19	Fossil Flower 463 Woodbine Avenue Toronto, Ontario, Canada M4E2H5	D,I
20	Fountain's Sierra Bug Company P.O. Box 114 Rough and Ready, CA 95975 916-273-0513	D
21	Gothard Inc. (P) P.O. Box 370 Canutillo, TX 79835 505-874-3125	I
22	Gurney Seed and Nursery Company Yankton, SD 57079 605-665-1671	D,F,I
23	Harmony Farm Service and Supply P.O. Box 451 Graton, CA 95444 707-823-9125	C,D,E,G-1,G-3,G-4,I
24	Integrated Pest Management 305 Agostino Road San Gabriel, CA 91776 213-287-1101	A,C,D,E,G-1,G-3,G-4 I,J-1,J-3,K,N-1,N-3
25	John W. Kennedy Consultants (P) 608 Washington Blvd., Suite 406 Laurel, MD 20707 301-490-1600	L (Beginning in 1983.)
26	King's Natural Pest Control 224 Yost Ave. Spring City, PA 19475 215-948-9261	C,D,E,F,I,J
27	Kunafin Trichogramma Insectaries Route 1, P.O. Box 39 Quemado, TX 78877 512-757-1483	I
28	Lakeland Nurseries Sales, Inc. 340 Poplar Street Hanover, PA 17331 717-637-5555	D,F
29	Mellinger's Nursery 2310 W. South Range Road North Lima, OH 44452 216-549-9861	D,F,I
30	Metro Pest Management Consultants (P) P.O. Box 1029 Arvada (Denver), CO 80001 303-422-3708	C,E,K,L
31	Mincemoyer's Nursery RD 7, Box 379 Jackson, NJ 08527 201-363-3215	F
32	Nationwide Seed and Supply Box 91073 Louisville, KY 40291	F
33	Natural Pest Controls 9397 Premier Way Sacramento, CA 95825 916-362-2660	C,D,E,F,G-1,G-3,G-4 I,J-1,J-3,K
34	Nature's Control 2518 Stewart Ave. Medford, OR 97501 503-773-5927	G-1,G-3,G-4
35	Necessary Trading Company 328 Main Street New Castle, VA 24127 703-864-5103	C,D,E,G,I,J
36	The Nematode Farm (P) 2617 San Pablo Ave. Berkeley, CA 94702 415-526-3006	H
37	Organic Control, Inc. 5132 Venice Blvd. Los Angeles, CA 90019 213-937-7444	D,F
38	Organic Pest Control Naturally 19920 Forest Park Drive NE Seattle, WA 98155 206-362-7684	B,C,D,E,I,J,K,N
39	Pacific Agricultural Labs, Inc. P.O. Box 439 San Luis Rey, CA 92068 714-439-6921	A
40	Peaceful Valley Farm Supply 11173 Peaceful Valley Road Nevada City, CA 95959 916-265-3339	A,C,D,E,F,G-1,G-2, G-3,G-4,H,I,J-1,J-3, K,M,N-1,N-2
41	Pest Management Group (3 locations) 810 Hollywood Road Kelowna, B.C. Canada V1X3S9 10844-139-A Street Surrey, B.C. Canada V3R3E5 545 West 8th Avenue Vancouver, B.C. Canada V5Z1C6	G-4,K
42	Professional Ecological Services 555 Hillside Victoria, B.C. Canada V8T1Y8	G-4,K
43	Resh Greenhouses and Hydroponic Garden Center 12626 Bridgeport Road Richmond, B.C. Canada V6V1J5	G-4,K
44	Rincon Vitova Insectaries (P) P.O. Box 95 Oak View, CA 93022 805-643-5407	A,C,D,E,G-1,G-3,G-4, I,J-1,J-3,J-4,K,M,N-1, N-3
45	Spalding Laboratories (P) 760 Printz Road Arroyo Grande, CA 93420 805-489-5946	B,J-1,J-3,J-4,J-5
46	Unique Nursery 5504 Sperry Drive Citrus Heights, CA 95610 916-961-7945, 916-967-7082	C,D,F,I,J
47	Whitefly Control Co. (P) P.O. Box 986 Milpitas, CA 95035 408-295-1444, Ext. 520	K

ADDITIONAL SOURCES OF BENEFICIAL INSECTS WITH ABBREVIATIONS USED

Fly Pupae Parasites (FP)
Ladybeetles (LB)
Lacewings (LW)
Predatory Mites (MI)
Praying Mantids (PM)
Trichogamma Wasps (TW)

Beneficial Insectary
2544 First Avenue
San Bernardino, CA 92405
(FP)

Burpee Seed Company
Warmingster, PA 18991
(LB, PM)

ORCON Organic Control, Inc.
5132 Venice Boulevard
Los Angeles, CA 90019
(LB, PM)

Pyramid Nursery
Box 22245
Sacramento, CA 95822
(LB, PM)

John Staples
389 Ropck Beach Road
Rochester, NY 14617
(PM)

Robert D. Robbins
424 No Coutland
E. Stroudsburg, PA 18301
(PM)

Montgomery Ward, Dept. B-4
618 W. Chicago Ave,
Montogmery Ward Plaza
Chicago, IL 60671
(LB)

Bo Biotrol, Inc.
54 S. Bear Creek Drive
Merced, CA 95340
(FP, LW)

W. Atlee Burpee Co.
P.O. Box 748
Riverside, CA 92502
(LB, PM)

Hanna Biologicals
199 Derrick Avenue
Uniontown, PA 15401
(Doom)

Mellinger's, Inc.
2334 N. Range Road
North Lima, OH 44452
(Doom)

Reuter Laboratories
2400 James Madison Highway
Haymarket, VA 22069
(Doom)

Galt Research, Inc.
Box 245-A, RR 1
Trafalger, IN 46181
(Dipel)

Burpee Seed Co.
Warminster, PA 18991
(Thuricide)

ORCON Organic Control, Inc.
5132 Venice Boulevard
Los Angeles, CA 90019
(BT)

Sandoz, Inc.
480 Camino del Rio South
San Diego, CA 92108
(Thuricide, Elcar)

Thompson-Hayward Chemical Co.
P.O. Box 2383
Kansas City, KS 66110
(Bactur)

Nichols Garden Nursery
1190 N. Pacific Highway
Albany, OR 97321
(Thuricide)

International Minerals & Chemical Corp.
Crop Aids Dept.
5401 Old Orchard Road
Skokie, IL 60076
(Thuricide)

Hopkins Agricultural Chemical Co.
P.O. Box 7532
Madison, WI 53707
(BT)

Abbott Laboratories
Agricultural & Chemical Products Div.
Dept. 95M
North Chicago, IL 60064
(Dipel)

Insect Disease Pathogens

Milky Spore Disease for Japanese beetle grub control (Doom)

Bacillus thuringiensis for control of various caterpillars (Thuricide, Dipel, Bactur, and BT.)

Virus for Tobacco Budworm and Cotton Bollworm Control (Elcar)

Fairfax Biological Laboratories
Clinton Corners, NY 12514
(Doom)

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2544 First Avenue
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(LB, PM)

John Staples
389 Ropck Beach Road
Rochester, NY 14617
(PM)

Robert D. Robbins
424 No Coutland
E. Stroudsburg, PA 18301
(PM)

Montgomery Ward, Dept. B-4
618 W. Chicago Ave,
Montogmery Ward Plaza
Chicago, IL 60671
(LB)

Bo Biotrol, Inc.
54 S. Bear Creek Drive
Merced, CA 95340
(FP, LW)

W. Atlee Burpee Co.
P.O. Box 748
Riverside, CA 92502
(LB, PM)

Botanical Insecticides

Nicotine sulfate, pyrethrins, rotenone, ryania, and sabadilla. (Also available through seed and garden catalogs and garden centers.)

Sunnybrook Farms Nursery
9448 Mayfield Road
Chesterland, OH 44026
(Nicotine Sulfate)

Burpee Seed Co.
Warminster, PA 18991
(Rotenone)

ORCON Organic Control, Inc.
5132 Venice Boulevard
Los Angeles, CA 90019
(Pyrethrins, rotenone, ryania)

George W. Park Seed Co., Inc.
Greenwood, SC 29647
(Rotenone)

S. B. Penick & Co.
1050 Wall Street
Lyndhurst, NJ 07071
(Rotenone)

Prentiss Drug & Chemical Co., Inc.
363 Seventh Ave.
New York, NY 10001
(Sabadilla)

Hopkins Agricultural Chemical Co.
P.O. Box 7532
Madison, WI 53707
(Rotenone, ryania)

Cryolite

Pennwalt Corp.
Agchem Div.
1630 E. Shaw Ave.
Fresno, CA 93710
(Kryocide)

Diatomaceous Earth

Flow Laboratories
1601 W. Orange
Orange, CA 92668
(Perma-Guard)

Dormant Oils

B. G. Pratt Co.
204 21st Street
Paterson, NJ 07503
(Scaleside)

Adhesive for Crawling Insects

The Tanglefoot Co.
314 Straight Avenue, S.W.
Grand Rapids, MI 49504
(Tree Tanglefoot)

Animal Repellants, Inc.
P.O. Box 999
Griffin, GA 30224
(Tack Trap)

Insect Traps

Burpee Seed Co.
Warminster, PA 18991
(Blacklight, Japanese beetle)

Ellisco Inc.
American and Luzerne Streets
Philadelphia, PA 19140
(Blacklight)

Zoecon Corporation
975 California Avenue
Palo Alto, CA 94304
(Gypsy moth lure)

Beneficial Biosystems
1525 63rd Street
Emeryville, CA 94608
(Fly traps)

Animal Repellents, Inc.
P.O. Box 999, Griffin, GA 30224
(Cockroach traps)

Agrilite Systems, Inc.
404 Barringer Building
Columbia, SC 29201
(Blacklight)

D-Vac Co.
P.O. Box 2095
Riverside, CA 92506
(Blacklight)

Bird Netting

Animal Repellents, Inc.
P.O. Box 999
Griffin, GA 30224

French Textiles Co.
835 Bloomfield Avenue
Clifton, NJ 07012

Ross Daniels, Inc.
P.O. Box 430
West Des Moines, IA 50265

Burpee Seed Co.
Warminster, PA 18991

Bird Repellents

Animal Repellents, Inc.
P.O. Box 999
Griffin, GA 30224

The Tanglefoot Co.
314 Straight Ave., S.W.
Grand Rapids, MI 49504

Farmer Seed and Nursery Co.
Faribault, MN 55021
(Scarecrows, plastic owls)

Animal Repellents

Animal Repellents, Inc.
P.O. Box 999
Griffin, GA 30224
(Dog, cat, rabbit, deer)

Burpee Seed Co.
Warminster, PA 18991
(Dog, cat)

George W. Park Seed Co., Inc.
Greenwood, SC 29647
(Dog, cat)

Lakeland Nurseries Sales
Hanover, PA 17331
(Mole, mechanical)

The Tanglefoot Co.
314 Straight Ave., S.W.
Grand Rapids, MI 49504
(Squirrel)

Animal Traps

Burpee Seed Co.
Warminster, PA 18991
(Mole, Havahart® for rat, weasel, chipmunk, squirrel, mink, rabbit, woodchuck, oppossum.)

Earthworms

Burpee Seed Co.
Warminster, PA 18991

Lakeland Nurseries Sales
Hanover, PA 18991

Brazos Worm Farms
P.O. Box 4185
Waco, TX 76705

Pyramid Nursery
P.O. Box 22245
Sacramento, CA 95822

Frogs

Nu-Tex Frog Farm
P.O. Box 4029
Corpus Christi, TX 78400

Deodorants

Fritzsche, Dodge and Olcolt, Inc.
76 9th Avenue
New York, NY 10011
(Neutroleum Alpha)

Cline-Buckner, Inc.
Cerritos, CA 90701
(Super Hydrasol)

APPENDIX E

PESTICIDES THAT CAN BE MADE AT HOME

INSECTICIDES

Nicotine extract. Soak one or two shredded, cheap cigars, or a standard plug of chewing tobacco in one gallon of water overnight at room temperature. Remove tobacco parts and add one teaspoon of household detergent. Used as a foliar spray against aphids and other small insects it is usually as effective as sprays made commercially. CAUTION. This nicotine extract is very toxic to all living animals, including man. It may also transmit tobacco virus to tomatoes and other sensitive plants.

Lime-sulfur concentrate. Use one pound of unslaked lime (quicklime), two pounds of sulfur and one gallon of water for each batch. Make a paste of the sulfur with some of the water. In a well-ventilated room or out-of-doors heat the water and lime until the lime starts to dissolve, then add the sulfur paste. Bring to a boil and simmer for about 20-30 minutes or until the material becomes dark amber. Add water as necessary to maintain original level. When the free sulfur has all disappeared the reaction is complete, and the mixture should be strained and stored in jars. This is the *concentrate*. To use as a dormant spray, dilute 1 part of concentrate to 9 parts of water. As a summer foliage spray, dilute 1 part to 49 parts of water. Lime sulfur sprays will stain the skin and clothing. Do not apply to vegetables to be canned. Jars are known to explode which contain trace amounts of elemental sulfur.

Dormant oil spray concentrate. Heat 1 quart of good lubricating oil (10 wt) free of additives, white oil such as mineral oil is preferred, with 1 pint of water and 4 ounces of potash fish-oil soap. Yellow kitchen bar soap can be used as a substitute for fish-oil soap. Heat until the boiling point is reached. Pour back and forth until blended. For deciduous trees mix 5 teaspoons of concentrate with 1 quart of water. For evergreens use 2 teaspoons per quart. For leftover concentrate, reheat and mix again before using.

Kerosene emulsion concentrate. Dissolve 2 cubic inches of kitchen grade bar soap in 1 pint of water. Add 1 quart of kerosene and beat with egg beater or electric mixer until a thick cream results. For dormant deciduous trees dilute 1 part of concentrate with 7 parts of water. For ordinary mid-summer growth, dilute with 10 parts water, and for a weak spray, dilute with 15 parts water.

Bordeaux mixture. Add 3 ounces of copper sulfate (bluestone) to 3 gallons of water and dissolve thoroughly. Add 5 ounces of hydrated lime and mix completely. Use without further dilution. This fungicide-insecticide can be stored but is corrosive to metal containers. While primarily a fungicide, it is also very repellent to many insects such as flea beetles, leafhoppers, and potato psyllid, when sprayed over the leaves of plants.

Wormwood. Use dry or fresh wormwood leaves. Cover with water and bring to a boil. Dilute with 4 parts of water and spray on plants immediately. Wormwood sprays are purported to kill slugs, aphids and crickets.

Quassia. Soak 2 ounces of quassia wood chips in 1 gallon water for 2-3 days. Simmer for 2-3 hours over low heat. Remove chips and mix with 2 ounces of soft soap. It's not the best but will control aphids.

Soaps. Soap dilutions have been used for control of soft-bodied insects, such as aphids, since 1787, when this control method first appeared in writing. Undoubtedly it had been used long before that. Most often these soaps were derived from either plants (cotton seed, olive, palm, or coconuts) or from animal fat, such as lard, whale oil, or fish oil. Vegetable or plant-derived soaps are more effective than those derived from petroleum. Commercial soaps today vary greatly in composition and purity, therefore vary widely in effectiveness.

If in doubt, you should try true soap suds from a known brand of inexpensive laundry soap against aphids on only a few plants. If this proves successful, the practice could be expanded. Old-fashioned homemade soap may be prepared using inexpensive waste lard or tallow, lye, water, and borax (optional). Six pounds of fat and a can of lye will make 7 pounds of soap, or 12 to 15 pounds of soft soap.

To make, strain 3 quarts of heated-to-melting fat. Dissolve a can of commercial lye in one quart of cold water. When this is dissolved and the water is still warm, stir into it the warm fat, and add one cup of ammonia and two tablespoons of borax which have been dissolved in a half-cup of warm water. If fragrance is desired add a teaspoon of citronella oil. Stir thoroughly to mix, and allow to cool. The soap will harden and can then be cut up into bars.

If soft soap is preferred, add 3 quarts of hot water where the oil of citronella is called for. This of course will prevent hardening and can be spooned or poured after cooling.

HERBICIDES

Petroleum oils. A non-selective, all-purpose weed killer can be made of 1 part old crankcase oil and 20 parts of kerosene, gasoline, paint thinner, or diesel fuel. This is an effective contact herbicide for all vegetation and should be used with caution. Though only temporary in effect, it is fast-acting and probably the safest of the materials to use around the home. Especially good for driveways, alleys, and paths. Caution: Leaves oily residue on concrete and stones.

Copper sulfate (bluestone). Copper in concentrated form is lethal to all plant life. To make an all-purpose weed killer that will also sterilize the soil on which it falls for 2-3 years, dissolve 8 ounces of copper sulfate in 1 gallon of water. This is corrosive to metal, and sprayers should be rinsed thoroughly after use.

FUNGICIDES

Bordeaux mixture. See instructions for making under "Insecticides". It is particularly effective against downy mildew and several diseases of deciduous fruits when applied as a dormant spray.

Sulfur. Dusting sulfur, flotation or colloidal sulfur, and wettable sulfur are all available for fungicidal use. Sulfur is quite effective against powdery mildews, and most effective when temperature is above 70°F. Caution: Do not use when temperatures exceed 90°F., or on susceptible plants. Do not apply to vegetables to be canned. Jars are known to explode which contain trace amounts of elemental sulfur.

Lime-Sulfur. Primarily a dormant fungicide for deciduous fruit trees. (See "Insecticides" for recipe.)

ALGICIDES

Copper sulfate. (Bluestone) Copper is lethal to all algae. Where other plants are not involved and there is no need to control bacteria, copper sulfate can be effectively used to inhibit algae growth at the rate of 1 to 2 ounces per 100 gallons of water.

INSECT REPELLENTS FOR PLANTS

Garlic and onion. In a blender place onion, garlic, horseradish, peppers, mint or any other aromatic herbs. Add enough water to blend into a frappe. Dilute with an equal volume of water and let stand overnight at room temperature. Filter through an old stocking, add 1 teaspoonful of detergent and spray on plants to be protected. This is only a repellent to a few species and will not kill any insect.

Horseradish. See "Garlic and Onion".

Peppers. See "Garlic and Onion".
Mint. See "Garlic and Onion".
None of these are very good and are not recommended.

INSECT REPELLENTS FOR HUMANS

Anise oil. A fragrant oil with slight repellency to gnats, biting flies, and mosquitoes.
Oil of citronella. One of the better natural repellents against mosquitoes and biting flies, with a pleasant fragrance.
Asefetida. A terrible smelling herb that has absolutely no insect repellent qualities. (It probably keeps other humans away!)
Oil of Pennyroyal. A pleasant, short-life repellent for mosquitoes and biting flies. Pennyroyal herb rubbed fresh on skin is reported also to be effective for a short period. The fragrance resembles mint.

INSECT REPELLENTS FOR ANIMALS

Tansy. Dried tansy leaves rubbed into a pet's fur are reputed to drive off fleas.
Oil of lavender. Purported to drive fleas off dogs when rubbed into fur. Dogs probably won't be any happier for your efforts, however!

INSECT REPELLENTS FOR THE HOME

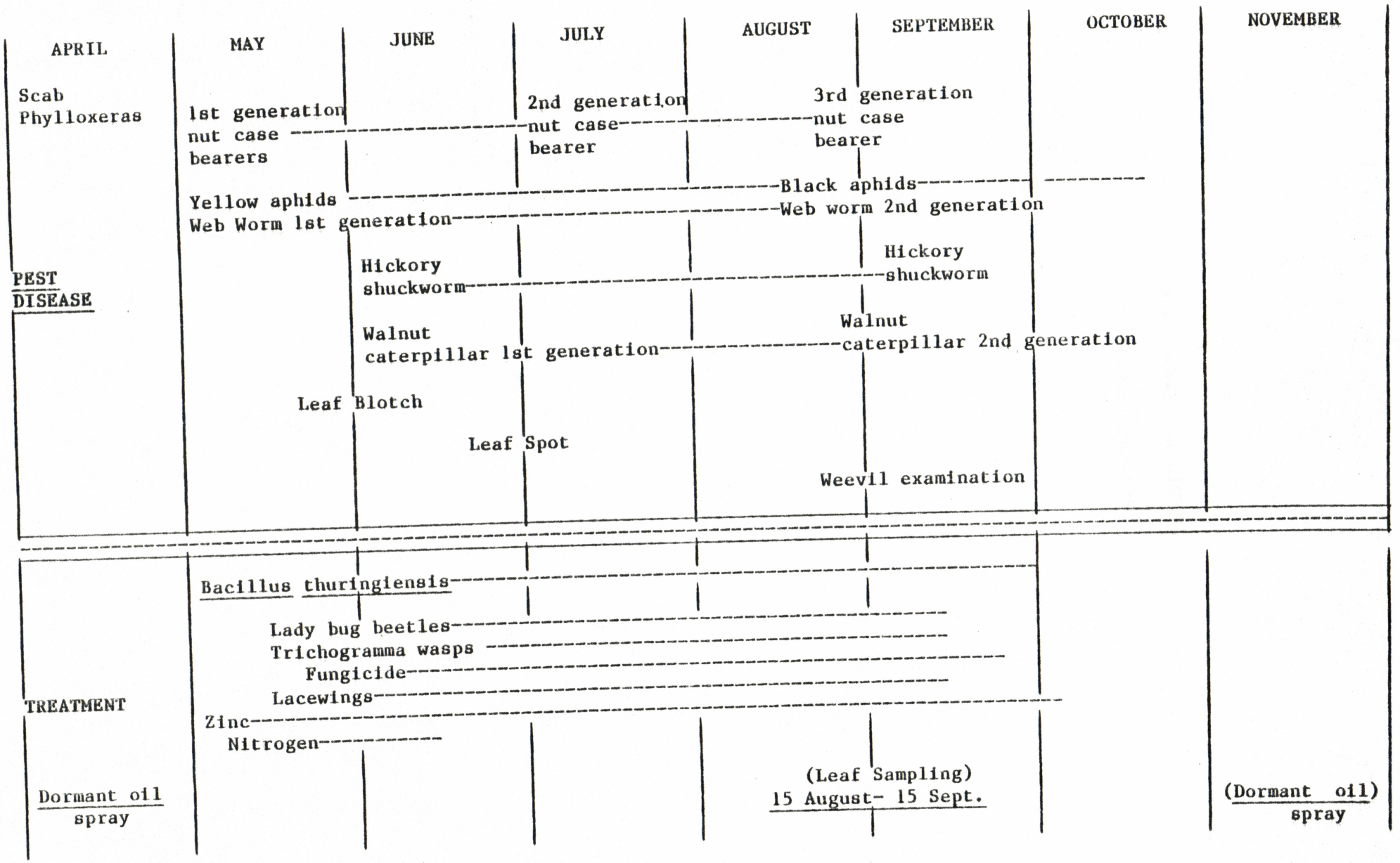
Tansy. Dried tansy leaves are supposed to keep ants off kitchen shelves and protect stored woolens and furs from moths by its repellent action.
Camphor. Camphor crystals have long been used for moth protection of woolens and furs in closed containers as chests and drawers.
Cedar. Still an old favorite is the pungent fragrance of cedar-lined chests and closets which are only moderately effective in repelling clothes moths from furs and woolens stored therein.
Oil of lavendar. Supposed to drive fleas and sand fleas from houses in the summer by sprinkling on carpets and floors. Of doubtful effectiveness.
Diatomaceous earth. When sprinkled heavily on dung heaps (chicken, cow, horse and dog) diatomaceous earth apparently repels flies so that egg laying is prevented, thus the usual reproduction is prevented.
Oil of Pennyroyal. The oil or the fresh herb rubbed on kitchen shelves will act as a short-lived ant repellent.

ANIMAL REPELLENTS

Mole and gopher repellent. Blend 2 ounces of castor oil with 1 ounce of liquid detergent. Add an equal volume of water and blend again. Fill a 2-quart sprinkling can with warm water and add 2 tablespoons of the mix, stir, and sprinkle over infested areas. Puncture mole tunnels and treat sparingly.
Deer. Deer can be repelled from fruit trees and areas by dusting the subject targets with blood meal or animal blood procured from a slaughter house.
Dogs and shrubs. Red pepper powder or napthalene flakes sprinkled on the subject urinating targets work equally well.
Dogs and cats on furniture. Dogs and cats can be prevented from sleeping in your best arm chairs or other locations by placing one or two moth balls or a few moth crystals in their normal resting place, or by giving the fabric (not wood surfaces) a very light spray of nicotine.
Dogs and rabbits in shrubs and flowers. Tobacco dust, lightly sprinkled over the area to be protected every 5-7 days acts as a good repellent.

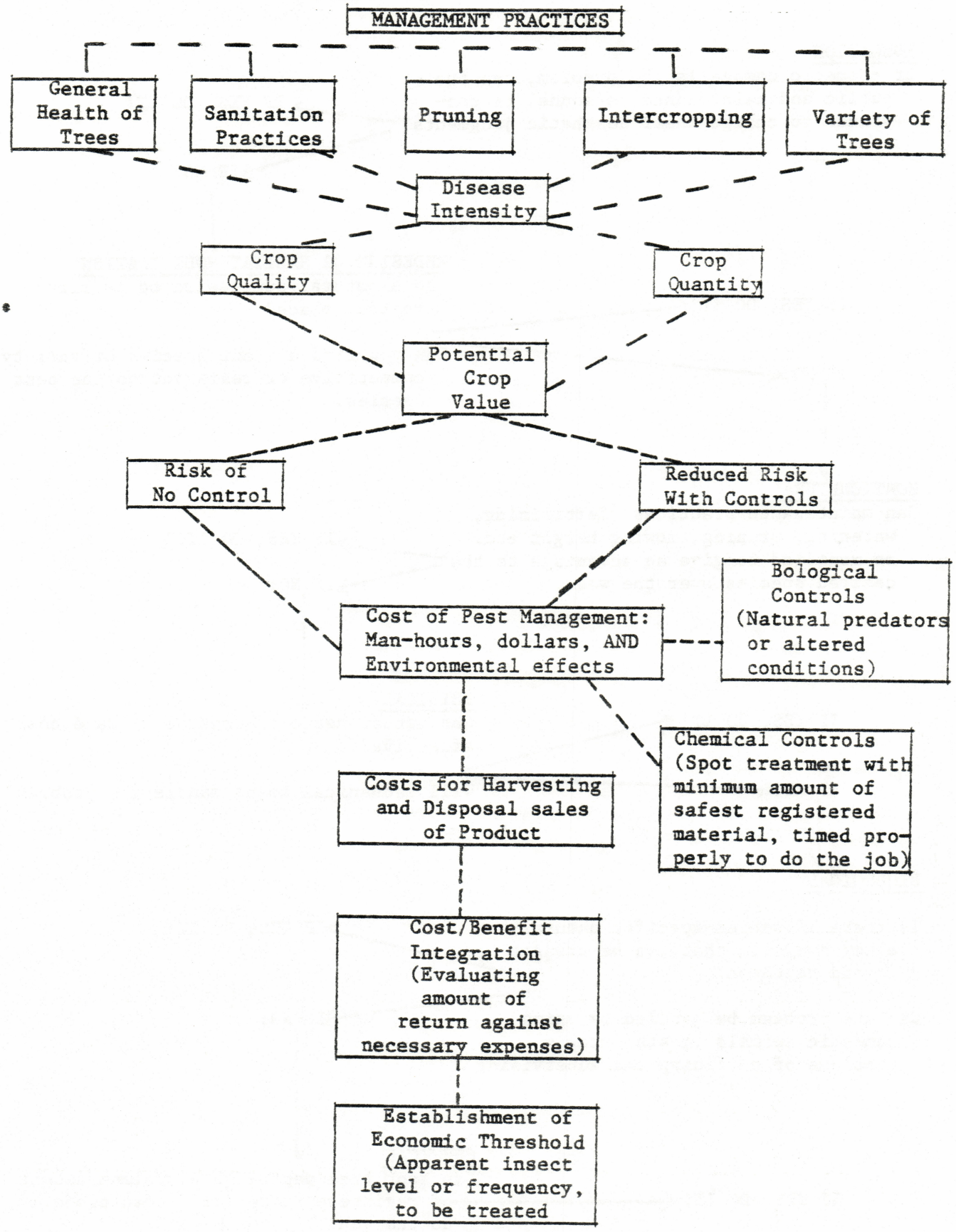
APPENDIX II - Guidelines and Program Suggestions

DISEASE/INSECT PEST/FERTILIZER/TRACE ELEMENT SPRAY SCHEDULE



COST/BENEFIT ANALYSIS

NATURAL ENVIRONMENT (SOILS, WATER, CLIMATE, DISEASES, INSECTS, ETC)



OPTIONS FOR WEED MANAGEMENT

EDUCATION

If cosmetic damage is the problem, can the public and maintenance personnel be convinced to change their aesthetic judgments?

- IF YES, DO IT!
- IF NO:

REDESIGN OR HABITAT MODIFICATION

Can a natural succession be permitted to take place?

- IF YES, DO IT!
- IF NO:

Can you find a plant species or variety competitive or resistent to the pest species.

HORTICULTURAL

Can maintenance practices (fertilizing, watering, pruning, mowing height etc. be modified to give an advantage to the desired species over the weed?

- IF YES, DO IT!
- IF NO:

PHYSICAL

Can manual means of control be made cost effective?

- IF YES, DO IT!
- IF NO!

Will mechanical means handle the problem?

BIOLOGICAL

Is there a species-specific natural enemy avalable that can be brought in and released?

- IF YES, DO IT!
- IF NO:

Can the problem be handled by using domestic animals (goats, etc. - problems of confining and supervising)?

CHEMICAL

Can spot treatment with a minimum amount of registered material, timed properly, do the job?

- IF YES, DO IT!

Appendix III - Insect Damage Symptoms and Alternative Controls

Terry control methods need to be updated per: this pamphlet Bobby

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SUGGESTIONS FOR CONTROLLING ROSETTE, INSECTS AND DISEASES ON COMMERCIAL PECANS

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Health and vigor of pecan trees and satisfactory nut quality and yield depend on a well planned and executed insect and disease control program. Insect and disease losses can be greatly reduced by using sound grove management and sanitation practices and by following suggested pest control procedures.

Zinc Nutrition

Pecans require zinc for normal stem and leaf growth. Trees not receiving zinc cannot produce the plant growth hormone, indoleacetic acid, and short clustered stems with small leaves result. This disorder is known as zinc rosette; therefore, zinc must be applied to the foliage. Zinc is not translocated from leaf to leaf and new shoots and foliage must be sprayed if they are to achieve optimum growth. Apply zinc frequently early in the season for optimum stem elongation and leaf expansion.

When and How to Spray

Preventing disease and insect losses requires strict adherence to properly timed spray applications. Table 1 specifies when to apply in relation to tree development or pest occurrence. Thorough spray coverage of the trees with each application is essential for effective control.

With conventional high-volume hydraulic sprayers, ½ to 1 gallon of spray mixture per foot of tree height is normally required for proper coverage.

Maintain sprayer pressure at 300 to 400 psi. Low volume sprayers (mist blowers, air blast sprayers, speed sprayers, etc.) utilize forced air as the carrier to deliver a concentrated spray mix and proportionately less water is required to deliver the recommended amount of pesticide per tree. When using such air delivery sprayers, carefully follow the manufacturer's directions for mixing spray materials and calibrating the sprayer. Concentrated spraying saves water and time but not pesticides since the same amount of pesticide must be applied to each tree to obtain control regardless of application method. *Dilutions in the accompanying table of pesticide suggestions are for conventional hydraulic sprayers. Adjustments in water-pesticide ratios are necessary for other types of sprayers.*

Commercial producers should be able to recognize major insect and disease problems likely to occur in a grove. Detailed information on disease and insect recognition, potential damage and development of life history is in the Extension Service publication, MP-1270 *Pecan Insects of Texas* or MP-1272 *Pecan Diseases*, available from your county Extension agent.

Chemical Use Precautions

Select suggested materials for most effective, safe, economical control. All suggested materials are poisonous, but proper handling reduces hazards associated with use. Comply with manufacturers' label directions for handling pesticides or fungicides.

Residues. The Environmental Protection Agency has established certain pesticidal residue tolerances on pecans. These regulations require that certain chemicals should not be applied near harvest. Always consult the product label for specific restrictions.

Caution. Most pesticides are poisonous. Use them with caution and store them out of reach of children, irresponsible persons, livestock and household pets. Properly dispose of left-over spray material and containers. Explicitly observe all precautions on pesticide labels.

Pesticide Drift. Avoid drift to adjoining forage crops or other agricultural lands. Take precautions against pond and stream contamination to prevent fish mortality. Avoid pesticide drift on bee hives, wild bee nesting sites and plants in bloom.

Symptoms of Poisoning. Some symptoms of pesticide poisoning are headache, nausea, cramps, blurred vision, weakness, muscular twitching and diarrhea. If any of these symptoms occur during or following the handling of any pesticide, consult a doctor immediately.

Pollination and Bee Poisoning. Many agricultural and horticultural crops are dependent upon pollinating insects for production. Honey bee colonies are

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rented for pollination service in fruit trees, cucurbits, vegetables, legume seeds and other crops. Bumble bees, alkali bees, alfalfa leafcutting bees and other wild bee species provide essential pollination in certain areas of Texas. Growers must take special precautions to protect these beneficial pollinating insects. The following suggestions are effective in reducing bee poisoning:

1. Apply "nonhazardous" pesticides to bees on blooming crops.
2. Mow or shred orchard cover crop blooms before applying pesticide.
3. Apply hazardous pesticides only when bees are not foraging. Use relatively nonhazardous pesticides whenever possible.
4. Do not apply or allow pesticides to drift over wild bee nesting sites or honey bee colonies.
5. Establish holding yards for honey bees at least 3 miles from orchard.
6. Contact the beekeeper to remove bees from the area where bee losses are likely.
7. Do not dump unused quantities of pesticides where they might become a bee-poisoning hazard.

Relative Bee Hazard of Pesticides Suggested for Commercial Pecans

Highly toxic at any time

carbaryl (Sevin®)
dimethoate (Cygon®, De-Fend®)
parathion
dialifor (Torak®)
azinphosmethyl (Guthion®)

Hazardous if applied in early morning or during the day. Apply in late evening after bees quit foraging.

malathion

Hazardous if applied during the day. Not hazardous in early morning or late evening when bees are not foraging.

phosalone (Zolone®)

Nonhazardous at any time

Pesticides

disulfoton (Di-Syston®) G
oil sprays
sulfur

Fungicides

benomyl (Benlate®)
dodine (Cyprex®)
hydroxytriphenyltin (Du-Ter®)
metiran (Polyram®)
zinc sulfate

Aerial Application of Fungicides. Aerial applications of fungicides either by fixed wing or rotary have not proven as effective as ground application. It can be used during periods of unfavorable weather conditions which prevent use of ground equipment. When weather conditions improve, respray the area with ground equipment. Aerial applications are not successful on pecans because of tree heights, dense leaf canopy and requirements for maximum coverage of each leaflet and pecan nutlet for maximum control.

Suggestions made by the Texas Agricultural Extension Service and the Texas Agricultural Experiment Station on the use of pesticides are based upon:

- Effectiveness under Texas conditions
- Avoidance of residues in excess of allowable tolerances
- Avoidance of toxicity to desirable vegetation, animals and humans
- Avoidance of adverse side effects upon beneficial predators, parasites, honey bees, fish and other wildlife, plants, animals and humans.

Suggested pesticides must be registered and labeled for use by the U.S. Environmental Protection Agency and the Texas Department of Agriculture. The pesticides listed in this publication reflect use and restriction information from company labels at the time of printing. County Extension agents and appropriate specialists are advised of changes as they occur. The *USER* always is responsible for the effects of pesticide residues on livestock and crops, as well as problems that can arise from drift or movement of the pesticide from the users property to that of others.

Always read and follow carefully the instructions on the container label. For further information, contact your county Extension agent or project leader in Pesticide Chemicals, Texas A&M University (713) 845-1353.

Table 1. 1978 Suggestions for controlling rosette, insects and diseases on commercial pecans

Time of application	Insects and diseases	Pesticide and formulation	Concentrate per 100 gal water unless otherwise stated	Number of days from last application to harvest	Remarks
dormant (winter)	scale and phylloxera (galls)	dormant oil 97% oil emulsion	4 gal	0	For phylloxera, spray tree trunk and branches thoroughly with dormant oil emulsion.
bud break	phylloxera	malathion 25% WP	3 lbs	0	Where a history of phylloxera damage indicates a need for control.

Time of application	Insects and diseases	Pesticide and formulation	Concentrate per 100 gal water unless otherwise stated	Number of days from last application to harvest	Remarks
		phosalone (Zolone[z]) 34.4% EC	1⅓ pts	See remarks	apply at bud break and at 3-day intervals until leaves are one-third grown or until over-wintered hatch ceases. See MP-1270. Phosalone - Do not apply after shuck split.
	scab	benomyl (Benlate[z]) 50% WP or hydroxytriphenyltin (Du-Ter[z]) 47% WP or dodine (Cyprex[z]) 65% WP or metiram (Polyram[z]) 80% WP	ground: ½-1 lb per acre aerial: 1 lb per acre ground: 3.2-9.6 oz aerial: ¾-1½ lb/20 gal water ground: ½-1 lb aerial: 2-4 lb/20 gal water ground: 2.0 lbs aerial: 8 lb/20 gal water		*Cyprex* may cause foliage burn on Moore and Burkett varieties when used with Guthion. *Benlate* used at the rate of ½ lb per acre on small trees and 1 lb per acre on trees greater than 30 ft in height. *Polyram* has performed well in the West Cross Timbers area and west. Due to intense disease pressure, it may not perform as well in South Central, East Texas and Gulf Coast areas. Benlate is the only fungicide with grazing clearance. *Maximum* rates of fungicides may be required when trees are fully developed and the area is receiving extended periods of high humidity.
	rosette	zinc sulfate 78% WP or NZN liquid	2-3 lbs 1¼ pts	0	The bud break spray of zinc is extremely important in Central and West Texas.
Prepollination (when leaves are one-third grown and before pollen is shed)	scab	same as bud break			
	rosette	zinc sulfate 78% WP or NZN liquid	2-3 lbs 1¼ pts	0 0	In far West Texas, zinc sulfate absorption can be increased by adding 3 pts of a 32% liquid nitrogen per 100 gal of water. Do not use at higher strength since foliage burn results.
Casebearer Soon after pollination as eggs appear on tips of nutlets	pecan nut casebearer	azinphosmethyl (Guthion[z]) 50% WP 22.2% EC (2L) 22% EC (2S) or Carbaryl (Sevin[z]) 80% sprayable or malathion 25% WP or phosalone (Zolone[z]) 34.4% EC or dialifor (Torak[z]P) 40.5% EC	 ¾-1⅛ lbs 1½-2¼ pts 1½-2¼ pts 2-3 lbs 3 lbs 1⅓ pts 1 pt	See remarks See remarks See remarks 0 See remarks See remarks See remarks	Eggs usually are deposited on tips of nuts. Examine nutlet clusters for greenish white eggs. Spray nutlet clusters thoroughly when egg hatch is occurring. Banding is valuable in timing applications and indicating need for repeat application. (see L-702) *Azinphosmethyl* - Do not apply after shuck split. Do not graze livestock in treated groves 21 days after treatment. *Carbaryl* - Do not apply after shuck split. *Malathion* - no time or grazing restrictions. *Phosalone* - Do not apply after shuck split. Do not allow livestock to graze treated grove. *Dialifor* - Do not apply more than 12 lbs (24 pts) per acre per season. Do not apply after shuck split. Do not

Time of application	Insects and diseases	Pesticide and formulation	Concentrate per 100 gal water unless otherwise stated	Number of days from last application to harvest	Remarks
					graze livestock in treated areas. Do not feed treated cover crops to livestock or poultry.
	scab	Same as budbreak			
	rosette	Same as budbreak			Same as prepollination
First cover spray: 14 days after casebearer spray	scab	Same as budbreak			This application may be required in areas of moderate to high rainfall.
	rosette	Same as budbreak			
Second cover spray: 14 days after first cover spray	scab	Same as budbreak			This application may be required in areas of moderate to high rainfall.
	rosette	Same as budbreak			Same as prepollination
May or early June	aphids	Disulfoton (Di-Syston®) 15% G	13.5 lbs/acre	80	Season-long control where properly applied and where soil moisture is adequate for uptake. Irrigate immediately after application, where possible. Apply in 6-foot bands on two or four sides of trees. Locate bands in tree's main "drip area." Work into upper 2 to 3 inches of soil in clean tilled groves and beneath grass roots (6-8 inches) in sodded groves. One application per season.
		or Disulfoton (Di-Syston®) 85% EC	2¾ pts/acre	80	
When present (Where disulfoton soil applications are not made)	aphids pecan spittlebug	Dimethoate (Cygon® or De-Fend®) 30.5% EC	1 pt	21 See remarks	*Dimethoate* - do not graze livestock in treated groves. Apply only with ground equipment. *Phosalone* - see remarks above on pecan nut casebearer. Black pecan aphid sucks juices from leaves. Bright yellow spots appear around feeding punctures. Spots turn brown and cause leaves to drop prematurely. Black pecan aphids do not feed in crowded colonies. Honeydew-producing aphids cause leaves to curl and turn brown. Considerable honeydew and sooty mold growth occurs when bright yellow aphids occur in numbers. Spittlebug control seldom is required in Texas.
		or Malathion 25% WP	3 lbs	0	
		or Phosalone (Zolone®) 34.4% EC	1⅓ pts	See remarks	
When present in damaging numbers	sawfly larvae may beetles pecan catocola	These insects normally do not occur in large numbers, and control is seldom necessary. When damaging infestations occur, pesticides suggested for all webworm and walnut caterpillar will provide adequate control.			
Last of July (approx.)	Fall foliage and nut disease (scab, downy spot, brown leaf spot)	benomyl (Benlate®) 50% WP	½-1 lb per acre		This should be timed with the occurrence of the liquid endosperm period. Do not apply any fungicides after shuck split.
		or hydroxytriphenyltin (Du-Ter®) 47% WP	½ lb		
Mid-August	hickory shuckworm	azinphosmethyl (Guthion®) 50% WP	¾-1⅛ lbs	See remarks	Damaging populations generally observed around mid-August. Begin application about Sept. 1 or as soon as shells harden. Make two applica-
		22.2 EC (2L)	1½-2¼ pts	21	

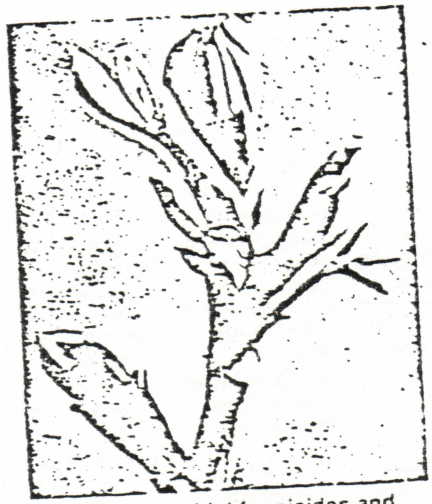
Time of application	Insects and diseases	Pesticide and formulation	Concentrate per 100 gal water unless otherwise stated	Number of days from last application to harvest	Remarks
		22% EC (2S)	1½-2¼ pts		tions at 10- to 18-day intervals. *Azinphosmethyl* - See remarks under pecan nut casebearer above for grazing restrictions. *EPN* - Do not graze livestock in treated grove. *Phosalone* - See remarks under pecan nut casebearer. *Dialifor* - See remarks under pecan nut casebearer.
		or			
		EPN 25% WP	2 lbs		
		or			
		phosalone (Zolone®)		See remarks	
		34.4% EC	1⅓ pts		
		or			
		dialifor (Torak® P) 40.5% EC	1 pt		
Mid-August	pecan weevil	carbaryl (Sevin®) 80% Sprayable	2-3 lbs	See remarks	Adults emerge in late summer usually after rains. Begin checking during the first week in August by spreading canvas beneath trees and jarring lower branches. When three or more weevils per tree are found, apply spray. Repeat application as needed at 10- to 14-day intervals. Pyramid emergence cages also can be used to indicate time of adult emergence. *Carbaryl* - Do not apply after shuck split. *Dialifor* - See remarks under pecan nut casebearer. Make applications at 7-day intervals.
		or			
		dialifor (Torak® P) 40.5% EC	1 pt		
Second application (2 weeks after first application	fall foliage and nut disease (scab, downy spot)	Same as first application			
Third application (2 weeks after second application)	fall foliage and nut diseases (scab, downy spot)	Same as first application			May be required during years of high rainfall or during periods of excessive fog, dew or high humidity

WP - wettable powder
EC - emulsifiable concentrate
G - granular

For additional information, see MP-1270 *Pecan Insects of Texas* or MP-1272 *Pecan Diseases*.

Alternate Fungicides in the Spray Program

To avoid the possibility of developing races of fungi that cannot be controlled with a particular fungicide, change fungicides during the season. Due to the extensive use of Benlate® in the southeastern states for controlling pecan scab, fungicide-resistant races have developed. To prevent this from occurring in Texas, rotate fungicides such as Du-Ter® or Cyprex® with Benlate®.



Bud break — Initial fungicides and zinc spray.



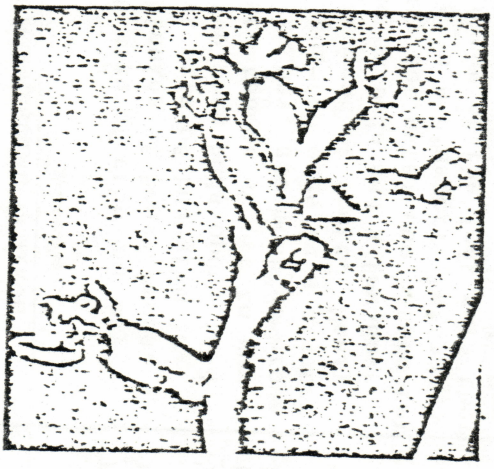
Prepollination sprays.



Phylloxera galls on pecan.



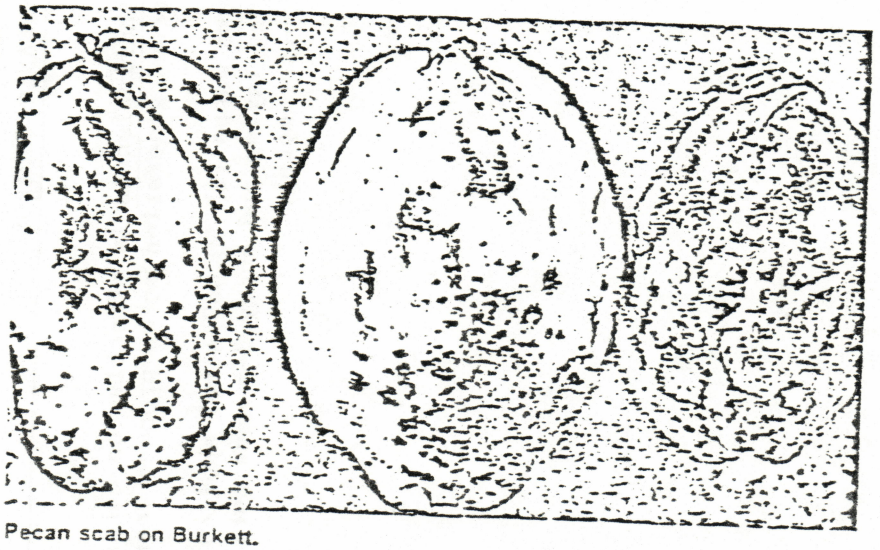
Injury to nutlets caused by first generation larvae of the pecan nut casebearer.



Approximate casebearer spray period.



Pecans require zinc for normal stem and leaf growth.



Pecan scab on Burkett.



Pecan weevil adult on pecan nut.

Educational programs conducted by the Texas Agricultural Extension Service serve people of all ages regardless of socio-economic level, race, color, sex, religion or national origin.

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INSECT/DISEASE	SYMPTOMS/DAMAGE/COMMERCIAL CONTROL	ORGANIC CONTROL
CASEBEARERS		
1. Nut casebearers	Nut losses vary with size of crop but may provide desirable thinning of heavy crops. Insects overwinter at axis of bud-stem in cocoons, become active when buds open, feed on buds, and bore into tender shoots to pupate. Moths emerge in May, are most numerous at nut set, and lay one-two eggs in a cluster of nuts on the blossom-end of fruit. Newly hatched insects feed on buds and a few days later bore into newly set nuts: one casebearer may destroy all nuts in a cluster. Larvae mature and pupate in one of the last nuts they attack. First generation larvae occur in May, second generation in late June to early July (usually a 42 day interval after the 1st generation) but nut losses are less in late summer because nuts are larger. Larvae of later generations feed on shucks and leaves and the last generation overwinters in cocoons on the buds. Three generations are common but four have occurred in Texas. COMMERCIAL CONTROLS: Wilted shoots on trees during spring indicates need for control. Spray with Zolone, Malathion, or combination of Malathion and Sevin during critical 6-7 days where over 3% of the previous year's shoots were infested with over-wintering larvae or if there is a history of serious infestation. No real damage to trees, proper, occurs from nut casebearers. Do not graze livestock for at least 30 days in areas where Zolone has been sprayed. Sevin is particularly hazardous to honey bees.	Bacillus thuringiensis is effective on caterpillar stage. Second generation moths produce less nut loss. Trichogramma wasps (25-50,000/acre) applied 10-15 days prior to egg laying and every 3-5 days until eggs hatch. Monitor moths.

INSECT/DISEASE	SYMPTOMS/DAMAGE/COMMERCIAL CONTROL	ORGANIC CONTROL
CASEBEARERS		
2. Cigar Casebearer	Usually a minor pest but can sometimes seriously damage buds and foliage during spring months. Also feeds on hickory and black walnut. Larvae overwinter in small cases on limbs or twigs and become active as buds open, feeding on buds and foliage until mid-May. Larvae pupate in cigar-shaped cases. Moths appear in early June and lay eggs on leaves; several generations per year. Commercial sprays to control leaf casebearer or nut casebearer will suppress cigar casebearer.	Bacillus thuringiensis effective on caterpillar leaf-feeding stage. Trichogramma wasps (see above)
3. Leaf Casebearer	Overwinters near buds in small cocoons similar to nut casebearers. Emerging larvae in spring attack unfolding buds and leaves. Heavy spring infestations can keep trees in semi-defoliated condition for 3-5 weeks, and injury often causes increase in nut drop. Moths appear about mid-May until early August and deposit eggs on underside of leaves. Larvae hatch from late August to early September and migrate to buds where winter cocoons are constructed. One generation per year. Chemical sprays are applied early when buds begin to open and during summer from late June to mid-August. One application is usually sufficient if the undersides of leaves are well covered.	Bacillus thuringiensis effective on caterpillar, leaf-feeding, stage. Be sure to coat the undersides of leaves. Trichogramma wasps (see above)

INSECT/DISEASE	SYMPTOMS/DAMAGE/COMMERCIAL CONTROL	ORGANIC CONTROL
HICKORY SHUCK WORM	One of most destructive of pecan insects, reduces crop; also feeds on hickory nuts. Commonly found feeding in phylloxera galls in early spring. Attacks nuts from 1st of June to harvest and from first appearance until shell hardening (late August) continually destroying interior of nuts. Immature, early season infested nuts fall to the ground. After shell hardening, worms tunnel into green shucks and prevent kernels from developing properly; infested nuts may be poorly filled and mature later than healthy nuts. Full-grown worms overwinter in shucks, on the ground, or in trees. Larvae pupate within shuck in late winter to early spring and metamophose into moths. Moths appear in April with a few remaining into summer. Little infestation before June; then, population rapidly increases with as many as 4-5 generations (in Georgia). Easy to control with proper chemical insecticide applications.	Remove old husks from trees after harvest. Plow shucks under in early spring. Summer nut drops should be gathered and burned. Gather and destroy old shucks on ground after harvest. *Trichogramma* wasps and *Bacillus thuringiensis* effective. Plowing during July to August to turn infested shucks under ground is relatively effective (larvae won't mature in decaying shucks and adults cannot emerge from the soil).
ROSETTE	Not a disease, rather a deficiency in available zinc (tied up in soils) producing abnormal growth and terminal die-back. Apply zinc at every possible opportunity. The rate of uptake is low but the only source of zinc available to the tree. Use 2 lbs. of 78% zinc sulfate per 100 gallons water: after pollination and when tips of nutlets turn brown; then 3-4 weeks later; then, 3-4 weeks later.	Do NOT just routinely apply zinc when symptoms do not appear: overfertilization with zinc has been reported to poison trees or reduce hardiness or crop. When in doubt, analyze leaf tissue for deficiency.

INSECT/DISEASE	SYMPTOMS/DAMAGE/COMMERCIAL CONTROL	ORGANIC CONTROL
PECAN WEEVIL	Causes serious crop loss in some areas. Weevils do not move far from the tree under which they emerge, provided there are nuts on that tree. Certain trees may be heavily infested with weevils while adjacent trees receive little damage. Weevils prefer trees in low areas and near hickory trees. Adults emerge from soil in August to early September after periods of heavy rainfall, they drill holes through shucks and shells and place 2-4 eggs in kernels. Adults feed on kernels in water stage and cause nut drop. Weevil larvae feed in partially matured nuts but nuts do not drop. White larvae, when fully grown, leave the nuts between late September and late December; they enter the soil and remain in the larval stage 1-2 years. Larvae pupate between first of September and mid-October and metamorphose into adults in about 3 weeks. Adults remain in the soil until the following summer. Complete life cycle requires 2-3 years. Spray with Sevin, spot treat only infested trees.	Currently, the only mechanical treatment suggests: shake trees after 1st heavy rain in mid-August or early September and repeat shakings weekly until 15 September or until no more weevils collected. Place sheets under trees to catch dislodged weevils: crush, burn or put weevils into kerosene. Periodically remove all fallen nuts and nut cases from beneath the trees. This may not be an effective treatment and be very expensive in man hours; thus, not feasible.
PECAN SCAB	Elongate olive-brown spots (lesions) on undersides of leaves. A fungus and most damaging disease. Secondary infections may become almost black. Infection occurs if plant tissues have been wet for several hours. Primary infestions can occur before mid-April and develop rapidly from spore lesions not commonly seen on new tissue for 1-2 weeks after germination. Secondary infections occur by late April or early May. Non-growing plant tissue is resistant to infection. Nuts infected usually fall before kernel has formed. Apply fungicides early in the season (once tissues are infected, the fungus is protected from chemical control) and on regular schedule thereafter, preferably prior to rain. Duter resistant races have developed; rotate fungicides: Duter, Cyprex, Benlate and others.	Shake old shucks and leaf stems off trees before tree leafing begins. After a heavy rain or on foggy days, a slight jarring of branches will cause most old shucks and leaf stems to fall. Burn those items. Infection is spread throughout the tree by scab spores moved by rain water. Large, low-hanging branches should be cut out to allow better air circulation through the tree and faster leaf drying. Humid conditions encourage scab. Air circulation through and around trees (i.e., a sparcity of plants per acre) helps to control scab. Separate plants farther apart in humid climates. Various leaf blights are controlled in much the same manner. Ground sulfur rock - apply every week to ten days but don't spread when temperature 85° or greater and not within 2 weeks of dormant oil

INSECT/DISEASE	SYMPTOMS/DAMAGE/COMMERCIAL CONTROL	ORGANIC CONTROL
PHYLLOXERAS	Tumor like swellings or galls on leaves, leafstalks, succulent shoots, and nuts of new growth caused by small sucking insects (phylloxeras), related to aphids. Damage causes malformed, weakend shoots which finally die. Severe infestatons can destroy entire limbs. Insect overwinters in the egg stage on the branches, young appear in spring just as buds unfold. Insertion of the insect's beak into plant tissue causes a gall to form that soon envelopes insect. Insects mature within the gall. Adult dies after laying large numbers of eggs. Nymphs hatch and are released as winged forms when galls split open in late May or early June. Several generations per year. Not considered a serious pest of mature pecans but can damage young nursery trees. Spray trees with recommended insecticide or dormant oil.	Dormant oil spray in winter to suffocate over-wintering stages.
APHIDS		
1. Black Pecan	Considered more destructive than other aphid species because feeding may cause defoliation in a short time. Feed on both sides of leaflet. Prefer the shaded, inner portion of a tree. As injured leaflets drop, aphids migrate towards outside of tree. Premature leaf drop from insect damage reduces the carbohydrate reserves of the plant, prevents proper nut filling, and reduces the following year's bloom. Insects pass the winter in an egg stage on the tree bark. Eggs hatch in late March into wingless aphids which move to buds and leaves where they feed until grown. Adults give birth to living young, about 15 generations per year and each adult produces about 60 young. Heavy infestations may develop with 3-4 weeks of favorable condi-tions. With beginning of cold weather, insects lay eggs for the overwintering generation.	Dormant oil sprays in winter. Lady bug beetles. Growing nasturtiums around trees and removing plantain weeds. Dormant oil spray in spring and winter (in spring before any of the buds are open). Ants spread aphids to other plants. Control ants by placing sticky bands of roofing paper around trees to prevent their ascent and by sprinkling steamed bone meal around ant mounds in lawns and on grounds. Pyrethrum is effective; non-toxic to ladybug beetle larvae but harmful to adult ladybug beetles and earth-worms. Non-toxic to bees. Sabadilla (red devil dust) is is effecting against aphids and webworms (Burgess Seed Company, Bloomington, Illinois) Diatomaceous earth is effective when insects are in a larvae stage=Diatect Corporation, Holland, Michigan 49423 or Astrochemical Corporation, Lafayette, Louisiana 70501

INSECT/DISEASE	SYMPTOMS/DAMAGE/COMMERCIAL CONTROL	ORGANIC CONTROL
2. Yellow Aphids	At lest 2 species. Adult feeds on underside of leaflets. Insects excrete large quantities of honeydew. Life cycle similar to black pecan aphid. General: Heavy infestations in late summer may cause defoliation and reduce nut crop in current and succeeding year. Large aphid populations require chemical control but indiscrimiate use of insecticides also kills helpful predaceous insects, parasites, and entomogenous fungi which help to keep aphids in check by natural means.	Entomophtora fungus(?) Braconid wasps(?) Lacewings Dormant oil spray in winter Ladybird beetles
FALL WEB WORM	Colony feeding caterpillars producing large dirty-white webs on trees in latesummer and fall. Caterpillars hatch from egg masses deposited on leaves by a single moth and feed on both surfaces of leaves, enlarging the web as they spread. Fully grown caterpillars spin flimsy, hairy cocoons beneath loose debris near surface of soil. Usually several generations per year with the second one feeding on leaves in late summer and fall. Insect overwinters as pupa, moths appear during following year in April and May. Control necessary only when insects are numerous but control should be undertaken when caterpillers are small. Serious infestations every 5-10 years. Carbaryl or Rotemane; apply when webs first appear, mid-June through July.	Check after rains and cut or pick caterpillars or webs off. Bacillus thuringiensis is effective but spray will not penetrate web. Webs may be destroyed by torch, carefully used so as to not ignite the tree. Sabadilla (Red Devil Dust; Burgess Seed Company, Bloomington, Illinois) effective against webworm and aphids. Diatomaceous earth may be effective when webworms are in a larval stage (Diatect Corporation, Holland, Michigan 49423 -or- Astrochemical Corporation, Lafayette, Louisiana 70501) Trichogramma wasps (see above)

INSECT/DISEASE	SYMPTOMS/DAMAGE/COMMERCIAL CONTROL	ORGANIC CONTROL
WALNUT CATERPILLAR	Colony feeding caterpillars which do not produce protective web. 1st generation occurs in June and July and 2nd generation in late August and September. In preparation for molting, caterpillars move down to large limbs and form compact masses. After shedding, they move back to the ends of branches and resume feeding. Molt occurs several times during development. Overwinters in pupal stage in soil much the same as fall webworm. Moths emerge in spring and deposit egg masses on undersides of leaves. Spray treatments are used similar to those for fall webworm. Because of the lack of protective webs, walnut caterpillars are very susceptible to insecticide sprays.	Caterpillars clustered on trunk or libs may be destroyed by crushing or burning. Bacillus thuringiensis is effective. Trichogramma wasps Red and paper wasps
BROWN LEAF SPOT	A fungus disease which can prematurely defoliate trees, more prevalent in humid areas. Neglected trees or trees not sprayed with a fungicide are apt to be seriously damaged. First appears in June or July and only found on mature leaves. Late September defoliation is mostly detrimental to next year's nut crop. Overwinters in infected spots on old leaves. Spray trees with fungicide, timing the sprays as for leaf blotch. Spray fungicide beginning of 2-3rd week in May about a week after bloom. Continuation with 1-2 additional sprays at 2-3 week intervals during the summer may be necessary.	Good ground sanitation practices after leaf fall. Increase air circulation (see pecan scab). Healthy trees are generally resistant. Ground sulfur rock (see pecan scab)

INSECT/DISEASE	SYMPTOMS/DAMAGE/COMMERCIAL CONTROL	ORGANIC CONTROL
LEAF BLOTCH	Fungus disease which attacks both young and mature trees but mainly trees of low vigor. Conidiophores appear in June or July on underside of leaves and on lower branches. Yellow spots appear on upper surface of leaves and are followed, in midsummer by black pimplelike fruiting bodies. Leaves develop shiny, black blotched appearance when spores have been washed away or otherwise deteriorated. Joining of blotches causes premature defoliation of the tree. Leaf blotch fungus only attacks pecan trees when trees have lowered vigor (from overcrowding, lack of fertilizer, insect borer attack, or general neglect). Spray trees with fungicide at the beginning of 2nd or 3rd week in May, about a week after bloom. One or 2 additional applications at 2 or 3 week intervals may be necessary. Overwinters in fallen leaves, and spores are carried upwards by air convection currents into the tree to cause reinfestation for the next season.	Maintain healthy condition of trees. Disc old, fallen leaves into the ground during spring. Increase air circulation (see pecan scab). Ground sulfur Rock (see pecan scab).
BUNCH DISEASE	Characteristic symptom is bushy growth of slender willowy shoots, resulting from an abnormal forcing of lateral buds into growth. Reported to be caused by undertermined virus, but not confirmed. Seriously affected trees may become mere skeletons, with thick broomy sucker growth covering main lateral branches. Disease is most consipicuous in spring and early summer since affected shoots put on leaves earlier than healthy ones. Evidence indicates that the spread of bunch disease is favored by wet weather during flushes of growth. May be mistaken for rosette, but unlike bunch disease, rosette also manifests itself in leaflets which crinkle and turn yellow between the veins. No known control but suggestions are to prune out and burn affected branches to prevent spread.	Prune and burn affected branches.

INSECT/DISEASE	SYMPTOMS/DAMAGE/COMMERCIAL CONTROL	ORGANIC CONTROL
SPANISH AND BALL MOSS	Epiphytes (non-parasitic) plants which use pecan trees (or other supporting structures) as a base upon which to grow. Excessive Spanish or ball moss development will compete with the tree leaves for sunlight and the shading effect they create may be detrimental to tree vigor, fruit bearing, and growth. Chemical fungicide sprays control.	Trees in vigorous growth produce dense foliage which will shadow out Spanish and ball moss. Prune moss out of tree by hand. Increase health/vigor/ growth of trees.

APPENDIX IV - Chemical Pesticides, Hazards, Safety

1978 SUGGESTIONS FOR CONTROLLING ROSETTE, INSECTS AND DISEASES ON COMMERCIAL PECANS

Time of Application	Insects and Diseases	Pesticide and Formulation	Concentrate per 100 gal water Unless Otherwise Stated	No. Days from last application to harvest	Remarks
Dormant (Winter)	Scale and phylloxera (galls)	Dormant oil 97% oil emulsion	3 to 4 gal. depending upon individual manufacturer's recommendations	0	For phylloxera, spray tree trunk and branches thoroughly with dormant oil emulsion.
Bud Break	Phylloxera	Malathion 25% WP or Phosalone (Zolone®) 34.4% EC	3 lbs. 1-1/3 pts.	0 See remarks	Where a history of phylloxera damage indicates a need for control, apply at bud break and at 3-day intervals until leaves are 1/3 grown or until overwintered hatch ceases. See MP-1270. Phosolone - Do not apply after shuck split.
	Scab	Benomyl (Benlate®) 50% WP or hydroxytriphenyltin (Du-Ter®) 47% WP or dodine (Cyprex®) or metiram (Polyram®) 80% WP	ground: ½-1 lb per acre aerial: 1 lb per acre ground: 3.2-9.6 oz. aerial: 3/4-1½ lb/20 gal water ground: ½-1 lb aerial: 2-4 lb/20 gal water ground: 2.0 lbs aerial: 8lb/20 gal water		Cyprex may cause foliage burn on Moore and Burkett varieties when used with Guthion. Benlate used at the rate of ½lb/A on small trees and 1 lb/A on trees greater than 30 ft. in height. Polyram has performed well in the West Cross Timbers area and west. Due to intense disease pressure, it may not perform as well in South Central, East Texas and Gulf Coast areas. Maximum rates of Du-Ter and Cyprex may be required when trees are full developed and the area is receiving extended periods of high humidity. For further information on aerial application refer to the paragraph on aerial application of fungicides

Time of Application	Insects and Diseases	Pesticide and Formulation	Concentrate per 100 gal water Unless Otherwise Stated	No. Days from last application to harvest	Remarks
Bud Break	Rosette	Zinc Sulfate 78% WP or NZN Liquid	2-3 lbs. 1½ pts.	0 0	The bud break spray of zinc is extremely important in Central and West Texas.
Prepollination (when leaves are 1/3 grown and before pollen is shed)	Scab	Same as bud break			Same as bud break
	Rosette	Zinc Sulfate 78% WP or NZN Liquid	2-3 lbs. 1½ pts.	0 0	In far West Texas, zinc sulfate absorption can be increased by adding 3 pints of a 32% liquid nitrogen per 100 gal. of water. Do not use at higher strength since foliage burn results.
Soon after pollination as eggs appear on tips of nutlets	Pecan nut casebearer	Azinphosmethyl (Guthion®) 50% WP 22.2% EC (2L) 22% EC (2S) or Carbaryl (Sevin®) 80% WP 80% sprayable or Malathion 25% WP or Phosalone (Zolone®) 25% WP	 3/4-1 1/8 lbs. 1½-2½ pts. 1½-2½ pts. 2-3 lbs. 2-3 lbs. 3 lbs. 3 lbs.	 See remarks See remarks See remarks 0 See remarks See remarks	Eggs usually are deposited on tips of nuts. Examine nutlet clusters for greenish white eggs. Spray nutlet clusters thoroughly when egg hatch is occurring. Banding is valuable in timing applications and indicating need for repeat applications. (See L-702). Azinphosmethyl - Do not apply after shuck split. Do not graze livestock in treated groves 21 days after treatment. Carbaryl - Do not apply after shuck split.

Time of Application	Insects and Diseases	Pesticide and Formulation	Concentrate per 100 gal. water Unless Otherwise Stated	No. Days from last application to harvest	Remarks
	Pecan nut casebearer	or Dialifor (Torak^{R} P) 40.9% EC	1 pt.	See remarks	Phosalone - Do not apply after shuck split. Do not allow livestock to graze treated grove. Dialifor - Do not apply more than 12 pounds (24 pints) per acre per season. Do not apply after shuck split. Do not graze livestock in treated areas. Do not feed treated cover crops to livestock or poultry.
	Scab	Same as Pre-pollination			Same as Prepollination
	Rosette	Same as Pre-pollination			Same as Prepollination
1st cover spray: 14 days after casebearer spray	Scab	Same as Pre-pollination			This application may be required in areas of moderate to high rainfall and others when it rains often.
	Rosette	Same as Pre-pollination			
2nd cover spray: 14 days after 1st cover spray	Scab	Same as Pre-pollination			This application may be required in areas of moderate to high rainfall and others when it rains often.
	Rosette	Same as Pre-pollination			Same as Prepollination
When present in damaging numbers	Sawfly larvae May beetles Pecan catocola	These insects normally do not occur in large numbers and control is seldom necessary. When damaging infestations occur, pesticides suggested for fall webworm and walnut caterpillar will provide adequate control.			

numbers. Pecan catocala provide adequate

Time of Application	Insects and Diseases	Pesticide and Formulation	Concentrate per 100 gal water Unless Otherwise Stated	No. Days from last application to harvest	Remarks
Last of July (approx.) Water Stage	Fall Foliage and nut disease (Scab and Stem End Blight	Benomyl (Benlate^{R}) 50% WP or hydroxytriphenyltin (Du-Ter^{R}) 47% WP	½-1 lb per acre ½ lb		This should be timed with the occurrence of the liquid endosperm period. Do not apply any fungicides after shuck split. Stem End Blight is the same disease as Sticky Shuck.
Mid-August	Hickory Shuckworm	Azinphosmethyl (Guthion^{R}) 50% WP 22.2 EC (2L) 22% EC (2S) or EPN 25% WP or Phosalone (Zolone^{R}) 25% WP 34.4% EC or Dialifor (Torak^{R} P) 40.9% EC	3/4-1 1/8 lbs 1½-2½ pts. 1½-2½ pts. 2 lbs. 3 lbs. 1 1/3 pts. 1 pt.	See remarks	Damaging populations generally are observed around mid-August. Begin application about Sept. 1 or as soon as shells harden. Make 2 applications at 10 to 18 day intervals. Azinphosmethyl - See remarks under pecan nut casebearer above for grazing restrictions. EPN - Do not graze livestock in treated grove. Phosalone - See remarks under pecan nut casebearer. Dialifor - See remarks under pecan nut casebearer.
	Pecan Weevil	Carbaryl (Sevin^{R}) 80% WP or Dialifor (Torak^{R} P) 40.9% EC	2-3 lbs. 1 pt.	See remarks	Adults emerge in late summer usually after rains. Begin checking during the first week in August by spreading canvas beneath trees and jarring lower branches. When three or more weevils per tree are found, apply spray. Repeat application as needed at 10 to 14 day intervals. Pyramid emergence cages also can be used to indicate time of adult emergence.

Time of Application	Insects and Diseases	Pesticide and Formulation	Concentrate per 100 gal water Unless Otherwise Stated	No. Days from last application to harvest	Remarks
	Pecan Weevil				Dialifor - See remarks under pecan nut casebearer. Make applications at 7 day intervals.
2nd application (2 wks. after 1st application)	Fall foliage and nut disease (Scab, Downy Spot)	Same as 1st Application			
3rd application (2 wks. after 2nd application)	Fall foliage Nut diseases (Scab, Downy Spot)	Same as 1st Application			May be required during years of high rainfall or during periods of excessive fog, dew or high humidity.

WP - wettable powder
EC - emulsifiable concentrate
G - granulate
For additional information, see MP-1270, Pecan Insects of Texas or MP-1272, Pecan Diseases.

TABLE 33. Accidental Ingestions Among Children Under 5 Years of Age

Type of Substance	1973 No.	1973 %
Medicines	52,113	44.3
*Internal	42,215	35.9
*Aspirin	7,763	6.6
*Other	34,452	29.3
*External	9,898	8.4
Cleaning and Polishing Agents	19,132	16.3
Petroleum Products	4,974	4.2
Cosmetics	10,362	8.8
Pesticides	5,591	4.8
Gases and Vapors	140	0.1
Plants	7,032	6.0
Turpentine, Paints, Etc.	6,988	5.9
Miscellaneous	10,517	9.0
Not Specified	740	0.6
Total	117,589	100.0

Source: Individual case reports submitted to the National Clearinghouse for Poison Control Centers; 1973, from 517 centers in 45 states.

Bull. Natl. Clearinghouse for Poison Control Centers. U.S. Food and Drug Admin. Bur. Drugs, H.E.W., May-June 1974.

Regardless of your attitude toward pesticides and their presumed hazard, they have an excellent safety track record, and it grows better each year, mainly through education and labeling of containers.

PESTICIDE EFFECTS ON MAN

Pesticides were developed to kill unwanted organisms, and are toxic materials which produce their effects by several different mechanisms. Under certain conditions they may be toxic to man, and an understanding of the basic principles of toxicity and the differences between toxicity and hazard is essential. As you already know, some pesticides are much more toxic than others, and severe illness may result when only a small amount of a certain chemical has been ingested, while with other compounds no serious effects would result even after ingesting large quantities. Some of the factors that influence this are related to (1) the toxicity of the chemical, (2) the dose of the chemical, especially concentration, (3) length of exposure, and (4) the route of entry or absorption by the body.

Early in the development of a pesticide for further experiments and exploration, toxicity data are collected on the pure toxicant as required by the Environmental Protection Agency. These tests are conducted on test animals that are easy to work with and whose physiology, in some instances, is like that of man, for example, dog. Test animals include white mice, white rats, white rabbits, guinea pigs, and beagle dogs. For instance, intravenous tests are determined usually on mice and rats, whereas dermal tests are conducted on shaved rabbits and guinea pigs. Acute oral toxicity determinations are most commonly made in rats and dogs, with the test substance being introduced directly into the stomach by tube. Chronic studies are conducted on the same two species for extended periods, and the compound is usually incorporated in the animal's daily ration. Inhalation studies may involve any of the test animals, but rats, guinea pigs, and rabbits are most commonly used.

These procedures are necessary to determine the overall toxic properties of the compound to various animals. From this information, toxicity to man can generally be extrapolated, and eventually some micro-level portion of the pesticide may be permitted in his food as a residue, which is expressed in parts per million, that is parts of a chemical per million parts of a particular food, by weight.

Toxicologists use rather simple animal toxicity tests to rank pesticides according to their toxicity. Long before pesticides are registered with the Environmental Protection Agency and eventually released for public use the manufacturer must declare the toxicity of their pesticide to the white rat under laboratory conditions. This toxicity is defined by the LD_{50}, expressed as milligrams (mg) of toxicant per kilogram (kg) of body weight, the dose which kills 50% of the test animals to which it is administered under experimental conditions.

This toxicity value, or LD_{50}, is measured in terms of oral (fed to, or placed directly in the stomachs of rats), dermal (applied to the skin of rats or rabbits), and respiratory toxicity (inhaled). Using two of these tests, oral and dermal, a toxicologic ranking is shown for the organophosphate and organochlorine insecticides in Fig. 26-27. The materials on the top of the list are the most toxic and those at the bottom the least. The size of the dose is the most important single item in determining the safety of a given chemical, and actual statistics of human poisonings correlate reasonably well with these toxicity ratings.

ESTIMATING PESTICIDE TOXICITY TO MAN

In addition to toxicity, the dose, length of exposure, and route of absorption are the other important variables. The amount of pesticide required to kill a man can be correlated with the LD_{50} of the material to rats in the laboratory. In Table 34 below, for example, the acute oral LD_{50} expressed as mg/kg dose of the technical material, is translated into the amount needed to kill a 170 lb. man. Dermal LD_{50}s are included for a better understanding of the relationship of expressed animal toxicity to human toxicity.

In a manner of generalizing, oral ingestions are more toxic than respiratory inhalations which are more toxic than dermal absorption. Additionally, there are physical and chemical differences between pesticides which make them more likely to produce poisoning. For instance, parathion changes to the more toxic metabolite paraoxon under certain conditions of humidity and temperature. Parathion is more toxic than methyl parathion to field workers, yet there is not that great a difference in their oral toxicities. Workers' exposure is usually dermal, which explains why many more illnesses are reported in workers exposed to parathion than those exposed to methyl parathion. So, we see that toxicity, route of absorption, dose, length of exposure and the physical and chemical properties of the pesticide contribute to its relative hazard. Hazard, then, is an expression of the potential of a pesticide to produce human poisoning.

TABLE 34. Combined Tabulation of Pesticide Toxicity Classes.

	Routes of Absorption		
Toxicity Rating*	LD_{50} Single ORAL Dose Rats mg/kg	LD_{50} Single DERMAL Dose Rabbits mg/kg	Probable Lethal Oral Dose for Man
6 - Super toxic	less than 5 mg	20 mg or less	A taste, a grain
5 - Extremely toxic	5 - 50 mg	20 - 200	A pinch - 1 teaspoon
4 - Very toxic	50 - 500	200 - 1,000	1 teaspoonful - 2 tablespoons
3 - Moderately toxic	500 - 5,000	1,000 - 2,000	1 ounce - 1 pint
2 - Slightly toxic	5,000 - 15,000	2,000 - 20,000	1 pint - 1 quart
1 - Practically nontoxic	>15,000	>20,000	>1 quart

* Modified from: Clinical Toxicology of Commercial Products, 2nd Edition 1963. Gleason, M. N., Gosselin, R. E., and Hodge, H. C. The Williams and Wilkins Company, Baltimore, Maryland.

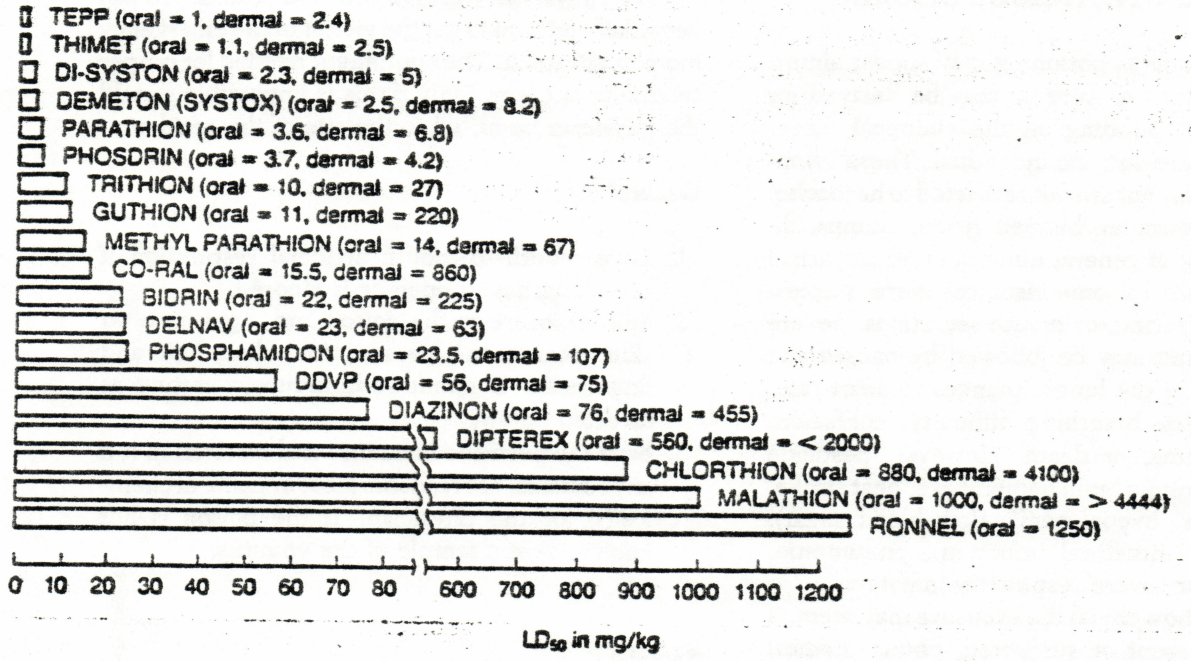


FIGURE 26. Acute Oral and Dermal Toxicity Values to Rats for Some Organophosphate Pesticides.[1]

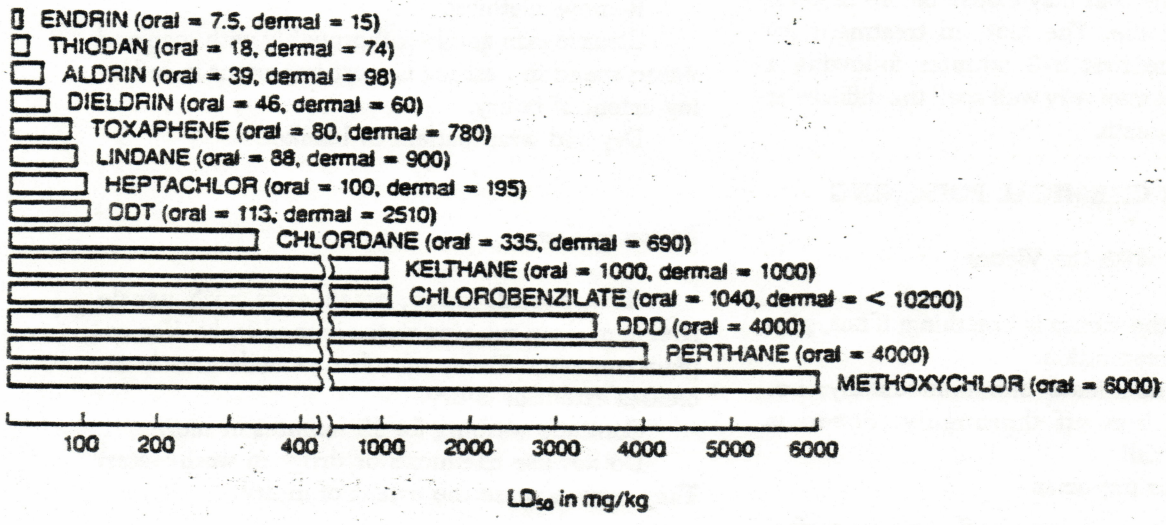


FIGURE 27. Acute Oral and Dermal Toxicity Values to Rats for Some Chlorinated Hydrocarbon Pesticides.[1]

[1] Source: Unpublished chart prepared by the Bureau of Occupational Health, State of California Department of Public Health. Reproduced by permission.

FIRST AID FOR PESTICIDE POISONING

The symptoms of poisoning may appear almost immediately after exposure or may be delayed for several hours depending on the chemical, dose, length of exposure and the individual. These symptoms may include, but are not restricted to headache, giddiness, nervousness, blurred vision, cramps, diarrhea, a feeling of general numbness, or abnormal size of eye pupils. In some instances there is excessive sweating, tearing, or mouth secretions. Severe cases of poisoning may be followed by nausea and vomiting, fluid in the lungs, changes in heart rate, muscle weakness, breathing difficulty, confusion, convulsions, coma, or death. However, pesticide poisoning may mimic brain hemorrhage, heat stroke, heat exhaustion, hypoglycemia (low blood sugar), gastroenteritis (intestinal infection), pneumonia, asthma, or other severe respiratory infection.

No matter how trivial the exposure may seem, if poisoning is present or suspected, obtain medical advice at once. If a physician is not immediately available by phone, take the person directly to the emergency ward of the nearest hospital and take along the pesticide label and telephone number of the nearest Poison Control Center.

First aid treatment is extremely important, regardless of the time that may elapse before medical treatment is available. The first aid treatment received during the first 2-3 minutes following a poisoning accident may very well spell the difference between life and death.

FIRST AID FOR CHEMICAL POISONING

If You Are Alone With the Victim

First — See that the victim is breathing; if not, give artificial respiration.

Second — Decontaminate him immediately; i.e. wash him off thoroughly. Speed is essential!

Third — Call your physician.

Note: Do *not* substitute first aid for professional treatment. First aid is only to relieve the patient before medical help is reached.

If Another Person Is With You and the Victim

Speed is essential; one person should begin first aid treatment while the other calls a physician.

The physician will give you instructions. He will very likely tell you to get the victim to the emergency room of a hospital. The equipment needed for proper treatment is there. Only if this is impossible should the physician be called to the site of the accident.

General

1. Give mouth-to-mouth artificial respiration if breathing has stopped or is labored.
2. Stop exposure to the poison and if poison is on skin cleanse the person, including hair and fingernails. If swallowed, induce vomiting as directed below.
3. Save the pesticide container and material in it if any remains; get readable label or name of chemical(s) for the physician. If the poison is not known, save a sample of the vomitus.

Specific

Poison on Skin

Drench skin and clothing with water (shower, hose, faucet).

Remove clothing.

Cleanse skin and hair thoroughly with soap and water; speed in washing is most important in reducing extent of injury.

Dry and wrap patient in blanket.

Poison in Eye

Hold eyelids open, wash eyes with gentle stream of clean running water immediately. Use copious amounts. Delay of a few seconds greatly increases extent of injury.

Continue washing for 15 minutes or more.

Do *not* use chemicals or drugs in wash water. They may increase the extent of injury.

Inhaled Poisons (Dusts, Vapors, Gases)

If victim is in enclosed space, do not go in after him without air-supplied respirator.

Carry patient (do not let him walk) to fresh air immediately.

Open all doors and windows, if any.

Loosen all tight clothing.

Apply artificial respiration if breathing has stopped or is irregular.

Call a physician.

Prevent chilling (wrap patient in blankets but don't overheat him).

Keep patient as quiet as possible.

If patient is convulsing, watch his breathing and protect him from falling and striking his head on the floor or wall. Keep his chin up so his air passage will remain free for breathing.

Do not give alcohol in any form.

Swallowed poisons

CALL A PHYSICIAN IMMEDIATELY

Do not induce vomiting if:

Patient is in a coma or unconscious.

Patient is in convulsions.

Patient has swallowed petroleum products (that is, kerosene, gasoline, lighter fluid).

Patient has swallowed a corrosive poison (strong acid or alkaline products); symptoms: severe pain, burning sensation in mouth and throat.

If the patient can swallow after ingesting a corrosive poison, give the following substances by mouth. A corrosive substance is any material which in contact with living tissue will cause destruction of tissue by chemical action such as lye, acids, Lysol, etc.

For acids: Milk, water, or milk of magnesia (1 tablespoon to 1 cup of water);

For alkali: Milk or water; for patients 1-5 years old, 1 to 2 cups; for patients 5 years and older, up to 1 quart.

Universal: Condensed canned milk, as much as the victim can consume.

Induce Vomiting (If Possible) When Non-Corrosive Substance has been Swallowed

Give milk or water (for patient 1-5 years old — 1 to 2 cups; for patients over 5 years — up to 1 quart).

Induce vomiting by placing the blunt end of a spoon, not the handle, or your finger at the back of the patient's throat, or by use of this emetic — 2 tablespoons of salt in an 8-10 oz glass of warm water.

When retching and vomiting begin, place patient face down with head lowered, thus preventing vomitus from entering the lungs and causing further damage. Do not let him lie on his back.

Do not waste excessive time in inducing vomiting if the hospital is a long distance away. It is better to spend the time getting the patient to the hospital where drugs can be administered to induce vomiting and/or stomach pumps are available.

Clean vomitus from person. Collect some in case physician needs it for chemical tests.

Chemical Burns of Skin

Wash with large quantities of running water.

Remove contaminated clothing.

Immediately cover with loosely applied clean cloth, any kind will do, depending on the size of the area burned.

Avoid use of ointments, greases, powders, and other drugs in first aid treatment of burns.

Treat shock by keeping patient flat, keeping him warm, and reassuring him until arrival of physician.

FIRST AID FOR PESTICIDE POISONING

The symptoms of poisoning may appear almost immediately after exposure or may be delayed for several hours depending on the chemical, dose, length of exposure and the individual. These symptoms may include, but are not restricted to headache, giddiness, nervousness, blurred vision, cramps, diarrhea, a feeling of general numbness, or abnormal size of eye pupils. In some instances there is excessive sweating, tearing, or mouth secretions. Severe cases of poisoning may be followed by nausea and vomiting, fluid in the lungs, changes in heart rate, muscle weakness, breathing difficulty, confusion, convulsions, coma, or death. However, pesticide poisoning may mimic brain hemorrhage, heat stroke, heat exhaustion, hypoglycemia (low blood sugar), gastroenteritis (intestinal infection), pneumonia, asthma, or other severe respiratory infection.

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First aid treatment is extremely important, regardless of the time that may elapse before medical treatment is available. The first aid treatment received during the first 2-3 minutes following a poisoning accident may very well spell the difference between life and death.

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Second — Decontaminate him immediately; i.e. wash him off thoroughly. Speed is essential!

Third — Call your physician.

Note: Do *not* substitute first aid for professional treatment. First aid is only to relieve the patient before medical help is reached.

If Another Person Is With You and the Victim

Speed is essential; one person should begin first aid treatment while the other calls a physician.

The physician will give you instructions. He will very likely tell you to get the victim to the emergency room of a hospital. The equipment needed for proper treatment is there. Only if this is impossible should the physician be called to the site of the accident.

General

1. Give mouth-to-mouth artificial respiration if breathing has stopped or is labored.
2. Stop exposure to the poison and if poison is on skin cleanse the person, including hair and fingernails. If swallowed, induce vomiting as directed below.
3. Save the pesticide container and material in it if any remains; get readable label or name of chemical(s) for the physician. If the poison is not known, save a sample of the vomitus.

Specific

Poison on Skin

Drench skin and clothing with water (shower, hose, faucet).

Remove clothing.

Cleanse skin and hair thoroughly with soap and water; speed in washing is most important in reducing extent of injury.

Dry and wrap patient in blanket.

Poison in Eye

Hold eyelids open, wash eyes with gentle stream of clean running water immediately. Use copious amounts. Delay of a few seconds greatly increases extent of injury.

Continue washing for 15 minutes or more.

Do *not* use chemicals or drugs in wash water. They may increase the extent of injury.

Inhaled Poisons (Dusts, Vapors, Gases)

If victim is in enclosed space, do not go in after him without air-supplied respirator.

Carry patient (do not let him walk) to fresh air immediately.

Open all doors and windows, if any.

APPENDIX V - Economic Factors of Pecan Orchard Management

ECONOMIC FACTORS IN PECAN ORCHARD ESTABLISHMENT, DEVELOPMENT AND MANAGEMENT

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TEXAS AGRICULTURAL EXTENSION SERVICE
The Texas A&M University System

January 30, 1979

Pecans are one of the most permanent forms of Texas agriculture. Planted orchards of improved varieties require 7 to 12 years to be developed. They can remain productive for over 50 years.

In planning a pecan orchard, horticultural considerations, such as soil, water, varieties and spacing should be studied in detail. However, economic considerations or profits are essential. A potential pecan producer needs to have an appreciation of the economic factors which lie ahead. This publication outlines the economic factors that affect pecan orchard profitability. It is designed for all areas of the state except the El Paso Valley.

No two orchards, management situations or economic systems are the same, so a hypothetical 50-acre orchard is presented as a guide for planning orchards and management programs. It is assumed that the orchard will receive the best economic management possible.

Orchard Situation

Soil and Climate - The soil is an alluvial deposit river bottom soil or otherwise No. 1 pecan soil in areas where pecans have produced well. Irrigation is required for developing the orchard. Supplemental water requirements for pecans in the production stage vary within the state. Supplemental watering costs are not included in the production stage.

Orchard Characteristics - The orchard is a 50-acre unit of improved varieties being planted on 35x35 feet on a diagonal system. After 15 years the trees will be thinned from 35 trees to 17 trees per acre on a 50x50 feet square system.

Prices - Costs will be based on 1977 prices and nut sale price is estimated to average $0.60 per pound to the grower.

Also, equipment, labor and supplies will be purchased specifically for the pecan orchard (this equipment could be utilized on orchards as large as 200 acres).

Orchard Establishment

In establishing the orchard, a tractor, disk and shredder will be needed. The cost is about $10,234 for serviceable working equipment; Table 1.

Table 1. Machinery required for establishing a new pecan orchard.

Item	Cost
Tractor, 40 HP	$ 7,000
Disk, 8 ft., hydraulic	1,700
Shredder, 8 ft.	1,534
TOTAL COST	$10,234

The labor required to plant 50 acres of pecans includes the manager and three hired laborers for 2 weeks. The trees cost $6.00 each. A rented posthold digger that fits the purchased tractor is used to dig the holes. The estimated machinery, labor and tree cost of establishing the orchard is $270 per acre; Table 2.

Table 2. Estimated pecan orchard establishment costs for one acre in Texas in 1977.

Costs	Unit	Price Or Cost/Unit	Quantity	Value Or Cost
Variable costs				
Pecan trees (5 - 6 ft.)	tree	$ 6.00	35.00	$210.00
Equipment rental	acre	4.00	1.00	4.00
Miscellaneous expense	acre	3.00	1.00	3.00
Machinery & tractors	acre	10.16	1.00	10.16
Labor (tractor & machinery)	hour	2.50	2.74	6.85
Other labor	hour	2.50	4.05	10.13
Interest on operating cap.	dol.	0.09	190.23	17.12
TOTAL VARIABLE COSTS				$261.26
Fixed costs				
Machinery & tractor	acre	9.64	1.00	$ 9.64
TOTAL COSTS				$270.90

After establishment, the annual maintenance cost of developing the orchard will gradually increase. Rather than estimate the cost each year, a typical development year's cost for the 1-7 year old orchard is presented. A typical production year's budget for the 8-15 year old orchard is also presented.

Development Program

Years 1-7 from establishment are considered the development period. During the development period the annual maintenance cost will gradually increase and additional equipment will be needed. Equipment does not have to be new, but a mechanically sound pickup truck, a hose sprayer and a trailer will be needed. A drip irrigation system is also purchased. The cost of this additional equipment is an estimated $21,600; Table 3.

Table 3. The machinery requirement for the 1-7 year development period of a 50-acre pecan orchard, East and Central Texas, 1977.

Item	Cost*
Pickup truck	$ 4,500
Hose sprayer	1,500
Irrigation equipment	15,000
Trailer	600
TOTAL COST	$21,600

*Costs are not necessarily for new equipment.

The orchard will begin bearing pecans before the end of the seventh year from establishment. The sixth year production is estimated at 150 pounds per acre and the seventh year is 300 pounds per acre; Table 4. These figures will be higher in Central and West Texas where more precocious varieties are grown.

Table 4. Proposed pecan yield from a 35x35 orchard during the 1-7 year development period, East and Central Texas, 1977.

Orchard Age	Pounds/Tree	Pounds/Acre
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
6	4.3	150
7	8.6	300

Management practices include weed control, applications of zinc, nitrogen, insecticides, fungicides and labor for pruning. The out-of-pocket expenses for chemicals, fertilizer, labor, fuel, oil, repairs and interest on operating expenses total $192 per acre. Depreciation of machinery and tractors amounts to $66 per acre. Amortizing the establishment cost over 20 years at 8 percent and using a $20 annual opportunity cost on an acre of land, makes the total out-of-pocket and fixed costs for an average development year equal $307 per acre; Table 5.

Production Program

The orchard should start into good production at about year 8 and the estimated average annual yield through year 15 is 1,500 pounds per acre; Table 6. Such yields are attainable with high level management of orchards on good soil.

Table 5. Estimated average annual management cost per acre during the 1-7 year development period on a 35x35 feet spaced pecan orchard, East and Central Texas, 1977.

	Unit	Price Or Cost/Unit	Quantity	Value Or Cost
Gross receipts from production				
Pecans (64 lbs., 7 yr. ave.)	lbs.	$ 0.60	64.00	$ 38.40
Variable costs				
Zinc	acre	1.83	1.00	1.83
Nitrogen (actual N.)	lbs.	0.22	82.00	18.06
Insecticide and fungicide	acre	45.00	1.00	32.10
Miscellaneous expense	acre	5.00	1.00	5.00
Machinery and tractors	acre	38.33	1.00	38.33
Irrigation equipment	acre	22.84	1.00	22.84
Labor	hour	2.50	26.42	66.05
Interest on operating cap.	dol.	0.09	91.94	8.27
TOTAL VARIABLE COSTS				$192.48
Fixed costs				
Machinery and tractors	acre	35.47	1.00	35.47
Irrigation equipment	acre	31.20	1.00	31.20
Amortized estab. cost, 20 yr.	acre	270.90	0.08	27.59
Land (net rent)	acre	20.00	1.00	20.00
TOTAL FIXED COSTS				$114.52
TOTAL COSTS				$307.00
NET RETURNS				(-$268.60)

Table 6. Estimated pecan yield of an orchard in the early production phase in East and Central Texas.

Orchard Age	Pounds/ Tree	Trees/ Acre	Pounds/ Acre	Acre Average
8	17	35	600	
9	26	35	900	
10	34	35	1,200	
11	43	35	1,500	
12	51	35	1,800	
13	60	35	2,100	
14	69	35	2,400	
15	77	35	2,700	1,500
16	86	17	1,462	
17	100	17	1,700	1,700

Additional equipment is needed as the pecans increase in production. Equipment purchases include a pecan tree shaker, a pecan cleaner, a harvester and a 1.5 mph speed sprayer. The older 40 HP tractor will be traded in for a 70 HP tractor. The approximate cost of this additional equipment is $24,000; Table 7.

Table 7. Pecan orchard machinery required in the early production phase in Texas in 1977.

Item	Cost	
Pecan tree shaker	$ 2,000	
Small pecan cleaner	3,000	
Harvester	8,000	
Speed sprayer, 1.5 mph	4,000	
Tractor, 70 HP (trade 40 HP tractor)	7,000	(difference in trade-in value)
TOTAL COST	$24,000	

The management program would require five pesticide applications. Yields would start at 600 pounds per acre in year 8 and increase to an average of 1,500 pounds over the 8 to 15 year period.

Annual variable production costs will increase to $373 with a major portion of the increase being labor for harvesting and cleaning. Additional fixed costs of machinery depreciation, amortized establishment cost and a $20 opportunity cost for land increases the total annual production cost to $509 per acre. The 1,500 pound yield at $0.60 per pound provides an income over total costs of $391 per acre; Table 8.

Pecan Orchards as Investments

The costs and returns budgets are useful in estimating annual profits; however, they do not clearly present pecan orchard profitability over the early life of the orchard. Evaluating pecan orchards as an investment requires estimating the occurrence of costs and income (or cash flow) through each year of the investment planning period. This analysis considers an investment planning period of 20 years.

In summarizing the 20 year cash flow, Table 9 indicates: (1) the annual cost (including establishment, variable operating cost and machinery cost), (2) the annual gross returns through year 20 from establishment, (3) the net annual cash flow and (4) the summation of the net annual cash flows. The pecans begin showing an annual profit at the end of year 9. Applying this profit to the accumulated debt makes the orchard pay off at the end of the thirteenth year, considering a zero interest rate.

However, money has time value; a dollar received today is worth more than a dollar received in the future. The reason is that money can be put in a savings account to draw interest or invested in a business to make a profit. For example, assume that you could invest $1,000 risk-free for 20 years at a 6 percent annual rate of return. At the end of 20 years, the $1,000 and accumulated interest would have a $3,207 cash value. Thus, in investing in a pecan orchard, the foregone income from not putting the money in alternative investments should be considered. To evaluate the profitability of establishing a pecan orchard, an interest rate on the investment must be considered. Other major factors to consider are tax rates and tax brackets, which are not considered in this publication.

Table 8. Pecan production and estimated costs and returns per acre on an 8-15 year Texas pecan orchard in 1977.

	Unit	Price Or Cost/Unit	Quantity	Value Or Cost
Gross receipts from production				
Pecans	lbs.	$ 0.60	1,500.00	$900.00
Variable costs				
Zinc	acre	4.84	1.00	4.84
Nitrogen	lbs.	0.22	120.00	26.40
Insecticide and fungicide	appl.	16.13	5.00	80.63
Dormant oil	appl.	11.10	1.00	11.10
Miscellaneous expense	acre	5.00	1.00	5.00
Machinery and tractors	acre	101.42	1.00	101.42
Labor	hour	2.50	54.00	135.00
Interest on operating cap.	dol.	0.09	101.89	9.17
TOTAL VARIABLE COSTS				$373.56
Income above variable costs				$526.44
Fixed costs				
Machinery and tractors	acre	88.10	1.00	88.10
Amortized estab. cost, 20 yr.	acre	270.90	0.08	27.59
Land (net rent)	acre	20.00	1.00	20.00
TOTAL FIXED COSTS				$135.69
TOTAL COSTS				$509.25
NET RETURNS				$390.75

This interest rate is used to discount all income and expenses to a present value. The investment is profitable only if the present value of future cash income exceeds the present value of the investment.

The present value of the net annual cash flow presented in Table 9 is $586 considering a 5 percent interest rate. Investing your money in establishing, developing and producing an acre of pecans over 20 years rather than putting the money in a savings account paying 5 percent interest for 20 years would be worth $586 additional return compared to the savings account opportunity. Considering a 10 percent interest rate, the present value of the 20 year net annual cash flow in Table 9 is $-534; thus, a 10 percent interest rate in a savings account should be a more profitable investment than the pecan orchard as projected.

Table 9. A 20 year cash flow per acre, excluding land for a well-developed and well-managed pecan orchard on good soil in Texas in 1977.

Year	Annual Cost	Annual Gross Returns	Net Annual Cash Flow	Summation Of Net Annual Cash Flows
1	$-1048	$ 0	$-1048	$-1048
2	- 154	0	- 154	-1202
3	- 162	0	- 162	-1364
4	- 173	0	- 173	-1537
5	- 184	0	- 184	-1721
6	- 199	90	- 109	-1830
7	- 206	180	- 26	-1856
8	- 852	360	- 492	-2348
9	- 386	540	154	-2194
10	- 398	720	322	-1872
11	- 409	900	491	-1381
12	- 421	900	479	- 902
13	- 433	900	467	- 435
14	- 445	900	455	20
15	- 455	900	445	465
16	- 457	877	420	885
17	- 436	1020	584	1469
18	- 436	1020	584	2053
19	- 436	1020	584	2637
20	- 437	1020	583	3220

Debt Service

An important consideration besides the profitability of pecan orchards is the ability of the investor to service the debt during the establishment and orchard development years. The repayment schedule on money borrowed to establish and develop an orchard may be difficult for many to arrange because there is no annual net profit until the ninth year. Most financial institutions are not interested in loans with such delayed repayment schedules. A source of income besides the pecan orchard during establishment and development years is required to make such an investment feasible for most investors.

Well-developed and well-managed pecan orchards also enhance the value of the land. However, to fully recognize this benefit, the land must be sold or remortgaged. The required selling price to recover all expenses considering various purchase prices, discount rates and selling dates is presented in Table 10.

Table 10. Net investment per acre in pecan orchard, considering three land purchase prices, holding periods of 10 and 20 years from establishment and three rates of interest on borrowed money.*

Land Purchase Price	Net Investment Per Acre					
	10 Years From Establishment With Discount Rates Of			20 Years From Establishment With Discount Rates Of		
	5%	8%	10%	5%	8%	10%
$/Acre	$/Acre			$/Acre		
$ 600	$3,909	$5,081	$6,025	$ 42	$3,723	$ 7,686
800	4,235	5,513	6,544	573	4,656	9,031
1,000	4,561	5,945	7,063	1,103	5,588	10,377

*Producers that are not using borrowed money and sell their orchards for the prices indicated, will be receiving a return on their money equal to the percent rate indicated. For producers that are using borrowed money, only the sell price above the indicated amounts would be the profit to investing in the pecan orchard and land.

Considering 8 percent paid for investment capital, the following is indicated:

1. Land costing $600 and developed into pecans would have to sell for $5,081 per acre 10 years from establishment to recover all costs. If the land was sold at the end of 20 years, all costs could be recovered by selling the land for $3,723 per acre.

   This difference is because the pecans return more profits from 10 to 20 years than the first 10 years from establishment. A person considering buying land at $600 per acre, establishing a pecan orchard, paying 8 percent for capital and selling the orchard in 10 years needs to sell it for more than $5,081 per acre. An alternative would be to keep it for more than 10 years under proper management.

2. A person considering an 8 percent interest rate and evaluating the purchase of a well-developed, well-managed 10 year old orchard versus purchasing $600 per acre of land and establishing an orchard may use Table 10 as a guide. Buying the 10 year old orchard for less than $5,081 per acre would be better than purchasing the $600 per acre bare pecan land. Buying it for less than $5,513 per acre would be preferred over purchasing $800 per acre land. At higher prices for a 10 year orchard, the open land purchase would be preferred.

3. A person contemplating going into the pecan production business for 10 years and having an 8 percent interest rate should consider purchasing an established orchard. A properly developed 10 year old orchard purchased for $5,081 per acre and expertly managed for 10 years would have to be sold for only $3,723 per acre to recover all expenses.

Other Considerations

In evaluating the establishment of a pecan orchard, a potential investor may consider the following factors:

1. There are non-economic considerations - an intangible aesthetic value exists in raising pecans as many people enjoy their labors in developing a beautiful orchard of pecan trees.

2. The information presented in this paper is based on a planning period of 20 years and an orchard size of 50 acres. As the planning period increases over 20 years, the investment potential improves considering 8 percent or lower interest rates. Extending the planning period past 20 years does not improve the investment potential considering higher than 8 percent interest. Increasing the orchard size above 50 acres would decrease the per acre fixed cost of owning the equipment; and improve the investment potential over that indicated in this publication.

Summary

Economic expenditures during the development phase are high. However, annual gross returns on a per acre basis are also high. In addition, well-developed and well-managed orchards significantly enhance the value of the land which pecans grow upon. Heavy pecan production and enhanced land value may justify high orchard development costs; however, purchase of well-managed 10 year old or older orchards should be considered.

The success of any pecan operation will depend on thorough planning, constant study and close daily management. The profit potential presented in this publication is highly dependent upon the success of the manager, and the yield and price assumptions.