WILDLAND FIRE MANAGEMENT PLAN

JAMES CAMPBELL NATIONAL WILDLIFE REFUGE

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INTRODUCTION

This document will establish a Fire Management Plan (FMP) for James Campbell National Wildlife Refuge (Refuge). This plan will meet the requirements of the National Environmental Protection Act (NEPA) and the National Historic Preservation Act (NHPA). A Categorical Exclusion and Environmental Action Statement (EAS) were completed as part of ths FMP and are located in Appendix E. Compliance with the Endangered Species Act was completed through informal concurrence with the Pacific Islands Ecological Services Office.

This plan is written as an operational guide for managing the Refuge's wildland fire and prescribed fire programs. It defines levels of protection needed to ensure safety, protect facilities and resources, and restore and perpetuate natural processes, given current understanding of the complex relationships in natural ecosystems. It is written to comply with a service-wide requirement that refuges with burnable vegetation develop a fire management plan (620 DM 1).

This Plan outlines a program of full suppression of all wildland fires and the utilization of prescribed burning as a management tool to assist in enhancement of endangered waterbird habitat, control of exotic vegetation, and fostering the recovery and establishment of native plant species. These all support the mission of the Refuge.

The Refuge has no dedicated fire staff. Oversight of the fire program is from the Regional Office in Portland, Oregon. Day-to-day fire management duties are coordinated and conducted through collateral duty personnel. Initial attack is generally undertaken by the County of Honolulu Fire Department and/or Refuge staff. The Refuge has developed a relationship with the National Park Service (NPS) to assist with training needs and prescribed fire.

COMPLIANCE WITH USFWS POLICY

The Refuge was established December 17, 1976 and is managed under a 55-year lease from James Campbell Estate. The purpose of the Refuge is to provide nesting and maintenance habitat for four endangered species of Hawaiian waterbirds as well as migratory waterfowl and shorebirds. The endangered native species are the Hawaiian stilt (*Himantopus mexicanus knudseni*), Hawaiian coot (*Fulica alai*), Hawaiian moorhen *(Gallinula chloropus sandvicensis*), and Hawaiian duck (*Anas wyvilliana*).

No approved Master Plan or Comprehensive Plan exists, however, a Master Plan for the Hawaiian Wetland NWR Complex is in DRAFT form which was created in 1983. The Fish and Wildlife Service (Service) manages the wetlands to provide open, productive wetlands for the four endangered Hawaiian waterbirds, optimizing endangered waterbird production and maintenance. Providing habitat for migratory waterfowl and shorebirds, and encouraging regrowth of native wetland vegetation is also achieved in this process. Prescribed burning of impoundments is one of a number of methods used to control noxious and exotic vegetation to provide secure, viable, adequate habitat. Specific goals include: providing open water areas interspersed with escape, nesting, and maintenance cover; limiting predator cover and access; providing mudflat areas for nesting and feeding Hawaiian stilts; and promotion of desirable wetland plant species with water/vegetation interspersed areas for Hawaiian coot, Hawaiian moorhen, and Hawaiian duck nesting and maintenance.

The Water Management Plan, June 1991, addresses the use of fire to clear impoundments of noxious and exotic vegetation.

The Department Manual, DM 910 (USDI 1997) states the following regarding wildland fires:

> AWildfires may result in loss of life, have detrimental impacts upon natural resources, and damage to or destruction of man-made developments. However, the use of fire under carefully defined conditions is to be a valuable tool in wildland management. Therefore, all wildfires within the Department will be classified either as wildfire or as prescribed fires.
>
> Wildfires, whether on lands administered by the Department or adjacent thereto, which threaten life, man-made structures, or are determined to be a threat to the natural resources or the facilities under the Department's jurisdiction, will be considered emergencies and their suppression given priority over normal Departmental programs.
>
> Bureaus will give the highest priority to preventing the disaster fire - the situation in which a wildfire causes damage of such magnitude as to impact management objectives and/or socio-economic conditions of an area. However, no wildfire situation, with the possible exception of threat to human survival, requires the exposure of firefighters to life threatening situations. Within the framework of management objective and plans, overall wildfire damage will be held to the minimum possible giving full consideration to (1) an aggressive fire prevention program; (2) the least expenditure of public funds for effective suppression; (3) the methods of suppression least damaging to resources and the environment; and (4) the integration of cooperative suppression actions by agencies of the Department among themselves or with other qualified suppression organizations.
> Prescribed fires...may be used to achieve agency land or resource management objectives as defined in the fire management plans....Prescribed fires will be conducted only when the following conditions are met:

a. Conducted by qualified personnel under written prescriptions.
b. Monitored to assure they remain within prescription.

Prescribed fires that exceed the limits of an approved prescribed fire plan will be reclassified as a wildfire. Once classified a wildfire, the fire will be suppressed and will not be returned to prescribed fire status.@

The authority for funding (normal fire year programming) and all emergency fire accounts is found in the following authorities:

Section 102 of the General Provisions of the Department of Interior's annual Appropriations Bill provides the authority under which appropriated monies can be expended or transferred to fund expenditures arising from the emergency prevention and suppression of wildland fire.

P.L. 101-121, Department of the Interior and Related Agencies Appropriation Act of 1990, established the funding mechanism for normal year expenditures of funds for fire management purposes.

31 US Code 665(E)(1)(B) provides the authority to exceed appropriations due to wildland fire management activities involving the safety of human life and protection of property.

Authorities for procurement and administrative activities necessary to support wildland fire suppression missions are contained in the Interagency Fire Business Management Handbook.

The Reciprocal Fire Protection Act of May 27, 1955 (42 USC 815a; 69Stat 66) provides Authorities to enter into agreements with other Federal bureaus and agencies; with state, county, and municipal governments; and with private companies, groups, corporations, and individuals regarding fire activities. Authority for interagency agreements is found in AInteragency Agreement between the Bureau of Land Management, Bureau of Indian Affairs, National Park Service, US Fish and Wildlife Service of the United States Department of the Interior and the Forest Service of the United States Department of Agriculture@ (1996).

FIRE MANAGEMENT OBJECTIVES

The overall objectives for fire management are to promote a program to ensure firefighter and public safety, aimed at reducing human-caused fires, to ensure appropriate suppression response capability to meet expected wildland fire complexity, and to continue to use prescribed fire as appropriate. Specific fire management objectives are:

Specific fire management objectives are:

- Promote a fire management program and control all wildland fires.
    - Protect life, property, and resources from wildland fires in a safe manner while considering resources at risk.
    - Use prescribed fire to reduce hazard fuel accumulation, maintain cultural/historic scenes where appropriate, or to otherwise accomplish management objectives.
    - Use appropriate suppression tactics and strategies that minimize long-term impacts of suppression actions.

DESCRIPTION OF REFUGE

The Refuge consists of 155 acres of wetland habitat in two management units (Ki'i and Punamano) near the community of Kahuku on the northeastern shore of O'ahu (Figure 1). The two units are approximately one mile apart in a coastal area which historically was an extensive freshwater wetland of about 400 acres, between the Koolau Mountains and Pacific Ocean. The entire Refuge is located close to the sea with a gently sloping topography of less than 5 feet to 10 feet in elevation above mean sea level. Land uses adjacent to both units of the Refuge consist of cattle grazing, shrimp aquaculture ponds and small farms (bananas and ti). Adjacent to the Ki'i Unit is a sewage treatment facility serving the nearby town of Kahuku.

KI'I UNIT

This 127-acre unit (Figure 2) is a remnant of a formerly larger marsh which was converted into a cane wash-water settling area by Kahuku Sugar Company. At present, the unit consists of seven impoundments totaling 70 acres, which straddle three ditches excavated to drain the area during sugar cane cultivation. Water levels suitable for nesting endangered Hawaiian waterbirds, as well as providing suitable wintering habitat for migratory waterbirds are achieved with a water delivery system gravity fed from three freshwater artesian wells located on the Refuge. In the past when additional water was needed, it was pumped from Kii Ditch using a crissifoli® pump, but this practice was stopped in about 1995 because of concerns about potential non-point source pollution. The Wildlife Biologist makes water level management decisions as needed. In general, water levels vary among impoundments. Some impoundments are maintained relatively high (18-24 inches deep) while others are kept low creating shallow water (3-12 inches deep) and exposing mudflats. During stilt nesting season (March through July) more of the impoundment water levels are lowered. Additional habitat management consists of constant vegetation control, construction of nesting islands following drawdown, and pulsing water levels during drawdown to encourage invertebrate forage species for waterbirds and their young.

PUNAMANO UNIT

The Punamano Unit (Figure 3) of the Refuge encompasses a 36-acre spring-fed natural wetland situated less than one mile from the sea and approximately 1.2 miles west of the Ki'i Unit. The pond's water originates from a freshwater spring located inland just off the Refuge. This water is augmented by groundwater trapped above an impermeable cap rock layer. The Punamano drainage ditch connects this pond with the Ki'i Unit and the sea.

CULTURAL RESOURCES

An archeological search of the Refuge was done in the early 1980's. No known sites exist due to the fact that a great deal of disturbance has occurred since the 1900's. No planned soil disturbances are scheduled to be conducted for any planned fire activities on the Refuge and future disturbances will receive an archeological clearance before planned activities begin. Undoubtedly native cultures inhabited the area, but disturbances prior to archeological sensitivity have made their discovery difficult. In the event surface disturbance occurs during wildland fire activities and any item with cultural significance is uncovered an archeologist will be notified.

FISH AND WILDLIFE

Six resident native wetland related bird species occur year around on the Refuge. Of these, four are Federally listed as endangered (Hawaiian stilt, *Himantopus mexicanus knudseni*; Hawaiian coot, *Fulica alai*; Hawaiian moorhen, *Gallinula chloropus sandvicensis*; and Hawaiian duck, *Anas wyvilliana)* and the Hawaiian short-eared owl is listed as endangered on the Island of O`ahu by the State of Hawaii and as a Species of Concern, by the Federal Government.

The four Federally listed endangered species nest and rear young throughout the year on an annual basis. The Refuge accommodates high numbers of all these endangered waterbirds and is important to the recovery of these species. Suitable short-eared owl nesting habitat exists on the Refuge, but active nests have not been located.

The Refuge is important to more than 54 species of migrant wetland related bird species. These migrants come from as far away as the mainland United States, Alaska, Asia, and Europe during the Fall, Winter, and early Spring. One migrant, the bristle-thighed curlew, is listed as a Species of Concern, by the Federal Government.

VEGETATION

The impoundments at Ki'i support a variety of scattered stands of wetland vegetation interspersed with mudflat or open water depending on depths of ponds and water levels. Species in impoundments include: California grass (*Brachiaria mutica*); saltwort (*Batis maritima*); knottgrass (*Paspalum distichum*); Indian marsh fleabane (*Pluchea indica*); makai (*Scirpus maritimus paludosus*); California bulrush (*Scirpus californicus*); cattail (*Typha angustata*); and millet (*Echinochloa crus-galli*). California grass, Bermuda grass (*Cynodon dactylon*) and Indian marsh fleabane are primary species on dikes and roads, however, California grass and Indian marsh fleabane will root and spread in water impoundments. A fringe of trees and shrubs consisting of hau (*Hibuscus tiliaceus*), Java plum (*Eugenia javanica*), koa-haole (*Leucaena leucocephala*), Noni (*Morinda citrifolia*), and Indian fleabane occurs along the northwest edge of the unit.

At the Punamano Unit aquatic vegetation in the pond includes tall Scirpus spp., knottgrass, and water hyssop (*Bacopa monnieri*). Upland habitat adjacent to the Refuge is dominated by dense shrubs, particularly koa-haole and Christmas berry (*Schinus terebinthifolius*) in dry areas and Indian fleabane and hau on moist sites.

There are no Federally listed plant species within the Refuge.

PHYSICAL RESOURCES

The Refuge receives 20 to 30 inches of rain annually with May through July typically the driest months. Mean monthly rainfall averages less than 5 inches. Mean maximum daily temperatures are in the high 70s and 80s degree F. The average annual temperature is 73^0 F with a daily range of 13^0F at Kahuku. August and September are the warmest months of the year. Warmest weather occurs with "Kona" weather conditions when normal northeasterly winds (trades) from cooler latitudes stall and little air movement occurs. Trades are common throughout the year, but are most persistent during the summer months, averaging from 10 to 15 knots. Seasonal and diurnal variability in cloud cover occur with clouds tending to be more abundant during the day. Average daily humidities range from 55% to 85%.

Soils of the Refuge are of the Entisol order and the Pearl Harbor series. This series consists of poorly drained clayey soils along nearly level coastal plains and is associated with Kaloko and Keaau series soil. Permeability is slow, run-off is very slow to ponded and erosion hazard is slight. Subsurface composition is muck. The pH is neutral grading to moderately alkaline with depth (Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii, USDA, SCS, 1972).

STRUCTURES AND FACILITIES

Refuge structures that could potentially be damaged during wildland fire are limited to the Ki'i Unit. These include:

Structure	Value (thousands)
Storage Bldg.	$1,200.0
40-hp and 5-hp pump	210.0
Boundary Fence	140.0
Interpretive Signs	123.0
Interpretive Center	90.0
Pump house	55.5
Kiosk	52.0
Wood Bridge	25.0

The only nearby structure on land adjacent to the Refuge is the City and County of Honolulu, Kahuku Sewage Treatment facility.

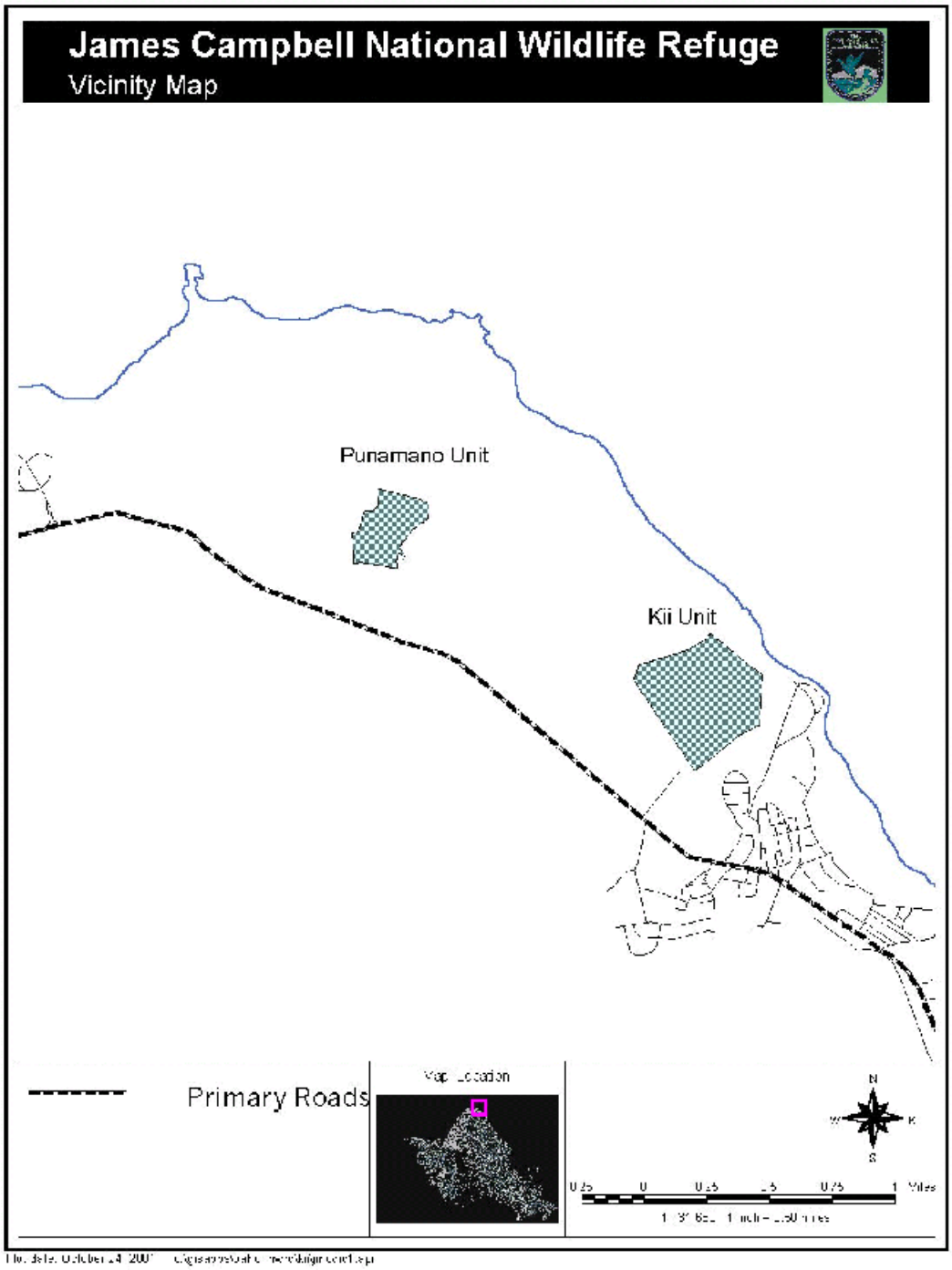
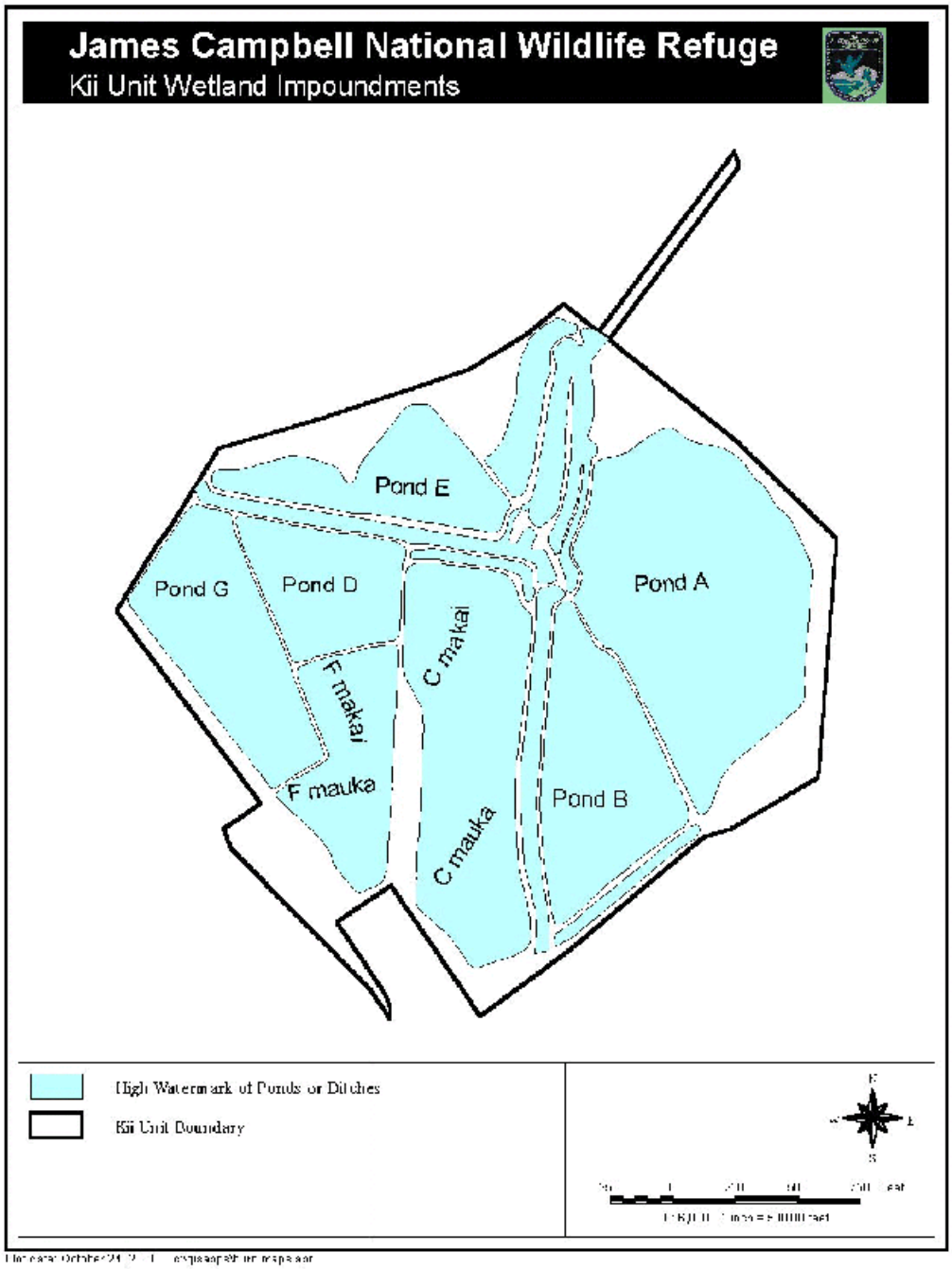


Figure 1: Vicinity Map

Figure 2: Ki'i Unit of James Campbell NWR



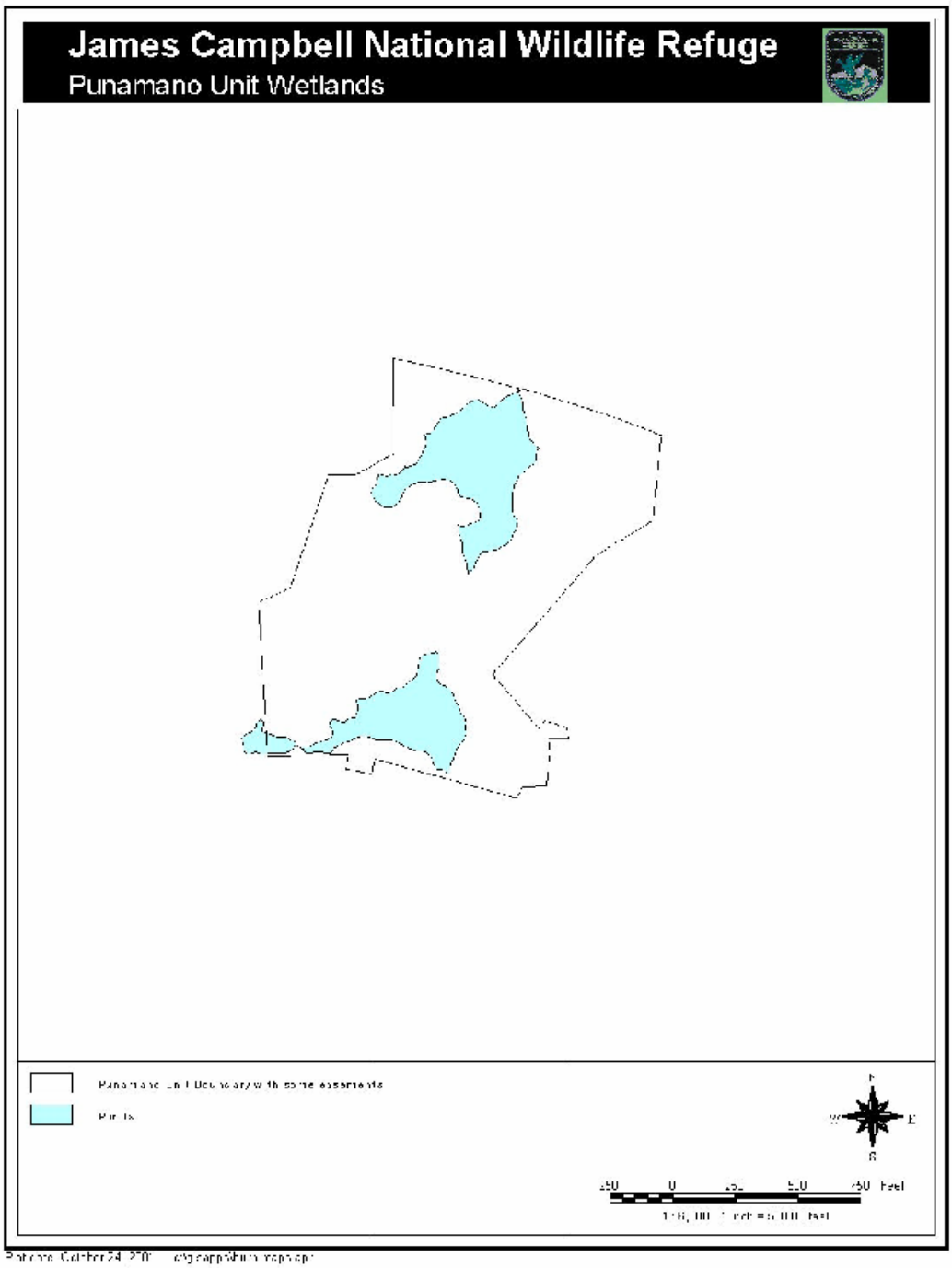


Figure 3. Punamano Unit of James Campbell NWR

WILDLAND FIRE MANAGEMENT SITUATION

HISTORIC ROLE OF FIRE

Pre-settlement fires

Fire is a relatively infrequent, low intensity disturbance in Hawaiian ecosystems, although fire was probably occasionally ignited by lava flows or lightning strike (Mueller-Bombois and Lamoureux 1967; Mueller-Dombois 1981b; Smith and Tunison 1992). Ecologists have concluded that natural fire has not played a significant ecological or evolutionary role in most Hawaiian ecosystems. There does not appear to be any evidence of fire playing any type of historical role in the area.

Post-settlement Fire History

The only known wildland fire in the vicinity of the Refuge occurred in dense stands of California grass during 1981. It began between the Ki'i Unit and the sea, moved inland to the Refuge boundary. Cause of the fire is unknown. Fire season, as identified by the State Division of Forestry, is a three-month period in late summer depending on month-to-month variations in weather. The preferred time for prescribed burning is during the period of minimal nesting and migrant waterbirds which runs from August to mid-October with September being the best month depending upon weather patterns.

As is the case in most Hawaiian wetlands, the vegetation on and adjacent to the Ki'i Unit experiences a year-round growing season. For fire to carry, treatment with herbicides is typically necessary. However, if a week of constant dry weather were to occur, any significant amount of dead, accumulated grass stems in California grass combined with typically strong winds could carry a wildfire. Fortunately, the network of ditches and dikes intersecting the area would limit the extent of spread. The combination of high humidities, frequent daily showers and a preponderance of green growing vegetation on the unit make the threat of wildfire slight. Dense accumulations of tall bulrushes and stands of Indian fleabane could serve to carry wildfire in the Punamano Unit. However, this would be dependent on the occurrence of unusually dry conditions. Punamano also supports a diverse mixture of vegetation and open water which would help confine a fire.

Prescribed fire history

The typical prescribed burning season on the Refuge extends from approximately the beginning of September through October. Prescribed burns on the Refuge have been conducted for more than ten years. Annually, about 10 acres are burned on the Kii Unit. The prescribed burning cycle is between two to three years in a given impoundment.

RESPONSIBILITIES

The composition of James Campbell NWR fire management team and responsibilities for both suppression and prescribed fire will be included in the Dispatch Plan (Appendix B). The plan lists personnel by name, position and qualifications.

James Campbell NWR does not have an onsite fire management staff and has only limited suppression equipment. Responsibilities for fire management at James Campbell NWR are shared by the Refuge Manager, Refuge Biologist, and Regional Fire Management Officer stationed at Portland.

The James Campbell NWR Refuge Manager is the primary line officer responsible for all aspects of the Refuge fire management program and for ensuring that all fire management program elements are carried out in accordance with Service policies, regulations, and guidelines. The Regional Fire Management

Officer assists with preparing and submitting the fire management plan updates, prescribed burn plans, and the annual fire budget. The prescribed burn plans are approved by the Refuge Manager.

Certified staff will assist with the overall implementation of the fire management program. Assistance from local fire department and neighboring refuges will be needed.

Refuge Manager

< Is responsible for implementation of all Fire Management activities within the Refuge and will ensure compliance with Department, Service and refuge policies.
< Selects the appropriate management responses to wildland fire in the WFSA process.
< Coordinates refuge programs to ensure personnel and equipment are made available and utilized for fire management activities including fire suppression, prescribed burning and fire effects monitoring.
< Ensures that qualified personnel are assigned to fire management tasks.
< Ensures that the fire management program has access to Refuge resources when needed.
< Ensures that Refuge staff considers the fire management program during Refuge related planning and implementation.

Biologist

< Identifies prescribed burn units and biological objectives to Fire Management Officer (FMO), notifies FMO of prescribed fire project constraints, and ensures that Refuge resources are available to accomplish prescribed fire and fire suppression objectives.
< Acts as the primary Refuge Resource Management Specialist during fire management planning and operations.
< Coordinates through the Refuge Manager to provide biological input for the fire program with the FMO.
< Participates, as requested, in prescribed burning and fire suppression.
< Coordinates fire related training.
< Coordinates with cooperators to ensure adequate resources are available for fire operational needs.
< Is responsible for preparation of fire reports following the suppression of wildland fires and for operations undertaken while conducting prescribed fires.
< Prepares an annual report detailing fire occurrences and prescribed fire activities undertaken in each calendar year. This report will serve as a post-year's fire management activities review, as well as provide documentation for development of a comprehensive fire history record for the complex.

Regional Fire Management Officer (FMO)

< Responsible for all fire related planning and implementation.
< Reviews the Refuge's Fire Management Plan and Prescribed Burn Plan.
< Submits budget requests and monitors FIREBASE funds.
< Maintains records for all personnel involved in suppression and prescribed fire activities, detailing the individual's qualifications and certifications for such activities.

Fire Management/Suppression Personnel

< Consist of all Refuge personnel, whether permanent or seasonal, who meet the minimum standard set by the National Wildfire Coordinating Group (NWCG) for firefighters.

< Are fully equipped with proper personal protective equipment, have taken and passed the minimum classroom training, and meet physical fitness standards required.
< Undertake fire management duties as assigned by the qualified Incident Commander on each suppression action or by the Prescribed Fire Burn Boss on each prescribed fire project.
< Are responsible for their personal protective equipment and physical conditioning, qualifying annually with the work capacity test.

Incident Commander
Incident Commanders (of any level) use strategies and tactics as directed by the Project Leader and WFSA where applicable to implement selected objectives on a particular incident. A specific Limited Delegation of Authority (Appendix D) will be provided to each Incident Commander prior to assuming responsibility for an incident. Major duties of the Incident Commander are given in the National Wildfire Coordinating Group (NWCG) Fireline Handbook, including:
< Brief subordinates, direct their actions, and provide work tools.
< Ensure that safety standards identified in the Fire Orders, the Watch Out Situations, and agency policies are followed at all times.
< Personally scout and communicate with others to be knowledgeable of fire conditions, fire weather, tactical progress, safety concerns and hazards, condition of personnel, and needs for additional resources.
< Order resources to implement the management objectives for the fire.
< Inform appropriate dispatch of current situation and expected needs.
< Coordinate mobilization and demobilization with dispatch and the AFMO.
< Perform administrative duties, i.e., approving work hours, completing fire reports for command period, maintaining property accountability, providing or obtaining medical treatment, and evaluating performance of subordinates.
< Assure aviation safety is maintained to the highest standards.

Initial attack modules
Initial attack modules will consist of red-carded firefighters with appropriate supervision. A Type 5 (ICT5) or Engine Boss (ENGB) is the basic requirement of leadership when responding to a fire with an organized suppression module, i.e. engine. Modules will be prepared and equipped with hand and power tools as needed and will be dispatched with a day's supply of food and water, so they can continue work for 24 hours without additional support.

Employees participating in any wildland fire activities on Fish and Wildlife Service or cooperators' lands will meet fitness requirements established in PMS 310-1, except where Service-specific fitness requirements apply.
< Continue to develop a cadre of "red-carded" firefighters for wildland fire; trained and equipped to accomplish the fire management program.
< Maintain the Refuge fire cache and fire equipment in ready state.

INTERAGENCY OPERATIONS
As of this writing, there are no formal agreements or contracts with cooperators. All cooperators or potential cooperators, including local fire departments, aircraft services, adjacent landowners, and Hawaii Department of Land and Natural Resources personnel will be contacted to determine the need for formal cooperative agreements or contracts and to discuss the content of these documents. Past attempts to secure formal agreements with local fire fighting entities have been unsuccessful. This is due to the

reluctance of these entities to enter into a formal agreement. Attempts to secure these agreements will again be pursued.

In general, contracts and cooperative agreements should, at a minimum, address the following:

$ Liability
  1. reimbursement rates, criteria, etc.
  2. liability release for personal injury, equipment loss, etc.
$ Restrictions
  1. e.g., limit overwater use of chemicals, heavy equipment use around cultural resources, etc.
  2. listings of resources/ manpower provided by each agency
  3. provision of formal permission/authority to enter refuge lands for the purpose of wildlife suppressions

James Campbell NWR will use the Incident Command System (ICS) as a guide for fireline organization. Qualifications for individuals is per DOI Wildland Fire Qualifications and Certification System, part of NIIMS and the National Wildland Fire Coordination Group (NWCG) Prescribed Fire Qualification Guide. Depending on fire complexity, some positions may be filled by the same person.

PROTECTION OF SENSITIVE RESOURCES

Retardants nor surfactant will be utilized in wetlands for wildland fire suppression. Due to the size of units and time to activate heavy equipment, their use is not anticipated during suppression activities. Additionally, there are endangered species concerns regarding use of these chemicals on the Refuge.

The Regional Archaeologist and/or his/her staff will work with fire staff, project leaders, and incident commanders to ensure that cultural resources are protected from fire and fire management activities. The "Request For Cultural Resource Compliance" form (Appendix H) will be used to inform the Regional Archaeologist of impending activities, thereby meeting the regulations and directions governing the protection of cultural resources as outlined in Departmental Manual Part 519, National Historic Preservation Act (NHPA) of 1966, Code of Federal Regulations (36CFR800), the Archaeological Resources Protection Act of 1979, as amended, and the Archaeological and Historic Preservation Act of 1974. The NHPA Section 106 clearance will be followed for any fire management activity that may affect historic properties (cultural resources eligible to the National Register of Historic Places).

Impacts to archaeological resources by fire resources vary. The four basic sources of damage are (1) fire intensity, (2) duration of heat, (3) heat penetration into soil, and (4) suppression actions. Of the four, the most significant threat is from equipment during line construction for prescribed fires or wildfire holding actions (Anderson 1983).

The following actions will be taken to protect archaeological and cultural resources:

Wildland Fires

$ Minimum impact fire suppression tactics (MIST) will be used to the fullest extent possible.
$ Resource Advisors will inform Fire Suppression personnel of any areas with cultural resources. The Resource advisor should contact the Regional Archaeologist and/or his/her staff for more detailed information.
$ Foam use will be limited in areas known to harbor surface artifacts.
$ Mechanized equipment should not be used in areas of known cultural significance.

- $ The location of any sites discovered, as the result of fire management activities, will be reported to the Regional Archaeologist.
- $ Rehabilitation plans will address cultural resources impacts and will be submitted to the Regional Archaeologist using the RCRC.

Prescribed Fires

- $ The Refuge Fire staff will submit a completed RCRC to the Regional Archaeologist and/or his/her staff as soon as the burn area is identified (i.e., as soon as feasible).
- $ Upon receipt of the RCRC, the Regional Archaeologist and/or his/her staff will be responsible for consulting with the FMO and evaluating the potential for adverse impacts to cultural resources.
- $ When necessary, the Regional Archaeologist and/or his/her staff will coordinate with the State Historic Preservation Officer (SHPO). The SHPO has 30 days to respond. The Refuge will consider all SHPO recommendations.
- $ Mechanized equipment should not be used in areas of know cultural significance.
- $ The location of any sites discovered as the result of fire management activities will be reported to the Regional Archaeologist.

WILDLAND FIRE ACTIVITIES

Fire program management describes the operational procedures necessary to implement fire management at the James Campbell National Wildlife Refuge. Program management includes: fire prevention, preparedness, emergency preparedness, fire behavior predictions, step-up staffing plan, fire detection, fire suppression, minimum impact suppression, minimum impact rehabilitation, and documentation.

All fires not classified as prescribed fires are wildland fires and will be appropriately suppressed. Refuge staff and/or the Honolulu Fire Department will perform initial attack actions on wildland fires. If needed, the Incident Commander may request additional resources from other refuges, the NPS, state, or military directly; the Oahu Wildfire Coordinating Group is still being chartered and should serve as the requesting group.

The probability of a wildland fire entering or escaping the Refuge is slight. Surrounding residents and farmers would understandably be concerned about economic impacts of wildland fire. Adjacent to the Refuge, agricultural burning of vegetation and other natural debris is undertaken by land owners as part of their normal operation.

FIRE MANAGEMENT STRATEGIES

All wildland fires will be suppressed in a prompt, safe, and cost-effective manner to produce fast, efficient action with minimum damage to resources using appropriate management strategies.

Due to the small size of Refuge units, proximity of public and private lands and property, and the potential for damage to Refuge structures (interpretive kiosk, fences, water control structures, pumps, pump housing, pipelines, bridges) it is the policy of this Complex to initiate a full suppression strategy for all instances of wildland fire on the wetland refuges. The lack of resident Refuge staff make it necessary to depend on notification of local fire authorities, and other involved parties as outlined in the Station's Fire Dispatch Plan (Appendix B.), except during normal working hours (7:30 a.m. to 4:00 p.m.) when personnel are generally on-site. Refuge personnel from the Honolulu office will be available to assist during fire suppression efforts. Initial attack would be provided by on-site qualified Refuge personnel.

Retardants nor surfactant will be utilized in wetlands for wildland fire suppression. Due to the size of units and time to activate heavy equipment, their use is not anticipated during suppression activities.

Critical protection areas, such as Refuge structures and critical habitat for listed species, will receive priority consideration in fire control planning efforts. Critical habitat as used in this context means any habitat that is important to one or more phases of the life cycle of endangered species occurring on the Refuge. Critical habitat as defined in the Endangered Species Act has not been designated for the species occurring on the Refuge. In all cases, the primary concerns of fire suppression personnel shall be the safety, and if needed, all individuals not involved in the suppression effort may be evacuated. There is no map depicting this habitat due to the rotational wetland management regime and the successional stages distributed throughout the several wetland impoundments on the Refuge.

Refuge staff mow around all structures on the Refuge approximately every two months, proving an adequate firebreak. Generally, the grass is mowed before it exceeds one foot in height.
Suppression strategies should be applied so that the equipment and tools used to meet the desired objectives are those that inflict the least impacts upon the natural and cultural resources. Minimum impact suppression strategies will be employed to protect all resources. Natural and artificial barriers will

be used as much as possible for containment. When necessary, fire line construction will be conducted in such a way as to minimize long-term impacts to resources.

Heavy equipment such as crawlers, tractors, dozers, or graders will not be used within the Refuge boundaries unless their use is necessary to prevent a fire from destroying privately-owned and/or government buildings and historic resources. The use of any heavy equipment requires approval from the Refuge Manager or delegate.

Sites impacted by fire suppression activities or by the fire will be rehabilitated as necessary, based on an approved course of action for each incident.

PREPAREDNESS

Preparedness is the work accomplished prior to fire occurrence to ensure that the appropriate response, as directed by the Fire Management Plan, can be carried out. Preparedness activities include: budget planning, equipment acquisition, equipment maintenance, dispatch (initial attack, extended, and expanded), equipment inventory, personnel qualifications, and training. The preparedness objective is to have a well trained and equipped fire management organization to manage all fire situations within the monument. Preparedness efforts are to be accomplished in the time frames outside the normal fire season dates.

In order to meet requirements for emergency preparedness, the Refuge will enter into a rental agreement with Pearl Pacific Air. This vendor who is already under contract with the Hawaiian Islands National Wildlife Refuge, will provide reconnaissance aircraft in the event of a fire occurring during the season of extreme fire danger.

All actions are employed to insure protection of Refuge resources including Refuge personnel safety and endangered species habitat and cultural resources which may be impacted by wildland fire.

Weather Analysis

Month	Average High Temp F. for Calendar Year 2000	Average Low Temp F. Calendar Year 2000	Average Rainfall
January	76.6	64.7	5.4
February	79.2	67.9	4.2
March	80.1	65.8	4.6
April	76.9	68.8	3.7
May	79.3	71.9	2.4
June	81.1	73.7	1.5
July	81.7	74.3	2.1
August	82.2	75.1	2.3
September	82.2	73.8	2.1
October	82.0	74.5	3.9
November	79.7	73.0	3.9
December	79.3	69.3	5
Year	80.8	73.0	41.3 inches

Rainfall data is from Kahuku (station 912) on O`ahu. Height is about 13 feet above sea level. Temperature averages for calendar year 2000 were provided from data collected by an automated weather system at the James Campbell NWR Ki`i Unit.

Lightning strikes and volcanos are the main natural sources of wildfires in Hawaii. In the vicinity of the Refuge lightning is very rare and no active volcanoes exist. Wildfires are essentially related to human activities with arson generally ranking in the top three. Thunderstorm activity during drier periods increase concern about wildfires. Fire season in Hawaii is generally considered to be during the summer months, however, when monthly rainfall, wind, fuel moisture deficit, and lower relative humidity are in a critical relationship a fire can break out at any time of the year (Pers comm. Pat Costales Hawaii, DLNR, DOFAW).

Fire Prevention

An active fire prevention program may be conducted in conjunction with other agencies to protect human life and property, and prevent damage to cultural resources or physical facilities. Visitor contacts, bulletin board materials, handouts and interpretive programs may be utilized to increase visitor and neighbor awareness of fire hazards.

During periods of extreme or prolonged fire danger, emergency restrictions regarding Refuge operations or area closures may become necessary. Such restrictions, when imposed, will usually be consistent with those implemented by cooperators. Closures will be authorized by the Refuge Manager.

Staffing Priority Levels

Because of the lack of occurrence of wildland fires, no step up plan will be developed. Planned ignitions will outline the particular needs of the prescribed burn project and include the adequate amounts of equipment and personnel to accomplish that job.

Training
Departmental policy requires that all personnel engaged in suppression and prescribed fire duties meet the standards set by the National Wildfire Coordinating Group (NWCG) or guidelines specific to Service employees. James Campbell NWR will conform strictly to the requirements of the wildland fire management qualification and certification system and USFWS guidelines.

Basic wildland fire training refreshers are offered annually for certified firefighters and records kept in a centralized database. Additional training is available from surrounding agencies in pump and engine operation, power saws, firefighter safety, fire weather and fire behavior, helicopter safety and prescribed fire objectives and activities. On-the job training is encouraged and will be conducted at the field level. Whenever appropriate, the use of fire qualification task books will be used to document fire experience of trainees. The FMO will coordinate fire training needs with those of other nearby refuges and cooperating agencies.

All certified Refuge personnel functioning in planned and unplanned fire activities must have the basic firefighter training required by Fish and Wildlife Service (FWS) and National Wildfire Coordinating Group, 310-1. This training includes basic firefighting techniques (S-130), basic fire behavior (S-190), annual refresher training in fireline safety (Standards for Survival), and the use of fire shelters. FWS policy requires that only trained and qualified people will be assigned to planned and unplanned fire management duties. All fireline personnel are required to have an aerobic fitness test prior to being assigned to fireline duties (see Fire Management Handbook).

The Refuge supports the development of individual Incident Command System (ICS) overhead personnel from among qualified and experienced Refuge staff for assignment to overhead teams at the local, regional, and national level.

Fire suppression is an arduous duty. On prescribed fires, personnel may be required to shift from implementation/monitoring activities to suppression. Poor physical condition of crew members can endanger safety and lives during critical situations. Personnel performing wildland fire management duties will maintain a high level of physical fitness. This requires successful completion of a fitness pack test. Personnel must complete a three mile hike with a 45 pound pack in less than 45 minutes.

Supplies and Equipment
Personnel who are certified are issued appropriate personal protective equipment (PPE). Additional; cache supplies are located at the base yard of the Kii Unit. To meet annual preparedness requirements, the Refuge will maintain all necessary fire tools, minor equipment and supplies to provide for normal unit strength (Appendix C). All equipment will be stored and properly maintained and all appropriate fire training needs of Refuge staff will be provided. The 100 and 200 gallon pumper slip-on units will be maintained in a ready state at all times to respond to wildland fire. The Refuge will require that permanent staff engaged in wildland fire suppression and prescribed burns meet all physical fitness and training qualifications as stipulated in their position description.
Additional equipment and supplies are available through cooperators and the interagency cache system. Requests for additional personnel and equipment are made directly through interagency cooperators.

DETECTION
Any wildland fire that might occur on then Refuge would likely be detected by Refuge personnel, Kahuku Sewage Treatment facility staff or the general public. All wildland fires will be reported to 911 who will

notify the Honolulu Fire Department. Refuge staff and fire department personnel will respond to any wildland fire report on the Refuge.

The Fire Management Plan does not discriminate between human-caused and lightning caused fire. All wildland fires will be suppressed. Human-caused fires may be investigated by law enforcement personnel. For serious human-caused fires, including those involving loss of life, a qualified arson investigator will be requested.

COMMUNICATIONS

Communication between Refuge staff during a fire is accomplished using the Nextel radio/cellular phone System. The group talk feature of the Nextel system will be used during all fire communications. Should Refuge staff work cooperatively with the Honolulu Fire Department sharing radios would require one of the cooperating agencies to provide the other with radio communication.

PRE-ATTACK PLAN

Upon discovery of a wildland fire, all subsequent actions will be based on the following:

1. The Incident Commander (IC) will locate, size-up, and coordinate suppression actions.
2. Provide for public safety.
3. Considering the current and predicted fire conditions, the Incident Commander will assess the need for additional suppression resources and estimate the final size of the fire. The potential for spread outside of the Refuge should be predicted, as well as the total suppression force required to initiate effective containment action at the beginning of each burning period.
4. The Incident Commander will assess the need for law enforcement personnel for traffic control, investigations, evacuations, etc. and make the request to the FMO.
5. Document decisions and complete the fire report (DI-1202).
6. Should a wildland fire move into an extended attack a Delegation of Authority will be invoked. Once a Delegation of Authority has been authorized the Incident Commander will make the final decisions pertaining to the fire. A copy of Delegation of Authority is in Appendix D.

FIRE MANAGEMENT UNITS

Fire Management Units (FMUs) are areas on a refuge which have common wildland fire management objectives and strategies, are manageable units from a wildland fire standpoint, and can be based on natural or manmade fuel breaks. An FMU may coincide with a prescribed fire burn block or treatment area or unit, but this is not always the case.

James Campbell National Wildlife Refuge will be considered as one fire management unit. All certified Refuge staff will control all unplanned ignitions with minimal loss of vegetation at minimal cost as determined by the Incident Commander. There will be no prescribed natural fires due to the size of the Refuge and unlikely starts by natural means. The total size of the Refuge (164 acres) will not tolerate any unplanned loss of nesting habitat. Intensive management for endangered Hawaiian birds require close control of vegetation. Unplanned ignitions could remove all habitat at once. The greatest threat to wildlife resources is during the nesting season when eggs and young or prefledglings are present and vulnerable because of their inability to escape a fire. Any unplanned ignition will have a Refuge representative to liaison with the Incident Commander to determine appropriate actions to take on the fire.

Fire Effects

The primary concern with prescribed burn effects relate to air quality (smoke management) and impacts on nesting waterbirds. The fire will remove the unwanted vegetation after herbicide application. There are no other prescribed fire effects of concern.

Depending on the time of year, a wildland fire passing through portions of the Refuge, could cause nesting failure by some waterbirds. Depending on their reproductive stage, renesting may or may not occur. The long-term effects of reducing domination by rank stands of exotic vegetation and opening up additional foraging and nesting sites would offset this short-term harmful effect.

Fuel Types and Fire Behavior
The Refuge has about 2/3 of the area in burnable vegetation (~100 acres) which includes fuel models 1, 3, and 5 (See Section VIII. B. 3. Table 1 and Table 2). The approximate acreage for each fuel model is: fuel model 1 = 19 acres; fuel model 3 = 61 acres; and fuel model 5 = 24 acres. Fire behavior in these fuel types is considerably different under normal conditions because of moist on-shore breezes. No reported information exists on unplanned ignitions, but planned ignition flame lengths vary from 4-6 feet in fuel model 1 and 3 to 10-12 feet in fuel model 5. Rates of spread under backing fires cover 30 feet burned in 3-7 minutes, under normal conditions. Relative humidity is rarely below 55% and the need to herbicide vegetation to achieve desired results from planned ignitions radically alters fire behavior. It is believed that unaltered natural vegetation would cause fire to move fairly slowly, with low intensity and heavy smoke under normal burning conditions.

SUPPRESSION TACTICS
Wildland fires will be suppressed in a prompt, safe, and cost-effective manner to produce fast, efficient action with minimum damage to resources. All wildland fires will be suppressed.

Personnel and equipment must be efficiently organized to suppress fire effectively and safely. To this end, the IC assumes the command function on major or multiple fire situations, setting priorities for the use of available resources and establishing a suppression organization.

There will be only one Incident Commander responsible through the Wildlife Biologist to the Refuge Manager. The Incident Commander will designate all overhead positions on fires requiring extended attack. A Delegation of Authority will be completed as needed (Appendix D). The Refuge Manager/Biologist will supply the IC with suppression objectives, and the IC will establish tactics to accomplish those objectives. A Resource Advisor will be appointed to provide on-site support to the IC.

Suppression Conditions
The most qualified person on scene, regardless of agency, will manage fire operations. If additional qualifications are required they will be ordered as soon as determined. Fire suppression resources will more than likely come from the City and County of Honolulu and the Refuge. Ground equipment, primarily engines, is sufficient to attack a wildland fire since all areas of the Refuge are accessible by vehicle. Water application to burning fuel is capable of extinguishing the fire in most circumstances.

Retardants nor surfactant will be utilized in wetlands for wildland fire suppression. Due to the size of units and time to activate heavy equipment, their use is not anticipated during suppression activities.

Wildland Fire Situation Analysis
For fires that cannot be contained in one burning period, a Wildland Fire Situation Analysis (WFSA) must be prepared (Appendix F). In the case of a wildland fire, the FMO/ Wildlife Biologist and Refuge Staff, will prepare the WFSA. Approval of the WFSA resides with the Refuge Manager.

The purpose of the WFSA is to allow for a consideration of alternatives by which a fire may be controlled. Damages from the fire, suppression costs, safety, and the probable character of suppression actions are all important considerations.

Public safety will require coordination between Refuge staff and the IC. Notices should be posted to warn visitors, trails may be closed, traffic control will be necessary where smoke crosses roads, etc. Where wildland fires cross roads, the burned area adjacent to the road should be mopped up and dangerous snags felled. Every attempt will be made to utilize natural and constructed barriers, including changing fuel complexes, in the control of wildland fire. Rehabilitation efforts will concentrate on the damages done by suppression activities rather than on the burned area itself.

Aircraft Operations

Aircraft may be used in all phases of fire management operations. All aircraft must be Office of Aircraft Services (OAS) or Forest Service approved. An OAS Aviation Policy Department Manual will be provided by OAS.

Helicopters may be used for reconnaissance, bucket drops and transportation of personnel and equipment. Natural helispots and parking lots are readily available in most cases. Clearing for new helispots should be avoided where possible. Improved helispots will be rehabilitated following the fire.

As in all fire management activities, safety is a primary consideration. Only qualified aviation personnel will be assigned to all flight operations.

REHABILITATION AND RESTORATION

When suppression action is taken, rehabilitation is appropriate. The most effective rehabilitation measure is prevention of impacts through careful planning and the use of minimum impact suppression techniques. All wildland fire sites will be evaluated for rehabilitation needs as soon as possible. Re-seeding needs will be determined according to Service policy and regulations. Per Service policy, only damage to improvements caused by suppression efforts can be repaired with fire funds. Rehabilitation will be directed toward minimizing or eliminating the effects of the suppression effort and reducing the potential hazards caused by the fire. These actions may include:

1. Backfill control lines, scarify, and seed.
2. Install water bars and construct drain dips on control lines to prevent erosion.
3. Install check dams to reduce erosion potential in drainages.
4. Restore natural ground contours.
5. Remove all flagging, equipment and litter.
6. Completely restore camping areas and improved helispots.
7. Consider and plan more extensive rehabilitation or re-vegetation to restore sensitive impacted areas.

If re-vegetation or seeding is necessary, native plant species will be considered first for re-vegetation.

If emergency rehabilitation measures are needed or if rehabilitation is needed to reduce the effects of a wildland fire, then the Refuge can request appropriate funding through the Burned Area Emergency Stabilization and Rehabilitation (ESR) fund.

REQUIRED REPORTING

The IC will be responsible for documenting decisions and completing the fire report (e.g., Ics-214, DI-1202). The Wildlife Biologist will be responsible for any additional required reports.

FIRE INVESTIGATION

Fire management personnel will attempt to locate and protect the probable point of origin and record pertinent information required to determine fire cause. They will be alert for possible evidence, protect the scene and report findings to the fireline supervisor.

Prompt and efficient investigation of all suspicious fires will be carried out. However, fire management personnel should not question suspects or pursue the fire investigation unless they are currently law enforcement commission qualified.

Personnel and services of other agencies may be utilized to investigate wildland fire arson or fire incidents involving structures. All fire investigations should follow the guidelines outlined in 4.1-2 of the Fire Management Handbook (2000).

PRESCRIBED FIRE ACTIVITIES

Currently, prescribed burning is conducted on a regular (yearly) basis on the Ki'i Unit of James Campbell National Wildlife Refuge. Additional prescribed burns may occur at the Punamano Unit of this Refuge. On average, the Refuge burns about 10 acres per year.

PRESCRIBED BURN PROGRAM OBJECTIVES

Prescribed fire can be a useful tool for restoring and maintaining natural conditions and processes at James Campbell NWR. Prescribed burns are conducted on these wetland units as a means of controlling noxious and exotic vegetation, primarily; California grass, millet, Indian fleabane, bulrush, cattail, knottgrass and makai. Control of establishment and spread of these species is required to provide secure and proper habitat for endangered waterbirds, migratory waterfowl and shorebirds. Specific goals include: providing open water areas; limiting predator cover and access; providing mudflat areas for nesting (stilts) and feeding; and promotion of desirable wetland plant species with water areas for Hawaiian coot, Hawaiian moorhen, and Hawaiian duck nesting and maintenance.

This wetland refuge was established for the maintenance and production of Hawaii's four endangered waterbird species and secondarily, to provide habitat for migratory waterfowl and shorebirds. Prescribed burning is one of a number of methods employed to increase and maintain habitat quality through provision of open water/emergent vegetation interspersion, optimum nesting habitat, release of nutrients for encouragement of invertebrate fauna and soil enhancement, and elimination of predator cover and predator access.

Burning will be conducted during periods of the year when there is minimal nesting activity for waterbirds which is September through October (Appendix E). The most ideal time for burning will be during September which has the best prescriptive window. Any short term negative impacts will be offset by the long term gains of improvement of the nesting and feeding habitat and the removal of predator cover.

Prescribed fires involve the use of fire as a tool to achieve management objectives. Research burning may also be conducted when determined to be necessary for accomplishment of research project objectives. Actions included in the prescribed burn program include: the selection and prioritization of prescribed burns to be carried out during the year, prescribed burn plans, burn prescriptions, burn operations, documentation and reporting, and burn critiques. Measures to ensure the successful implementation of the prescribed fire program are to:

$ Maintain successional stages among ponds conducive to suitable nesting/maintenance habitat for four species of Hawaiian endangered waterbirds.

$ Provide interspersion of vegetation, mudflat, and open water.

$ Remove all vegetation bridging from impoundment perimeter into endangered species maintenance and nesting areas to limit predator access.

$ Reduce predator concealment cover along dikes and roads.

$ Create a more desirable interspersion of wetland vegetation, mudflat and open water fostering enhanced avian invertebrate forage.

$ Encourage growth of forage/seed producing species for wintering waterfowl.

$ Use prescribed fire to reduce hazard fuel accumulation, restore fire to fire-dependent ecological communities, and to maintain cultural/historic scenes where appropriate.

The Refuge reserves the option to utilize an interagency team approach for complex burns carried out on the boundaries and close to developed areas or burns of large acreage. The most highly qualified and experienced personnel in the regional interagency community would be requested to serve on this team. Only qualified personnel will prepare and implement prescribed fire operations and follow Agency policy to do so.

FIRE MANAGEMENT STRATEGIES

Prescribed fire will be used to reduce hazard fuel accumulation, restore fire to fire-dependent ecological communities and improve wildlife habitat where appropriate. All prescribed fire activity will comply with applicable Federal, state, and local air quality laws and regulations.

All prescribed fire projects will have a burn plan approved by the Refuge Manager. Each burn plan will be prepared using a systematic decision-making process, and contain measurable objectives, predetermined prescriptions, and using an approved environmental compliance document. Appropriate NEPA and Section 7 documentation (Appendix E) exist for this Fire Management Plan. Therefore, additional compliance will be necessary only for prescribed fire projects not meeting the criteria outlined in this Plan.

Burns should be conducted between September and November. During this period, waterbird nesting is minimal, there is more flexibility in managing impoundment water levels, and weather is favorable for effective burns. Since the later part of this window is also the onset of the rainy season, all treatments and burns must be initiated as soon as possible to circumvent rainy periods that could jeopardize the effectiveness of burns. This period is usually of adequate length for both pre-treatment (herbicide application, mowing, discing, etc.) and burning.

Fuel moisture is a primary constraint to prescribed burning on this Refuge's wetland vegetation. It is usually necessary to treat live fuels by mowing and/or herbicide application prior to burning. Dead or dying fuels must be adequately cured to carry a fire of required intensity to accomplish the goals of vegetation removal and control. In addition, high relative humidity during morning hours precludes early burning. Dead fuels will not adequately ignite until around 9:00 - 10:00 a.m., and occasionally later. Test burns should be conducted prior to ignition of the prescribed burn area.

Fire monitoring will be used to evaluate the degree to which burn objectives are accomplished. Monitoring can assist managers in documenting success in achieving overall programmatic objectives and limiting occurrence of undesired effects.

BURN UNITS

Kii Unit

Periodic use of prescribed burning is required to control the spread of California grass from dikes out into impoundments. In addition, spot control of Indian fleabane, millet, cattail, bulrush and knottgrass will be required in most of the impoundments in order to provide open water habitat. Most of the impoundments are shallow (less than 3 feet) and can be drained to facilitate burning. Presently about 70% of the Ki'i Unit is covered with vegetation. Acreage and percent species composition of vegetated areas along with corresponding NFFL Fuel Models are presented in Table I. The remainder is open water within

impoundments and ditches. California grass is the most widespread, growing almost everywhere on this unit. Paspalum and Indian marsh fleabane are the next most prevalent species. Saltwort is found concentrated in more brackish to saline waters.

Table 1: Ki'i Unit Primary Vegetation Types by Acreage and NFFL Fuel Model

Vegetation Type	Acres	%	NFFL Fuel Model
California Grass	39	48	3
Paspalum	19	24	1
Cattail	3	4	3
Bulrush	1	2	3
Marsh fleabane	13	16	5
Saltwort	5	6	3
TOTAL	80	100	

NOTE: Figures are approximate. This includes within impoundments and surrounding area within unit. Particular species may change, but the fuel model remains the same.

On average, two impoundments per year are scheduled for prescribed burning, although there may be none to as many as three burned. Generally, burns will be small (approximately 5 acres) which reduces smoke management concerns. However, due to the proximity of Kamehameha Highway and the town of Kahuku, care must be taken to continue to limit the overall size and intensity of prescribed burns and to monitor wind direction and speed prior to and during all burns.

Smoke management will be a primary concern on this unit due to the proximity of private residences, Kamehameha Highway, and the volatility of the fuel in the burn area. In addition to monitoring wind direction and speed, it may be necessary to arrange for possible temporary closure of the highway if winds will carry smoke in that direction. Smoke management for this unit will begin prior to ignition of the burn and include proper signing alerting motorists of possible impaired visibility because of smoke. Signing can be accomplished by placement of advisory signs to alert drivers. Signs should be placed on both sides of the highway. Secondly, coordination with proper authorities prior to the burn would ensure the highway would be temporarily closed if necessary. If these arrangements cannot be made, it will be necessary to limit burns to low-wind or windless days (a rarity in this area) which will allow smoke to rise out of areas of concern. As in all prescribed burns, a contingency plan for immediate suppression will be part of the prescription.

Punamano Unit

This large, relatively deep wetland has become overgrown with bulrush over the past 10 years. This is primarily due to a change in water use patterns and sedimentation rates in the basin. Periodic burning is desirable to create and maintain open water areas and to facilitate water flow through the wetland. At present, only the deepest portions of this wetland are open. Currently relatively deep water is found in the center of the unit. Surrounding this, dense stands of bulrush, Indian marsh fleabane and Acacia sp. make

up the predominant vegetation between the boundary and open water edge. California grass also occurs in this belt. Scattered throughout the interior and to some extent near the perimeter of the open water, saltwort, hyssop, and paspalum are found. An estimated 65% (about 24 acres) of Punamano's acreage is covered with vegetation. Acreage and percent species composition of vegetated areas along with corresponding NFFL Fuel Models are presented in Table II. The remaining 13 acres is open water or exposed mesic soil.

Table 2: Punamano Unit Primary Vegetation Types by Acreage and NFFL Fuel Model

Vegetation Type	Acres	%	NFFL Fuel Model
Bulrush	12	50	3
Marsh fleabane and Acacia sp.	11	45	5
Saltwort, hyssop, California grass, and paspalum	1	5	3
Cattail	T*	T*	3
TOTAL	24	100	

*T = Trace

NOTE: Figures are approximate. This includes within impoundments and surrounding area within unit. Particular species may change, but the fuel model remains the same.

If vegetation type consists of multiple/mixed species, NFFL rating is for the most severe.

Prior to conducting burns in the bulrush of this unit, extensive firebreak construction will be necessary to prevent spread of fire into adjacent non-refuge lands. Most of the bulrush area is within the Refuge boundary, however, the volatility, height and density of the fuel will create a hazard for spread. Special care will be required to isolate the private residence and land along the west boundary and the private land along the south boundary. Much of the east boundary borders on overgrazed Indian fleabane uplands and the threat of spread into this area is not as severe. Most of the firebreak can be created with a bulldozer, however some hand clearing of fuels will be required in wet areas, primarily along the west and south boundaries and the Punamano Ditch.

Smoke management will be a primary constraint on this unit due to the proximity of private residences, Marconi Road, Kamehameha Highway, the volatility of the fuel and large size of the burn area. In addition to monitoring wind direction and speed, it may be necessary to arrange for possible temporary closure of the highway and road as prevailing winds will carry smoke in that direction. Smoke management for this unit will begin prior to ignition of the burn and include proper signing alerting motorists of possible impaired visibility because of smoke. Signing can be accomplished by placement of advisory signs to alert drivers. Signs should be placed on both sides of the highway and Marconi Road. Secondly, coordination with proper authorities prior to the burn would ensure the highway would be temporarily closed if necessary. If these arrangements cannot be made, it will be necessary to limit burns to low-wind or windless days (a rarity in this area) which will allow smoke to rise out of areas of concern. As in all prescribed burns, a contingency plan for immediate suppression will be part of the prescription.

PRESCRIBED FIRE PLANNING

Annual Activities

The Wildlife Biologist will be responsible for completing an annual fire summary report. The report will contain the number of fires by type, acres burned by fuel type, cost summary, personnel utilized, and fire effects.

Prescribed Burn Plan

The Prescribed Burn Boss, will conduct a field reconnaissance of the proposed burn location with the Maintenance Supervisor and/or Refuge Manager to discuss objectives, special concerns, and gather all necessary information to write the burn plan. After completing the reconnaissance, the Burn Boss will write the prescribed burn plan.

All prescribed fires will have prescribed burn plans prepared by qualified persons per Agency policy. The prescribed burn plan is a site specific action plan describing the purpose, objectives, prescription, and operational procedures needed to prepare and safely conduct the burn. The treatment area, objectives, constraints, and alternatives will be clearly outlined. No burn will be ignited unless all prescriptions of the plan are met. Fires not within those parameters will be suppressed. Prescribed Burn Plans will follow the format contained in Appendix G. Each burn plan will be reviewed by the Refuge Manager, Biologist, FMO, and Burn Boss. The Refuge Manager has the authority to approve the burn plan. The term Aburn unit@ refers to a specific tract of land to which a prescribed burn plan applies.

Strategies and Personnel

Execution of prescribed burns will only be executed by qualified personnel. The Prescribed Burn Boss will fill all required positions to conduct the burn with qualified personnel. All personnel listed in the burn plan must be available for the duration of the burn or the burn will not be initiated.

Weather and fuel moisture conditions must be monitored closely in planned burn units to determine when the prescription criteria are met. A belt weather kit may also be utilized to augment monitoring.

When all prescription criteria are within the acceptable range, the Prescribed Burn Boss will select an ignition date based on current and predicted weather forecasts. A thorough briefing will be given by the Prescribed Burn Boss and specific assignments and placement of personnel will be discussed. An updated weather forecast will be obtained on the day of ignition and all prescription elements will be rechecked to determine if all elements are still within the approved ranges. If all prescription elements are met, a test fire will be ignited to determine on-site fire behavior conditions as affected by current weather. If conditions are not satisfactory, the test fire will be suppressed and the burn will be rescheduled. If conditions are satisfactory the burn will continue as planned.

If the prescribed burn escapes the predetermined burn area, all further ignition will be halted except as needed for suppression efforts. Suppression efforts will be initiated, as discussed in the preburn briefing. The FMO will be notified immediately of any control actions on a prescribed burn. If the burn exceeds the initial suppression efforts, the burn will be declared a wildland fire and suppressed using guidelines established in this plan. A WFSA will be completed and additional personnel and resources ordered as determined by the Incident Commander. If the fire continues to burn out of control, additional resources will be called from the local cooperating agencies via the servicing dispatch. A management overhead team may be requested to assume command of the fire.

Monitoring and Evaluation

Monitoring of prescribed fires is intended to provide information for quantifying and predicting fire behavior and its ecological effects on Refuge resources while building a historical record. Monitoring measures the parameters common to all fires: fuels, topography, weather and fire behavior. In addition, ecological changes such as species composition and structural changes will be monitored after a fire. This information will be very useful in fine-tuning the prescribed burn program.

During prescribed burning, monitoring should include mapping, weather, site and fuel measurements and direct observation of fire characteristics such as flame length, rate of spread and fire intensity. Operational monitoring provides a check to insure that the fire remains in prescription and serves as a basis for evaluation and comparison of management actions in response to measured, changing fire conditions, and changes such as fuel conditions and species composition.

All fires may be monitored regardless of size. The FMO will establish specific fire information guidelines for each fire to update intelligence about the fire.

Required Reports

All prescribed burn forms will be completed as outlined by the Prescribed Burn Boss. A monitor will be assigned to collect all predetermined information and complete all necessary forms prior to, during, and after the burn. All records will be archived in the Refuge's fire records for future use and reference.

The Prescribed Burn Boss will prepare a final report on the prescribed burn. Information will include a narrative of the burn operation, a determination of whether objectives were met, weather and fire behavior data, map of the burn area, photographs of the burn, number of work hours, and final cost of the burn.

Prescribed Burn Critique

A report detailing the actual burn will accompany any recommendations or changes deemed necessary in the program. This report will be submitted to the Refuge Project Leader. A post-season critique of the fire management program, including the prescribed burn program, will be held each year.

AIR QUALITY / SMOKE MANAGEMENT GUIDELINES

Smoke management constraints in each unit are discussed below. Prescribed burns on the Hawaiian wetland refuges are small burns in limited areas. Smoke from the fires does not significantly affect air quality standards. An annual burn permit is required by the State of Hawaii, Department of Health for each prescribed burn. This permit process evaluates the burn in relation to emissions and local air quality standards. In previous years we have been issued permits as burns were not expected to affect air quality standards. The Refuge is required to report the schedule of each burn to the Department of Health and is also required to follow permit conditions provided by the Department of Health that are designed to minimize effects on air quality. These conditions include a specified time period when burns are permitted and attention to not burning on specified "no-burn" days for specified islands as provided on or before 4:00 p.m. by radio broadcast through the National Weather Service or other appropriate means, applicable for the succeeding day.

The State of Hawaii, Department of Health, Agricultural Burn Permit along with an approved Prescribed Burn Plan for the Refuge are maintained in the Refuge Complex office. The Agricultural Burn Permit must be renewed annually and in possession at the burn site while conducting a prescribed burn.

FIRE RESEARCH

No direct fire research has been conducted on the Refuge as of the completion of this plan. Monitoring is done generally by relating past usage by waterbirds to usage after burns are completed. The history of fire use has been proven to increase utilization by waterbirds.

PUBLIC SAFETY

James Campbell NWR is dedicated to ensuring the safety of each visitor and to all residents and property adjacent to the Refuge's boundary. Public and personnel safety is the Service's number one priority in fire management. Every ignition will be treated with caution and public safety will be given first consideration. Each planned ignition will cover specifics to identify and notify visitors and neighbors at possible risk. Smoke exposure is a known health concern. Smoke management considerations have been identified and individual burns will discuss mitigation techniques.

The Refuge is closed to the public, so impacts to visitors are not a concern during fire activities. The Estate of James Campbell will be notified in advance of any prescribed burn and if any fire poses a threat to burn outside the Refuge boundary.

During prescribed burns, at least one burn team member will have first aid training. A first aid kit will be on-site for prescribed burns as well as wildland fires. The local police, fire, and emergency medical services will be notified prior to the ignition of any prescribed burn. They will also be notified of the location of any wildland fires.

PUBLIC INFORMATION AND EDUCATION

Fire is a common occurrence on the north shore of Hawaii. Sugarcane and other agricultural burns are conducted on a regular basis so that visitors and locals are accepting of them. The major concern is that as more and more residents move into the area less tolerance to burning could develop. The fine fuels involved cause a short duration fire with little residual smoke and ash to cause concern. As long as identified precautions are taken in accomplishing planned ignitions, burns should not be a problem.

Prior to the lighting of any planned ignition, information will be made available to visitors, local residents, and/or the press about what is scheduled to happen and why. As outlined in the prevention section, emergency closures or restrictions may become necessary during periods of extreme or extended fire danger.

FIRE CRITIQUES AND ANNUAL PLAN REVIEW

FIRE CRITIQUES

Fire reviews will be documented and filed with the final fire report. The Wildlife Biologist will retain a copy for the Refuge files.

ANNUAL FIRE SUMMARY REPORT

The Wildlife Biologist will be responsible for completing an annual fire summary report. The report will contain the number of fires by type, acres burned by fuel type, cost summary (prescribed burns and wildland fires), personnel utilized, and fire effects.

ANNUAL FIRE MANAGEMENT PLAN REVIEW

The Fire Management Plan will be reviewed annually. Necessary updates or changes will be accomplished prior to the next fire season. Any additions, deletions, or changes will be reviewed by the Refuge Manager to determine if such alterations warrant a re-approval of the plan.

LITERATURE CITED

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CONSULTATION AND COORDINATION

The following agencies, organizations and/or individuals were consulted in preparing this plan.

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James Roberts, Fire Planner, Pacific Region, USFWS, Portland, OR.

APPENDICES

APPENDIX A: DEFINITIONS

Agency Administrator. The appropriate level manager having organizational responsibility for management of an administrative unit. May include Director, State Director, District Manager or Field Manager (BLM); Director, Regional Director, Complex Manager or Project Leader (FWS); Director, Regional Director, Park Superintendent, or Unit Manager (NPS), or Director, Office of Trust Responsibility, Area Director, or Superintendent (BIA).

Appropriate Management Action. Specific actions taken to implement a management strategy.

Appropriate Management Response. Specific actions taken in response to a wildland fire to implement protection and fire use objectives.

Appropriate Management Strategy. A plan or direction selected by an agency administrator which guide wildland fire management actions intended to meet protection and fire use objectives.

Appropriate Suppression. Selecting and implementing a prudent suppression option to avoid unacceptable impacts and provide for cost-effective action.

Bureau. Bureaus, offices or services of the Department.

Class of Fire (as to size of wildland fires):
Class A - 3 acre or less.
Class B - more than 3 but less than 10 acres.
Class C - 10 acres to 100 acres.
Class D - 100 to 300 acres.
Class E - 300 to 1,000 acres.
Class F - 1,000 to 5,000 acres.
Class G - 5,000 acres or more.

Emergency Fire Rehabilitation/Burned Area Emergency Rehabilitation (EFR/BAER). Emergency actions taken during or after wildland fire to stabilize and prevent unacceptable resource degradation or to minimize threats to life or property resulting from the fire. The scope of EFR/BAER projects are unplanned and unpredictable requiring funding on short notice.

Energy Release Component (ERC) A number related to the available energy (BTU) per unit area (square foot) within the flaming front at the head of a fire. It is generated by the National Fire Danger Rating System, a computer model of fire weather and its effect on fuels. The ERC incorporates thousand hour dead fuel moistures and live fuel moistures; day to day variations are caused by changes in the moisture content of the various fuel classes. The ERC is derived from predictions of (1) the rate of heat release per unit area during flaming combustion and (2) the duration of flaming.

Extended attack. A fire on which initial attack forces are reinforced by additional forces.

Fire Suppression Activity Damage. The damage to lands, resources and facilities directly attributable to the fire suppression effort or activities, including: dozer lines, camps and staging areas, facilities (fences, buildings, bridges, etc.), handlines, and roads.

Fire effects. Any consequences to the vegetation or the environment resulting from fire, whether neutral, detrimental, or beneficial.

Fire intensity. The amount of heat produced by a fire. Usually compared by reference to the length of the flames.

Fire management. All activities related to the prudent management of people and equipment to prevent or suppress wildland fire and to use fire under prescribed conditions to achieve land and resource management objectives.

Fire Management Plan. A strategic plan that defines a program to manage wildland and prescribed fires and documents the Fire Management Program in the approved land use plan. The plan is supplemented by operational procedures such as preparedness plans, preplanned dispatch plans, prescribed fire plans and prevention plans.

Fire prescription. A written direction for the use of fire to treat a specific piece of land, including limits and conditions of temperature, humidity, wind direction and speed, fuel moisture, soil moisture, etc., under which a fire will be allowed to burn, generally expressed as acceptable range of the various fire-related indices, and the limit of the area to be burned.

Fuels. Materials that are burned in a fire; primarily grass, surface litter, duff, logs, stumps, brush, foliage, and live trees.

Fuel loadings. Amount of burnable fuel on a site, usually given as tons/acre.

Hazard fuels. Those vegetative fuels which, when ignited, threaten public safety, structures and facilities, cultural resources, natural resources, natural processes, or to permit the spread of wildland fires across administrative boundaries except as authorized by agreement.

Initial Attack. An aggressive suppression action consistent with firefighter and public safety and values to be protected.

Maintenance burn. A fire set by agency personnel to remove debris; i.e., leaves from drainage ditches or cuttings from tree pruning. Such a fire does not have a resource management objective.

Natural fire. A fire of natural origin, caused by lightning or volcanic activity.

NFDRS Fuel Model. One of 20 mathematical models used by the National Fire Danger Rating System to predict fire danger. The models were developed by the US Forest Service and are general in nature rather than site specific.

NFFL Fuel Model. One of 13 mathematical models used to predict fire behavior within the conditions of their validity. The models were developed by US Forest Service personnel at the Northern Forest Fire Laboratory, Missoula, Montana.

Prescription. Measurable criteria which guide selection of appropriate management response and actions. Prescription criteria may include safety, public health, environmental, geographic, administrative, social, or legal considerations.

Prescribed Fire. A fire ignited by agency personnel in accord with an approved plan and under prescribed conditions, designed to achieve measurable resource management objectives. Such a fire is designed to produce the intensities and rates of spread needed to achieve one or more planned benefits to natural resources as defined in objectives. Its purpose is to employ fire scientifically to realize maximize net benefits at minimum impact and acceptable cost. A written, approved prescribed fire plan must exist and NEPA requirements must be met prior to ignition. NEPA requirements can be met at the land use or fire management planning level.

Preparedness. Actions taken seasonally in preparation to suppress wildland fires, consisting of hiring and training personnel, making ready vehicles, equipment, and facilities, acquiring supplies, and updating agreements and contracts.

Prevention Activities directed at reducing the number or the intensity of fires that occur, primarily by reducing the risk of human-caused fires.

Rehabilitation (1) Actions to limit the adverse effects of suppression on soils, watershed, or other values, or (2) actions to mitigate adverse effects of a wildland fire on the vegetation-soil complex, watershed, and other damages.

Suppression. A management action intended to protect identified values from a fire, extinguish a fire, or alter a fire's direction of spread.

Unplanned ignition. A natural fire that is permitted to burn under specific conditions, in certain locations, to achieve defined resource objectives.

Wildfire. An unwanted wildland fire.

Wildland Fire. Any non-structure fire, other than prescribed fire, that occurs in the wildland.

Wildland Fire Situation Analysis (WFSA). A decision-making process that evaluates alternative management strategies against selected safety, environmental, social, economical, political, and resource management objectives as selection criteria.

Wildland/urban interface fire A wildland fire that threatens or involves structures.

APPENDIX B: FIRE DISPATCH PLAN

FIRE DISPATCH PLAN
EXAMPLE

Oahu National Wildlife Refuge Complex
(James Campbell and Pearl Harbor NWR's)

Initial Documentation

Record as much information from a caller who is reporting a fire or the persistence of smoke:

< Location and color of smoke
< Location of caller
< Name and telephone number of caller
< Size of fire
< Type of fuel (grass, timber, trash, etc.)
< Character of fire (running, smoldering, etc.)
< Weather at the fire location
< Is anyone fighting the fire?
< Did they see anyone in the vicinity or vehicles leaving the area?

Dispatch Procedures

1. Check map location of fire and determine status.

2. If a small fire is on Refuge or threatening a Refuge:

   Oahu NWR Complex (James Campbell and Pearl Harbor)
   Dispatch 4-wheel drive pickup truck with slip-on fire fighting unit staffed by qualified personnel, 1 Wayjack pump with 3-50 ft. hose sections and necessary attachments, fire equipment, and at least 3 qualified fire fighters to fire.

3. Notify:

   Project Leader RW/Hawai'i and Pacific Islands:

.....
.....

   Deputy Project Leader RW/Hawaii and Pacific Islands:

.....
.....

.....
.....
Refuge Manager (O'ahu NWR Complex)

.....
.....
..... Cellular

4. Notify Hawai`i Department of Land and Natural Resources, Division of Forestry and Wildlife:

.....

5. Notify local fire department(s).

.....
.....
.....
.....

1. Notify Regional Fire Management Officer in Portland, OR.

.....

7. If fire danger is high or extreme, put recon aircraft in air over fire.

Carded aircraft: Pearl Pacific (Bob Justman)

.....
Pager:.....279-0972
Piper Aztec #40370 ($400.00/hr)

NOT AUTHORIZED TO FLY BELOW 500 FT. AND MUST NOT BECOME INVOLVED IN FIRE SUPPRESSION. USE AS AIR VANTAGE POINT AND AERIAL PHOTOGRAPHY.

8. Maintain a log of all radio and telephone communications.

9. Maintain a log of all actions and decisions.

10. Remain on duty and dispatch further assistance as ordered from fire.

Qualified Fire Personnel - Oahu NWRC

Refuge Fire Personnel	Qualification	Pack or Field Test	Home Phone
(Current information will be provided when plan is developed)			

Directory

Regional Office

..... Deputy

(Rowan Gould)

..... Fire Ma

(Pam Ensley)

..... Fire Ma

(Andy Anderson)

U.S. Forest Service (Interagency)

..... South Z

(POC: Les Metarazzi)
Call to request support &/or order supplies)

National Interagency Fire Center (NIFC)

..... FWS Fi

..... Logistic

(Should never have to contact NIFC directly. Call South Zone Interagency Coordination Center.)

Other Services

Hospital - O'ahu:

.....

.....

Ambulance

.....

..... O`ahu F

Adjacent Land Owners

James Campbell

1. Campbell Estate

.....

2. Kahuku Sewage Treatment Facility

.....

Pearl Harbor

1. U.S. Navy Federal Fire Chief

.....

APPENDIX C: EQUIPMENT

FIRE TOOLS, MINOR EQUIPMENT AND SUPPLIES
NORMAL UNIT STRENGTH (NUS)

Oahu National Wildlife Refuge Complex
(James Campbell and Pearl Harbor, NWRs)

ITEM	QUANTITY
Belt Weather Kit	3
Can, 5 gal. jeep w/spout	3
Can, 3 ga. gas, safety vent	3
First Aid Kit, 10 person	2
First Aid Kit, individual	6
Gloves, forest worker (pair)	12
Goggles, anti-fog	12
Helmet, safety plastic	12
McCleod, NFES	6
Pulaski, NFES	6
Pump, backpack	4
Shelter, forest fire w/case	12
Shirt, fire yellow	12
Shovel, NEFS	6
Torch, drip	2
Trousers, fire	14

CAPITALIZED PROPERTY
FIRE EQUIPMENT ON HAND

ITEM	QUANTITY
Pumper, slip-on, 100-gallon	1
Water Tanker, 1,100 gallon w/ live reel & rear sprayer	1
Pumper, slip-on, 200-gallon	1
Chain saw	2

CAPITALIZED PROPERTY
FIRE EQUIPMENT NEEDED

ITEM	QUANTITY
All-terrain vehicle	1
Chain saw	2
Hand-held radios	6
Pumper, slip on, 200-gallon	1
Portable Pump	1

APPENDIX D: DELEGATION OF AUTHORITY

James Campbell National Wildlife Refuge

Delegation of Authority
for

_____ Incident

_____ is assigned as Incident Commander. You have full authority and responsibility for managing the fire suppression acitivities within the framework of laws, Agency policy, and direction provided in the Wildland Fire Situation Analysis and the Agency Administrator Briefing.

Your primary responsibility is to organize and direct your assigned resources for efficient and effective suppression of the fire. You are accountable to the Agency Administratoror the representatives designated below.

Specific direction for this incident covering management and environmental concerns are:

1. Protection of life and private property is your highest priority task.
2. Give special consideration to firefighter safety, especially with respect to aviation operations, working around dozers, snags, and entrapments. Avoid sensitive environmental areas such as the Little White Salmon River and hatchery fish production ponds and intakes. When in doubt, sacrifice acres not people in your strategic and tactical decisions.
3. You are authorized to utilize helicopters, chainsaws, portable pumps, fireline explosives, and retardant at James Campbell NWR. Do not use retardant.
4. Manage human resources assigned to the fire in a manner that promotes mutual respect and is consistent with the enclosed U.S. Fish & Wildlife Service "Harassment-Free Workplace" policy.
5. Be cost effective; Final costs should be no more than 120% of the preferred WFSA alternative.
6. Manage equipment and supplies to ensure losses are within Acceptable Fire Loss/Use Rates.

You should takeover management of the incident on or before _____, _____.

_____ _____
NAME, Project Leader, REFUGE NAME Date

Delegation of Authority - Guidelines for Mitigating the Effects of Fire Suppression

<u>LINE BUILDING</u>

1. Do not fall snags on the outside of the line unless they are an obvious safety hazard.
2. On the inside of the line, fall only those snags that would reach the fire line should they burn and fall over, or if they are an obvious safety hazard.
3. Don't cut live trees over 12" d.b.h. unless deemed absolutely necessary by the Complex Manager. Limbing of these trees, as necessary, should be the first choice.
4. Cut brush or small trees flush with the ground if the area is visible from roads.

5. Lop and scatter cut limbs so the depth will not exceed 15 inches.

MOP-UP

1. Ensure duff or other smoldering fuel is completely extinguished.

AIR OPERATIONS

1. Use the safest and most effective means.

APPENDIX E: COMPLIANCE DOCUMENTS

UNITED STATES FISH AND WILDLIFE SERVICE
ENVIRONMENTAL ACTION STATEMENT FOR CATEGORICAL EXCLUSION

Within the spirit and intent of the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA), and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following administrative record and determined that the following proposed action is categorically excluded from NEPA documentation requirements consistent with 40 CFR 1508.4 and 516 DM 2.3A.

Proposed Action and Alternatives
The U.S. Fish and Wildlife Service (Service) proposes to adopt a Fire Management Plan for James Campbell National Wildlife Refuge (NWR) that will utilize fire as a habitat management tool for the maintenance and enhancement of wetlands and reduction of hazardous fuels on the Refuge. The Refuge supports a variety of habitats including grasslands and seasonal and permanent wetlands,. Alternate vegetation management approaches which the Refuge is pursuing include mowing, discing,and tilling. All methods may be incorporated, to varying degrees, into the grassland and wetland management programs of the Refuge, when appropriate and feasible to implement. However, the Refuge has determined that fire should continue to be utilized for restoration of wetlands and hazardous fuel reduction due to it's cost effectiveness and since not all Refuge properties are suitable for the alternative vegetation techniques.

Categorical Exclusion(s)
The specific categorical exclusions from NEPA allowing for this action pursuant to 516 DM 2.3A (2) are:

> B.(4) The use of prescribed burning for habitat improvement purposes, when conducted in accordance with local and State ordinances and laws.
>
> B.(5) Fire management activities, including prevention and restoration measures, when conducted in accordance with departmental and Service procedures.

Permits/Approvals
In accordance with Service policy, a Prescribed Burn Plan will be prepared and approved by the Refuge Manager prior to conducting a prescribed burn.

An Agricultural Burn Permit will be obtained from the State of Hawaii, Department of Health, Clean Air Branch.

Service Endangered Species Division staff from the Pacific Islands Fish and Wildlife Office were informally consulted on the Refuge grassland habitat management program including the use of fire as a management tool. As result of this consultation, the Refuge Manager determined this management program will have "may affect, not likely to adversely effect" on listed, proposed, and/or candidate species or designated critical habitat.

_____ _____

Refuge Manager Date
James Campbell National Wildlife Refuge

INTRA-SERVICE SECTION 7 EVALUATION FORM
CONSULTATION/CONFERENCE/CONCURRENCE

Origination Person: Johnny Beall

Date: August 9, 1993

I. Region 1: Portland, OR

II. Service Activity:
Prescribed burning as a marsh vegetation management technique on units of the O'ahu National Wildlife Refuge Complex.

III. A. Listed species and/or their critical/essential habitat

1. Within the action that will be or may be affected:

Hawaiian stilt (Himantopus mexicanus knudseni), Hawaiian coot (Fulica americana alai), Hawaiian moorhen (Gallinula chloropus sandvicensis), and Hawaiian duck (Anas wyvilliana). Wetland impoundments and adjacent Refuge areas.

2. Within the action area that will not be affected:

B. Proposed species and/or proposed critical habitat.

1. Within the action that will be or may be affected:
None

2. Within the action area that will not be affected:
None

IV. Geographic area or station name and action.

Areas within the Oahu National Wildlife Refuge Complex consisting of wetland refuges on the island of O'ahu (James Campbell NWR [Kii and Punamano Units] and Pearl Harbor NWR [Honouliuli and Waiawa Units]; Moloka'i (Kakahai'a NWR); and Maui (Kealia Pond NWR).

V. Location (attach map):

Figures 1-4 show location of James Campbell, Pearl Harbor, Kakahai'a, and Kealia Pond NWRs, respectively.

A. County and State:

All units of this complex are located in the state of Hawai'i.
James Campbell and Pearl Harbor NWRs are located in the County of Honolulu.
Kakahai'a and Kealia Pond NWRs are in Maui County.

B. Section, township, and range:

James Campbell NWR:	Latitude 21E 41'N; Longitude 157E 57'W.
Pearl Harbor NWR :	Latitude 21E 23'N; Longitude 157E 59'W.
Kakahai'a NWR:	Latitude 21E 04'N; Longitude 156E 57'W.
Kealia Pond NWR :	Latitude 20E 48'N; Longitude 156E 29'W.

C. Distance and direction to nearest town:

James Campbell NWR:	Kii Unit is located approximately 3/4 mile northwest and Punamano Unit 2 miles northwest of the town of Kahuku.
Pearl Harbor NWR:	Honouliuli Unit is about 1 mile south of Waipahu. The Waiawa Unit is about 3/4 mile from Pearl City to the northeast and Waipahu to the northwest.
Kakahai'a NWR:	Located approximately 3.5 miles southeast of Kamiloloa.
Kealia Pond NWR:	Located about 1 mile northwest of Kihei.

VI. Action Objectives:

Prescribed burning will be conducted on these wetlands refuges as a means of controlling noxious and exotic vegetation that interferes with nesting and maintenance of endangered and other waterbirds. Control of establishment and spread of these species is required to provide secure, viable, adequate habitat for endangered waterbirds, migratory waterfowl and shorebirds. Specific goals include: providing open water areas interspersed with escape, nesting, and maintenance cover; limiting predator cover and access, providing mudflat areas for nesting (stilts) and feeding, and promotion of desirable wetland plant

species with water areas for Hawaiian coot, Hawaiian moorhen, and Hawaiian duck nesting and maintenance.

VII. Explanation of impacts of action:

This action will result in enhanced wetlands for endangered and other species using the Refuge. Undesirable plant species will be controlled encouraging growth of more beneficial species. Dense predator concealment cover will be reduced making it more difficult for predators to prey on endangered species and allow waterbirds to detect predators at a greater distance, reducing predation. Increased habitat for a multitude of species both resident and migratory will be made available. The ratio of open water to vegetation will be altered to provide additional habitat diversity within wetland impoundments.

All burns will be conducted outside major endangered species nesting seasons. Burns will normally be conducted between August and mid-October. Burns will not be initiated when prefledgling birds are present. A check of each burn site will be made to determine the presence of waterbirds, young, and or nests. If any of the above are discovered, no burning in that area of the pond will be undertaken. To provide necessary foraging habitat while burning, not all ponds/impoundments will be drawn down or dry at the same time. Wetland habitat on the Refuge will continue to be provided for endangered and other waterbirds to utilize until worked ponds are reflooded.

VIII.Effect determination and response requested:

A. Listed species/critical/essential habitat:

Determination	Response Requested
will not affect	*concurrence
beneficial affect	concurrence
	*formal consultation
is not likely to adversely affect	concurrence
	*formal consultation
is likely to adversely affect	formal consultation

B. Proposed species/proposed critical habitat:

Determination	Response Requested
will not affect	*concurrence
beneficial affect	*concurrence
is not likely to adversely affect	*concurrence
is likely to adversely affect	formal consultation
is likely to jeopardize/adverse modification of critical habitat	conference

REMARKS:

*optional

SECTION 7 EVALUATION

REFUGE MANAGER DATE
OAHU NATIONAL WILDLIFE REFUGE COMPLEX

Comments:

PROJECT LEADER, HAWAIIAN AND PACIFIC ISLAND DATE
NATIONAL WILDLIFE REFUGE COMPLEX

Comments:

FIELD SUPERVISOR, PACIFIC ISLANDS OFFICE DATE

Comments:

ASSISTANT REGIONAL DIRECTOR, DATE
REFUGES AND WILDLIFE

Comments:

ASSISTANT REGIONAL DIRECTOR, DATE
FISH AND WILDLIFE ENHANCEMENT

Comments:

REGIONAL DIRECTOR, DATE

Comments:

APPENDIX F: WFSA

Jurisdiction: **US Fish and Wildlife Service**	Geographic Area:
Unit: National Wildlife Refuge	WFSA Number of .
Fire Name:	Incident Number:
Accounting Code:	
Date/Time prepared / / @ : .	
Attachments	
-Complexity Analysis X -Risk Assessment/Analysis X Probability of success Consequences of Failure -Maps -Decision Tree -Fire Behavior Projections X -Calculations of Resource Requirements -Other	

OBJECTIVES AND CONSTRAINTS

Objectives (Must be specific and measurable) These objectives must be considered in the development of alternatives in III, below. Suppression objectives must relate to the Unit resource management objectives.

Safety (These must receive the highest priority)

-Public

-Firefighter

a. Economic (May include closure, which could impact the public through transportation, communication and resource values)

b. Environmental (e.g. management objectives for wildlife habitat, water quality, etc.)

c. Social (May include local attitudes towards fire that might affect decisions on the fire)

d. Other (e.g. legal or administrative constraints needing consideration such as fire encroaching onto other jurisdictions)

Constraints (e.g. environmentally and culturally sensitive areas, irreparable damage to resources, and economic constraints)

ALTERNATIVES

	A.	B.	C.
Wildland Fire Strategy	Direct Attack	Indirect Attack	Combination Attack
Narrative			
Resources Needed Hand Crews Engines Dozers Air Tankers Helicopters			
Final Size			
Est. Contain/ Control Date			
Costs			
Risk Assessment -Probability of success -Consequence of failure			
Complexity			
Attach maps for each alternative			

EVALUATION OF ALTERNATIVES

	A.	B.	C.
Evaluation Process			
Safety Firefighter Aviation Public			
Sum of safety values			
Economic Forage Improvements Recreation Water Wildlife Other			
Sum of economic values			
Environmental Air Visual Fuels T&E Species Other			
Sum of environmental values			
Social Employment Public Concern Cultural Other			
Sum of social values			
Other			
Sum of other values			
TOTAL			

ANALYSIS SUMMARY

	A.	B.	C.
Compliance with Objectives Safety			

Economic Environmental Social Other			
Pertinent Data Final fire size Complexity Suppression cost Resource values Probability of success			
External/Internal Influences			

VI. DECISION

The Selected Alternative is: .
Rationale:
Agency Administrator's Signature Date/Time

VII. DAILY REVIEW

			PREPAREDNESS LEVEL	INCIDENT PRIORITY	RESOURCE AVAILABILITY	WEATHER FORECAST	FIRE BEHAVIOR PREDICTIONS	WFSA VALID
Date	Time	By						

VIII. FINAL REVIEW

The elements of the selective alternative were met on:
Date Time:

By:
Agency Administrator

APPENDIX G: SAMPLE BURN PLAN

U.S. FISH AND WILDLIFE SERVICE - REGION 1

PRESCRIBED FIRE PLAN
EXAMPLE

O`ahu National Wildlife Refuge Complex

James Campbell National Wildlife Refuge

Ki`i Unit

Prepared By:_____ Date:_____
O`ahu NWR Complex,
Wildlife Biologist

Reviewed By:_____ Date:_____
Burn Boss

Reviewed By:_____ Date:_____
O`ahu NWR Complex,
Refuge Manager

Reviewed By:_____ Date:_____
Regional Fire Management Coordinator

The approved Prescribed Fire Plan constitutes the authority to burn. No one has the authority to burn without an approved plan or in a manner not in compliance with the approved plan. Actions taken in compliance with the approved Prescribed Fire Plan will be fully supported.

PRESCRIBED FIRE PLAN

Station: O`ahu National Wildlife Refuge Complex

Sub Station:James Campbell NWR Maximum Acres to be Burned: 7.6
Name of Area: Ki`i Unit Maximum Perimeter Length :2,450'

Unit Number: Ponds C makai, F mauka, F makai, and “G”

Legal Description: Lat. 21E 41' North Long. 157E 57' West

Have considerations of environmental, economic, and social effects, both on and off site, been addressed in a Refuge Master Plan or EA prepared as part of the Fire Management Plan? YES
(If not, attach short form EA to this plan.)

Proposed prescribed burn areas on this unit during calendar year 2000 are depicted in Figure 1.

As a minimum, the Burn Boss will participate in the development of Sections III, IV, V, VII and VIII.

I. GENERAL DESCRIPTION OF BURN UNIT

Physical Features and Vegetative Cover Types (Species, height, density, etc.):

The Ki`i Unit consists of 7 wetland management impoundments, each bordered by earthen dikes/roads and water control structures. Slope is gentle, almost flat except at juncture of impoundment bottoms and dike/road toe. Three main ditches (Hospital, Ki`i, and Punamano) lay adjacent to some of the ponds. A smaller ditch, "B" Ditch parallels the south edge of Pond "B" and connects Raboy Ditch (off-refuge) to Hospital Ditch. Physical structures on the area consist of a pump house, visitor kiosk with displays, a wooden bridge, and perimeter fence.

PREDOMINANT VEGETATION/CHARACTERISTICS:

SPECIES	EST. MAX. HEIGHT (Ft.)
California grass (*Brachiaria mutica*)	5
Honohono (*Commelina diffusa*)	1
Millet (*Echinochloa crus-galli*)	4
California bulrush (*Scirpus californicus*)	8
Cattail (*Typha angustata*)	8
Indian marsh fleabane (*Pluchea indica*)	3

INSERT FIGURE 1
PROPOSED BURN AREAS

California grass, Bermuda grass (*Cynodon dactylon*) and Indian marsh fleabane are primary species on dikes and roads. California grass forms a relatively contiguous band around impoundment perimeters, encroaching into ponds at places by creeping rhizomes. Remaining species listed above occur in patches or stands either isolated or sometimes mixed together in standing water or the evaporative tension zone of the wetlands adjacent to pond perimeters or within impoundments. A fringe of trees and shrubs consisting of Hau (*Hibuscus tiliaceus*), Java plum (*Eugenia javanica*), koa-haole (*Leucaena leucocephala*), Noni (*Morinda citrifolia*), and Indian fleabane occurs along the Northwestern edge of the unit, outside wetland impoundments.

Are Primary Resource Objectives of Unit adequately discussed in Station Fire Management Plan ? Yes (If not, list here):

1) Maintain successional stages among ponds conducive to suitable nesting/maintenance habitat for 4 native Hawaiian endangered waterbirds.

2) Provide interspersion of vegetation, mudflat, and open water.

3) Remove all vegetation bridging from impoundment perimeter into endangered species maintenance and nesting areas to limit predator access.

4) Reduce predator concealment cover along dikes and roads.

5) Create a more desirable interspersion of wetland vegetation, mudflat and open water fostering enhanced avian invertebrate forage.

6) Encourage growth of forage/seed producing species for wintering waterfowl.

Objectives of Fire (Be specific. These are different than management goals):

1) Reduce area of coverage of California grass in impoundments to less than 5% of the present level.

2) Remove 100% of all California grass encroaching from pond perimeter into pond interior.

3) Remove at least 60% of the existing cattail from each impoundment.

4) Remove at least 90% of all bulrush in all ponds.

5) Remove all grass species from nesting islands.

6) Remove at least 90% of the current Honohono in each impoundment.

Acceptable Range of Results (Area burned vs. unburned, scorch height, percent kill of a species, range of litter removed, etc.):

1) A successful burn of 75% of the prescribed burn area will be considered acceptable.

2) An increase of 50% more interspersion is acceptable due to the short burn window and the number of small burns that might be necessary to accomplish the overall intended burn.

3) No less than 100% reduction of impoundment perimeter vegetation encroaching into the foraging/nesting areas will be considered acceptable.

4) Due to the perennial nature of many of the species being burned a kill rate of 25% by burning will be considered acceptable.

Is Historical Fire Occurrence adequately discussed in the Station Fire Management Plan? Yes (If not, discuss here):

The only known wildfire in the vicinity of the James Campbell National Wildlife Refuge occurred in dense stands of California grass during 1981. It began between the Ki`i Unit and the sea, moved inland to the Refuge boundary and destroyed a stationary pump mounted over a ditch. Fire season as identified by the State Division of Forestry is for a three-month period in late summer depending on month-to-month variations in weather.

Past and present agricultural practices incorporated fire as an integral part of the farming process. Sugar cane plantations have a long history in Hawaii, dating back to the early part of this century. Prior to harvesting large tracts of sugar cane are burned to remove much of the unused vegetative material from the culm. Other agricultural burning of brush and litter piled is also common in the State and the local vicinity.

Prescribed burning has also been a part of wetland management on this unit in the past.

Is the Natural Role of fire in the Unit adequately discussed in the Station Fire Management Plan? No (If not, discuss here):

Having a volcanic origin, fire was an integral part of island development. Today on O`ahu there are no active volcanoes. What has occurred is the introduction of numerous exotic plant species that thrive in the tropical environment. The result is the alteration and destruction of native vegetation and plant communities by these highly invasive pests.

Depending on the time of year, a wildfire passing through portions of the Refuge, could cause nesting failure by some waterbirds. Depending on their reproductive stage, renesting may or may not occur. The long-term effects of reducing domination by rank standards of exotic vegetation and opening up additional foraging and nesting sites would offset this short-term harmful effect.

Are the potential impacts upon visitors, users, and local communities, both on and off site, adequately identified in the Station Fire Management Plan? No. (If not, identify here):

Potential Impacts Upon:

Visitors:
The Refuge is open to visitors on a limited basis because of endangered species management practices and the need to limit disturbance during nesting season. The public use season begins August 1 and ends February 15. The burn areas planned for this year are located along the tour route. Because the normal burn season on the Refuge is between August and mid-October, efforts will be made to complete burns as early as possible within this time frame, providing all burn parameters are within prescription. The public tours will be cancelled as necessary if they conflict with potential burn days.

If weather conditions resulted in heavy smoke blowing low over Kamehameha Highway it could temporarily slow or stop traffic along the North Shore. This is not expected to be a long delay as there are sugar cane burns along this highway.

II. PRE-BURN MONITORING

Vegetation Type	Acres	%	NFFL Fuel Model
California grass	4.1	54	3
Bulrush	2.0	26	3
Cattail	0.7	9	3
Honohono	0.4	5	1
Millet	0.2	3	1
Scirpus sp.	0.2	3	1
Hyssop	<0.1	<1	1
Makai	<0.1	<1	3
Fleabane	<0.1	<1	3
TOTAL:	7.6	100	

Habitat Conditions (Identify with transect numbers if more than one in burn unit.):

Current conditions consist of dense overgrown vegetation that eliminates nesting and migratory bird feeding habitat. Entire burn area is approximately 90% vegetation covered lacking suitable open water to vegetation ratio or interspersion. California grass areas provide concealment for predators (mongoose and rats) of endangered waterbirds.
Type of Transect: GPSed vegetation cover.

Other:

Photo Documentation (Add enough spaces here to put a pre-burn photo showing the habitat condition or problem you are using fire to change/correct. A photo along your transect may reflect your transect data.):

The following photos depict existing vegetation conditions in each pond scheduled for prescribed burning. Figure 2 depicts line-of-sight along which each photo was taken. All photos were taken June 8, 2000.

INSERT FIGURE 2

PRE-BURN PHOTO POINT LOCATIONS KI`I UNIT

JAMES CAMPBELL NWR

Other:

III. PLANNING AND ACTIONS

Site Preparation (What, when, who & how. Should be done with Burn Boss):

High humidity, soil moisture, and robust perennial vegetation make getting a good burn difficult, if not impossible, without pre-burn site preparation. To ensure an acceptable burn, wetland impoundments within the burn area will be drawn down to allow for substrate drying and resultant decreased soil moisture. Grasses and brushy fuel will then be sprayed with an approved herbicide to kill enough vegetation to provide dead, dry fuel for carrying a fire and to aid vegetation control. Areas of dense vegetation will be disced or mowed to break up the continuity reducing burn area in this fuel type. Firebreaks consisting of earthen road/dikes will be mowed to reduce the possibility of fire spreading outside the prescription burn areas. Firebreaks will be maintained until the burn can be accomplished to ensure vegetation doesn't grow tall between initial mowing and the burn day. Water-filled ditches also provide firebreaks, as does the arrangement of Refuge wetland impoundments. Impoundments not scheduled for burning will have water in them and will act as firebreaks. These activities will begin in July following completion of waterbird nesting.

On the day of the prescribed burn a belt fire weather kit in combination with an automated weather data collection system will be used to determine if climatic conditions are right for igniting the burn. If conditions are favorable, a test fire will be ignited to confirm burning conditions. These tasks will be accomplished by Refuge personnel.

Safety Considerations (Specifically discuss Buffer and Safety Zones for: Adjacent lands, visitors, burn personnel, facilities, terrain, etc., and needed actions - Be specific, indicate on a burn unit map. Map should be a "topo" if possible, so ridges, washes, water, trails, etc. can be identified).

Adjacent lands are separated from the Refuge by one or more types of firebreaks (wetland impoundments, earthen roads/dikes and water-filled ditches). Site preparation measures described above incorporate safety considerations. Refuge visitation will not be allowed on burn

days. This will keep all but authorized fire personnel out of the Refuge. Adjacent landowners will also be notified prior to ignition of a prescribed burn.

Burn personnel will be required to wear proper fire resistant clothing and other personal protective equipment. Burns that may be required near Refuge equipment and facilities will have a wet line in place prior to ignition, be kept small, have fire personnel and a slip-on pumper unit assigned to them, and will be confined to the area immediately in the vicinity of structures to minimize the burning area. Escape routes will be discussed and shown to all crew members.

Special Safety Precautions Needing Attention (Aerial ignition, aircraft, ignition from boat, etc.):

The potential for rapidly changing climatic conditions exists on the North Shore. As a result frequent weather monitoring throughout the burn will be a priority. No other special safety precautions are foreseen.

Media Contacts that may be contacted (Radio stations, newspaper, etc., list with telephone numbers):

Entity	Telephone Number(s)

Special Constraints and Considerations (Should be discussed with Burn Boss):

Smoke management (See below).

Communication and Coordination on the Burn (Who will have radios, frequencies to be used, who will coordinate various activities.):

Close proximity between fire crew members will allow for adequate communication in most instances. In cases where members must split up, cellular phone/radio combined hand units will be carried by all firefighting personnel on the fire line. This system allows for communication between the entire fire crew or individual members of the crew. This communication system can also be used to contact police, fire, ambulance and other entities in the event of an emergency.

The Crew Boss will coordinate all activities between fire personnel. This individual will discuss the burn plan, point out escape routes, safety areas, and assign crew members their jobs during the pre-burn meeting.

The Project Leader, Hawaiian and Pacific Islands National Wildlife Refuge Complex will be notified of all proposed burn dates and notified on burn days prior to ignition.

IV. IGNITION, BURNING AND CONTROL

	Planned or Proposed	Actual
Scheduling: Approx. Date(s):	July - October	September
Time of Day :	9:00 AM - 6:00 PM	09:30 - 18:00

Acceptable Prescription Range

	Low	Desired	High	Actual
NFFL Fuel Model 3				
Temperature:	75	80-85	88	
Relative Humidity:	40	45-55	>69	
Wind Direction:		NE-NNE		
Wind Speed (20',forecast):	5	12-30	37	
Wind Speed (mid-flame): (40% of 20')	2	5-12	15	
Cloud Cover (%):	10	11-40	75	

Environmental Conditions:	Low	Desired	High	Actual
Soil Moisture* (State depths):	MED-HI		Med-High	
Fuel Moisture:	5	9-10	>15	
Litter/Duff Moisture:				
Live Fuel Moisture:*	<60	60	>60	
Other: (1000 Hr. fuels*, Drought Index*, etc.)				

* Show at least one

Fire Behavior:				
Type of Fire (head, backing, flanking, etc.):	Backing		Back/Flank	
Rate of Spread:	<4	4-6	6	
Intensity:	30	50-100	>100	
Flame Length:	<2	3-6	>7	
Heat/Unit Area:*	<600	600-800	>800	
Energy Release Component*:				

* Show at least one.

Ignition Technique (Explain and include on map of burn unit. Use of aerial ignition must be identified in this plan.):

One or two crew members will be assigned the responsibility of igniting the prescribed fire. Fires will be ignited along the southwest boundary/edge (downwind edge of the burn area) of a burn area/unit. Head fires, if used, will be ignited only after blackline creation. All ignition will be from the ground using a commercially available drip-torch.

Prescribed Fire Organization (See Section VII, Crew and Equipment Assignments. All personnel and their assignments must be listed. All personnel must be qualified for the positions they will fill.)

Six trained firefighters, 1-150 gallon and 1-200 gallon slip-on pumper unit each mounted in a pick-up bed, and 1-1,100 gallon water tanker; two 31/2 hp water pumps, with 2" diameter hose on standby to pump water from wetland impoundments or piped water source. Each pick-up truck with a pumper unit will carry hand tools, including flappers, shovels, backpack sprayers, pulaskis, and McLeods.

Crew members will wear hardhats, protective eye goggles, gloves, fire retardant clothing (pants and shirt), and carry required safety equipment, including a fire shelter.

Two tractors will be stationed in safe yet accessible locations in the event they might be necessary for emergency fire suppression.

All qualified crew members will be allowed to utilize hand tools, operate pumpers, and pumps. Operation of heavy equipment will be limited to properly trained crew members.

Other (If portions of the burn unit must be burnt under conditions slightly different than stated above, i.e., a different wind direction to keep smoke off of a highway or off of the neighbors wash, detail here.)

None.

V. SMOKE MANAGEMENT

Distance and Direction from Smoke Sensitive Area(s):

Four-tenths of a mile Northeast of Kamehameha Highway (State Highway). One mile North of Kahuku Town, four-tenths of a mile West of the Ming Dynasty aquaculture operation, eight-tenths of a mile West of Tanaka's Corner, a tourist stop. Adjacent to the burn area are Romy Aquinaldo's aquaculture operation (to the Southwest) and Kahuku Sewage Treatment Facility (to the South).

Necessary Transport Wind Direction and Elevation (Explain how this information will be obtained and used.):

Northeast at mid-flame elevation. Wind direction and velocity will be obtained from on-site hand-held anemometers and National Weather Forecast information from daily broadcasts when available. Twenty-foot wind speed will be gathered from National Weather Service forecast reports and an on-site weather collection system. This information will be used; 1) to determine if the prescribed burn should be ignited and 2) if and when the fire should be extinguished, in the event wind conditions change.

Visibility Hazard(s) (Roads, airports, etc.):

State highway (Kamehameha Highway).

Actions to Reduce Visibility Hazard(s):

1) Burn dried/dead vegetation with low moisture content.
2) Utilize backing fire to reduce amount of vegetation burning at any one time.
3) Limit area burning at one time to no more than 2 acres.
4) Burn when weather is conducive to good smoke dispersal.
5) Fire crew will be available to extinguish fire starting to produce excessive smoke effecting highway visibility.

Residual Smoke Problems (Measures to reduce problem, i.e., rapid and complete mop up, mop-up of certain fuels, specific fuel moisture, time of day, etc.):

1) Accomplish rapid mop-up of burned areas.
2) Extinction of burning/smoldering areas, when necessary.
3) Prevent, as much as practical, burning duff on dike slopes.
4) Begin mop-up as soon as possible after fire has passed through area.

VI. FUNDING AND PERSONNEL					
Accounting Data: 12527-9263-XXXX					
Costs					
	Equipment/Supplies	Labor (PSD)*	Overtime	Staff Days	Total Cost
Administration: (planning, permits, etc.)					
Site Preparation					
Ignition & Control					
Travel/Per diem					
Monitoring/Eval.					
TOTAL					
*per staff day					

VII. BURN-DAY ACTIVITIES

Public/Media Contacts on Burn Day (List with telephone numbers):

ENTITY TELEPHONE NUMBER

O`ahu Fire Alarm Bureau .....

James Campbell Estate ....

Kahuku Fire Station .....

Kahuku Police Dept .....

Kahuku Sewage Treatment Facility .....

Crew & Equipment Assignments (List all personnel, equipment needed, and assignments. The following is not an all inclusive list for what you may need.)

CREW ASSIGNMENTS

Crew members will be given equipment assigned prior to the burn based on their qualifications. Personnel will only be assigned to equipment and duties for which they are qualified.

EQUIPMENT ASSIGNMENTS CREW

1 - 1,100 gal. Water Tanker/pumper .....
1 - Slip-on 100 gal. pumper unit .....
.....1 - Slip-on 200 gal. pumper unit
..... 1 - John Deere with front mounted blade
.....1 - John Deere backhoe

Crew Briefing Points (Communications, hazards, equipment, water sources, escape fire actions, etc. to be done by Burn Boss. Refer to Safety Considerations in Planning Actions and points listed below):

Initial briefing/discussion with all crew members will take place at least 1 week prior to first scheduled burn date. This will include an inspection of all burn areas and fire equipment, including personal protective equipment.

At least 1 hour prior to ignition the burn prescription and individual crew member job assignments will be reviewed at the burn site vicinity.

Ignition Technique (Methods, how, where, who, and sequence. Go over what was submitted in Section IV and any changes needed for the present conditions.)

A test fire will be ignited by using a drip-torch. If acceptable burn conditions exist, a backing fire will be set to either; 1) effect the burn, or, 2) to create a blackline if a head fire is appropriate. All backing fires will be initiated from a firebreak. Two crew members will be involved in ignition. One will ignite the fire using a drip-torch, while walking along the edge of the firebreak. The second will attend the pumper unit and watch for any problems so they may be quickly extinguished.

Personnel Escape Plan:

At least one escape route will be available to each crew member at all times. Escape routes will be along firebreaks (mowed earthen dikes/roads). In an emergency, water-filled ditches can also be used as escape routes from the fire. Escape routes will be reviewed with all crew members prior to ignition. Visual inspection of all escape routes will be made prior to ignition to ensure their accessibility. If necessary these routes will be cleared immediately prior to ignition.

Holding and Control:

Critical Control Problems:

None anticipated as long as wind remains within set limits.

Water Refill Points:

Freshwater can be drafted from the vertical anti-siphon pipe located between Pond C and Hospital Ditch, well water collection cistern located near Pond F makai and G, as well as wetland impoundments, and Punamano Ditch, if necessary.

Other:

Contingency Plan for Escaped Fire (Are there crews standing by to initial attack or will people doing other jobs be called upon to do initial attack, who must be called in case of an escape, what radio frequencies will be used, etc.)

In the event of an escaped fire, the O`ahu Fire Alarm Bureau, Kahuku Police and Fire Department will be notified immediately. Additionally, adjacent landowners and lessees will be notified. Crew members at the burn site having passed the Pack Test will start initial attack. All other crew members will fall into a technical assistance mode meeting incoming initial attack personnel to provide information such as routes and access ways around the Refuge, acceptable suppression techniques on the Refuge relative to Hawaiian waterbird protection, water source locations, and other pertinent resource/suppression information.

O`ahu Fire Alarm Bureau .....

..... James Campbell Estate . . . .

.....Kahuku Police Dept

..... Kahuku Fire Dept

.....Kahuku Sewage Treatment Facility

Hawai`i Dept. of Land & Natural Resources.....
Division of Forestry and Wildlife

Mop Up and Patrol:

Special Problems:

None foreseen.

VIII. CRITIQUE OF BURN

Were burn objectives within acceptable range of results? (Refer to Section I): Yes.

1. California grass in impoundments was reduced to less than 5% of the pre-burn area.

2. 100% of all California grass encroaching from pond perimeter into pond interior was removed.

3. Remove at least 60% of the existing cattail from each impoundment. 100% was removed mechanically.

4. Remove at least 90% of all bulrush in all ponds. More than 95% was effectively removed. The best burn of bulrush ever on the Refuge was accomplished.

5. Remove all grass species from nesting islands. 100% was removed.

6. Remove at least 90% of the current Honohono in each impoundment. No burning was conducted in areas of honohono because mechanical techniques were used due to prescribed burning ban within DOI.

What would be done differently to obtain results or get better results?

Getting a good, clean and complete burn of areas covered with dense stands of bulrush has always been a problem on the Refuge. This year a new technique was tried after observing that bulrush laying down burned much better that the standing biomass. The standing patches of bulrush were flattened using a tractor and rear flail mower. The mower was not cutting, but its weight smashed the plants to a more horizontal position. The degree of flattening was adjusted by the height of the mower. The mower was set to a height that flattened the fuel enough to provide greater stem density, yet maintain sufficient air space to promote a good burn. The technique worked so well all the bulrush remaining that was treated in this manner, burned to planned objective specifications. This technique will be employed whenever possible in the future.

A backing or flanking fire is the best method to achieve the greatest most complete cleanest burn of bulrush and California grass.

Was there any deviation from plan? If so, why?

Total acreage burned (3.0 acres) was smaller than planned (7.6 acres). The reduction was associated with the extreme fire season on US Mainland and resultant lengthy ban on all prescribed burning on DOI lands. Since pre-burn work had already been completed and there was a possibility no burning would be permitted within our burn window alternative mechanical and hand methods were employed to enhance as much habitat as possible so when the ban was lifted only about 39% of the intended burn area remained.

Problems and general comments:

Most of the burn was clean and complete. The exception was California grass that had been pulled to the toe of the dike slopes in Ponds G and F. At these locations creeping fire in roots entrapped in mud released dense white smoke. These areas were mopped up as the flame front passed to minimize smoke concerns and conform to the burn plan. Some of these sites were not subsequently burned because of the smoke and mop up times involved on these sites. Smoke management was a concern with these sites, but was controlled without incident during the burn by rapid and complete mop up and cessation of burning additional areas of similar composition.

For three members of our fire crew this was the first experience on the fireline of a prescribed burn. These new members performed well during the entire burn. More experienced firefighters mentored them during the burn. In addition to members of the Oahu NWRC fire crew, Andy Kikuta from Hakalau NWR located on the Island of Hawaii, participated in the burn as the Burn Boss. Mr. Andy Kikuta evaluated the pre-planning, on-site pre burn procedures, field

observations, and other tasking requirements necessary for certification of Mike Silbernagle as an FWS RxB3. Mr. Kikuta will complete the necessary sections of Mike Silbernagle's Task Book to reflect this.

There were no injuries or near injuries to fire crew members during the prescribed burn and the anticipated results were achieved. There was also no equipment damaged or lost during the burn.

IX. POST BURN MONITORING

Date:_____ Station Burn Number:_____

Length of Time after Burn:_____

Vegetative Transect:

Comments on Habitat Conditions, etc.:

Photo Documentation:

Other:

FOLLOW-UP EVALUATION

Date:_____ Station Burn Number:_____

Length of Time after Burn:_____

Vegetative Transect:

Comments on Habitat Conditions, etc.:

Photo Documentation:

Other:

REQUEST FOR CULTURAL RESOURCE COMPLIANCE

U.S. Fish and Wildlife Service, Region 1

Project Name:					**Program:** (Partners, Refuges, JITW, WSECP, etc.)	
State: CA, ID, HI, NV, OR, WA		**EcoRegion:** CBE, IPE,KCE, NCE			**FWS Unit:** **Org Code:**	
Project Location:	**County**	**Township**	**Range**	**Section**	**FWS Contact:** Name, Tel#, Address	
USGS Quad:					**Date of Request:**	
Total project acres/linear ft/m:		**APE Acres / linear ft/m (if different)**			**Proposed Project Start Date:**	

MAPS Attached	**Check below**		
Copy of portion of USGS Quad with project area marked clearly **(required)**			Project (sketch) map showing Area of Potential Effect with locations of specific ground altering activities **(required)**
Photocopy of aerial photo showing location **(if available)**			Any other project plans, photographs, or drawings that may help CRT in making determination **(if available)**

Directions to Project: (if not obvious)	
Description of Undertaking:	Describe proposed project and means to facilitate (e.g., provide funds to revegetate 1 mile of riparian habitat, restore 250 acres of seasonal wetlands, and construct a 5-acre permanent pond). How is the project designed (e.g., install 2 miles of fence and create approximately 25' of 3' high check dam)?

Area of Potential Effects (APE):	Describe where disturbance of the ground will occur. What are the dimensions of the area to be disturbed? How deep will you excavate? How far apart are fenceposts? What method are you using to plant vegetation? Where will fill be obtained? Where will soil be dumped? What tools or equipment will be used? Are you replacing or repairing a structure? Will you be moving dirt in a relatively undisturbed area? Will the project reach below or beyond the limits of prior land disturbance? Differentiate between areas slated for earth movement vs. areas to be inundated only. Is the area to be inundated different from the area inundated today, in the recent past, or under natural conditions? Provide acres and/or linear ft/m for all elements of the project.
Environmental and Cultural Setting:	Briefly describe the environmental setting of the APE. **A)** What was the natural habitat prior to modifications, reclamation, agriculture, settlement? **B)** What is land-use history? When was it first settled, modified? How deep has it been cultivated, grazed, etc.? **C)** What is land use and habitat today? What natural agents (e.g., sedimentation, vegetation, inundation) or cultural agents (e.g., cultivation) might affect the ability to discover cultural resources? **D)** Do you (or does anybody else) know of cultural resources in or near the project area?